ECONOMICS OF TOURISM TAXATION:
A STUDY OF TOURISM TAXES IN AUSTRALIA

By

RANJITH IHALANAYAKE
B.Sc. (Public Administration) Special, M. Bus. (Tourism Development)

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Faculty of Business and Law

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This thesis is dedicated to

My Mother &

My wife Aja who sacrificed her career for my higher education

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ABSTRACT

This thesis examines the current Australian tourism tax structure and analyses the effects of tourism taxes on the Australian economy. The analysis is based on simulations carried out using a computable general equilibrium model (CGE) of the Australian economy, a modified version of the ORANI-G model which incorporates two tourism sectors, the domestic and international, explicitly using the dummy sector approach. In addition, a finance module was also incorporated into the model to facilitate the analysis.

The economic effects of tourism taxes were evaluated, under a number of scenarios, by examining what would happen to the Australian economy if existing tourism taxes are changed and/or new taxes are introduced. The nature of the effects of such tax changes on the economy varies and the manner in which these effects vary is a reflection of the assumptions about different economic environments considered - the short-run and long-run. The short-run economic environment is somewhat rigid and it was assumed that real wage rate and industry-specific capital stock are exogenous while aggregate employment and the rate of return on capital are endogenous. Further, all the components of domestic absorption including household consumption, investment, government consumption and inventory changes are assumed to be exogenous and the balance of trade is endogenous. Some of these assumptions were relaxed in the long-run where it was assumed that real wage rate and the current capital stock are endogenous and aggregate employment and the rate of return are exogenous. In relation to domestic absorption, both government spending and investment are assumed to be exogenous while household consumption is endogenous.

The alternative scenarios under which the economic effects of tourism taxes are investigated relate to differing assumptions about the economic rationale of taxing tourists. They are, respectively, the externality argument and public revenue maximisation. Three main simulations were carried out focusing on: (i) recovery of external costs generated by tourists; (ii) funding tourism-related public goods; and (iii) maximisation of government revenue.

The simulation results show that tourism tax increases can cause a considerable reduction in international tourism consumption both in the short-run and long-run. The initial effects of a fall in tourism consumption are felt in substantial output contractions in tourism-related sectors while other sectors experience output expansions. Overall, all three simulations reveal that increases in tourism taxes can have broader, negative economy-wide effects in the short-run as reflected in reductions in real GDP and aggregate employment. However, the effects of such tax changes appear to be different in the long-run. The simulations show that in the long-run, tax increases bring about marginal expansions in overall economic activities. Furthermore, these expansionary effects are reflected in: (i) increases in the current capital stock resulting from improved terms of trade, and (ii) increases in real household consumption resulting from improved after-tax real wage, an indication that tourism tax increases are welfare-improving in the long-run.

Two additional simulations were also carried out to evaluate alternative tourism tax policy scenarios, a tax refund scheme and an introduction of a broad base commodity tax that replaces existing tourism taxes. The results indicate that both of these policy changes are beneficial to the tourism sector as they effectively reduce the cost to tourists and hence increase demand for tourism goods and services. However, the macroeconomic effects of these policy changes vary. The first policy simulation (tax refund) indicates an increase in real GDP in the short-run while a marginal reduction is evident in the long-run. By contrast, the simulation of the second policy scenario (tax abolition) reveals substantial macroeconomic contractions both in the short-run and in the long-run.

These findings, however, should be viewed in the context of the particular modelling structure applied, and the various assumptions used in the simulations. Our findings are subject to the inherent limitations of CGE models and the particular version applied, and the database used in this study. Subject to these limitations, policy inferences are made.

Policy changes considered in the simulations were compared and evaluated based on their overall effects. This led to the conclusion that significant changes in the current tax structure should not be considered. In particular, significant tax increases tested for maximisation of government revenue were not supported. While these tax increases are appealing in terms of their ability to increase government revenue, they tend to generate substantial negative effects on the tourism sector in particular, and on the economy in general. Though they result in some expansionary effects in the long-run, these are negligibly small, and thus it appears that there is little room for using the tourism sector as a source of raising government tax revenue. In relation to tourism externalities there appears to be a case for consideration of either increasing existing taxes or introducing a new tax, as the existing taxes do not yield sufficient revenue to recover the externality cost. Although such tax increases could have negative effects on the tourism sector, on efficiency grounds such tax changes may be justified.

DECLARATION

"I, Ranjith Ihalanayake, declare that the PhD thesis entitled Economics of Tourism Taxation: A Study of Tourism Taxes in Australia is no more than 100,000 words in length, exclusive of tables, figures, appendices, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work".

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CHAPTER ONE
BACKGROUND, OBJECTIVES AND THE STRUCTURE OF THE THESIS

1.1. Background and Objectives of the Study

Tourism taxation has become an issue of interest among academics, policy makers and industry representatives. Policy makers may consider tourism taxation as a convenient tool that can be used to raise government revenue and to address some tourism-related issues such as negative externalities. Industry representatives view tourism taxation as a possible threat. This is largely based on the premise that tourism taxes could drive potential tourists away from a destination since they could adversely affect tourism price competitiveness. From an academic perspective, tourism taxation is of specific interest since it is a relatively recent phenomenon and thus many of the theoretical and empirical aspects remain largely unexplored. While these parties may differ in their approach to the issues surrounding tourism taxes and their effects, there are several important issues of common interest. These include tourism's tax structure, its levels and magnitude, and the effects of tourism taxation. Explicitly or implicitly, these issues are the underlying theme of most research into tourism taxation.

In Australia, tourism taxation and the related issues have been addressed in a number of previous studies. The first formal discussion was an industry study carried out by the Industries Assistance Commission (IAC 1989a) entitled '*Some Economic Implications of Tourism: An Inquiry into Travel and Tourism*' and in this the broad policy issue of whether international tourism should be taxed was discussed. The study made no specific recommendations for a particular tourism tax policy. Nevertheless, it was instrumental in furthering other inquiries into tourism taxation. For instance, Divisekara (1995, 2001, and 2002) examined the issue of tourism taxation in the context of rent extraction from international visitors and the effects of the Goods and Services Tax (GST) on tourism within a partial equilibrium setting. Except for two studies by (i) Dixon and Rimmer (1999a) in which the effects of the GST on the tourism sector were addressed and (ii) Giesecke *et al.* (1997) which was limited to an analysis of the effects of an accommodation duty, much of the general equilibrium aspects of tourism taxation in Australia have not been addressed so far.

In the global context, much of the early work focused on very specific aspects of tourism taxation i.e. hotel room taxes in Hawaii and the US. They were predominantly based on partial equilibrium models analysing issues such as the tax burden and the exportability of taxes (Bonham *et al.* 1992, Combs and Elledge 1979, Fujii *et al.*1985, Hiemstra and Ismail 1992, 1993, Mak 1988 and Mak and Nishimura 1979). These were followed by the studies of Wanhill (1995) and Jensen and Wanhill (2002) which departed considerably from the above studies. They analysed the effects of changes in Value Added Tax (VAT) rates in the UK and Denmark, respectively and applied an economy-wide approach. However, even in the global context, applications of general equilibrium models to examine issues in tourism taxation have not been common, apart from a few recent exceptions such as Blake (2000) and Gooroochurn and Sinclair (2005). Blake studied the general equilibrium effects of accommodation taxes in Spain, while Gooroochurn and Sinclair analysed the equity and efficiency effects of tourism taxation in Mauritius.

The available studies in both the global and Australian contexts make a substantial contribution to our understanding of the effects of various taxes on the tourism sector in general. However, none of these examines the full picture, which includes tourism's tax structure, its levels and the extent of tourism taxes in Australia, together with analysis of the economic effects of such taxes. This is a major drawback from a policy perspective since a clear understanding of the current tax structure, its effects and the economic underpinning of tourism taxation is necessary for any meaningful policy discussion about tourism taxation.

Against this background, the main objective of this study is to make a contribution by studying the current tourism tax structure and by analysing the effects of tourism taxes in Australia. In the process, this study attempts to analyse and evaluate the economic effects of tourism taxes within a general equilibrium framework. To achieve this, a Tourism Tax Model (TTM): a modified version of the ORANI-G model (computable general equilibrium model, CGE) will be developed by incorporating tourism sectors and it will be applied to analyse the effects of tourism taxes. This study, therefore, will provide a basis for better informed policy debate by analysing alternative tourism tax policy changes within a theoretically consistent framework, and by developing a framework within which tourism tax policy measures can be formulated. More specifically, the proposed study aims to achieve the following:

i. Examine and audit various taxes and levies specific to the wider tourism sector in Australia.
ii. Estimate revenue generated through various taxes.
iii. Evaluate the current state of tourism taxation and develop a framework to analyse policies towards an equitable tax regime.
iv. Develop a model explicitly incorporating tourism sectors that can be applied to examine tourism policy issues.
v. Analyse general equilibrium effects of tourism tax changes within the Australian economy.

In achieving the above objectives, this thesis will make several contributions to the empirical literature, the methodology and data. It will make its major contribution to the empirical literature in two ways: first, by examining the current tourism tax structure and by estimating the total tax revenue attributable to the Australian tourism sector; and second, by analysing the general equilibrium effects of tourism tax changes in Australia. With regard to methodology, the thesis will make two contributions. First, it will be the first study to apply Tourism Satellite Accounts to estimate tax revenue attributable to the wider tourism sector. Second, it will also make its contribution to the methodology by applying a CGE model with explicit tourism sectors to analyse a tourism tax issue. Finally, the tourism tax database developed in this study will be a useful basis for future research in tourism taxation in Australia. Overall, the findings of the thesis will provide relevant background information to further policy debate on tourism taxation.

1.2. The Scope of the Study

This study involves an examination of the current Australian tourism tax structure and an analysis of the effects of tourism taxes within the sector, as well as within the Australian economy. Both the domestic tourism and international tourism sectors are considered. The study covers the period 1993 – 2003.

1.3. Structure of the Thesis

The thesis contains ten chapters. Chapter Two draws the conceptual and theoretical background for the major issues addressed in the thesis. This chapter begins with defining tourism, the tourism product and the tourism sector and describes the implications of taxing tourism based on the specific features of tourism. A review of the major concepts in tourism taxation, including definitions of tourism taxes, various classifications, typologies and tourism tax principles is presented. The main arguments for tourism taxation are also outlined and these include internalising externalities, rent extraction and government revenue generation. This is followed by a discussion on the general arguments in favour of tourism taxation, and the arguments against it.

The remainder of the chapter reviews tourism taxation in the context of general tax theory. It includes an overview of the effects of tourism taxes and an outline of partial equilibrium perspectives of tourism tax changes. This is followed by a review of the effects of tourism tax changes in a general equilibrium setting, highlighting the likely limitations of a partial equilibrium framework to explain tourism tax changes. Welfare changes arising from tourism tax policy changes and various measurements of welfare changes are outlined, and a review of previous empirical studies are presented at the end of the chapter.

An overview of the economic significance of the Australian tourism sector is contained in Chapter Three. In particular, this chapter analyses the growth, structure, and the contribution of the tourism sector to the economy. The chapter begins with the recent growth trends of the Australian tourism sector within the broader global and regional markets. The growth trends of the Australian tourism sector in relation to domestic tourism and international tourism are analysed, and the economic significance of Australian tourism is highlighted. The aggregate contribution of the Australian tourism sector within the economy is evaluated.

In Chapter Four an examination of the current tourism tax structure in Australia, together with tourism tax estimations for the period 1993 – 2003, are provided. First, Australia's general tax structure, focusing on the tax structure before and after the tax reforms of 2000, is explained. This is followed by a discussion of the Australian tourism tax structure where tourism taxes are categorized as 'general' and 'special' tourism taxes. The data sources used and the methodology applied in the estimation of tourism tax revenue are described and estimates of tourism taxes over the 1993-2003 period are presented along with an estimate of the total tax contribution by the tourism sector. Based on these estimates, the tourism sector's tax contribution is compared with those of two comparable sectors: mining and retail.

An assessment of the current state of the tourism tax structure is given in Chapter Five. The assessment is based on two major tourism tax policy issues (i) internalising externalities that includes recovering the external cost of tourism and funding tourism-related public goods and (ii) maximising government revenue. In line with the theory of externalities, the external cost of international tourism is estimated and the total tax revenue from relevant taxes is compared against the external cost. The cost of public goods consumed by international visitors is approximated and then the total tax revenue attributable to international tourism is compared with this cost. Finally, based on the current international tourism pricing structure, the levels that maximise government tax revenue are estimated. In each assessment, a tourism tax policy scenario is developed and a range of tourism tax policy changes is proposed.

Chapter Six reviews the current literature in relation to alternative modelling tools for tourism policy analysis and, accordingly, three major alternatives: partial equilibrium, input output (IO) and general equilibrium (GE) or computable general equilibrium models, are identified. The chapter begins with a review of partial equilibrium and IO models by highlighting both their relevance and limitations in addressing tourism policy issues. This is followed by a detailed review of CGE modelling highlighting the nature, characteristics, strengths and limitations of such modelling. This includes a historical view of GE modelling in general, and in Australia in particular, and also includes the structure of a CGE model and CGE modelling as applied in tourism research, noting possible limitations. A new perspective of CGE modelling in tourism, which is the incorporation of tourism sectors using the "dummy sector approach", is introduced.

The development of the Tourism Tax Model (TTM, a CGE model), a modified version of the ORANI-G model, is outlined in Chapter Seven. The chapter delineates all modifications undertaken in the development of the TTM including the incorporation of two tourism sectors based on a dummy sector approach and the addition of a finance module, following Parmenter (1988) and Adams *et al.* (2003).

The chapter begins with an overview of the general theoretical structure of the ORANI-G model. This is followed by a discussion of the theoretical aspects of the tourism sectors and finance module incorporated. Both the demand and supply sides of the two tourism sectors, domestic and international, are outlined. The second section of the chapter deals with the database development undertaken in the development of the TTM. This includes the adjustment of the ORANI-G core database to include the GST system, development of a tourism database (tourism consumption vectors) and the merging of this with the core database and the development of the finance database.

All experimental simulations in line with the policy scenarios developed in Chapter Five are carried out and results are analysed in Chapter Eight. Simulations are carried out using the TTM developed in the previous chapter. Three sets of simulations in relation to recovering the external cost of tourism, funding tourism-related public goods and maximising government revenue are carried out and the results are analysed to understand the general equilibrium effects of tourism tax changes. They are followed by the analysis of the results of two sets of simulations carried out in relation to a tourism tax refund scheme and the abolition of current tourism taxes.

In Chapter Nine, alternative tourism tax policy changes that are tested in simulations in Chapter Eight are compared and evaluated with a view to providing guidelines to formulate an Australian tourism tax policy. This chapter begins with a discussion of summary measures of all tourism tax policy changes, which also leads to a comparison across alternative policies. This is followed by an evaluation of alternative tax policy changes and policy inferences are drawn. Guided by the evaluation and policy implications, suggestions for a viable and equitable tourism tax policy for Australia are made.

Chapter Ten summarises the main findings of the study, highlights its contributions and limitations, and proposes an agenda for future research.

CHAPTER TWO

ECONOMICS OF TOURISM TAXATION:

A Review of Conceptual and Theoretical Issues

The aim of this chapter is to draw a conceptual and theoretical background for the major issues addressed in the thesis. The chapter is divided into several sections. Section one defines tourism, the tourism product and highlights features that distinguish the tourism product from others. Section two is a review of major concepts in tourism taxation including various classifications, typologies and tax principles. Section three outlines arguments for and against tourism taxation highlighting major economic arguments for tourism taxation. Section four examines the effects of tourism taxes both from partial equilibrium and general equilibrium perspectives while section five reviews empirical evidence for tourism taxation. The last section summarises the chapter.

2.1. Tourism: Definitions and Concepts

Tourism arises from the human desire for travel, exploration, leisure and recreation and thus tourism history could run back thousands of years. Following its long history, definitions of the term "tourism" keep evolving over time. The Oxford Dictionary defines tourism as "business of providing accommodation and services for tourists". This views tourism as a pure service and considers tourism only from the tourism supplier's point of view. Thus, it ignores to a greater extent the tourist's own experience. Moreover, this narrow definition emphasizes on one major component of the total tourism experience: accommodation. The remaining components of tourism are covered by the term "services" and thus physical objects or goods consumed by tourists are ignored.

In the current study, we adopt the definition recommended by the United Nations according to which tourism includes "the activities of persons travelling and staying places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited" (OECD, EC, UN and WTO 2001, p. 13).[1]

[1] This definition represents international standards of the concept of tourism, and is adopted in the development of tourism satellite accounts around the world. For example, the Australian Bureau of Statistics (hereafter ABS, 2004a) adopted this definition in the development of the Australian Tourism Satellite Account (ATSA).

This definition is broad and it views tourism from the tourist's perspective, covering all his/her experiences and activities. Similarly, in our study, we take a broader view of tourism whereby those who are travelling and staying outside their usual environment are recognised as visitors. "A visitor is any person travelling to a place other than that of his/her usual environment for less than twelve months whose main purpose of trip is other than the exercise of an activity remunerated from within the place visited" (OECD, EC, UN and WTO 2001, pp. 13).[2]

Not only is a broader view adopted with the terms tourism and visitor, several visitor categories are recognised in our study, including visits for holiday or leisure, visits to friends and relatives (VFR) and visits for business and any other purpose. The latter can include visits for study purposes, attendance at conferences or conventions, and for medical treatment where the travel period is less than one year. Visitors can also be identified broadly as domestic (interstate or intrastate visitors) and international visitors.

In conventional economic activity, buyers purchase a commodity produced by a sector or an industry. Does this conventional activity apply in tourism and can we identify a tourism product and sector? The following sections will address these two issues.

2.1.1. The Tourism Product and Its Nature

It is clear that tourism covers a wide range of activities and experiences by visitors in a given destination. Therefore, the tourism product may be defined as the one that covers all goods and services consumed by visitors, those activities undertaken in the destination and experiences by visitors in the destination.[3] Medilik and Middleton (1973) defined the tourism product as a bundle of activities, services and benefits that constitute the total/overall tourism experience. The bundle includes destination attractions, destination facilities, accessibility, and images. While this definition is comprehensive in the sense that it covers most components of the total tourism

[2] We use terms visitor and tourist interchangeably throughout this study with the same meaning as shown in this definition.

[3] A product can be defined as anything that can be offered to the market for attention, acquisition, use or consumption, which might satisfy human needs and wants. It includes physical objects, services, ideas, advice, places, people, organizations and programs (Kotler 2003).

product, it narrows its focus by defining tourism as a pure service. It is true that tourism is primarily a service but it can include physical objects as well.[4]

Jefferson and Lickorish (1988) extended their definition to include what was lacking in the previous one and noted that the tourism product is a collection of physical features together with symbolic associations, which are expected to fulfil the visitor's requirement in the destination. Even though this definition does not identify the type of goods and services and activities included in the tourism product, it provides a useful direction to find the most suitable definition for the tourism product.

Smith (1994) considered a much broader view even towards tourism and defined the generic tourism product. This includes the physical plant, service, hospitality, freedom of choice, and involvement. In Smith's model, these elements are introduced as a series of concentric circles starting from the physical plant as the core. As the visitor moves away from the core, increasing consumer involvement and increasing intangibility are evident.

Tisdell (2001, p. 55) noted "tourism is both a composite commodity and a mixed good. It consists of some portions, which are private goods and other components, which include collective or pure public goods, open access commodities and favourable or unfavourable external consumption elements". In this definition, Tisdell emphasized the types of goods and services included in the tourism product from the economics perspective.

Following these definitions, it is clear that the tourism product differs from other conventional products and it includes a range of sub-components that most likely are produced by different sectors or industries. Therefore, we consider the tourism product as a composite product consumed by the visitor on the way to, and within, the destination. Thus, the tourism product that we adopt in the current study includes food and drinks, accommodation, transport, entertainment and leisure, sporting activities, business activities, education and training, health, other goods and services and

[4]Palmer (1998, pp. 2) defined "A service is any activity or benefit that one party offers to another, which is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product".

package tours (Forsyth *et al.* 1995). Furthermore, it consists of both private goods as well as public goods.

2.1.2. Tourism Sector or Industry?

The composite tourism product comes from various related sectors or industries within the economy. Thus, the tourism product is not a homogenous one that has a single production process, rather it has multiple production processes in various sectors and industries. Therefore, from the conventional perspective, it is doubtful whether a single sector or an industry can be identified as "tourism". Conventionally, economic sectors or industries are defined based on their supply or output. In contrast, tourism is defined and identified based on the demand for the activity.

Wilson (1998) argued in favour of the conventional view towards tourism and noted that tourism is not, and cannot be, an industry. However, he further wrote that it is possible to identify a set of closely related industries as tourism-related industries. ABS (2000) adopted a similar approach in the development of ATSA. Three categories of industries are identified in ATSA as tourism-related and they are tourism characteristics, tourism-connected and all other industries. These are classified based on the volume and the degree of tourism concentration in the production of the said industry.[5]

In the current study, we follow the same line to define tourism as a multifaceted sector/industry, which is a combination of tourism-related sectors including tourism characteristics, tourism-connected and all other industries. Thus, the tourism sector compiles or combines all relevant components of the tourism product and offers it to the relevant visitor category, domestic or international. Subsequently, the tourism sector generates strong forward and backward linkages with the rest of the economy.

2.1.3. Distinguishing Features of the Tourism Product

It appears that the tourism product differs considerably from the conventional product. This section highlights the distinguishing features of the tourism product and their implications.

[5] For more details about the development of TSAs and the role of WTO and WTTC in initiating the development of TSAs, see Section 4.4.

The tourism product can be sold to two main categories of buyers: local residents (domestic visitors) and foreigners (international visitors). The first distinguishing feature is that from a trade theoretic perspective, the tourism product sold to a foreigner is regarded as a service export (Clarke 1997). However, the trade in tourism significantly differs from trade in other goods in several aspects. Firstly, Copeland (1991) argued that in contrast to commodity exports, a tourist must visit the exporting country to purchase and consume the tourism product. Accordingly, the consumption of this export takes place within the exporting country itself. In commodity exporting, goods are sent across national boundaries and the consumption takes place in the foreign country. Secondly, tourists typically consume a bundle of goods and services while in a destination. Hence, in making travel plans, they assess the cost of the implicit travel package as a whole, whereas, in individual goods purchasing, consumers make individual decisions as to the purchase of each good.

The second distinguishing feature of the tourism product is that its exportability may generate a strong demand for some otherwise non-tradable goods and services (Copeland 1991). An accommodation service sold to an international visitor, for example, is an un-exportable service without the presence of foreign tourists. Tourism, therefore, expands the trading and exporting capacity of a country. The final distinguishing feature of the tourism product is that it is not produced and offered by one sector or industry, but by various industries in the economy. Given the above three distinguishing features of the tourism product, any change in one sector, for example the imposition of taxes or tax reductions, will have far reaching economic implications for other sectors of the economy.

2.2. Tourism Taxation: A Government Intervention in the Sector

Tourism taxation is a part of government's interventionist approach in the sector and such intervention may have several justifications. Of these, the efficiency justification is important and it is based on two interdependent ideas: first that markets fail to achieve an efficient allocation of resources, and second that government intervention can correct rather than exacerbate the degree of allocative distortion (Bailey 1995). Additionally, it can be used to achieve distributive efficiency. Government intervention in realizing these efficiency and equity goals comes under the various economic roles that government needs to play.[6]

The Oxford Dictionary defines a "tax" as "money to be paid by people or businesses to a government for public purposes". This definition confirms that taxes are mandatory payments collected by government to fund the provision of public services. Woellner *et al.* (2002, p. 66) quoted a similar definition of a tax: "a compulsory exaction of money by a public authority for public purposes enforceable by law". Musgrave and Musgrave (1984) wrote that taxes are the price of civilization and they are not voluntary payments but mandatory impositions, payable in line with whatever tax statute has been legislated. Although these definitions slightly differ in wording, they all share the common characteristics of a tax. These characteristics are as follows (Woellner *et al.* 2002):

i. it is a compulsory payment;
ii. the moneys are raised for government purposes;
iii. the exactions do not constitute payment for services rendered;
iv. the payments are not penalties;
v. the exactions are not arbitrary; and
vi. the exaction should not be incontestable.

However, taxes are not the only source of government income. Government borrowings, income from government businesses, foreign aid and grants and charges for government services are also important sources. Among these, taxation constitutes a major portion of the budget.

Taxes are traditionally classified into two types: direct taxes and indirect/consumption taxes. Direct taxes are levied on incomes, profits and wealth. Some of the examples in this category are personal income tax, corporation tax, fringe benefit tax and

[6] According to Bailey (1995), there are four main economic roles of government. They are as follows: (i) the allocative role: the government undertakes the role of allocation of resources to maximise efficiency. (ii) the distributive role: the government balances efficiency with equity in the allocation of resources by using taxation, social security and the distribution of public goods to influence the distribution of income, (iii) the regulatory role: in order to make sure that the market economy functions with maximum efficiency, the government legislates and enforces laws of contract, consumer protection, and justice, and (iv) the stabilization role: the government also undertakes the role of tackling very important macroeconomic policy issues such as inflation and unemployment, using fiscal, monetary and other economic policies.

superannuation tax. The payer of a direct tax cannot shift the direct burden of these taxes to another party. Indirect taxes on the other hand, are taxes that are levied mainly on expenditures and include value added tax, sales taxes, customs and excise duties and gambling taxes. The major distinction between these two categories is that the payer of an indirect tax can shift the burden to another party.

2.2.1. Defining Tourism Taxation

Defining tourism taxation is not as easy as defining general taxes for two reasons: (i) tourism taxation is a relatively new branch in the tourism literature; and (ii) there are no such things as "tourism taxes" in the general tax regime that are readily identifiable. This raises questions as to what constitutes tourism taxes and how to identify them. However, by considering on which products the taxes are imposed, and their impact, tourism taxes can be identified.

According to WTO (1998b, p.16) tourism taxes are "taxes which could be described as applicable specifically to tourists and the tourism sector or, alternatively, if not specific to the tourism sector, those which are applied differently in tourist destinations". These taxes come in a variety of ways and it is observed, as shown in Table 2.1, that there are more than forty such taxes world-wide. Some of these taxes are imposed on tourism businesses while others are imposed on tourists.

By looking at the different types of taxes shown in Table 2.1, one might wonder how, and on what basis, some of these are considered tourism taxes. They may include, for instance, passenger movement charge, visa charges and toll charges. Although these are imposed to cover the cost of provision of such services and, in some cases, everyone else other than tourists pay these charges, it is often argued that these charges act as barriers to international movements of people. Travellers have often argued that the visa application process is cumbersome and time-consuming (Durbarry and Sinclair 2001). Against this background, these charges may well be recognised as tourism taxes.

Table 2.1: Tourism Taxation Typology

	Sector	Type of the tax/charge/fees/duty	Charged to
1	Air Travel	Air passenger duty	Tourist
2		Air passenger ticket levy	Tourist
3		Air craft noise levy	Tourist
4		Passenger service charge	Tourist
5		Safety & security charge	Tourist
6		Aircraft fuel tax	Business
7		Aircraft landing charges	Business
8		Aircraft parking charges	Business
10		Terminal charges	Business
11	Entry/Exit	Passenger movement charge	Tourist
12		Departure tax/Foreign travel tax	Tourist
13		Visa charges/Travel permit	Tourist
14	Hotel and Accommodation	Bed tax/Bed night tax	Tourist
15		Occupancy tax	Tourist
16		Hotel tax	Tourist
17		Lodging tax/Accommodation tax	Tourist
18		Value Added Tax (VAT)	Tourist
19		Goods and services tax	Tourist
20		Wholesale sale tax	Tourist
21		Sales tax	Tourist
22		Business turnover tax	Business
23		Company income tax	Business
24		Fringe benefit tax	Business
25		Payroll tax	Business
26		Land tax/Property taxes	Business
27		Customs and duties	Business
28	Food/Meals/Drinks	Wholesale sales tax/VAT/GST	Tourist
29		Liquor taxes/duties/Tobacco duties	Business
30		Wine equalisation tax	Business
31	Road transport	Car rental duty	Tourist
32		Fuel tax	Business
33		Toll charges	Tourist
34		Registration recovery charge	Tourist
35		Premium location surcharge/Airport tax	Tourist
36	Environment	Environmental management charge/Surf tax	Tourist
37		Eco-tourism tax	Business
38		Carbon tax	Business
39	Gambling	Gambling taxes	Business
40		Betting tax	Business
41	Tourist attractions	Visitor attractions tax	Tourist
42		GST/Sales taxes	Tourist

Source: Adapted from WTO (1998b) and modified.

2.2.2. Different Tourism Tax Typologies

In order to gain a clear understanding of the issues related to tourism taxation, it is important to look at different types of tourism taxes, categories, and different sectors that are affected by tourism taxes. Tourism taxes can be classified in two different ways as shown in following sections.

2.2.2.1. First Classification

Tourism taxes can first be classified by looking at the nature of the tax. Forsyth and Dwyer (2002) placed tourism taxes in two categories, namely, general taxes and special or differential tourism taxes. General tourism taxes are "those imposed generally on the supply of tourism goods and services, income arising from tourism businesses, and compensation to employees of tourism businesses". While it is true that these are essentially part of general taxes, both tourism suppliers and tourists bear a significant portion of the tax burden. Hence, these taxes constitute tourism taxes and are accordingly defined as general tourism taxes. Table 2.2 shows different types of general tourism taxes imposed on the tourism sector around the world.

Table 2.2: General and Special Tourism Taxes

General Tourism taxes	Special tourism taxes/charges/duties
Value added tax	Air passenger duty
Goods and services tax	Air passenger ticket levy
Wholesale sale tax	Air craft noise levy
Sales tax	Passenger service charge
Business turnover tax	Safety & security charge
Company income tax	Aircraft fuel tax
Personal income tax	Aircraft landing charges
Fringe benefit tax	Aircraft parking charges
Payroll tax	Terminal charges
Land tax/Property taxes	Passenger movement charge
Wine equalisation tax	Departure tax/Foreign travel tax
Customs duties	Visa charges/Travel permit
Excise duties	Bed tax/Bed night tax
Gambling taxes	Occupancy tax
Betting tax	Hotel tax
Carbon tax	Lodging tax/Accommodation tax
	Car rental duty
	Fuel tax
	Toll charges
	Registration recovery charge
	Premium location surcharge/Airport tax
	Environmental management charge/Surf tax
	Eco-tourism tax
	Visitor attractions tax

In addition to these general tourism taxes, the tourism sector is also subject to some other special taxes and they can be defined as "those imposed specifically on the tourism product or its components and tourism service providers" (Gooroochurn and Sinclair 2003). Column 2 of Table 2.2 presents a list of special tourism taxes. There are two reasons why special tourism taxes are important: (i) most of these special taxes are imposed on the sector in addition to existing general taxes; and (ii) in most destinations there are more special tourism taxes than general taxes (this is clear from the table). The latter form the basis of one of the strong arguments by tourism sector representatives to claim that the tourism sector is heavily taxed, as there are more special taxes levied on the sector in addition to general taxes. Overall, tourism taxes are levied at different levels of government such as national, state and local government.

2.2.2.2. Second Classification

This classification is done considering the party on which the tax is imposed thus tourism taxes are broadly categorized into two, namely: (i) taxes directly imposed on tourists; and (ii) taxes imposed on user businesses (WTO 1998b, Gooroochurn and Sinclair 2003). Special attention is paid to identifying the sectors or industries that are affected by tourism taxes.

Taxes Imposed on User Businesses

Table 2.3 categorizes different taxes imposed on tourism businesses around the world and seventeen such taxes are identified. Air transport, road transport, food and beverages, hotel and accommodation, recreation and other services are the major tourism sectors that could be directly affected by tourism taxes. Almost all these sectors are largely dependant upon international and domestic tourism. Furthermore, these are the core sectors by which a significant portion of the composite tourism product is produced. The imposition of taxes on such sectors/businesses could discourage them and could jeopardize the growth momentum of those sectors. From the list of taxes given in Table 2.3, it appears that most of these taxes are existing general taxes that are applicable to tourism. From an administrative point of view, it appears that these taxes are easy to administer. They may not need specific administrative mechanisms and they may be easily collected via existing systems.

Taxes Imposed on Tourists

Taxing tourism businesses does not seem as lucrative as taxing tourists (Goorrochurn and Sinclair 2003). Consequently, tourists are often targeted by taxation more than tourism businesses. As Table 2.3 shows, there are at least 23 different taxes imposed on tourists around the world and of these the majority appear to be special tourism taxes. Although special taxes imposed on tourists are numerous, they may have less significance in terms of tax revenue. For instance, general taxes such as VAT/GST, wholesale sales tax or sales tax could generate much more tax income than special taxes.[7] Moreover, as noted above, the advantage of using these consumption taxes in tourism is that they do not need special deliberate tourism tax policies (Gooroochurn and Sinclair 2003).

Table 2.3: Taxes Imposed on Tourism Businesses and Tourists

Taxes Imposed on Businesses	Taxes Imposed on Tourists
Aircraft fuel tax	Air passenger duty
Aircraft landing charges	Air passenger ticket levy
Aircraft parking charges	Air craft noise levy
Terminal charges	Passenger service charge
Customs and duties	Safety & Security charge
Liquor taxes/duties/Tobacco duties	Passenger movement charge
Wine equalisation tax	Departure tax/Foreign travel tax
Fuel tax	Visa charges/Travel permit
Eco-tourism tax	Bed tax/Bed night tax
Carbon tax	Occupancy tax
Gambling taxes	Hotel tax
Betting tax	Lodging tax/Accommodation tax
Business turnover tax	Car rental duty
Company income tax	Toll charges
Fringe benefit tax	Registration recovery charges
Payroll tax	Premium location surcharge/Airport tax
Land tax/Property taxes	Environmental management charge/Surf tax
	Visitor attractions tax
	Value Added Tax
	Goods and services tax
	Wholesale sale tax
	Sales tax

Although taxing tourists is seen as advantageous, it may generate some complexities as well. First, post-tour satisfaction of the tourist is negatively affected. On realizing that the tourist has been heavily taxed, the likelihood of a repeat visit can be significantly reduced. Second, as information about taxes and other factors during the destination is now readily available, it cannot be assumed that this information will not reach the tourists before the trip and might affect the destination choice. These two factors might plausibly drive tourists away from highly taxed destinations.

As explained so far, tourism taxation has become a major issue in recent years, since governments use taxing tourism to generate revenue and as a way of maximising national gains. Tourism taxation is an effective and contemporary policy tool that can

[7] In Australia, the total collection of general tourism taxes accounted for $5001 million while the total collection of special tourism taxes accounted for $622 million in 2002. Out of the total of general tourism taxes, the GST contribution was $3547 million, which was almost six times higher than the total of special tourism taxes.

replace some traditional policy tools. Consequently, numbers and types of tourism taxes have increased. WTO (1998a, 1998b) claimed that around forty different taxes have been levied on tourism worldwide. WTO further estimated that travel and tourism directly and indirectly generated US $802 billion in taxation revenue or 10.6 per cent of global taxation in 1998. It is forecast that by 2010, this will increase to US $1,800 billion, or 12 per cent of global taxation, and this suggests that the world tourism sector has become an easy target for taxation.

2.2.3. Principles of Tourism Taxation

In appraising a tourism tax system, it is imperative that such a system is assessed against tax principles. It is widely accepted that good taxation should comply with three main principles; (i) efficiency; (ii) equitability; and (iii) administrative simplicity. Efficiency stands for the minimum distortion caused by the tax system. In the case of a GST, it should result in a minimum change in patterns of consumption from the untaxed patterns. Equity, a more subjective concept, concerns a society's preference for how different income groups and other groups should share the tax burden. The idea is that higher-income earners should bear more burdens than low-income earners do. Administrative simplicity means that the cost of collecting tax should be as low as possible (Forsyth and Dwyer 2002).

The WTTC, in its attempt to address the issue of tourism taxation, has formulated a set of alternative Travel and Tourism Taxation Principles (Lipman 1996, Myers *et al.* 1997). They are:

i. Efficiency: The development of tax policies that have a minimal effect on the demand for travel and tourism.
ii. Equity: The fair and evenhanded treatment of travel and tourism with respect to other sectors.
iii. Simplicity: The smooth and efficient operation of the travel and tourism system requires that the taxes levied on the tourism industry should be simple both in terms of mechanism for payment and bureaucratic administration.
iv. Fair revenue generation: Fair revenue generation arises out of the concept of equity.
v. Effective stimulus to growth: Tax incentives and disincentives should be imposed with the underlying goal of stimulating the growth of the sector.

In the following sections, tourism taxes are analysed against the WTTC tourism tax principles outlined above and implications are drawn.

2.2.3.1. Tourism Taxes and Efficiency

Taxing tourism is believed to be efficient on two grounds. First, there is a general rule relating to the efficiency of taxation that the broader the tax base the better it is. In this sense, it is obvious that taxing tourism is efficient as it widens a country's tax base that would otherwise comprise only locals. With a larger tax base, government tax revenue is also larger (Gooroochurn and Sinclair 2003) and this is one of the strong arguments put forward by governments to justify their decisions to target tourists.

Second, it is argued that tourism taxes tend to improve domestic welfare. From a general equilibrium theoretic perspective, tourism taxes, particularly special tourism taxes, can be considered as partial commodity taxes. Imposition or increases of such taxes tend to reduce other commodity prices while they increase tourism prices. Accordingly, household consumption may increase due to reduced commodity prices. Moreover, tax-induced demand reductions from international visitors imply that those commodities are available for local consumption. In this context, tourism taxes lead to increases in household consumption hence welfare improvements.

2.2.3.2. Tourism Taxes and Equity

It is often argued that the tourism sector is targeted for taxation via differential or special taxes. Economic theory suggests that differential taxation should be based on factors such as the price elasticity of demand for products. Less price-elastic products are very promising candidates for tax purposes since a tax does not distort demand much in the same way as an elastic product. The case for taxing tourism seems to be less strong from a differential taxation perspective since the available empirical evidence regarding tourism demand elasticities is complex. However, based on the luxurious nature of the tourism product, the differential tax argument may be justified. It is argued that luxury items should be more heavily taxed than necessities (Forsyth and Dwyer 2002). Tourism has traditionally been recognised (however, this may not be the case in the modern world where travelling has become less expensive) as a luxury activity whereby one will undertake it only once he or she has fulfilled other basic life requirements. Therefore, imposition of differential taxes on the tourism product from the luxury perspective is compatible with equity principles (Gooroochurn and Sinclair 2003).

2.2.3.3. Tourism Taxes and Simplicity

Most of the available tourism taxes are collected through tourism service providers. For instance, special tourism taxes such as entry and exit taxes and accommodation taxes and, general taxes such as GST/VAT are extracted through tourism service providers and hence, tourism taxation is deemed as complying with the administrative simplicity principle. Although from the government's point of view tourism taxes are simple to administer and incur low costs of collection, from the tourism sector's view this may not be the case: The extra cost of administration and collection of such taxes incurred to the tourism service providers, particularly to small businesses in the sector, is an important concern (Hughes 1981). Given that the tourism sector comprises many small and medium size businesses, the extra wage bill incurred by tourism taxation to the whole economy should be an important issue for policy makers.

2.2.3.4. Tourism Taxes and Effective Stimulus to Growth

Higher personal income taxes may cause a disincentive to work effect, however this problem might be avoided by imposing commodity taxes. Gooroochurn and Sinclair (2003) argued that those goods that complement leisure could be taxed at higher rate. By imposing higher tax rates on goods that are complementary to leisure increases the price of those goods and this will in turn reduce the demand for leisure activities. A reduction in demand for leisure means a reduction in the disincentive to work. They further argued that tourism taxation is equivalent to taxing leisure complementary goods. This will not only reduce the disincentive effects, but also it reduces those induced by personal income taxation and the entire tax system becomes more efficient.

2.3. Arguments For and Against Tourism Taxation

The available arguments concerning taxing tourism are conflicting. There are arguments for, as well as against, tourism taxation. Arguments for taxing tourism can be presented in two ways: (i) economic arguments; and (ii) other (general) arguments.

2.3.1. The Economic Arguments for Taxing Tourism

The economic arguments for taxing tourism are based on three major principles:

i. Internalising externalities
   a. Internalising negative externalities
   b. Provision of public goods
ii. Rent extraction
iii. Government revenue generation

2.3.1.1. Internalizing Negative Externalities Argument

The externality argument has two aspects. The first aspect of the externality argument is related to the premise that tourism gives rise to negative externalities such as environmental degradation and congestion, which are described as the environmental costs of tourism (Hughes 1981, Divisekara 1995, Jensen & Wanhill 2002). The decision of tourists to undertake a trip incurs additional costs on themselves (this is the cost of the trip), on service providers, on other tourists visiting the same place and on the host society.

Tourism-related costs to other tourists and to the host society are referred to as the negative externality/external cost of tourism. In the economic sense, negative externalities of tourism arise when the activities of the tourist (activities of one agent) within the destination have an impact on the welfare of other tourists or of the hosts (the other agents), without the impact having been taken into account by the tourist (the first agent) and thus the effect is not reflected in market transactions (Nash *et al.* 2004, Nicholson 2005).

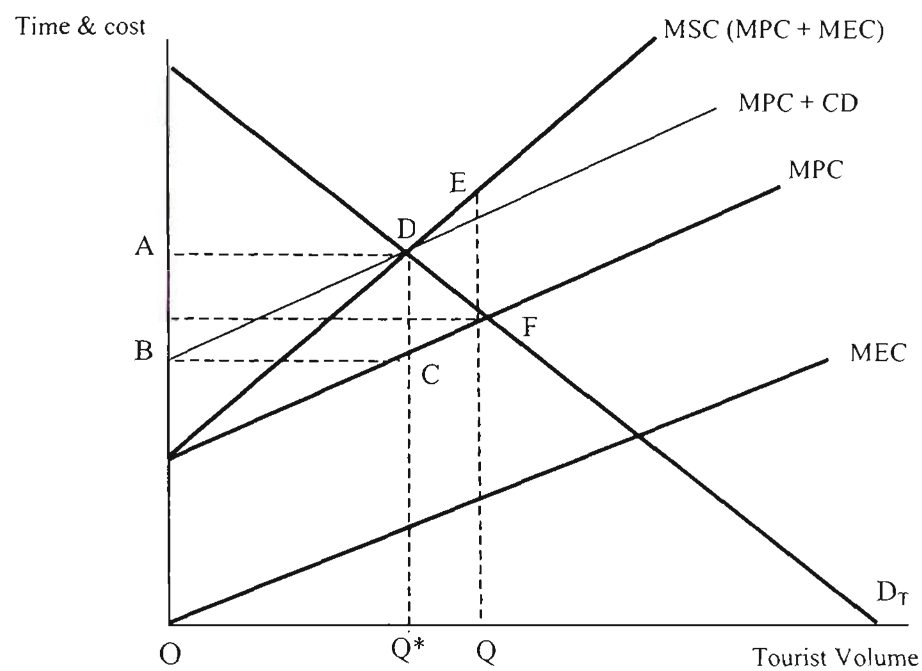
The existence of tourism affects many aspects of the environment of the host nation. Natural resources such as flora and fauna, beaches, wilderness areas, forests, mines and lakes are often degraded and polluted. Tourism might destroy habitats and change the ecology of an area. Man-made resources such as heritage sites, historical cities, museums, relics and recreational facilities have often been used beyond their carrying capacity. This could degrade the historical value of these resources that cannot be replaced. Human resources such as a country's resident population, institutions, and artistic and cultural activities are often disturbed (Forsyth *et al.* 1995). The extra tourist influx increases traffic congestion.

Crowding, long queues at popular places, traffic congestion and untidy environments affect both the host nation as well as the tourists (Gooroochurn and Sinclair 2003). Increased adverse environmental effects, therefore, can result in the discouragement of visitors to a particular destination. Tisdell (1988) proved how increased pollution, using marine pollution as an example, results in reduced surpluses to both visitors and tourism service providers, using a partial equilibrium model. This happens as a result of the reduced demand for tourism/recreation due to the pollution. Thus, from both the tourism sector's and host society's viewpoints, there should be appropriate policies to address tourism-related externality issues, which would optimise the tourism volume as well.

The economic case of tourism-related negative externalities could further be explored by applying the theoretical view of congestion introduced by Pigou (Nash *et al.* 2004, Bureau of Transport & Communications Economics 1996). In Figure 2.1, the vertical axis represents the cost of visiting a particular destination (price of tourism) and this may include the monetary cost incurred to the tourist as well as the money value of travelling time within the destination. The horizontal axis shows tourism volume. Tourism demand (D_T curve) is based on the perceived value of tourists visiting the destination in terms of the cost and time (marginal benefits of tourism). If the cost is lower, the tourist's perceived value is higher (higher demand) and hence a higher tourism volume within the destination. Marginal Private Cost (*MPC*) represents the cost that individual tourist takes into account in making decisions to visit the destination. Each individual tourist might incur increasing cost as his or her stay increases in the destination. The increasing cost may include increasing expenditure within the destination plus additional time taken in travelling within the destination. For instance, when tourist numbers are higher in a destination, tourists have to spend additional time searching for parking facilities, queuing, and the like.

The competitive equilibrium level of tourism volume in the destination is given at point *F*, the intersection of the *MPC* and the demand curve (D_T). The equilibrium level *OQ* is determined purely based on the private cost for each tourist (*QF*). Up to this level, the marginal benefit of tourism is higher than the private cost and thus, they still maximise individual welfare. However, from society's viewpoint, *OQ* is inefficient as it takes into account only *MPC* and disregards the possible external costs.

Figure 2.1: Negative Tourism Externalities and Optimal Tourism Taxes



Marginal External Cost (*MEC*) that arises as a result of visitation is presented by the *MEC* curve and it is up-sloping representing the greater visitor numbers with increasing external costs. However, visitors do not take into account such external costs in their decision to travel. Against this background, in order to determine the efficient level of tourism volume as perceived by local residents (society's point of view) Marginal Social Cost (*MSC*) should be considered and it represents the sum of the marginal private and marginal external costs (*MPC* + *MEC*).[8] The up-sloping MSC curve represents the increasing level of social cost arising from the increasing level of tourism.

When marginal social cost is considered, the efficient level (socially optimal level) of tourism is determined at point *D* where the *MSC* curve intersects the demand curve and it gives the optimal tourism volume of *OQ**. This analysis shows that tourism is

[8] Graphically, the *MSC* schedule is derived by adding together the heights of MPC and MEC at each level of tourism volume.

beneficial as long as marginal benefits (reflected in D_T curve) exceed marginal social cost, and thus the efficient or socially optimal level of tourism is at point D. At point E, clearly marginal social cost exceeds marginal benefits by an amount equal to the distance shown as *FE*, the vertical distance between *MSC* and *MPC* curves. By construction, the distance between these two curves represents the marginal external cost arising from tourism.

The above analysis shows that the parties involved in tourism are less than likely to come to an agreement on the efficient level of tourism, thus government intervention into the market is desired.[9] Accordingly, it is argued that a Pigouvian tax can be levied to correct the negative externality.[10] Pigouvian tax theory suggests that a tax equivalent to the difference between marginal social cost and marginal private cost (i.e. *MEC*) could be levied at the efficient level of tourism (Bailey 1995, Pindyck and Rubinfeld 2001, Rosen 2005, Tisdell 1993).

According to Figure 2.1, a tourism tax equivalent to the distance *CD* could be imposed.[11] The area *ABCD* represents the total revenue from such tourism taxes. Although, the welfare of current tourists (OQ^*: post tax level) is reduced due to the tax, the total welfare is not affected. Moreover, national welfare can be improved if the government tax revenue (shown in *ABCD*) is redistributed among the residents. The net social gain from taxing tourists to internalise negative externalities is shown by ΔDEF. The tourism volume falls from Q to Q^* and this is socially desirable. If the tourism volume declines further, the tourism sector would suffer from such reductions. Therefore, taxes should not exceed the optimal level.

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[9] There appear to be three instruments available (Bailey 1995, Forsyth *et al.* 1995) in handling this problem: (i) price-based instruments; (ii) quantitative limits; and (iii) other instruments. Among these instruments, price-based instruments such as user pays prices or taxes are the most common and efficient.

[10] A Pigouvian tax is a tax levied on each unit of an output or consumption that generate the negative externality in an amount just equal to the marginal damage it inflicts at the efficient level of output or consumption (Rosen 2005).

[11] Divisekara (1995), Clarke (1997), Jenson & Wanhill (2002) and Tisdell (2001) also held a similar view that government could intervene in imposing taxes on the tourism product to redress the induced environmental problems.

Tisdell (1987, 2001) applied a similar theoretical framework to address the issue of negative externalities in tourism and advocated government intervention to impose a tax on tourism to keep the tourism volume at the socially optimal level (i.e this level clearly is below the competitive equilibrium level). Clarke (1997) described the above policy as the *first-best* policy i.e. imposing a tax equivalent to marginal external cost and redistributing the resulting tax revenue among the residents alone. However, he noted that chances for the first-best policy might erode due to several reasons including significant transaction costs of pricing, availability of a better regulation policy, existence of boundary problems (second-best reasons), and the existence of political economy objections.

However, sufficient care should be taken in the policy-making process, since intervention in tourism to impose taxes may generate significant negative effects on tourism volume/arrivals. Therefore, there should be a balance and a sound policy framework before implementation of a new policy. Non-discriminatory taxes should be imposed upon all users of the tourist facility regardless of their residency. The tax policy should be based merely on the contribution to environmental degradation rather than residency status.[12] Tourists would not feel they were discriminated against by having to pay a higher price. In contrast, there is also an argument against non-discriminatory tax. This argument is based on the premise that the tax contribution made by residents and international visitors is different. Residents are making enough contribution by way of paying income taxes, local council rates and other levies. However, international visitors are not making such contributions. Against this background, there appears to be no reason to tax residents for internalising externalities.

Moreover, it is argued that taxes or charges on externalities should, as far as possible, be directed to the goods and services that generate the externalities to avoid inefficiencies (Gooroochurn and Sinclair, 2003). They should be imposed

[12] Clarke and Ng (1993) provided a sound theoretical framework to show how residents benefit from such a non-discriminatory tax to internalize the external costs of tourism. They argued that although residents are made worse-off by having to pay a higher price due to the tax and hence losing their consumer's surplus, they still are better-off with the taxing policy due to two main reasons. First, government revenue generated by the tax exceeds the loss of consumer's surplus and thus there is no overall welfare loss. Second, if a redistribution of tariff revenue among residents is implemented, residents are always better-off in the presence of visitors.

immediately before the use of the particular facility, which in turn does not adversely affect tourist influx to the region. If controls are introduced well before the arrivals it will negatively affect the tourism influx.

2.3.1.2. Provision of Public Goods to Visitors

The second aspect of the externality argument is that tourists consume un-priced natural amenities and public goods, which in turn gives rise to the free rider problem (Divisekara 1995, Gooroochurn and Sinclair 2003). Public goods have two features: they are non-rival and non-exclusive. A good is non-rival if for any given level of production, the marginal cost of producing it to an additional consumer is zero. On the other hand, a good is non-exclusive if people cannot be excluded from consumption (Pindyck and Rubinfeld 2001, Rosen 2005).

The level of efficient provision of a public good is similar to that of a private good (where the marginal benefit of an additional unit is equal to the marginal cost). However, the marginal benefit of a public good can differ from person to person. For a public good there is no market and thus no observable price is available at which people are willing to trade. Even if a price is set, it is not possible to force everyone to make the payment due to the non-excludability. One way of addressing this is to encourage users to make voluntary payment/contributions based on their willingness to pay. However, many users may avoid such payments (Pindyck and Rubinfeld 2001). In this context, the free rider problem arises and it is believed that the efficient provision of a public good is affected by the existence of free riders.[13]

Following the above theory on public goods, it is clear that tourism, particularly international tourism, gives rise to the free rider problem in two ways. First, tourists consume a range of non-exclusive public goods while visiting the destination. These may include road network, parking facilities, transport network, water and sewer system, utilities, communication network, parks and recreation, garbage disposal,

[13] A free rider is someone who lets other people pay while enjoying the benefits of a non-exclusive good (Rosen 2005). Given the presence of free riders, it is understood that a public good should be subsidized or provided by the government to maintain efficient provision (Pindyck and Rubinfeld 2001).

health care facilities, police protection, and public safety systems (Wong, 1996).[14] Second, as noted above, price instruments are ineffective for public goods, thus they are subsidised or provided by the government.

Therefore, the efficient provision of public goods can only be maintained by government intervention through tax collections. In this case, the local residents make a significant contribution to the provision and maintenance of public goods through taxation (i.e. direct taxes including income taxes and property taxes). Other than commodity taxes and some special taxes (if there are any), international visitors make no contribution to the central fund out of which public goods are provided. Accordingly, the cost of provision of public goods consumed by visitors appears to be a burden on local residents (an externality on residents).

However, in the case of tourism, particularly international tourism, the cost of provision of public goods can be recovered by taxes so that efficiency can be improved (Clarke 1997, Divisekara 1995, Jenson & Wanhill 2002). With regard to international visitors, a special tourism tax could be imposed since they, as a group, are easily identifiable.

2.3.1.3. Rent Extraction Argument

As noted earlier, trade in tourism is different from the conventional trade in goods and thus provides some opportunities for maximising national gains via rent extraction. This arises because, unlike traditional trade where the commodity is sent to the consumer, tourists have to travel to the place where production take place and consume it while in the destination. Modern tourism, in principle, thus inevitably gives rise to economic rents or returns higher than the marginal social cost of the service provided (Bird 1992, Hazari and Nowak 2003).

To be able to extract rents from tourism, several conditions should be satisfied (Clarke and Ng 1993). First, the destination should be prepared to extract rent. Second, the destination should enjoy some monopolistic power over what it is offering. The

[14] Adequate facilities of this nature are a must for a healthy tourism sector in any destination as these form an integral part of the composite tourism product.

monopolistic power stems from the fact that most destinations are faced with less than perfect elasticity of demand for tourism. The intuition is that such an elasticity of demand for tourism means that tax-induced price increases may not tarnish tourism demand significantly. Climate, scenic beauties, and more specifically attractions such as the Twelve Apostles or Uluru in Australia, the Pyramids in Egypt, the tropical sun, sea and sand in Asian countries are all unique to those particular destinations. Although there may be close substitutes for some of these, still these tourism products face less than perfect elastic demand curves.[15] Third, there should not be existing extractions of rent by the way of monopolistic prices given the local tourism sector is competitive. Fourth, there should be minimal chances for other destinations to take retaliatory measures.

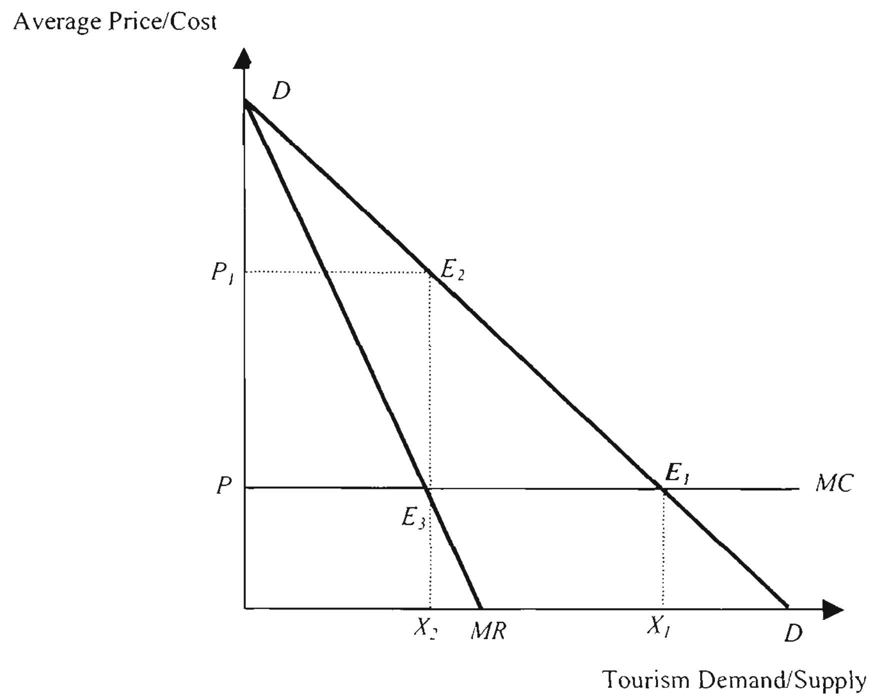
Given that these conditions are satisfied, domestic welfare of a country may be improved if appropriate interventionist pricing policy is implemented. From a conventional trade theoretic perspective, an optimum tariff can be imposed upon the tourism product (service export). Figure 2.2 illustrates graphically how a nation can extract rents via optimum tariffs (Divisekara 1995). The downward-sloping curve *DD* represents the demand for international tourism. The curve *MC* shows the marginal cost curve (supply curve) of tourism sector/suppliers. The prevailing competitive market situation results in equilibrium price (P) and equilibrium quantity (X_1) at the point E_1. Since there are no monopolistic rents accruing through tourism, the government can impose a tax where the marginal revenue curve (*MR*) intersects the marginal cost curve (*MC*) at point E_3.

This implies that visitors are now paying the tax inclusive price of P_1 and thus the demand contracts, resulting a new equilibrium quantity of X_2. The government tax revenue arising from tourism taxes is equal to the rectangle $PP_1E_2E_3$. As a result of reduced tourism demand, consumer surplus accruing to visitors has declined and this is the dead weight loss or welfare loss of tourism taxes. This is represented by the triangle area of $E_1E_2E_3$ in the figure. However, in the case of international tourism, the

[15] The Maldives offers a similar sea, sun and sand experience to that of the Sri Lankan experience. However, when the total experience with the kind of foods, the culture, the atmosphere and so on and so forth is considered, they become two totally different tourism products.

welfare loss accruing to international visitors is not a concern of the host nation as long as higher tax revenues are raised.[16]

Figure 2.2: Rent Extraction and Optimum Tariff Argument



In the case of taxing for rent extraction, for an efficient tourism tax policy, the type of tax, the method of taxing and the optimal level of the tax need to be decided. With regards to these issues, it is argued that the tourism sector should be taxed together with its complementary sector, that is the travel sector. However, such a general tax policy covering travel and tourism seems practically difficult due to the complexity arising from setting the optimal level of taxes. Divisekara (2002) noted that the complexity is mainly due to the unavailability of cross demand elasticities and cost structures of the sectors that are essential in setting optimal taxes. Therefore, he suggested a more realistic way is to target one of the sectors, and, of the two sectors, extracting rents from the travel sector is considered the best strategy.[17]

The choice of the travel sector for rent extraction has a number of advantages over the tourism sector. First, if the tourism sector is targeted, a considerable cost resulting

[16] For a detailed analysis of rent extraction in tourism, see Divisekara (1995).

[17] Clarke (1997) also proposed that all rents could be extracted from the travel sector via airfares letting the internal tourism market to price at marginal (social) cost.

from the loss of domestic consumer surpluses arises. This is because of the inability to discriminate internally for pricing. Second, international price discrimination and targeting niche markets for rent extraction is much easier to achieve than internal price discrimination. Third, the compliance cost of collection of such taxes can be kept as low as possible as they are collected at a single point and hence the simplicity of the tax system can be maintained (Clarke 1997, Divisekara 2002).

A number of alternative tax tools are available to be used in the travel sector. Entry and exit taxes, per passenger taxes or levies, extra premiums on airfares, landing charges and duties on aircraft fuel are examples. Each of these alternatives has its own advantages and disadvantages and the suitable tax tool should be chosen based on the ability of the tax to achieve the objectives of the tax policy. Upon deciding the type of the tax, there is then the question of the optimal size of the tax. The size of the tax could be decided based on the price elasticity of travel/tourism demand. The tax rate can be estimated using the conventional tariff formula.[18]

2.3.1.4. Government Revenue Generation Argument

Revenue generation is the final economic argument for taxing tourism. WTO (1998b) estimated that the world tourism sector contributes as high as 10 per cent of total world government revenues. Some of the developing nations in Asia, Africa and Latin America generate even more revenue from the tourism sector. For example, some of the tropical countries such as The Bahamas and The Maldives generate over 50 per cent and 40 per cent of government revenue respectively from the tourism sector (as quoted in Bird 1992).

There are several reasons as to why governments target tourism for taxation purposes. First, due to the recent success of the world tourism sector, governments tend to target the tourism sector as an easy revenue-generating source. The tourism sector is the single largest sector in the world that has shown significant growth in the last few decades. Such growth always invites higher taxation. Second, there is some evidence that some of these tourism taxes have helped governments to finance the tourism

[18] Divisekara (1995) proves that optimum tariff rate is obtained using the following formula:

$t = -\frac{1}{(\varepsilon + 1)}$ where ε is the price elasticity of demand for tourism.

budget. For example, as quoted in Crotts and McGill (1994), in the US it has been estimated that 62 per cent of local government funding for tourism was derived from lodging tax revenues, whereas in Florida 80 to 100 per cent of local government funding for tourism was derived from lodging tax revenues.

Third, simplicity in collection and administration of taxes is another reason. Most of the taxes in the tourism category are unit taxes imposed on a per tourist basis. The sector that directly deals with tourists collects the tax and remits it to the government and hence the compliance costs to the government tend to be low. Fourth, taxing tourists seems as less troublesome. Most of the taxes imposed on tourists are effective while the tourist is in the destination. By this time, the tourist has already made the destination choice. From a consumers' behavioural perspective, the tax does not negatively affect the destination choice as it has already been made.

2.3.2. General Arguments for Taxing Tourism

There are also several general, non-economic arguments for taxing tourism. Dwyer and Forsyth (1993) argue that since the government spends a considerable amount of money in promoting tourism, there is a legitimate need for those who gain (the tourism sector) from tourism promotion to bear the cost of promotion to some extent. Tourism promotion is often a government priority and in developing countries relatively small tourism suppliers cannot afford the large expenditures on tourism promotion in overseas countries. The government alone is left to undertake promotion and marketing. Furthermore, after serious tourism growth setbacks such as those following the September 11 attack in the US, the Bali bomb attack in Indonesia, and SARS in China, Singapore and Taiwan, the role of governments in tourism promotion became crucial.

It is also common belief that tourists are seen as a part of the overall tax base and hence taxing them generates fewer problems for governments because tourists are not voters (Jenson & Wanhill, 2002). Politicians, in particular, are often in favor of tourism taxes because it is less risky to tax non-voters than taxing voters. Taxing tourists ensures that the burden which could have been on voters/locals is redistributed, at least in part among non-voters/tourists.

In many cases, the local communities who host tourist destinations benefit very little from the existence of the tourism industry. A large proportion of tourism expenditure may leak out of tourism localities to other parts of the economy or even to the rest of the world (Hughes, 1981). In many developing countries, the tourism sector is comprised of large multinational investments. This is because the private sectors in these countries do not have the capacity to invest in large tourism facilities. Large multinational hotel chains own and operate most of the star hotels in these countries and the supply of inputs for the sector is also largely imported from the Western world. Moreover, much of the skilled labour for the sector is sourced externally. Accordingly, leakage from this sector is very significant and a tourism tax may be deemed an appropriate measure to retain income within the community.

2.3.3. Arguments against Taxing Tourism

Taxing tourism is not without risks. Although it is used increasingly as a revenue-generating source, it can yield undesirable results. Theoretically, any increase in price results in a decrease in the quantity of product demanded by a consumer and destinations that regularly increase taxes paid by tourists, or that target tourists specifically as a source of tax revenue, run the risk of inflating the price of travel to their destination. This in turn may decrease the destination's price competitiveness (the following sub section will explain this issue further) in the world market (Myers *et al.* 1997).

This could reduce the tourism volume and hence reduce foreign exchange earnings, employment opportunities and the total output. Tourism taxation is, therefore, problematic in two ways. First, due to the reductions in travel volume, the revenue from direct taxes imposed on tourists is lower. Second, as higher taxes discourage tourism suppliers, the revenue component from taxes imposed on user businesses will also be lower. The above process could be analogous to the process that is known as paradox of thrift in economics.[19] Though tourists are taxed to raise more income, due

[19] The paradox of thrift holds that an attempt to increase savings by the household will result in saving the same or an even less amount nationally as higher savings curtails consumption expenditure and thereby causing aggregate expenditure to decline. Reductions in aggregate expenditure then reduce the national output causing further reductions in savings as savings depend on household income.

to adverse effects and their chain reactions, ultimately the country could end up with lower income from tourism taxes.

There is a greater likelihood that tourism taxation may invite retaliation by other governments: the intuition is that if country *A* feels that their nationals visiting country *B* are unfairly taxed, country *A* may retaliate in taxing nationals from country *B* visiting country *A* (Tisdell 1983). Gooroochurn and Sinclair (2003) noted that Kenya and Tanzania introduced visa charges for UK citizens in retaliation to the application of visa fees by the UK on their citizens. In the absence of retaliation, the country that imposes taxes gains from taxing tourism while the other looses. However, if countries retaliate they both tend to experience welfare losses. In the final analysis, the extent of each country's welfare loss seems to depend on the elasticity of demand for their tourism products (Tisdell 1983).[20] However, the possibility of retaliation could be minimised if taxes are imposed appropriately, concealed as a way of financing essential costs of tourism such as airport landing charges and visa processing fees (Clarke and Ng 1993).

In summary, it is clear that tourism taxation may be disadvantageous to the destination country, visitors, tourism suppliers and the world as a whole. Therefore, tourism taxation policy needs to be formulated after a careful analysis of its overall costs and benefits. It is often argued that the tourism sector is targeted for taxation because of its fast growth.[21] This seems to be an irrational move and it can be contended that the tourism industry should not be subject to increasing taxes and charges simply as a consequence of its success. Such taxes and charges should be introduced only if they have a specific rationale in terms of their efficiency (Clarke 1997). Before introducing or increasing taxes on tourism, policy makers should systematically analyse the underlying rationale.

2.3.3.1. Tourism Taxation and Tourism Price Competitiveness

As noted in the previous section, the nexus between tourism taxation and tourism price competitiveness (TPC) is evident. TPC is considered to be one of the most

[20] See Tisdell (1983) for a comprehensive theoretical framework of retaliation in tourism taxation.

[21] WTO (1998a) and WTTC (2002) argued that tourism taxation is a direct result of its recent success.

important issues in a severely competitive world and hence has attracted considerable attention in the tourism literature during the recent past.[22] Competitiveness is a relatively difficult concept to define, as it is both a relative and a multidimensional concept. However, it is the most crucial determinant of how well an industry performs in the global market. TPC can be defined as the ability of the tourist destination to create, produce and offer a differentiated tourism product in the international market while maximising national gains for its resources (as quoted in Crouch and Ritchie 1999).

Dwyer *et al.* (2000a) noted that the potential for any country's tourism industry to develop might largely depend on its ability to maintain competitive advantage in its delivery of the tourism product. Further, they argued that competitiveness is a general concept that encompasses price differentials coupled with exchange rate movements, productivity levels of various components of the tourist product and qualitative factors affecting the attractiveness of a destination. While there is considerable disagreement about definitions of destination competitiveness, we can identify common factors that affect the competitiveness.

Following Crouch and Ritchie (1999), four major elements of TPC such as core resources and attractors of destination, supporting factors and resources, destination management and qualifying determinants can be identified.[23] Qualifying determinants include four major factors: cost, location, safety and dependencies. Moreover, the cost comprises transportation costs, the effect of exchange rates and the cost of living in a destination.

Against this background, it appears that rising taxes on the tourism product, its components and tourism service providers may lead to an overall increase in cost of the tourism product. Accordingly, this may deteriorate the price competitiveness of the tourism sector in the world market. Such deteriorations in price competitiveness might encourage international visitors to substitute away from the destination (Dwyer

[22] See Crouch and Ritchie (1999), Dwyer, *et al.* (2000), Go and Govers (2000), d'Hauteserre (2000), Sahli *et al.* (2003), Enright and Newton (2004) and Gooroochurn and Sugiyarto (2004).

[23] Crouch and Ritchie (1999) formulated a Conceptual Model of Destination Competitiveness (CMDC) after years of research.

and Forsyth 1999, Ihalanayake and Divisekara 2006) while residents may be induced to undertake more foreign trips. This would generate an unfavourable balance in the tourism trade.

There is some empirical evidence about tax-induced changes in price competitiveness and related changes in the growth momentums of tourism sectors. Wanhill (1995) noted that the Irish tourism industry grew dramatically during the late 1980s. International arrivals grew more than 60 per cent while tourism expenditure increased by more than 50 per cent. He argued that the single most important driver of Irish tourism growth might have been the reduced VAT rates and exemptions offered to the tourism sector and the subsequent increases in the price competitiveness. Moreover, analysing results of a consumer survey conducted in the UK, Wanhill noted that international tourists to the UK are more likely to take a UK holiday if price reductions are offered.

Durbarry and Sinclair (2001) confirmed the above claims in their research in which they analysed the price competitiveness of UK tourism in the light of higher VAT rates on tourism-related products. They argued that an improvement in the price competitiveness of the tourism sector in the UK could be achieved by means of depreciation of the exchange rate for sterling and also by a reduction in the rate of VAT, so as long as tourism businesses respond to the tax reduction by decreasing prices. Jensen and Wanhill (2002) carried out some simulations in lowering VAT rates for hotel and holiday centers in Denmark and found that overnight stays in hotel and holiday centers and tourism expenditures in Denmark increased by 6 per cent.

The empirical evidence outlined above suggests that tourism taxes are critical in determining the TPC and hence the volume of tourism (i.e. tourism arrivals and tourism consumption). This is even more important against a background where most destinations in the developed world are becoming uncompetitive due to various other reasons.[24]

[24] For instance, the recently-released WTTC Travel and Tourism Competitiveness Monitor (TCM) revealed that Australia's competitive position is relatively low (WTTC, unspecified). TCM measures the competitiveness of over 200 world destinations using 8 indices: price competitiveness, human tourism, infrastructure, environment, technology, human resources, openness, and social. Among these, price competitiveness is considered to be the most important. Index values ranges from 0 to 100 where

2.4. Effects of Tourism Taxation: An Overview

Like any other tax, tourism tax policy may have a number of effects depending on whom the taxes are imposed. Firstly, they may have a direct effect on the level of effective tourism demand and hence, employment. Secondly, taxes can affect work incentives, the amount of saving and the level and pattern of investment. Thirdly, some tourism taxes might distort the resource allocation and could lead to inefficiencies. Finally, the level and structure of tourism taxes determine the level of disposable income and distribution of after-tax income among different groups (Mieszkowski 1969). Tax incidence analysis in general is concerned with about most of these effects of taxation. Generally, tax incidence is the study of who bears the burden of a tax.

Before a detailed discussion on who bears the burden, it is essential that the term tax "burden" is defined. The burden or the effect of a tax can arise in different ways. It may be an increase in price paid by consumers or a decrease in the price received by producers. Sometimes it may be a reduction in nominal as well as real household income. In a more macro sense, it could be a change in GDP, level of employment, or a change in the level of inflation.

Musgrave and Musgrave (1984) introduced three different aspects of the burden of a tax: excess burden, input effects and employment effects. Excess burden (commonly known as efficiency loss) refers to the situation where the total burden outweighs the total revenue collected from the tax. Input effects refer to possible changes in input/factor supply due to the tax and hence the subsequent changes in output. The employment effects are the changes in the level of employment as a result of tax-induced changes in output, input supply and aggregate demand.

The incidence of a tourism tax can be explained in terms of two aspects:

i. statutory incidence; and
ii. economic incidence.

Statutory incidence of a tourism tax indicates who is legally responsible for paying the tax to the government. Musgrave and Musgrave (1984) noted that the statutory

100 represents the most competitiveness and 0 represents the least competitiveness. In 2003, the Australian price competitiveness index reads at 35 and ranks 95 in the world ranking.

incidence of a tax is determined by several factors such as: how the tax is imposed, how the base is defined and how general is its coverage. When a tourism tax is imposed on a tourism business, the tax is paid by the business, but this does not reveal the actual tax burden.

Of the two aspects of incidence, the most important is economic incidence. Mieszkowski (1969, p.1103) noted "the analysis of tax incidence is the investigation of the distributive effects of taxes. In a general way, incidence theory is applied distribution theory in which the focus is on how various tax regimes affect factor returns and commodity prices". Rosen (1978) defined the economic incidence of a tax as the change in the distribution of private real income brought about by a tax. Musgrave (1953) described tax incidence as a function of relative price changes: still the same concept but from a different perspective. According to him, "changes in the state of distribution, which result from changes in tax policy depend on changes in relative factor and product prices" (1953, p.307). Divisekara (2001) pointed out that economic incidence measures the changes in economic welfare or changes in distribution of private real income brought about by the imposition of a tax.

The definitions presented above have commonly focused on one particular aspect of tax incidence, household real income. Household real income is a good indicator of the well-being of individuals and households in an economy. In this context, Keller (1980, p.12) introduced an operational definition for economic incidence (individual tax burden) "the difference between real income of an individual before and after the tax is levied, provided that all households (including the government) and firms reacted to the resulting change of prices and transfers, so that the economic system is returned to (some kind of) equilibrium".

From the above definitions it is clear that tax-induced changes in household real income are determined by changes in relative prices. Relative price changes are reflected in tax-induced changes in factor prices (i.e. land, labour and capital) and commodity prices. The effects of taxes can also be broadly discussed in two ways:

i. efficiency effects, and
ii. equity effects.

Efficiency effects refer to the effects of an imposition or change of a tax on economic efficiency, in particular efficiency in allocation of resources. On the other hand, equity effects refer to tax-induced changes in income distribution, also known as the distributional effects of taxes. While they both are interrelated effects, tax-induced relative price effects are the principle determinants of such effects.

Tourism tax incidence and various aspects of efficiency and equity effects are discussed in the following sections, with the use of two main theoretical approaches: the partial equilibrium approach and the general equilibrium approach. These two are selected as they are the most widely-used and, more importantly, the most suitable models in economics to explain the theoretical background of tax incidence. The discussion starts with the partial equilibrium model since the theory of tax incidence emerged in the partial equilibrium setting. The partial equilibrium explanation is simple to understand and less complicated. More importantly, the partial equilibrium theory of tax incidence provides the essential theoretical underpinnings for the general equilibrium incidence analysis.

As far as tax incidence is concerned, there are two comments that are worthwhile repeating before going into more theoretical details (Rosen 1978). First, only people can bear taxes and although different taxes are imposed upon different entities such as consumers, suppliers, corporations and capital items like land, ultimately no organization or entity other than natural persons will bear taxes. For example, a corporation tax is imposed upon the income/profit of companies, however corporation tax ultimately is borne by customers, shareholders, employees, suppliers and possibly others.

Second, both sources and uses of income should be considered in tax incidence studies. This implies that tax changes affect both commodity prices and factor prices and thus effects of taxes can be discussed from both the consumer's side (users of income) and the factor suppliers' side (sources of income). Third, tax incidence depends upon how prices are determined and how long it takes price changes to take place. Tax-induced price changes occur to a different degree according to a time dimension. It is thought that responses are larger in the long-run than in the short-run.

Thus, the short and long-run incidence of a tax may differ and the time frame that is relevant for a given policy question should be specified.

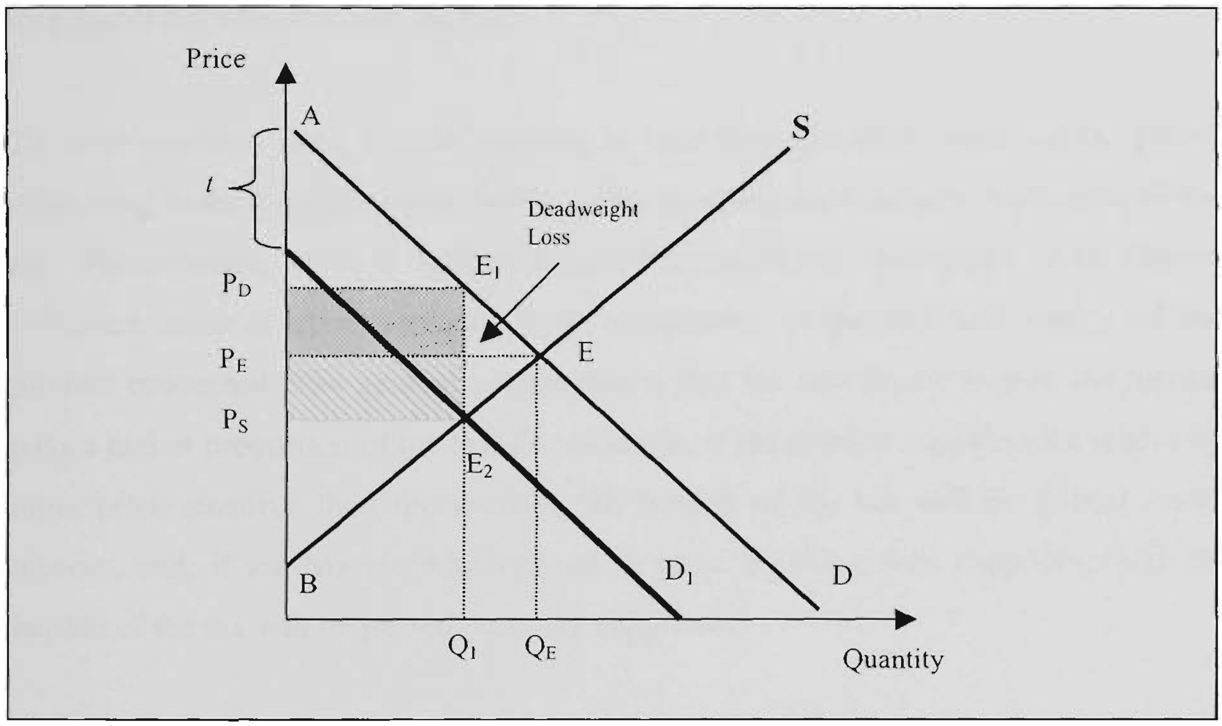
2.4.1. The Partial Equilibrium Theory of Tax Incidence

In partial equilibrium theory, the effects of a tax are explained as a change of price (consumer price and producer price), and output change of the selected commodity. In terms of price, the approach determines whether it is the consumer or the producer who bears the most of the tax. This further determines the amount of tax income. It uses the producer surplus and the consumer surplus to explain the welfare loss or deadweight loss. The partial equilibrium view of tax incidence can be presented in two different ways: incidence of a commodity or product tax and incidence of a factor tax. Incidence of a commodity/product tax can further be explained using a competitive market model and a monopolistic market model. In this section, the incidence of a unit tourism tax imposed on visitors is explained in a competitive market equilibrium condition and other aspects such as an ad valorem tax and a tax on tourism suppliers are briefly explained.

The partial equilibrium case of incidence is based on several assumptions. First, we assume that the economy is operating in a competitive environment. Second, consumers (tourists) and suppliers are concerned about the net demand price and net supply price, respectively. Thus, the demand and supply are functions of price. Third, at the equilibrium, the quantity demanded is equal to the quantity supplied. Fourth, a commodity tax creates a wedge between consumer price and supplier price and the wedge is equal to the tax (Bailey 1995, Pindyck and Rubinfeld 2001).

As shown in Figure 2.3, the demand for tourism is represented by the curve *D* while the supply of tourism is given in the curve *S*. Therefore, the equilibrium price and the quantity of this tourism product are determined competitively by tourism demand (*D*) and tourism supply (*S*). The equilibrium is given at point *E* and the equilibrium price and the quantity are P_E and Q_E respectively, before the imposition of the unit tax. Now, suppose that the government levies a tax at a rate (t) on consumption of a tourism product. Each time a purchase is made, a tourist has to pay the tax. Along the demand curve (*D*), a combination of maximum prices that tourists are willing to pay at different quantities is shown. Even after imposition of a unit tax of t, the maximum that tourists are willing to pay remains unchanged. Therefore, as perceived by suppliers each tourist's demand price decreases by t. This is because, after the tax, suppliers receive $P-t$. Since all individual demand curves are shifted down by t, the market demand also shifts down by t (from D to D_I) as perceived by suppliers. The new demand curve D_I shows how much suppliers receive for each unit sold. After the unit tax, there is a new market equilibrium at E_2 where the supply equals the demand as perceived by suppliers.

Figure 2.3: Incidence of a Unit Tax Imposed on Tourists (Demand Side)



Using this scenario, tax-induced price changes, quantity changes, the amount of tax income and the deadweight loss can be explained. What price changes are brought about by the new tourism tax? At the new equilibrium there are two prices: the price paid by tourists and the price received by tourism suppliers. The price paid by tourists has gone up to P_D whereas the price received by tourism suppliers has gone down to P_S. Here, a wedge between the price paid by the tourist and the price received by the supplier has been generated (from P_E to P_D, and from P_E to P_S). Both tourists and suppliers are made worse-off by the unit tax. However, none of the prices has changed by the full amount of tax.

This simple example provides evidence of two adverse effects of a unit tax: changes of quantity and the generation of deadweight loss. A tax-induced price increase has brought the equilibrium quantity down from Q_E to Q_1 at point E_2. The second adverse effect is the deadweight loss/welfare loss (unless either demand or supply is perfectly inelastic). This can be explained by the use of the tourist's surplus (consumer surplus) and the suppliers' surplus. Before the imposition of the tax, consumer surplus is given by the triangle AEP_E and supplier surplus is given by the triangle P_EEB. After the unit tax both the tourist surplus and the supplier surplus are reduced by the amount shown by the shaded rectangle plus the triangle E_1EE_2. The shaded rectangle shown as $P_DE_1E_2P_S$ is received by the government as tax income. However, the triangle E_1EE_2 belongs to none of the parties. Thus, this is considered as dead weight loss or welfare loss due to the imposition of the tax.

The real question, here, is who is going to bear the increased portion of the price? According to the figure, tourists and suppliers roughly share equally the burden of the tax. Nevertheless, it is a well-established principle in economics that relative incidence depends upon the appropriate elasticities of demand and supply of the product concerned. The general proposition is that the less elastic side of the market pays a higher proportion of the tax. For example, if the tourism suppliers are relatively more price-sensitive than the tourists, the burden of the tax will be passed on to tourists, and, if tourists are relatively more price sensitive than suppliers, then the burden of the tax will be passed on to the suppliers.

In the case of the incidence of a unit tax imposed upon the supplier, the supply curve will shift by the amount of tax. Moreover, if the tax is an ad valorem (imposed on tourists for example) the demand curve will shift proportionately at different price levels. In each case, the resulting changes in prices and quantity are the same as in the above case.

Based on the above discussion, the partial equilibrium effects of a tourism tax can be categorised into three areas: (i) price changes, (ii) quantity changes and (iii) changes in consumer welfare. As noted above, a tax on tourism can lead an increase in the price paid by tourists and a decrease in the price received by tourism suppliers, creating a wedge between two prices. The increased price paid by tourists results in a reduction of demand for tourism and hence a decrease in equilibrium quantity. The reduction in equilibrium quantity implies that both the consumer's surplus (in this case tourist) and supplier's surplus have decreased significantly. These changes could be explained as welfare changes. However, such changes cannot be considered a total welfare lost since a part of this reduction is transferred to the government as tax income. While the government receives the tax income, there is a total welfare loss arising from the above-explained changes in equilibrium quantity that is also known as the dead weight loss.

2.4.2. The General Equilibrium Theory of Tax Incidence

Partial equilibrium analysis of tourism tax incidence provides an essential, basic theoretical understanding of the issue at hand. However, the discussion has been limited to a particular market and has focused on the effects of a tourism tax on the supplier and the visitor. Thus, the major limitation of partial equilibrium theory is that it does not address the totality of the issue necessary in tourism tax incidence. It tends to ignore tax-induced relative price changes, subsequent changes in other markets such as in factor markets, and the feedback effects. Accordingly, partial equilibrium theory covers only part of a wider policy issue.

Moreover, given that the tourism product is different from a conventional product, tax incidence related to tourism cannot be fully explained by partial equilibrium theory. At the outset of this chapter, we defined the tourism product and the sector as a composite product and a multifaceted sector, respectively. Therefore, tax-induced demand changes in tourism and related sectors may not be as simple as stated in partial equilibrium theory. Partial equilibrium theory focuses on a single product offered in a single market. Against this background, general equilibrium theory can be a very useful framework to explain effects and the tax incidence of tourism taxes.

The literature on tax policy in general equilibrium analysis started with Harberger's two-sector two-factor model (Harberger 1962). With this pioneering work, general equilibrium modelling has led to a tremendous improvement in tax policy studies.[25] It is not our intention to provide a full theoretical view of general equilibrium modelling

[25] Shoven and Whalley (1984) provide a comprehensive survey of general equilibrium tax models. See also Ballentine and Eris (1975), Mieszkowski (1967), Morgan *et al.* (1989), Murphy (2001) and Shoven (1976).

in this section as this will be covered in Chapter Six. In this section, tax incidence theory is explained in a general equilibrium framework.

Unlike partial equilibrium theory, in general equilibrium theory all sectors including households, businesses, government and international sectors are considered and modelled. The economy is assumed to be fully competitive and subsequently consumers are price-takers in the economy and free entry to, and exit from, markets exist. The pure competitive nature of the economy may guarantee zero pure profits. Taxes are imposed and collected by the fiscal sector and tax revenue is used to finance government consumption. There are numerous goods, services and factors in the economy and the households own factors (labour, land and capital). The household sector receives factor income when it supplies factors for production and this income is used to demand goods and services for consumption.

The effects of taxes in general equilibrium theory depend on several factors and they include general assumptions made, the demand and the production theories applied, underlying assumptions regarding substitution in consumption and production and underlying assumptions regarding factor availability. General equilibrium tax incidence theory is relatively broad, and hence complex. However, if simplified, it can be categorized into two main areas: incidence of factor taxes and incidence of commodity taxes. Factor taxes are those imposed upon income from, or the use of, factors of production such as labour, land and capital. Commodity taxes are those imposed upon the consumption or the production of any commodity. The incidence of these two types of taxes can further be explained in terms of partial and general taxes. In order to explain general equilibrium tax incidence, a commodity tax and a factor tax are selected and related changes are outlined in following sections.

2.4.2.1. Effects of Commodity Taxes

Effects of commodity taxes can be discussed in two ways: effects of a general commodity tax (i.e. a tax on all commodities) and, effects of a partial commodity tax (i.e. a tax on a selected commodity). The general equilibrium effects of a partial commodity tax, which is similar to a special tourism tax, are explained below.

The imposition of a tax on a selected commodity increases the relative price of the taxed commodity and this is the immediate price change. Responding to higher prices, consumers may substitute away from the taxed commodity towards untaxed, less expensive, commodities (Rosen 2005).[26] This substitution can create significant changes in other markets and it is at this point that general equilibrium analysis goes beyond the partial equilibrium explanations. Consumer demand for a taxed commodity falls while demand for untaxed commodities rises. Producers respond to these changes in demand composition in producing less of the taxed commodity and more of other untaxed commodities.[27]

These production changes can create temporary imbalances in factor markets. As the production of a taxed commodity falls due to demand deficiencies, some factors used in the taxed industry become unemployed (McLure and Thirsk 1975). Land, labour and capital that are employed in the taxed sector may be forced to move to other untaxed sectors of the economy. The absorption of extra factors by other sectors is mainly dependent upon the factor intensity, factor mobility and the factor substitution of sectors.

The factor intensities among the sectors are different and hence relative prices of factors need further changes for easy absorption of factors. Assume that there are two factors of production, capital and labour in a given condition. Assume further that the taxed sector is labour intensive while the untaxed sector/sectors are capital intensive. As the production declines in the taxed sector and given that it is a labour-intensive sector, a large amount of labour (small amount of capital) is unemployed. The unemployed labour and capital should be absorbed by the other sector/sectors in order to maintain the factor market equilibrium. The absorption of extra factors is possible only if the price of labour relative to the price of capital declines (Musgrave and Musgrave 1984). If so, the other sectors could absorb excess labour and capital and thus the factor markets are at equilibrium again.

[26] General equilibrium theory offers the possibility of substitution in both consumption and production in response to relative price changes in partial commodity taxation.

[27] It is also argued that at this stage there is a possibility of price increases in the other commodities. As the production of untaxed commodities increase, if increasing cost in the production prevails, their prices tend to increase.

The aforementioned adjustment process makes labour relatively worse-off since the relative price of labour decreases. A general theoretical statement can be established about the tax-induced changes in relative factor prices: "a partial commodity tax on the output of a selected sector induces a decline in the relative price (a heavy burden) of the input used intensively in that sector" (Creedy 1997, Rosen, 2005). The changes in relative prices of capital and labour would then change the income distribution of households.

Changes in household income could further change household consumption. Moreover, relative price changes may change imports and exports volume resulting in changes in the balance of trade. Overall, in the macro environment, these changes mean changes in aggregate employment and the capital stock on the income side and changes in real household consumption, government consumption, real investment, and net exports on the expenditure side. In summary, such changes are reflected as changes in real GDP.

Based on the above discussion, several important aspects in relation to general equilibrium effects of tax changes can be identified (Rosan 2005). First, the starting point of the process of changes in tax incidence is substitution in consumption. If substitution in consumption is zero, consumer demand for a taxed commodity may not change in the first place, hence the incidence is on the consumer. However, in the real world, zero substitution for many commodities is very remote. Second, tax-induced changes in relative factor prices are dependent on the factor intensities among the sectors (Mieszkowski 1969). If all the sectors employ equal proportions of factors, it is more likely that all factors experience equal proportions of burdens. For example, if industries use capital and labour equally in the production, tax-induced effects on prices of these factors tend to be in equal proportions.

Third, the magnitude of the incidence on factors of production depends, largely, on the flexibility of substituting one factor for another. If, for example, labour can easily be substituted for capital, the tax-induced effect on the price of labour tends to be less than in an inflexible situation. Changes in factor prices are also dependent on the degree of factor mobility i.e. complete mobility or partial mobility (McLure and Thirsk 1975). For instance, in the case of complete mobility of factors, a general reduction in factor prices is seen whereas in the partial mobility case, the mobile factor shows an economy-wide reduction in prices while the price of the immobile factor declines only in the taxed sector.

It is important to relate this general theory to tourism taxes. As noted above, special tourism taxes can be considered as partial commodity taxes. Thus, such taxes may lead to an increase in tourism prices. For instance, in the case of international tourism, special tourism taxes may increase the price of international tourism. This may result in a fall in the demand for international tourism depending on the size of the elasticity of demand. Since the tourism product is a composite product, the fall in demand means that the demand for the commodities of all tourism-related sectors declines. Accordingly, special tourism taxes (partial commodity taxes in general) tend to generate an induced industry effect (arising from an induced commodity effect) on all the other tourism-related sectors.[28]

With reduced demand, the tourism-related sectors may restrict their outputs and hence factor usage. Tourism-related sectors are mostly labour-intensive sectors. However, since there are a large number of tourism-related sectors, tourism taxes might affect some of the capital-intensive sectors too. In this context, the impact on factor markets in the case of tourism taxes appear to be more complex than the standard case explained earlier in the section. Overall, it appears that the number of sectors that are likely to be affected by the tax is greater in the case of tourism taxes than in the conventional case of partial commodity tax. The other possible changes in factor returns, household consumption and other macro variables closely follow the standard case.

2.4.2.2. Effects of Factor Taxes

The incidence of taxes on factors such as labour and capital has received much attention in the literature (Ballentine 1978, Kubik 2004, Mieszkowski 1969, Mieszkowski and Zodrow 1985, Shoven 1976). Factor taxes can take different forms and the incidence differs from one form to another. Generally, the initial effect of

[28] In the conventional case, due to tax-induced price increases, the demand for a taxed commodity declines and hence output contracts. Prices of all the other commodities may remain unchanged. Most likely, the demand for untaxed commodities could increase, as consumers substitute away from the taxed commodity towards the untaxed commodity.

factor taxes is similar to that of commodity taxes. There are two initial tax-induced price changes in factor and product markets. Musgrave and Musgrave (1984) described these changes as burdens of factor taxes on the sources side and the uses side. In the factor market, the net price received by factor suppliers of the taxed factor reduces by some amount, which is the sources side effect. Prices of commodities for which taxed factors are used in the production increase, generating effects on the uses side. Mieszkowski (1969) distinguished between two initial effects of a partial factor tax: the output effect and the substitution effect. A partial factor tax is a tax imposed upon only one of the factors (for example on capital, out of labour and capital) used in the production of one of the sectors (for example the mining sector). The output effect arises from tax-induced output changes.

The imposition of the tax can induce an increase in the cost of the taxed factor and hence the relative prices of the output could rise. As the relative price of the output rises, demand tends to fall. The output contraction of the taxed sector causes reductions in the demand for all the factors employed in the sector. Therefore, factors are unemployed and they should be absorbed by other sectors. The absorption, however, depends on how factor prices react to the changes. The change in the price of the taxed factor totally depends on the factor intensity of the taxed sector. If the taxed sector is capital intensive (tax factor is capital for example), a large amount of capital is unemployed and other sectors should absorb them. In this case, the relative price of capital declines to make way for absorption. If the taxed sector was labour-intensive, a large amount of labour would be unemployed, and hence the relative price of labour declines.

The issue of substitution arises only in a partial tax situation and the substitution effect is dependent upon the possibility of substituting the untaxed factor (elasticity of substitution) for the taxed factor. If, for example, producers of the taxed sector can substitute labour for capital (taxed factor), they tend to employ more labour and less capital since the tax-induced price of capital has risen. This leads to a fall in the relative price of capital. If the untaxed factor cannot be substituted for the taxed factor, producers will react by decreasing the usage of both factors (Keller 1980). However, factor substitution is dependent upon the supply elasticity of factors. As noted in the previous section, these changes in factor markets are also dependent upon factor mobility. In summary, the effects and the burden of a factor tax largely depend on three major factors: factor intensity of the taxed sector, factor substitutability and the supply elasticity of factors and factor mobility.

2.4.2.3. Highlights of General Equilibrium Effects of Tourism Taxes

Following the partial equilibrium theory, in the preceding two sections the general equilibrium theory of tax incidence was explained and the effects of tourism taxes were highlighted. The discussion focused broadly on the efficiency and equity effects arising from taxes. Based on this discussion, the effects of tourism taxes can be summarised into the following four major areas:

i. relative price effect/price changes;
ii. industry effects and related effects on factor usage;
iii. household consumption effects and welfare changes; and
iv. macroeconomic and general effects.

In this thesis, the key issue addressed is the general equilibrium effects of tourism taxes and thus our analysis will focus on the above four aspects.

As explained above, tax-induced relative price effects can be considered as the core of tax policy studies and they initiate all other subsequent effects. These changes are reflected in commodity price changes (in relation to tourism taxes, this implies the price of the composite tourism product and the prices of other commodities) and factor prices. Industry effects measure mainly the changes in the output of commodities and the usage of factors, labour and capital, arising from relative price changes.

Changes in relative prices of commodities and factors lead to changes in household income and hence household consumption.[29] Welfare changes are measured in relation to changes in household consumption. Overall, these tax-induced changes in prices, demand, output and revenue could result in broader macroeconomic changes

[29] Traditionally, effects on the distribution of income among various levels of households, which are known as distributional effects, have been the major concern in tax policy studies. These are considered as clear indicators of the extent of the incidence. However, in the current context, the distributional changes of tax incidence are represented by household demand changes.

within the economy in question. These can include changes in GDP, aggregate employment, capital stock, export and import volumes, general price level, foreign exchange rates and government finances.

The general equilibrium aspect of tourism tax incidence is broad and complex and gives rise to various effects within the economy, as noted above. Of these changes, changes in household consumption and related welfare changes are of high importance from the efficiency aspect. The following sections will address the issue of welfare changes in the light of tourism taxes focusing on both the nature of welfare changes and the various methods of measurement of welfare changes.

2.4.3. Welfare Changes and Excess Burden

As noted above, the measurement of efficiency is an important aspect of a tax policy study. There are some three indicators of an efficient tax structure. An efficient tax administration and low compliance cost are two primary indicators of efficiency.[30] The third and the most important efficiency criterion is a change in consumer welfare. Measurement of welfare relating to a policy change is an important branch of Welfare Economics. As explained in both partial equilibrium and general equilibrium theories, a tax policy can interfere with economic decisions and hence distorts the efficient choice i.e. in consumption and production. This distortion can change welfare and it can either be a welfare improvement or a loss.

Welfare improvement of a particular policy change can be identified when the gainers of the policy change gain sufficiently for them to be able to compensate the losers and still remain gainers on balance (Hicks 1942). The reverse holds true for a welfare loss of a policy change and thus generates a burden on taxpayers that is referred to as excess burden, deadweight loss or efficiency cost. Consumers choose a basket of commodities, subject to a budget constraint, in order to maximise utility. When taxes distort the efficient choice of commodities, there could be a loss of utility. The excess burden measures the degree of the loss of utility. Thus, the excess burden of a tax arises as it affects the welfare or the well-being of taxpayers by way of utility loss.

[30] Fast, reliable and accurate administration of the tax policy at minimum possible cost and the simplicity of the tax policy are two key aspects of administrative efficiency. Furthermore, a minimum compliance cost that could incur both on the taxpayer and the government can improve efficiency.

An efficient tax policy is one that minimises the excess burden of taxes (Musgrave and Musgrave 1984). Excess burden can be discussed in two different ways: individual burden and aggregate burden (Keller 1980). The individual burden is the burden of a tax on an individual household, i.e. the difference between individual well-being before and after the tax while the aggregate burden measures the change in welfare of all households.

There is a vast literature on various aspects of welfare changes starting from Hotelling (1938) who applied consumer surplus theory to analyse welfare effects of taxes and utility rates. This was followed by a major contribution to welfare economics by Hicks (1942). He argued that consumer surplus theory is limited in measuring welfare changes as it can only be applied to measure welfare changes in relation to changes in the price of a single commodity. He highlighted the need for a measure of welfare where more than one commodity can be considered. Extending further from consumer surplus theory, Hicks then introduced four alternative measurements of welfare changes: compensating variation, equivalent variation, Laspeyre variation and Paasche variation. Harberger (1964) also introduced a well-known method of measuring welfare changes extending from consumer surplus theory. The most important contribution of his method is that the loss of welfare can be transformed into a dollar amount. These pioneering works were followed by several important theoretical and empirical contributions to the literature on welfare changes.[31]

Most of these early works were focused on identifying alternative measures to estimate the money measure of welfare changes of taxation. Auerbach and Rosen (1980) and Creedy (2000, 2004) provided a survey of available alternative measures of welfare changes and explored how these different measures can be approximated. Mayshar (1990) and Goulder and Williams III (1999) introduced some of the new measures based on early theoretical works. Among the recent developments in this

[31] See, for example, Ahmad and Stern (1984), Ballard *et al.* (1985b), Browning (1987), Creedy and Kalb (2001), Diamond and McFadden (1974), Feldstein (1978), McKenzie and Pearce (1982), McLure and Thirsk (1975), Rosen (1978), Shoven (1976).

area, marginal excess burden (MEB) has started to appear in a series of recent studies.[32]

According to the above discussion, it is clear that there are five alternative but interrelated measures of welfare changes relating to tax-induced price changes:

i. consumer surplus measure;
ii. equivalent variation;
iii. compensating variation;
iv. Laspeyre variation/Laspeyre cost difference; and
v. Paasche variation/Paasche cost difference

Among these, the consumer surplus measure is said to be the simplest measure of welfare changes in taxation and it is based on the well-known Marshallian demand curve.[33] Marshall has defined consumer's surplus as "the excess of price which the consumer would be willing to pay rather than go without the thing, over what he actually does pay" (as quoted in Hicks 1942, p.126). The excess burden concept emerged against the background of consumer surplus theory and it is the most convenient and most frequently cited measure of welfare cost (Harberger 1964).

In Marshallian theory, the net benefit to society of a choice of a commodity is equal to the sum of the consumer and producer surpluses. The imposition of a tax increases the price and reduces both consumer and producer surpluses as the quantity demanded falls. This process was explained in Section 2.4.1 and Figure 2.3 showed that the excess burden/deadweight loss is represented in the triangle E_1EE_2. If government net transfers are fixed, households' welfare is represented by the reduced area of consumer surplus. Even if the government returns tax revenue to consumers as a lump sum, they are still worse-off by the area shown by triangle. Thus, the triangle represents pure efficiency loss. The money value of welfare loss shown in this triangle can be estimated as follows.

[32] See, for example Fullerton and Henderson (1987), Fullerton (1991), Diewert and Lawrence (2000), Gooroochurn and Milner (2004) and Stuart (1984).

[33] However, Hotelling (1938) and Ng (2004) held that it was Jules Dupuit, a French engineer, whose work laid the foundation for Marshal to develop the concept of consumer surplus.

By using simple geometry (c.f. Figure 2.3), the area of the triangle is equal to a half of the product of the tax rate and the change in quantity, which can be presented as follows:

(2.14) $$EB = \frac{1}{2}\Delta P * \Delta Q$$

Where EB is the excess burden in money terms, ΔP is the tax-induced change in price (P_D - P_S) and ΔQ is the quantity change (Q_I-Q_E) due to the imposition of the tax.

Equation (2.14) can also be defined in the following way using elasticity of demand (Rosen 2005).

(2.15) $$EB = \frac{1}{2}\eta PQt^2$$

Where, η is the elasticity of demand, P and Q are the pre-tax price and quantity and t is the tax rate.

According to Equation (2.15), the magnitude of the excess burden is dependent upon the elasticity of demand and if the demand is perfectly inelastic ($\eta = 0$), the excess burden is zero.

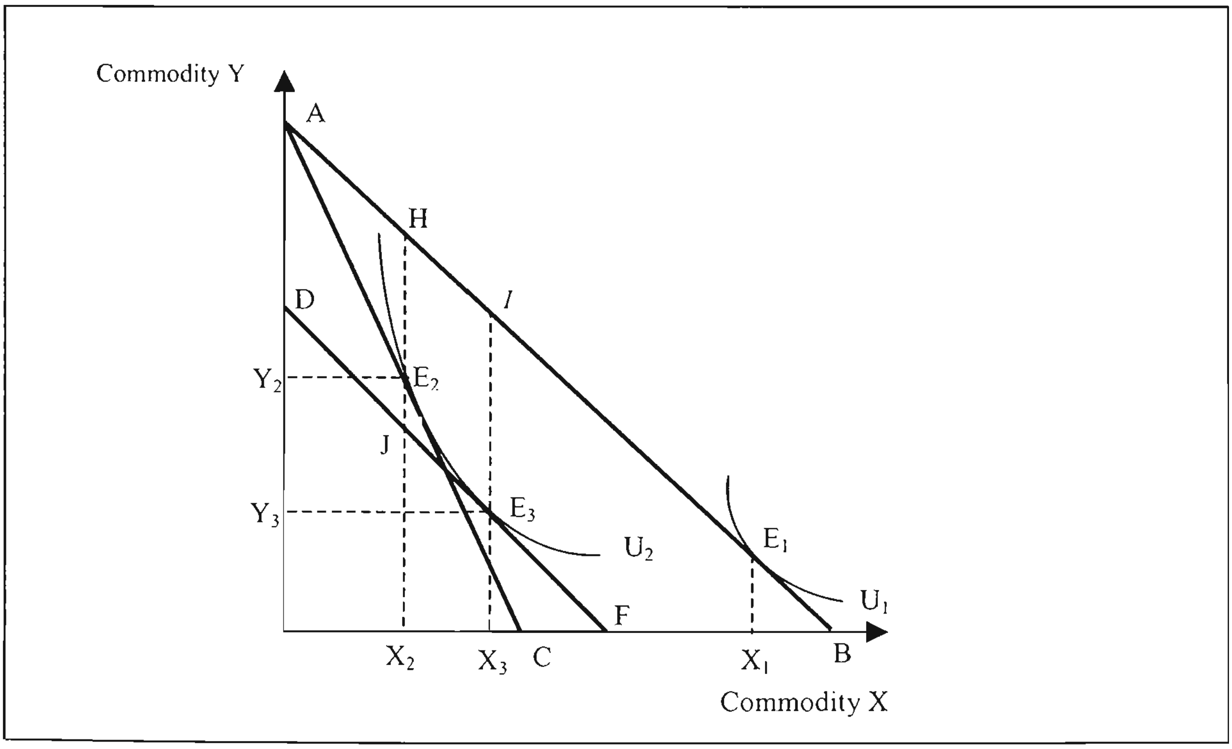
2.4.3.1. Equivalent Variations

One of the limitations of the consumer surplus measure is that it takes into account only demand changes of the taxed commodity. Tax-induced relative price changes can affect the choice of the entire basket of commodities that the consumer purchases. The consumer surplus theory is useful only in situations where a single market is considered. In contrast, the use of a utility concept allows the analyst to consider more than one commodity (often two commodities) subject to budget constraints. Both equivalent and compensating variations are based on the concept of utility (Auerbach and Rosen 1980). Thus, in this framework, the tax-induced changes in the consumption of the untaxed commodity can be taken into account and hence it can be used even in a general equilibrium framework.

Equivalent variation is the amount of income that has to be taken away from a consumer to induce him or her to move to a lower level of utility (represented by an indifference curve sitting left of the one before the tax) as a result of distortion (Auerbach and Rosen 1980, Creedy 2003, Rosen 2005).

To explain this concept, Figure 2.4 is used, and an individual who is willing to maximise utility subject to a fixed budget constraint is considered (Rosen 2005). There are two commodities, *X* and *Y*, and the consumer can choose a combination of these two. The budget constraint is shown as line *AB* before the distortion of the tax and it is drawn based on the prices of the two commodities. Wanting to maximise utility, the consumer chooses point E_1 in which the budget line *AB* and indifference curve U_1 are tangent. If, at this stage, the government imposes a tax on commodity *X*, the budget constraint is affected as the price of the taxed commodity rises. The new budget constraint after the distortion is represented by *AC*. This change forces the consumer to choose a new optimal position along the indifference curve U_2 that gives the new consumption combination of two commodities as X_2 and Y_2. The amount of tax paid by the consumer is the vertical distance between two budget lines shown by HE_2 and it is measured in terms of the number of items of commodity *Y*. This situation reveals a welfare loss due to the distortion as the consumer has moved to a lower indifference curve. Three questions arises: (i) can the loss of utility (U_1-U_2) be considered as a useful measure of welfare loss?[34] (ii) what would be the extent of the welfare loss? (iii) does it exceed the tax revenue?

Figure 2.4: Welfare Changes Based on Equivalent Variations



[34] The measure of utility is regarded as an ordinal concept and utility levels are entirely arbitrary. Utility functions define simply a preference ordering of alternative bundles with standard properties and hence changes in the level of utility cannot be considered as a useful measure of welfare change (Creedy 2004).

The extent of the welfare loss can be measured using equivalent variation. Generating a parallel budget line *DF* to the budget line before the distortion, the amount of income that should be taken away from the consumer to move him or her to a lower indifference curve (U_2 the same indifference curve that was tangent to *AF* after tax) can be estimated. The vertical distance between *AB* and *DF* amounts to the welfare loss (equivalent variation). The budget line *DF* is tangent to the indifference curve *U2* at *E3* and hence the consumer enjoys the same utility level as the post-tax level given at point E_2. The welfare loss as measured by equivalent variation is equal to the distance IE_3 and the tax revenue is HE_2. It is clear from these two measures that the welfare loss as measured in equivalent variation exceeds the tax revenue by E_2J. The government is unable to raise enough tax revenue to cover the welfare loss thus even if the government redistributes total tax revenue as lump sum transfers consumers are still worse-off by the amount E_2J. This is the excess burden and it is considered a pure efficiency loss of distortionary taxation.

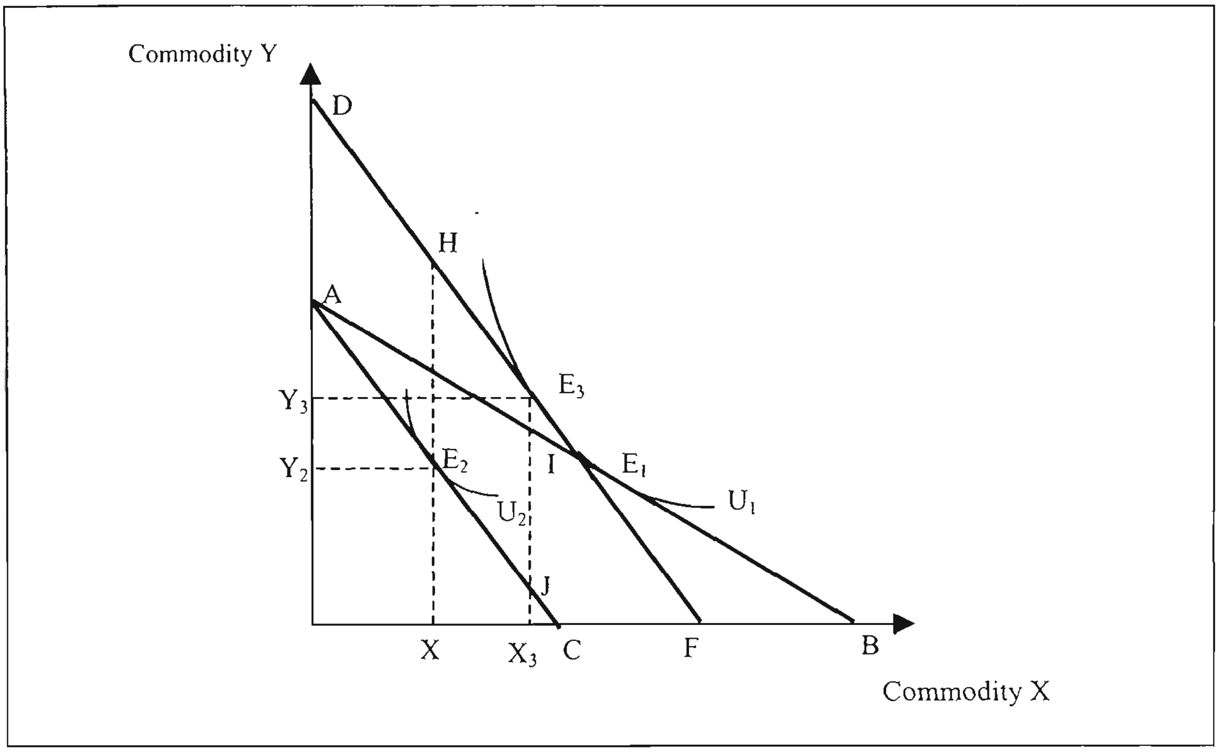
2.4.3.2. Compensating Variations

Compensating variation is the second utility compensation measure and is defined as the amount of additional income or transfer payment that should be given to the consumer after the distortion to maintain his or her original level of welfare (Auerbach and Rosen 1980, Keller 1980). Figure 2.5 illustrates compensating variation. The original budget line is *AB* and after the imposition of a tax on commodity *X*, the budget line pivots to *AC*. The consumer is forced to choose a combination that gives a lower level of utility along the indifference curve U_2 at point E_2. A parallel budget line *DF* (parallel to *AC*) has been drawn to measure the amount of compensation needed. The new budget line *DF* is tangent with pre-tax indifference curve U_1 and the consumer can choose an optimal combination of commodities at E_3. This combination gives the consumer the same level of utility as the pre-tax level.

Compensating variation is measured as the vertical distance (HE_2 or E_3J) between two budget lines (*AC* and *DF*) and is expressed in terms of the number of units of commodity *Y*. The vertical distance shows the amount of additional income needed to restore the loss of welfare due to distortion. Government tax income is shown by the distance *IJ* (the vertical distance between *AB* and *AC* at the point E_3) and hence it is clear that compensating variation exceeds tax income by E_3I. Therefore, the distance

E_3J represents the excess burden and this is a clear efficient loss of partial commodity taxation. Creedy (2004) noted that unlike equivalent variation, with compensating variation the excess burden is not based on the actual amount of tax paid, rather it is based on the amount of tax that would be paid if the individual were compensated.

Figure 2.5: Welfare Changes Based on Compensating Variation



2.4.3.3. Money Measure of EB using Equivalent and Compensating Variations

Theoretical measurements of welfare changes shown above are of limited use if they cannot be tested empirically, hence, a money measure is important. The derivation of a money measure based on the change in the level of consumer utility first involves defining the relevant expenditure functions. As explained earlier, the level of utility is an ordinal measurement and hence the minimum expenditure levels (represented by expenditure functions) that are required to gain those utility levels are close proxies. Diamond and McFadden (1974), Rosen (1978) and Creedy (2000) defined equivalent variations and compensating variations using expenditure functions.

Denoting expenditure function as $E(p, U)$, prices as p^0 (pre-tax) and p^1 (post-tax), utility levels U^0 (pre-tax) and U^1 (post-tax), equivalent and compensating variations can be expressed in the following ways:

Equivalent variation, EV:

(2.16) $$EV = E(p^1, U^1) - E(p^0, U^1)$$

Compensating variation, CV:

(2.17) $$CV = E(p^1, U^0) - E(p^0, U^0)$$

In equivalent variation, the excess burden (EB) is equal to the excess amount (measured in terms of units of the untaxed commodity) that equivalent variation exceeds the total tax revenue (R). Excess burden based on equivalent variation EB_{EV} can be defined as follows:

(2.18) $$EB_{EV} = E(p^1, U^1) - E(p^0, U^1) - R$$ [35]

Excess burden based on compensating variation EB_{CV} is described in the following equation:

(2.19) $$EB_{CV} = E(p^1, U^0) - E(p^0, U^0) - R$$ [36]

It is understood that the estimation of excess burden in precise terms seems practically difficult as it requires detailed information about expenditure functions. Thus, approximation into the expression $E(p^1, U) - E(p^0, U)$ using Taylor series expansion provides the following measure of excess burden (Creedy 2000, Rosen 1978):

(2.20) $$EB = \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} s_{ij}\, dp_i\, dp_j$$

Where, s_{ij} is the i,jth element of the Slustky matrix. An element of the Slustky matrix represents a change in household consumption of commodity i (x_i) to the change in the tax-induced price of commodity j (p_j).

Creedy (2000) noted that the above equation could be used to approximate the excess burden without knowing the exact form of the utility function, so long as compensated changes are available. However, the major limitation of this approach is that it demands the compensated changes in consumption after the tax change and it is

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[35] R is defined as $R = \sum_{i=1}^{n}(p_i^1 - p_i^0)x_i$ where x_i is the amount of commodity i consumed.

[36] Creedy (2000) noted that R appeared in Equation (2.19) can be higher than that of Equation (2.18). However, he noted that the subtraction of actual revenue as shown in Equation (2.19) is acceptable.

doubtful whether these are available with most of the empirical studies. Thus, given the data limitation, a more practical and plausible approach is needed for empirical estimations of welfare changes.

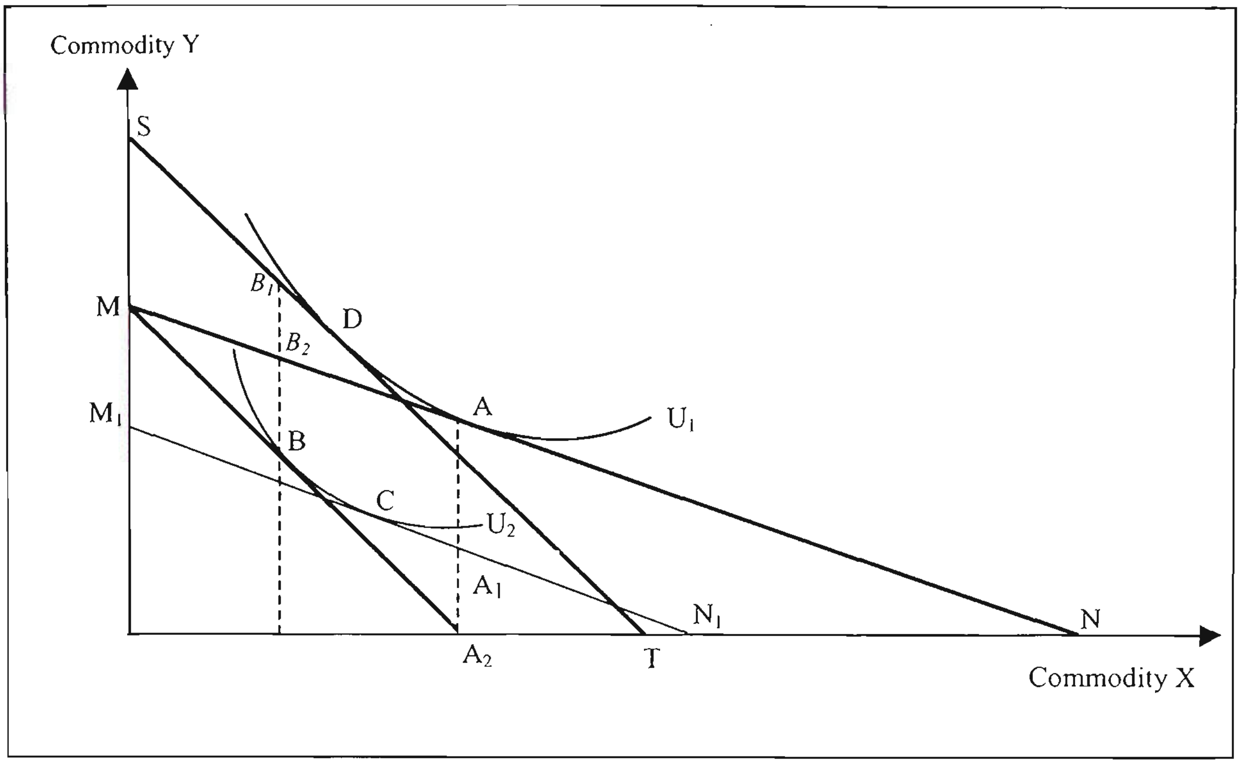
2.4.3.4. Welfare Measurement using Laspeyre and Paasche Variations

Hicks (1942) pointed out that Laspeyre and Paasche variations (these are also known as the Laspeyre cost difference (LCD) and the Paasche cost difference (PCD)) are also very useful and are close proxies of welfare changes arising from price changes. The Laspeyre variation of a tax-induced price change is the amount of money that could be taken away from the consumer while leaving him or her just able to buy the original bundle of goods bought before the change. The Paasche cost difference is the amount of money that must be given to the consumer so that he or she has just enough money to buy the new bundle of goods at the original prices (Ng 2004). According to these definitions, in Laspeyre variation, the welfare change is measured based on the original bundle of commodities and a new set of prices while in Paasche variation, it is measured based on the new bundle of commodities with original prices.

Figure 2.6 illustrates the interrelationships among the four measures as elaborated in Hicks's analysis. The estimated value of each variation solely depends on the nature of the price change. For example, according to the figure it depends on whether the consumer moves from A to B (increase of price of X) or B to A (decrease of price of X). If moving from A to B, all measures are negative and vice versa. If a price increase of X (due to a tax) is assumed, the consumer moves from point A (original position) to B as the income line rotates from the original line MN to MA_2. Now, the consumer is in a lower indifference curve that gives him or her a lower level of utility. The consumer's movements from B to C (in the same indifference curve U_2 assuming relative prices are constant) and from A to C (in the same indifference curve U_1) must be clear from earlier sections. In this context, welfare changes arising from a tax-induced price increase as measured in the four measures are equal to the distances represented as follows:

Laspeyre variation	$= -AA_2$
Equivalent variation	$= -AA_1$
Compensating variation	$= -BB_1$
Paasche variation	$= -BB_2$

Figure 2.6: Welfare Measure of Laspeyre and Paasche Variations



It should be clear from the above explanation that while there is a difference between changes in welfare measured in Laspeyre and Paasche variations, they clearly set limits between which compensating and equivalent variations lie (Hicks 1942) and thus they can be good enough proxies to measure welfare changes. In order to overcome the problem of difference between the two measures, the average of the Laspeyre and Paasche variations can be estimated and the Average Cost variation (difference) could even be a much closer proxy (Ng 2004).

Dixon and Rimmer (1999a) applied Laspeyre cost difference (LCD) and Paasche cost difference (PCD) to measure the welfare effects of changes in indirect taxes in Australia. Following Dixon and Rimmer, LCD and PCD can be defined as follows:

(2.21) $$LCD = \sum_{i=1}^{n} \alpha_i * \Delta x_i$$

(2.22) $$PCD = \sum_{i=1}^{n} \beta_i * \Delta x_i$$

Where α_i is the share of household budget (post-tax) accounted for by commodity i, β_i measures the share of household budget (pre-tax) accounted for by commodity i and Δx_i represents percentage changes in household consumption of commodity i.

As noted above, one major limitation of applying measures of welfare such as equivalent and compensating variations is their heavy reliance on utility functions and thus, they demand additional information about various parameters. This could make the assessment very tedious. As shown in Equation (2.21) and (2.22), LCD and PCD are two useful alternatives that can be applied where appropriate with a greater degree of precision. There are three major advantages of using such methods: (i) these measures do not demand the use of utility functions and hence the application becomes simple and less tedious, (ii) welfare changes can easily be estimated using actual market data, and (ii) results are immediately interpretable (Dixon and Rimmer 1999a).

2.5. A Review of Previous Studies

In this chapter, we have reviewed conceptual and theoretical issues in relation to tourism taxes and their effects. In this section, we intend to provide some empirical evidence from previous studies in the area of tourism taxation that would provide some reasonable parameters within which the results of this study may lie.[37] However, there are not many previous studies dealing directly with tourism taxation to be found in the literature, apart from a few recent studies. However, the debate on tourism taxation runs back to the late seventies where a number of research studies emerged which examined hotel room taxes, mainly based on the Hawaiian hotel industry. We start the section with one of the earliest studies in this area.

Mak and Nishimura (1979)

Mak and Nishimura (1979) applied a partial equilibrium model and analysed the impact of a special hotel room tax on visitor behaviour with special emphasis on the revenue-generating potential of the tax. Using cross-section expenditure survey data, they studied a special hotel room tax and its implications for demand for trips to Hawaii, for length of stay, for the composition of expenditure on the trip, and on tax revenue.

[37] Various theoretical aspects of tourism taxes are discussed in Abeyratne (1993), Dwyer and Forsyth (1999), Fish (1982), Forsyth (1997), Spengler and Uysal (1989). See also Edgell (1995), Piga (2003a, 2003b), Thomson and Thomson (1994) and Weston (1983)

First, they estimated demand parameters for visitor length of stay and total visitor numbers. The results indicated that a special hotel room tax had a negligible impact on visitor trip demand and on visitor length of stay. Secondly, they analysed whether visitors responded to higher hotel room prices, due to a special hotel room tax, by curtailing spending on non-lodging items. In this experiment, visitors were categorized into five quintiles in terms of their daily expenditure range. They found that visitors consider lodging and non-lodging expenditures as substitutes. While for visitors in the first and last quintiles increases in lodging prices have a negligible impact, this is not the case with the remaining quintiles, where an increase in lodging prices by one dollar gives rise to an 80 to 90 cents decrease in non-lodging expenditures. Finally, based on estimations of total revenue gain and losses, they concluded that a special hotel room tax generates additional tax revenue to the state sector at the cost of private sector income.

Combs and Elledge (1979)

Combs and Elledge (1979) in their study addressed two major issues involved with an imposition of a room occupancy tax: (i) how much tax revenue does the tax generate for local government and (ii) what is the impact of the tax on the travel industry in general? Without appropriate empirical evidence, the study assumed the demand for lodging to be inelastic with respect to price. Based on such assumptions, they found that a room occupancy tax has little impact on the industry but significant potential for raising tax revenue for the county concerned.[38] Furthermore, in line with the equity aspect of the tax, they concluded that a room occupancy tax is likely to be progressive.

Fujii et al. (1985)

Fuji *et al.* (1985) considered the incidence and exportability of an ad valorem hotel room tax in Hawaii. They estimated both demand and supply parameters for the Hawaiian hotel industry, and applied a partial equilibrium model to analyse the tax incidence. The results indicated that the ratio of the supply and demand elasticities for lodging to be approximately 2, indicating that two thirds of a hotel room tax can be

[38] This conclusion, however, could be unrealistic since demand for lodging often tends to be price elastic. The assumption adopted in this study that demand for lodging is almost perfectly inelastic can be misleading.

passed on to visitors in the form of higher prices. Only the remaining one third is borne by the hotel industry. They concluded that a hotel room tax is highly exportable when compared with a similar tax on other commodities purchased by visitors. Furthermore, they noted that general sales taxes are not appropriate in terms of exportability since a large portion of such a tax comes from residents. Thus, specific taxes (discriminatory taxes) such as a hotel room tax are appropriate measures for higher tax revenue. However, they suggested that taxes imposed upon tourism consumption might have a moderately large negative effect on the tourism sector.

Bonham et al. (1992)

The purpose of the Bonham *et al.* (1992) study was to estimate the impact of the 1987 Hawaiian hotel room tax by comparing real net (after tax) rental receipts of hotel operators before and after the imposition of the tax. To achieve this, they applied interrupted time series analysis. The results of this study suggested that the hotel room tax is almost fully shifted forward to tourists (by way of higher prices) with no significant revenue loss to hotel operators. Based on such results, they concluded that the demand for lodging in Hawaii may be close to perfectly inelastic and thus a small ad valorem tax on lodging might have little effect on the industry.

Hiemstra and Ismail (1992)

Following previous studies examining the Hawaiian hotel room tax, Hiemstra and Ismail (1992) analysed the impact of hotel room taxes levied in the lodging industry in the US. Based on data from a national survey of lodging establishments, demand elasticity for the lodging industry was estimated. Applying estimated price elasticity, they assessed the effect of a hotel room tax on the room occupancy rate and concluded that such taxes could have adverse effects on the sales of hotel rooms.

Hiemstra and Ismail (1993) extended some of the findings of the above study in a new study to analyse the incidence of hotel room taxes in the US. In this study, they estimated the price elasticity of supply for the lodging industry. Accordingly, they used demand and supply parameters to estimate the incidence of hotel room taxes. Their results indicated that most of the hotel room tax is borne by the guest (almost 86 per cent). However, in a recent study (2001), they revised their earlier estimation of elasticity of supply, calculating it to be less than the earlier figure and subsequently finding that a significant portion of the hotel room tax is borne by the lodging industry (almost 72 per cent).

Wanhill (1995)

All the studies examined so far in this section have focused on hotel room taxes and thus are narrow in scope. Among the recent studies that addressed tourism taxation from a much wider perspective, Wanhill's study on VAT (value added tax) rates and the UK tourism and leisure industry is important. Based on data from two surveys of tourism operators and tourism consumers and case studies undertaken, it was concluded that a reduction in VAT rates could considerably increase visitor arrivals and hence foreign exchange earnings from tourism. As a result of tourism expansion, employment opportunities are expected to increase in the UK. Although, VAT reduction caused substantial reduction in total VAT revenue, overall the economy appeared to be better-off. In particular, the net gains are positive when a reduction in VAT for accommodation only was considered.

Blake (2000)

In a study that focused on the economic effects of tourism in Spain with a CGE application, Blake (2000) considered several fiscal policy changes. Of these, two policy changes were in relation to tourism taxation and they were VAT exemption for accommodation sectors and an increase in accommodation tax. Results of this study indicated that VAT exemption for accommodation has a negative welfare effect while an increase in accommodation tax has a positive welfare effect.

Durbarry and Sinclair (2001)

Durbarry and Sinclair (2001) also analysed the issue of tourism taxation in the UK and used an econometric model to estimate the price elasticity of demand for tourism in the UK. Judging from available evidence about relatively lower hotel occupancy rates, they considered that the elasticity of supply of tourism was greater than the estimated unitary elasticity of demand for tourism. This thus gave rise to the likely conclusion that the ratio of supply and demand elasticity is high. Accordingly, they concluded that most of the tourism tax burden is likely to be borne by tourists. Moreover, they suggested that, based on the unitary elasticity of demand for tourism in the UK, any increase in tourism taxes is likely to result in a considerable decrease in demand.

Jensen and Wanhill (2002)

A study by Jensen and Wanhill (2002) addressed the issue of whether reductions in VAT on accommodation increase economic efficiency in Denmark and they analysed this within a Keynesian macroeconomic system with an interregional input output model. A fifty per cent reduction of VAT on accommodation was considered, and, accordingly, simulations were carried out. The simulation results indicated that VAT reduction results in increases in visitor nights and total tourism expenditure. Overall, they concluded that such changes in the tourism sector could yield positive efficiency effects in the Danish economy.

Gooroochurn and Sinclair (2005)

Gooroochurn and Sinclair's (2005) study on the efficiency and equity effects of tourism taxation in Mauritius is the most recent attempt to address one important perspective on tourism taxation. They applied a CGE model of the Mauritian economy. The results of this study indicated that taxing tourism is efficient and thus it is a valid additional source of government revenue. Moreover, they found that tourism taxes are welfare-improving in terms of domestic consumption. In terms of equity effects, results showed that tourism taxes tend to improve income distribution. Overall, they concluded that tourism taxes can be contractionary since they have significant adverse effects on international tourism.

Divisekara (2001)

Empirical literature on tourism taxation in Australia is limited as it is elsewhere. However, Divisekara's (2001) study on the incidence of GST on the inbound tourism sector in Australia provides some important insights concerning tourism taxes and their implications. In this study, he applied a simple partial equilibrium model to analyse the incidence of GST. Simulation results of this study revealed that the price of international tourism rose roughly by half the tax rate. Accordingly, both international visitor nights and tourism receipts declined considerably. Furthermore, results indicated that almost half of the tax is borne by tourism suppliers. Government tax revenue increased by the amount of tax. Overall, however, the GST appeared to be welfare-decreasing.

2.5.1. Conclusion of the Empirical Evidence and Issues for Current Study

In this sub section, we reviewed the most relevant empirical literature on tourism taxation. Several common empirical conclusions can be drawn from this review.

i. Changes in tourism taxes directly affect tourism prices. For instance, an increase in taxes on international tourism causes an increase in international tourism prices considerably.

ii. Since tourism sectors, in particular international tourism, are price sensitive, such price increases can adversely affect the demand for tourism. Thus, visitor arrivals and tourism consumption can be adversely affected. This could considerably curtail the growth momentum of tourism-related sectors.

iii. One positive aspect of tourism taxes is the likely improvement in domestic welfare. This is particularly true in the case of international tourism taxes. Moreover, it is evident that discriminatory taxes such as those directly targeting international tourists are most likely to generate more welfare improvements.

iv. The overall effect, whether tourism taxes are expansionary or contractionary, is dependent upon the magnitude of tax-induced changes in tourism demand and domestic welfare.

Based on the general literature reviewed and the empirical evidence provided, we recognise that the following issues need to be addressed in the empirical analysis of this study.

i. Examination of the tourism tax structure focusing on the levels and the magnitude of such taxes. This is important since an understanding of the current tax structure is a prerequisite for any policy discussion in relation to tourism taxation.

ii. Empirical evidence showed that with very few exceptions, most of the empirical work was carried out within partial equilibrium frameworks. This suggests that the general equilibrium aspect of tourism taxation may be largely unexplored. Thus, there is a clear need to analyse the general equilibrium effects of tourism taxation.

iii. In the analysis of the general equilibrium effects of tourism taxes, four aspects identified in Section 2.4.2, namely price effects, industry effects, consumption and welfare effects and macroeconomic effects need to be analysed. In relation to welfare effects, LCD and PCD measures are to be used.

iv. Moreover, an appropriate modelling tool needs to be identified and developed to analyse the effects of tourism taxes. In Chapter Six the relevant literature will be reviewed to identify the most appropriate modelling followed by the development of the model in Chapter Seven.

The above mentioned issues that are addressed in this thesis are presented in a conceptual diagram that is given in Appendix D (Figure D1).

2.6. Summary

In this chapter, we reviewed the relevant literature and developed a conceptual and theoretical framework in relation to tourism taxation, and the framework helped identify basic components of tourism taxation. Accordingly, in this framework, we defined tourism taxes as those which could be described as applicable specifically to tourists and the tourism sector or, alternatively, if not specific to the tourism sector, those which are applied differently in tourist destinations. Two major types of tourism taxes, general and special, were identified. General tourism taxes are those imposed generally on the supply of tourism goods and services, income arising from tourism businesses, and compensation to employees of tourism businesses. On the other hand, special tourism taxes were defined as those imposed specifically on the tourism product or its components and tourism service providers. Additionally, based on the party on which taxes are imposed, tourism taxes were also categorized as taxes imposed on tourists and taxes imposed on tourism businesses.

Drawing from general tax theory, four tourism tax principles including efficiency, equity, simplicity, and effective stimulus to growth, were noted and a tourism tax regime can be assessed in the context of such principles. Accordingly, in this chapter, we have theoretically reviewed tourism taxes against these principles. This provided some mixed conclusions in that tourism taxes appear to be compatible with some principles while they seem to be conflicting with others. However, such theoretical views need to be empirically tested.

Both arguments for and against tourism taxation were outlined next in the chapter. Among the arguments for tourism taxation, three major economic arguments were identified. They include internalising externalities, rent extraction and government revenue generation. Under internalising externalities, it was argued that tourism gives rise to increased external costs in relation to negative environmental effects and the free rider problem arising from the provision of public goods to international visitors. In both cases, economic theory suggests that taxes could be imposed to internalise the externality. Furthermore, tourism taxes might also be justified based on maximisation of national gains via rent extraction and maximisation of government tax revenue.

In addition to these economic arguments, there were several general arguments for tourism taxation in that it helps to expand the current tax base, makes a contribution by the sector in return for the heavy government investment in the tourism industry and provides some benefits to local communities who most likely receive less from tourism development. In contrast to the arguments in favour, tourism taxation was criticised for several reasons. Among the major criticisms, a likely reduction of tourism price competitiveness and the implications were highlighted. It was argued that increased tourism taxes could drive prospective visitors away from the destination and thus the growth momentum of the sector could be adversely affected. As a multifaceted sector, such adverse effects could have far-reaching implications. Furthermore, it was noted that tourism taxation could invite retaliation by other governments for taxing their nationals.

Among the concepts reviewed in this chapter, the most important was the economic effects of tourism taxation and their wider economic implications. The effects of tourism taxes were reviewed in two theoretical frameworks: partial equilibrium and general equilibrium. In partial equilibrium, the effects of tourism taxes were simply explained by changes in tourism prices and subsequent changes in tourism volume. Overall, it was clear that the degree of changes in tax-induced price is determined by demand and supply elasticities. However, the chapter noted that the partial equilibrium view seems to be limited in its ability to articulate all relevant aspects of the effects of tourism taxation since it is simply based on conventional demand and supply theories.

Having identified such limitations, we then reviewed the general equilibrium effects of tourism taxation. In general equilibrium, tax-induced relative price changes and their implications were highlighted. It was argued that tourism taxes, in particular special tourism taxes, act as partial commodity taxes and could lead to an increase in tourism prices and a decrease in prices of other commodities. Due to such relative price changes, consumers tend to substitute away from the taxed commodity towards untaxed commodities. Producers may respond to such changes in consumption by producing less of a taxed commodity and more of untaxed commodities. Accordingly, temporary imbalances arise in factor markets. This implies that factors employed in the taxed sector become unemployed and thus relative factor price could change to restore the equilibrium in factor markets. The intuition is that the price of the factor used intensively in the taxed sector declines relative to the price of the other factors, so that the other sectors can absorb the unemployed factor restoring the equilibrium.

These changes may also change household income distribution, hence, lead to further changes in household consumption. Moreover, changes in tourism taxes are also reflected in changes in real GDP since most components of GDP appear to be affected by tourism taxes. In summary, general equilibrium effects of tourism taxation can be categorized into relative price effects, industry effects, household consumption and welfare effects and broader macroeconomic effects.

A detailed review of welfare changes in the background of tourism tax changes and alternative measurements of welfare changes were also included in the chapter. The measures include the consumer surplus measure, equivalent and compensating and variations, and Laspeyre and Paasche variations (cost differences). Among these measures, the last two measures were found to be better measures in the empirical context due to both the simplicity and the fact that they tend to set relevant limits of the other widely-used measures, equivalent and compensating variations.

Finally, we reviewed some empirical evidence in relation to tourism taxation. The evidence confirmed that tourism taxes result in higher tourism prices, which result in discouraged tourism demand, and, accordingly, they could tarnish the growth momentum of tourism sectors. In contrast to such adverse effects, tourism taxes appear to generate some welfare improvements in terms of domestic consumption.

Moreover, the evidence suggested that in the case of discriminatory tourism taxes, welfare effects tend to be more pronounced.

CHAPTER THREE
THE AUSTRALIAN TOURISM SECTOR:
Growth, Structure and its Contribution to the Economy

3.1. Introduction

The main objective of this chapter is to present an overview of the economic significance of the Australian tourism sector. This chapter, in particular, analyses the growth, structure, and the contribution of the tourism sector to the economy. The chapter contains five sections. Section two describes the recent growth trends of the Australian tourism sector within the broader global tourism market as well as the regional market. Section three outlines the growth trends of the Australian tourism sector within the national context and highlights the economic significance in terms of tourism expenditure and tourism consumption. Section four assesses the aggregate contribution of the Australian tourism sector within the economy and the final section summarises the chapter.

3.2. The Global and the Australian Tourism Sectors

In Australia, like in many other countries, the tourism sector plays a vital role in both the economic and social context. In the economic context, the sector is valued for its generation of foreign exchange, employment opportunities and value added. In the social context, the tourism sector is highly important as it provides leisure and recreation facilities for both local and foreign visitors. In both aspects it is clear that tourism sector's growth is very important.

The global tourism sector has been one of the fastest growing sectors during the last few decades and it further continues to grow. Table 3.1 presents world international tourist arrivals and their regional distribution, and reveals how fast the tourism sector has been growing. For example, during the last four decades, the global tourism sector, in terms of total arrivals, grew well over 900 per cent and evidence suggests that the sector will continue to grow. In *Tourism 2020 Vision*, the WTO (1998c) forecasts that global tourist arrivals will reach over 1.56 billion by 2020. Of these, 0.4 billion will be long-haul travellers.

While total tourist arrivals rise in numbers, growth rates in each period continue to fall sharply. For instance, from 1960-65 total arrivals grew by 63 per cent but from 1995-2000 total arrivals show only 25 per cent growth. The global tourism sector experienced the most severe setback during the period 2001-2003 resulting from a series of events such as the September 11 attack, the Iraq conflict, SARS and a weak global economic growth.

Table 3.1: International Tourist Arrivals (mn)

Period	World Tourist Arrivals		Regional distribution							
			Regional share in world total arrivals				Growth in regional total arrivals			
	Total	Growth	Europe	America	Asia & Pacific	Africa & Middle East	Europe	America	Asia & Pacific	Africa & Middle East
1960	69.3	-	72.7	24.1	1.3	2.0	-	-	-	-
1965	112.9	62.9	74.1	20.5	1.9	3.4	66.1	38.9	133.3	171.4
1970	165.8	46.9	68.2	25.5	3.7	2.6	35.0	82.9	195.2	13.2
1975	222.3	34.1	69.2	22.5	4.6	3.7	36.2	18.2	64.5	90.7
1980	286.5	28.9	64.9	21.4	8.5	5.2	20.9	22.8	138.2	81.7
1985	328.8	14.8	64.9	19.6	10.2	5.3	14.7	4.9	38.3	16.8
1990	455.9	38.7	61.5	20.4	12.7	5.4	31.5	44.4	71.7	42.0
1995	550.4	20.7	58.6	19.8	15.6	6.1	14.9	17.0	48.4	36.0
2000	687.3	24.9	57.1	18.6	16.8	7.5	21.8	17.6	34.7	53.0
2003	691.0	0.5	57.7	16.4	17.3	8.6	1.6	-11.7	3.5	16.0

Source: WTO, Yearbook of Tourism Statistics (various issues)

Among the receiving regions in the world, Europe receives the most tourist numbers followed by the Americas and Asia and the Pacific. In the 1960s, Europe, the market leader, received 73 per cent while the Americas' share was 24 per cent. Asia and the Pacific region had a little over one per cent of the world total. The most noticeable improvement in regional shares is the increase in the share of Asia and the Pacific region. While the shares of Europe and the Americas continue to decline significantly (up to 58 per cent and 16 per cent respectively), the regional share of Asia and the Pacific has increased sharply up to 19 per cent of the world total over the last four decades. Meanwhile, the regional share of Africa and the Middle East has also shown a considerable increase.

While the growth rates of all regions fluctuate, the Americas have experienced the highest decline (-11.7 per cent) in tourist arrivals during the period 2000-2003. In contrast, the other three regions are able to maintain a comparatively low growth rate during the same period. The Asia and the Pacific region have consistently grown at a significantly higher rate than all other regions. As a result of such growth rates, by 2003, the region has become the second highest receiving region, overtaking the Americas. The WTO forecasts that this region will grow annually at rates of over 5 per cent above the world average of 4.1 per cent per year and will receive 416 million visitors by 2020. Subsequently, the region will become the fastest-growing region.

Table 3.2 records the historical trends in international tourism receipts (in US$ billion) and they suggest an even stronger growth of the global tourism sector as receipts grow at a faster rate than arrivals. Most regions receive a larger share of tourism receipts from the world total relative to their market share in arrivals. For example, Asia and the Pacific and the Americas receive 20 per cent and 24 per cent of world tourism receipts, respectively, for their market shares of 19 per cent and 16 per cent in 2002. However, Europe, the market leader, receives 51 per cent of world tourism receipts even though its market share of arrivals is 57 per cent for the same year.

Table 3.2: International Tourism Receipts (US$ bn)

Period	World Tourism Receipts		Regional distribution							
			Regional share in world total receipts				Growth in regional total receipts			
	Total	Growth	Europe	America	Asia & Pacific	Africa & Middle East	Europe	America	Asia & Pacific	Africa & Middle East
1960	6.9	-	56.5	36.2	2.9	4.3	-	-	-	-
1965	11.6	68.1	62.1	29.3	4.3	5.2	84.6	36.0	150.0	100.0
1970	17.9	54.3	61.5	26.8	6.7	5.0	52.8	41.2	140.0	50.0
1975	40.7	127.4	63.6	25.1	6.1	5.4	135.5	112.5	108.3	144.4
1980	105.4	159.0	60.3	24.1	9.8	5.8	145.6	149.0	312.0	177.3
1985	118.0	12.0	53.7	28.2	12.4	5.7	-0.3	31.1	41.7	9.8
1990	264.1	123.8	54.4	26.2	15.6	3.7	126.8	107.8	182.9	46.3
1995	404.6	53.2	52.1	24.6	19.2	4.2	46.5	43.9	88.1	74.5
2000	473.4	17.0	48.5	28.2	18.4	4.9	9.0	34.0	11.8	35.7
2003	523.0	10.5	54.5	21.9	18.2	5.4	24.1	-14.3	9.8	22.0

Source: WTO, Yearbook of Tourism Statistics (various issues)

In summary, these comparative figures of international tourism arrivals and receipts indicate that the world tourism sector is growing at a faster rate despite all the challenges that could hinder its growth momentum. Furthermore, they indicate that the Asia and the Pacific region has become a strong force in the world market even overtaking a mature market region such as the Americas. Given this background, it is important to explore trends within Asia and the Pacific region and the next section covers this aspect.

3.2.1. Australian Tourism in the Regional Context

The Asia and the Pacific region consist of diverse destinations of which most are considered as long-haul destinations. Our particular interest is to explore growth trends in the Australian market. Table 3.3 presents the growth trends of the Asia and the Pacific region and the trends of Australian tourism within the region. The region is divided into four sub regions and of the four regions, the North-East Asia region receives the most international visitor numbers and tourism receipts. For example, in 1990, the North-East Asia region received almost 48 per cent of arrivals and 43 per cent of tourism receipts of the Asia Pacific total. These shares are 6 per cent and 7 per cent of the world total, respectively. This region consists of destinations such as China, Japan and Hong Kong, which receive most visitors in the region.

Table 3.3: International Visitor Arrivals (mn) & Receipts (US$ bn) in Asia & the Pacific[1]

Description	1990		1995		2000		2002	
	Arriv	Recei	Arriv	Recei	Arriv	Recei	Arriv	Recei
North-East Asia	27.9	17.6	44.1	33.7	62.5	41.3	73.6	47.9
South-East Asia	21.5	14.5	29.2	28.3	37.0	26.5	42.2	27.4
South Asia	3.2	2.0	4.2	3.5	6.1	4.7	5.9	5.1
Oceania	5.2	7.1	8.1	12.2	9.6	14.4	9.6	14.3
Asia & Pacific total	57.7	41.3	85.6	77.7	115.3	86.9	131.3	94.7
World total	455.9	264.1	550.4	404.6	687.3	473.4	702.6	474.2
Australia	2.2	4.1	3.7	7.6	4.9	8.5	4.8	8.1
% in world	0.5	1.6	0.7	1.9	0.7	1.8	0.7	1.7
% in Asia & Pacific	3.8	9.9	4.3	9.9	4.2	9.9	3.7	8.6
% in Oceania	42.0	57.7	45.7	62.3	51.0	59.0	50.0	56.7

Source: WTO, Yearbook of Tourism Statistics (various issues)

Arriv. = International arrivals, Recei. = International Tourism Receipts

The South-East Asia region, which consists of destinations such as Thailand, Malaysia, Singapore and Indonesia, receives the second largest share of the Asia Pacific regional arrivals and receipts, accounting for about 37 per cent of total regional arrivals and receipts in 1990. Both these regions continue to grow during the

[1] In the presentation of data, the same time period could not be used due to two reasons (i) data unavailability in the same disaggregation as we need, and (ii) the difficulty of presenting some data for a longer period.

12-year period shown in the table. Oceania, the third receiving sub region, accounts for 9 per cent of international arrivals and 17 per cent of international tourism receipts of the Asia Pacific regional total in 1990. However, in terms of world total they represent only a small proportion. For instance, in 1990, Oceania received just over one per cent of world total visitor arrivals. Even though the regional share is small, an important aspect of tourism in this region is that the regional share of tourism receipts is almost two times larger than its share of arrivals (i.e. it receives 17 per cent of receipts of the Asia and the Pacific total for just 9 per cent of arrivals).

Australia and New Zealand are the two most important destinations in the Oceania region and of these two Australia is the largest receiving destination. However, as a long-haul destination for most generating countries, Australia's market share in the world tourism market is extremely small. For example, in 1990, Australia received only 0.5 per cent of arrivals and 1.6 per cent of tourism receipts from the world total and during the period, this remains largely unchanged. However, in the broader Asia and the Pacific region, Australian tourism is in a strong position accounting for 3 - 4 per cent of arrivals and 8 - 9 per cent of tourism receipts of the Asia and the Pacific total during the period under consideration. The most important feature is the higher proportion in tourism receipts compared to the number of arrivals.

It is also clear from Table 3.3 how significant Australian tourism in the Oceania sub region. For instance, Australia receives almost 40 - 50 per cent of total arrivals and on average 60 per cent of total tourism receipts for the region, making Australia the highest receiver in the region. Moreover, by 2002, Australian international tourism receipts, as a single destination is almost US$3 billion higher than that of the entire South Asia region. In summary, the growth and the size of the Australian tourism sector in the region are significant despite poor performances in the global market in general.

3.3. Australian Tourism Sector in the National Context

The preceding sections outlined the historical trends in international tourism in regional tourism markets and in the world at large and it also highlighted the importance of the Australian tourism market in the same contexts. This section will further explore the Australian tourism market and its performances in the national context.

3.3.1. International Tourism

Table 3.4 records total international visitor arrivals in Australia from 1983 to 2003. During this period, the international tourism sector has grown significantly, showing a little over a 400 per cent increase in arrivals. This growth is almost three times higher than the growth of the global tourism sector that records only about a 140 per cent increase in arrivals for the same period (c.f. Table 3.1). Overall, the Australian tourism sector has grown at an annual average of 9 per cent during the two decades.

Table 3.4: International Visitor Arrivals in Australia

1983-1989			1990-1996			1997-2003		
Year	Arrivals 000	Change %	Year	Arrivals 000	Change %	Year	Arrivals 000	Change %
1983	944	-	1990	2,215	6.5	1997	4,318	3.7
1984	1,015	7.6	1991	2,371	7.0	1998	4,167	-3.5
1985	1,143	12.6	1992	2,603	9.8	1999	4,460	7.0
1986	1,429	25.1	1993	2,996	15.1	2000	4,931	10.6
1987	1,785	24.9	1994	3,362	12.2	2001	4,856	-1.5
1988	2,249	26.0	1995	3,726	10.8	2002	4,841	-0.3
1989	2,080	-7.5	1996	4,165	11.8	2003	4,746	-2.0
Average annual growth		15.0			11.0			2.0

Source: ABS, (Cat. No. 3401.0, various issues)

While Australia experiences an overall growth in international visitor arrivals over the period, a sharp decline in annual average growth is evident during the same period. For instance, in the 1980s, the Australian tourism sector grew at an annual average of 15 per cent, recording the most successful era in international tourism in Australia. This is followed by the period 1990-96 with a relatively slower growth rate. Since the late 90s, tourism's growth has slowed down even further. During the period 1997-03, Australian tourism grew at an annual average of only 2 per cent, less than one fourth of the overall average of 9 per cent during the two decades. This is primarily due to the sharp decline in arrivals by 3.5 per cent in 1998 and the continuous decline in arrivals since 2001. The deterioration of price competitiveness in the Australian tourism sector due to the introduction of the GST coupled with the reduction in global tourism demand after 2001 may be the major causes for the continuous decline in last three years.

The percentage distribution of international visitors by the purpose of visit such as holiday (HOL), visiting friends and relatives (VFR), business (BUS), education (EDU) and others (OTH) is presented in Table 3.5.[2] Figures in the table indicate that the majority of international visits to Australia are for holiday and leisure purposes, accounting for 63 per cent of total visitors in 1993. However, over the years, the importance of this segment continues to decline, and by 2003, holiday visitors account for only 51 per cent, a sharp decline in the percentage distribution.

VFR and business visitor markets are relatively stable in their percentage distributions with marginal increases over the period. However, the growth rates of these two categories also show considerable reductions. While Australia's popularity as a holiday destination declines over the years, it becomes increasingly attractive to visitors for education purposes. Even though this category represents a relatively small portion (i.e. 2 per cent of the total in 1993), the percentage distribution is more than doubled by 2003.

Table 3.5: Distribution of International Visitors by Purpose of Visit

Year	Percentage share in total arrivals					Percentage change				
	HOL	VFR	BUS	EDU	OTH	HOL	VFR	BUS	EDU	OTH
1993	63.1	17.7	10.6	2.3	6.3	-	-	-	-	-
1995	60.6	18.8	12.1	2.6	5.9	19.4	31.9	41.6	42.4	16.6
1997	58.7	18.9	12.7	3.3	6.3	12.3	16.8	21.7	46.6	24.5
1999	56.1	19.4	12.3	3.4	8.8	-1.3	5.8	-0.1	6.5	43.2
2001	51.2	19.4	11.7	4.3	13.4	-0.7	9.0	4.0	37.3	65.9
2003	51.4	19.6	12.4	4.8	11.7	-1.8	-1.1	3.5	7.6	-14.2

Source: ABS, (Cat. No. 3401.0, various issues)

International visitor expenditure in Australia based on where spent and by the type of broad visitor category is presented in Table 3.6. Growing in tandem with international visitor arrivals, international visitor expenditure has increased significantly and has changed the composition considerably. While there are considerable variations in percentage changes (as shown in the last column), overall, total visitor expenditure has increased by almost 80 per cent during the ten-year period at an annual average of 6 per cent.

[2] Other visitors include short-term visitors for employment purposes and visitors whose purpose is not specified.

Of the total expenditure, traditionally, prepaid expenditure for trips to Australia has been dominant, accounting for 57 per cent in 1993 while expenditure in Australia represents 43 per cent. Two most important components of prepaid expenditure are international airfares and expenditure on package tours. As a long-haul destination for most generating countries, the international airfare represents a large portion of total expenditure. Even though expenditure on international airfare for trips to Australia continues to increase, the importance of prepaid expenditure in total visitor expenditure continues to decline, while a similar increase in the relative importance of expenditure in Australia is evident. For example, the relative importance of prepaid expenditure in total expenditure declines from 57 per cent in 1993 to 47 per cent in 2003 while the importance of expenditure in Australia increases from 43 per cent to 53 per cent during the same period.

Table 3.6: International Visitor Expenditure in Australia

Year	Expenditure based on where spent				Expenditure by the visitor category				Total expenditure ($mn)	
	Prepaid		In Australia		Package visitors		Other visitors			
	Share	% Δ	Share	% Δ	Share	% Δ	Share	% Δ	Amount	% Δ
1993	57.0	-	43.0	-	41.3	-	58.7	-	10,985	-
1995	56.5	25.2	43.5	27.6	39.1	19.7	60.9	30.9	13,872	26.3
1997	51.4	-3.1	48.6	18.8	36.0	-2.1	64.0	11.9	14,769	6.5
1999	52.6	13.9	47.4	8.8	33.7	4.3	66.3	15.4	16,455	11.4
2001	50.3	19.9	49.7	31.2	33.2	23.3	66.8	26.3	20,611	25.3
2003	46.9	-11.7	53.1	1.4	27.4	-21.8	72.6	3.1	19,546	-5.2

Source: BTR (IVS, various issues), Tourism Research Australia (2005)

Table 3.6 also reveals the increasing importance of expenditure by other visitors in total visitor expenditure when compared with expenditure by package visitors. The percentage distribution of expenditure by other visitors in total has increased by almost 14 per cent during the period while package visitors record a similar decline in the percentage distribution of expenditure. These compositional changes are important and they may signal some important developments.

Table 3.7 shows the percentage distribution of expenditure of international visitors by the purpose of visit. These shares are based on visitor expenditures in Australia only, since data on the expenditure by package tourists by purpose of visit is unavailable for the entire period. The pattern of expenditure shown in Table 3.7 has strong links with that of Table 3.5. The most noticeable link is the fact that the percentage distribution in visitor expenditure by holiday visitors declines from 48 per cent in 1999 to 43 per cent in 2003 while the percentage distribution in expenditure by visitors for education purposes increases from 19 per cent to 28 per cent during the same period. This pattern is closely replicated by a similar pattern of changes in visitor arrivals in these two categories, even though the changes are not necessarily at the same magnitude. Visitors in the education category can be expected to spend relatively more as their numbers increase over the years due to Australia's increased intake of overseas students. In addition to the changes in these two categories, VFR and business visitor categories also record a marginal decline in their contribution to visitor expenditure.

Table 3.7: Percentage Distribution of International Visitor Expenditure

	Visitor category					
	Holiday	**VFR**	**Business**	**Education**	**Other**	**Total**
1999	48.3	14.4	14.1	18.7	4.5	100.0
2000	47.4	13.8	13.2	20.6	5.0	100.0
2001	47.0	12.9	11.7	21.7	6.7	100.0
2002	43.4	12.3	11.4	26.5	6.4	100.0
2003	42.7	13.1	11.5	26.4	6.3	100.0

Source: Compiled using BTR (IVS, various issues)

We have examined trends in international visitor arrivals and expenditure in Australia. Evidence gathered and analysed suggests that both arrivals and expenditure have grown markedly while there are apparent structural changes over the period. Information of this nature is necessary to understand the general picture of tourism. However, one important aspect to the background of the current thesis is the structure of tourism expenditure and its changes. More precisely, the specific sectors or product categories that receive tourism expenditure and their structural changes need to be described. This aspect is addressed by using the Australian Tourism Satellite Accounts (ATSA) in the following section.

3.3.2. International Tourism Consumption

International tourism consumption by the type of aggregated tourism product is presented in Table 3.8.[3] Nine tourism products shown in the table are aggregated from

[3] ABS (2004a, pp. 34) defines tourism consumption as "the total consumption made by a visitor or on behalf of a visitor for and during his/her trip and stay at the destination". This definition includes both actual and imputed expenditures. Tourism consumption is defined to include only transactions between

a total of 18 tourism characteristics and tourism-connected products in ATSA.[4] These tourism products are compiled from more than 70 products classified in the Australian New Zealand Standard Product Classification (ANZSPC). Those products are produced and supplied by 51 industries classified in the Australian and New Zealand Industrial Classification (ANZSIC). This implies that the presence of tourism consumption in the Australian economy is extremely important. It has wider economic significance since it has direct links with the vast majority of sectors and industries to a varying degree.

Table 3.8: Australian International Tourism Consumption

Tourism products	Percentage distribution				Percentage change		
	99-00	00-01	01-02	02-03	00-01	01-02	02-03
Accommodation	14.6	14.6	15.4	15.3	17.2	5.4	-2.9
Food & beverages	16.0	16.6	16.7	17.2	21.7	0.3	0.2
Long distance transportation	29.3	30.7	29.0	28.9	23.2	-6.1	-2.8
Local transportation	4.5	4.4	4.2	4.3	15.0	-3.9	-1.0
Shopping	14.4	13.9	13.6	13.2	13.4	-2.5	-4.9
Recreation & gambling	3.5	3.3	3.0	3.0	9.2	-7.2	-2.1
Education	7.8	7.5	8.6	9.3	12.1	15.1	5.5
Travel agency	2.0	2.1	2.0	1.9	24.7	-6.7	-7.2
Other tourism	8.0	7.0	7.5	6.9	2.7	6.2	-10.1
Total tourism consumption ($mn)	14,612	17,141	17,080	16,666	17.3	-0.4	-2.4

Source: ABS (2004a)

Table 3.8 shows that total international tourism consumption increased significantly by 17 per cent in 2000-01 over the previous year, before a sudden drop in the following two years by 0.4 per cent and 2.4 per cent, respectively.[5] Understandably, almost 75 per cent of tourism consumption is directed towards four major tourism products: long distance transportation, food and beverages, accommodation and shopping. Among these four, the long distance transportation service that includes air,

a visitor and a business with whom the visitor has direct contact. Direct contact does not necessarily imply payment has to occur.

[4] ATSA has categorised 7 tourism characteristics products (travel agency & tour operator services, taxi fares, long distance passenger transportation, motor vehicle hiring, accommodation, takeaway & restaurants meals and shopping) and 11 tourism-connected products (local area passenger transportation, repair & maintenance of motor vehicles, fuel, food products, alcoholic beverages & other beverages, motor vehicles, caravans & boats etc., recreational cultural & sports services, gambling & betting services, education, actual and imputed rent on holiday houses and other tourism goods and services). For more information, please see (ABS 2004a). Tourism product and Tourism industry concordance is given in Appendix A.

[5] This pattern of change in consumption is consistent with the changes in visitor arrivals shown in Table 3.4. As we have seen, international visitor arrivals have changed almost in the same pattern.

water, road and rail transport services accounts for, on average, 30 per cent of total tourism consumption for the period and it shows marginal fluctuations. Consumption of food and beverages, accommodation, and shopping ranges between 14 - 17 per cent on average for the same period.

Among the remaining products, education attracts the next highest portion of tourism consumption as a single product.[6] For instance, in 1999-00, education accounts for almost 8 per cent of tourism consumption and this increases marginally over the period despite reductions in the relative importance of most of other products. As mentioned earlier, the increasing importance of expenditure on education in total tourism consumption is mainly due to the increasing number of visitors for education purposes.

As far as percentage changes in levels of consumption are concerned, 2000-01 is the most successful year. Among the broad categories of tourism products, the highest increase of 25 per cent is recorded in the consumption of services of travel agencies. This is followed by long distance transportation (23 per cent) and food and beverages products (22 per cent). During the next two years, consumption of almost every tourism product declines with the notable exception of education that shows significant increases by 15 per cent and 6 per cent respectively. The highest decline in the level of consumption in 2001-02 is recorded in travel agencies (7 per cent) and in the following year, it is in other tourism goods and services (10 per cent).

From the above discussion, it becomes clear how important tourism consumption within the Australian economy is as a multifaceted activity. Furthermore, tourism consumption may have some potential for government tax revenue. The presence of international visitors and their consumption mean that a substantial amount of tax revenue may have been collected from them given the existence of various commodity taxes in Australia. However, this primarily depends on the tax regime of the period under consideration.

[6] Other tourism goods and services include 15 products.

During the period before July 2000, the major commodity tax was the wholesale sales tax (WST). By considering both tourism product categories appearing in Table 3.8 and the level of WST exemption, it is clear that most of the tourism product (composite tourism product) was WST free. Among the tourism products, the most likely category for WST is shopping which might include various goods bought by visitors such as electrical items, jewellery and household goods. Therefore, the contribution of international visitors to WST is minimal. The lower tax contribution by international visitors could have been changed since July 2000, after the introduction of the GST.[7] Those goods and services consumed by international visitors that were exempt from WST became taxable under the GST system. Additionally, excise duties on alcohol, tobacco, and petrol and the wine equalisation tax are also part of the taxes paid by international visitors on their consumption.

Substantial taxation of tourism consumption in Australia may have a number of implications. First, tax revenue collected from international visitors should increase as tourism consumption increases. Although Table 3.7 shows that total tourism consumption declined during 2001-2003, the general trend is that the tourism sector, and hence consumption, is growing considerably. Second, increasing taxes, in particular commodity taxes, can have a discouraging effect on tourism consumption and thus the growth momentum of tourism consumption may have been hindered. Third, changes in tourism consumption patterns can take place. For example, taxes relevant to accommodation services can have changing effects on accommodation consumption. On the one hand, visitors may be forced to look for relatively inexpensive accommodation that has a small tax component. On the other hand, a prospective visitor who might prefer to stay in accommodation facilities may be forced to find alternative sources. This is increasingly possible among VFR visitors. VFR visitors, proportionately high in numbers, often tend to stay with their friends and relatives. As accommodation services become more expensive, VFR visitors may increasingly seek out alternative accommodation with friends and relatives. In summary, this suggests that presence of taxes has strong significance in tourism consumption.

[7] More information about the WST and GST and implications of changes of these taxes are given in Chapter Four.

Based on the above discussion, an inference can be drawn that international visitors may have a substantial contribution to total Australian tax revenue. Furthermore, it suggests that the tax contribution can vary due to the changes in the relevant tax regime. Since there was a significant change in the tax regime with the introduction of the GST in 2000, the international visitor's tax contribution may have been significantly changed. However, as noted in Chapter Two, taxes paid by visitors are only one aspect of the total contribution. There are also taxes paid by tourism sector businesses. Therefore, the total amount of tax from the sector could be even higher. However, the tourism consumption data presented in this chapter does not quantify the actual size of the tax contribution from the sector. This aspect needs further consideration.

3.3.3. Domestic Tourism

Domestic tourism represents more than 75 per cent of total tourism activities in Australia. Thus, from the economic perspective, domestic tourism, its growth and contribution, is of high importance. Table 3.9 records total domestic visitor numbers, their percentage distribution by purpose of visit and the total domestic tourism expenditure for the period 1999-2003.

According to the table, when compared with international visitor numbers, domestic tourism is about 16 times larger than international tourism. For example, in 1999 there were 73 million domestic visitors while international visitors account for just 4.5 million. Since 1999, domestic visitor numbers continue to grow before a marginal decline in 2003. These figures also reveal that domestic tourism is relatively stable when compared with volatile international tourism. This is mainly due to both Australia's remote location from the rest of the world and less sensitivity of domestic tourism to security and health concerns that directly affect international tourism.

As with international tourism, holiday visitors dominate the domestic tourism market representing almost 45 per cent in 1999 but declining to 42 per cent in 2003. The VFR market is the second largest and accounts for 33 per cent in 1999 with its importance continuing to grow. For example, VFR visitor numbers increase to 37 per cent of the total in 2003, showing a 4 per cent increase from 1999. Business and other visitor categories appear to be relatively stable with minor fluctuations over the period.

Table 3.9: Australian Domestic Visitors and Domestic Tourism Expenditure

Year	Percentage distribution of domestic visitors				Total Visitors '000'		Tourism Expenditure $mn	
	Holiday	VFR	Business	Other	Total	% Δ	Total	% Δ
1999	44.5	32.6	20.2	2.6	72,981	-	33,579	-
2000	44.6	32.4	19.9	3.2	73,771	1.1	36,593	9.0
2001	43.6	32.8	20.1	3.5	74,585	1.1	38,262	4.6
2002	42.4	34.6	19.8	3.2	75,339	1.0	39,929	4.4
2003	42.1	36.7	19.0	2.1	73,621	-2.3	39,589	-0.9

Source: BTR, (NVS, various issues), Tourism Research Australia (2005)

The last two columns of the table present total domestic tourism expenditure and it can be seen that total expenditure increases over the period solidly before a marginal decline in 2003 by around one per cent. In year 2000, expenditure has recorded the highest increase by 9 per cent.

3.3.4. Domestic Tourism Consumption

Table 3.10 presents the percentage distribution of total domestic tourism consumption by aggregated tourism products. It shows that total domestic tourism consumption has risen by a little over 13 per cent during the four-year period under consideration. During the period, the highest growth of 9 per cent over the previous year is recorded in 2000-01 just before a marginal decline of less than one per cent in the following year. Recovering from the drop, domestic tourism consumption increases again by 5 per cent in 2002-03. Among the tourism products, recreation and gambling realizes the highest growth of 21 per cent in 2000-01, followed by local transportation (15 per cent) and accommodation (14 per cent). In 2001-02, most tourism products experience reductions except accommodation and food and beverages.

The composition of domestic tourism consumption is very different from that of international tourism, though both increase over the period. There are five major tourism products that account for almost 83 per cent of total domestic tourism consumption.[8] These include long distance transportation, food and beverages, accommodation, shopping and local transportation. Among these five products, unlike international tourism where long distance transportation accounts for the highest consumption, food and beverages account for the largest portion. For example, food

[8] In international tourism consumption, long distance transportation, food and beverages, accommodation and shopping account for almost 75 per cent of total international tourism consumption.

and beverages account for, on average, 31 per cent of total domestic tourism consumption and is followed by shopping (16 per cent), long distance transportation (14 per cent), local transportation (12 per cent) and accommodation (11 per cent).

Table 3.10: Australian Domestic Tourism Consumption

Tourism products	Percentage distribution of total domestic tourism consumption				Percentage change		
	99-00	00-01	01-02	02-03	00-01	01-02	02-03
Accommodation	10.8	11.4	11.8	11.8	14.2	3.1	4.9
Food & beverages	30.4	30.1	31.1	31.2	7.8	2.4	5.1
Long distance transportation	14.4	13.8	13.5	13.0	4.7	-3.2	1.3
Local transportation	11.7	12.3	11.4	11.1	14.8	-7.9	1.4
Shopping	16.0	16.0	16.0	16.5	9.1	-1.0	8.0
Recreation & gambling	4.6	5.1	5.1	5.1	20.5	-1.6	5.6
Education	0.3	0.2	0.2	0.3	0.7	-1.5	6.8
Travel agency	3.6	3.5	3.5	3.4	6.8	-1.9	2.5
Other tourism	8.3	7.4	7.5	7.7	-2.9	0.8	8.2
Total tourism consumption ($mn)	50,026	54,384	54,063	56,641	8.7	-0.6	4.8

Source: ABS (2004a)

For most international visitors, Australia is a long-haul destination and hence consumption on long distance transportation is highly significant. However, in the case of domestic visitors, this component is less significant. Local transportation expenditure by international visitors is less than 5 per cent for the period while for domestic visitors it is almost 12 per cent. The relative importance in consumption on accommodation by domestic visitors is low when compared with international visitors. This can partly be explained by the fact that there is a higher presence of VFR visitors among domestic visitors than with international visitors. For example, in 2003, 20 per cent of total international visitors are in the VFR category whereas with domestic tourism this is as high as 37 per cent. Lower consumption on accommodation by domestic VFR visitors is not surprising, since there is a high likelihood that they may stay with their friends and relatives.

A similar picture to that drawn in relation to international tourism can be drawn in relation to domestic tourism consumption. That is, domestic visitors may make a significant contribution to Australian tax revenue. In fact, by looking at total domestic tourism consumption which is almost four times higher than international tourism consumption, it is clear that considerably higher taxes may have been collected from domestic tourism than international tourism. However, the extent, the levels and trends in tourism taxes arising from tourism consumption need to be examined separately.

3.4. Aggregate Contribution of Tourism to the Australian Economy

In the preceding sections, the importance and the growth of the Australian tourism sector are discussed in the context of visitor arrivals and expenditure. Following this discussion, there appears to be one important issue that needs further attention: What is the aggregate contribution of the Australian tourism sector within the overall economy? In the conventional system of national accounts (SNA), the sector is not identified separately.

An important methodological improvement is achieved with the development of tourism satellite accounts which identify the actual contribution of the tourism sector within the conventional SNA. As a result, the tourism sector contribution is readily comparable with any other economic sector. In this section, the contribution of the Australian tourism sector is analysed using relevant ATSA information.

Table 3.11 shows the contribution of the tourism sector in the Australian economy in terms of three major macro economic indicators of tourism: gross value added, GDP and employment for the period 1999-00 to 2002-03. Of these, tourism gross value added is the main indicator.[9] Gross value added is an indicator of a sector's contribution to the economy. Thus, tourism gross value added can be considered as the actual contribution of the tourism sector to the Australian economy.

Table 3.11 shows that tourism gross value added continues to increase. For instance, in 1999-00, tourism gross value added is $23,994 million and in the following year, this increases by 4.4 per cent to $25,044 million. However, during the last two years, tourism gross value added records relatively slower growth rates. The lowest growth rate is recorded in 2001-02 and this could have been due to both the global downturn in tourism that affected Australian international tourism and the introduction of the GST in 2000 that came in to full effect in 2001-02.

[9] Tourism gross value added is measured as the value of the output of tourism products by industries less the value of the inputs used in producing these tourism products. Output is measured at basic prices, that is, before any taxes or subsidies on tourism products are adjusted (ABS 2004a).

Table 3.11: Tourism Gross Value Added, GDP & Employment in Australia

Description	1999-00	2000-01	2001-02	2002-03
Tourism gross value added ($ mn)	23,994	25,044	25,229	25,875
% Change	-	4.4	0.7	2.6
Total gross value added ($ mn)	572,662	609,766	652,346	691,010
% Change	-	6.5	7.0	5.9
Tourism GDP ($ mn)	27,316	30,861	30,865	31,985
% Change	-	13.0	0.0	3.6
Gross domestic product ($ mn)	623,461	668,426	713,229	758,147
% Change	-	7.2	6.7	6.3
Tourism employment (000)	524.7	537.7	533.7	540.7
% Change	-	2.5	-0.7	1.3
Total employment (000)	8,886.6	9,074.3	9,207.4	9,441.4
% Change	-	2.1	1.5	2.5
Tourism share of total gross value added	4.2	4.1	3.9	3.7
Tourism share of GDP	4.4	4.6	4.3	4.2
Tourism share of total employment	5.9	5.9	5.8	5.7

Source: ABS (2004a)

Even though the Australian tourism sector continues to grow in terms of gross value added, its growth has been far less than the overall growth of the economy. For instance, total Australian gross value added has grown ten times (in 2001-02) and more than two times (2002-03) higher than the growth of tourism value added. This indicates that (i) contraction in the tourism sector has had relatively little impact on the overall growth of the economy, and (ii) other economic sectors have recorded much faster growth than tourism.

Tourism GDP is the second important macro economic indicator and this shows a similar pattern as in the previous case, with two notable exceptions. First, tourism GDP in 2000-01 increased by 13 per cent over the previous year, which is the highest growth recorded by a tourism macro indicator. Second, tourism GDP figures in Table 3.11 are considerably higher than tourism value added figures. Overall, the difference between tourism GDP and value added is due to a larger tax contribution by the tourism sector. This is in line with our earlier inferences that increasing tourism consumption gives rise to increasing tourism taxes. Moreover, the sharp increase in tourism GDP in 2000-01 is a result of changes in the Australian general tax structure. The GST was introduced in this year and thus taxes on tourism increased at a higher rate than gross tourism value added, resulting in a higher increase in tourism GDP. However, in the following two years, tax increases are normalised and tourism GDP reflects this. Furthermore, Table 3.11 shows that Australian GDP increases by 22 per cent over the period while tourism GDP increases only by 17 per cent.

From a conventional perspective, the contribution of a sector is also measured by its generation of employment. Table 3.11 presents employment in the Australian tourism sector together with national aggregates. While the total number of employment opportunities has increased over the years, the annual percentage changes are the lowest recorded in each year among the three major indicators. For example, when tourism value added and tourism GDP records a 4 per cent and 13 per cent increase in 2000-01 over the previous year, total employment in tourism increases by only 2.5 per cent. When compared with total Australian employment, the growth of the tourism sector's employment is relatively low.

The three major macro economic indicators examined above clearly indicate that tourism is an important economic activity and that the significance of the sector is on the rise. What is even more important is the relative size of this economic activity, or what share of the Australian economy is represented by the tourism sector. This can be determined by looking at the tourism share of total gross value added, the tourism share of GDP and the tourism share of employment in the overall economy.

Table 3.11 also shows estimations of these shares. Tourism shares of total gross value added and GDP are in the range of 3.7 per cent to 4.6 per cent over the period. While these two shares show a marginal decline over the period, the tourism share of GDP remains little higher than the share of gross value added. The employment share is the highest among the three shares and is almost 6 per cent on average during the period.

3.5. Summary and Major Highlights

This chapter examined the growth, structure and economic significance of the Australian tourism sector. The chapter began with an overview of trends in the global tourism sector with special reference to regional tourism markets. Then, trends in the Australian tourism sector were discussed in the context of the regional tourism market of Asia and the Pacific and Oceania. This was followed by an analysis of international and domestic tourism based on visitor arrivals, expenditure and tourism consumption. The aggregate contribution of tourism was highlighted using indicators such as tourism gross value added, tourism GDP and tourism employment.

Evidence presented in the chapter shows that the Australian tourism sector, particularly international tourism, in terms of visitor arrivals, has grown markedly over the last two decades. Evidence suggests that international visitor arrivals have grown by some 450 per cent over the period. International visitor expenditure in Australia has also grown markedly. Moreover, available evidence suggests that there are some important structural changes in tourism expenditure in Australia. There is a considerable shift of expenditure by international visitors from prepaid expenditure towards expenditure in Australia. The size of expenditure by package visitors is declining while expenditure by other visitors (non-package) is increasing. Such changes may have some implications for the type and the amount of commodities they purchase, and hence the amount of taxes they pay.

The domestic tourism sector is also growing although the growth rate is less than that of international tourism. However, the domestic tourism sector is considerably larger than the international tourism sector in terms of both visitor numbers and expenditures.

The analysis based on tourism expenditure was further supplemented by tourism consumption data from ATSA to identify the specific tourism product categories on which visitors spend money. By looking at various tourism product categories, it confirms that the tourism sector is not a single sector but a multifaceted sector. The tourism product, and in particular its components, are produced and supplied by many other sectors of the Australian economy. Its multifaceted nature makes it more important in terms of economic significance. Unlike any other sector, the tourism sector has strong forward and backward linkages as shown by tourism consumption figures in different product categories. This extended nature of the sector can also make it more sensitive, as any change in the sector is likely to have far reaching implications in related sectors.

In each tourism category (domestic and international) there are four to five major tourism products that account for more than 75 per cent of total tourism consumption. These include accommodation, food and beverages, long distance transportation, shopping and local transportation. Additionally, there is a set of other commodities, mainly services, that carry less weight in total tourism consumption.

The aggregate contribution of the Australian tourism sector was examined based on gross tourism value added, tourism GDP and tourism employment. All three measures indicated that the overall tourism sector contribution continues to increase. However, the growth rates of the tourism sector are somewhat lower than the overall growth of the Australian economy. Furthermore, evidence suggests that there is an increasing gap between gross tourism value added and tourism GDP.

Judging by the expansions of the sector in terms of arrivals, tourism consumption, and the existing gap between gross tourism value added and tourism GDP, an inference that "the Australian tourism sector accounts for higher taxes" is drawn. This raises two questions: (i) What are the possible taxes that are attributable to the tourism sector? (ii) What would be the total amount of such taxes from the sector? We will explore these issues in the next chapter. To be more specific, the next chapter will examine tourism tax structure and estimate the tourism sector's contribution in total Australian tax revenue.

CHAPTER FOUR

TOURISM TAX STRUCTURE IN AUSTRALIA:

Examination and Estimation of Tourism Taxes

The Australian tourism tax structure is examined and the total tax revenue attributable to the tourism sector is estimated. There are two broad types of taxes: general and special tourism taxes. Of the two types of taxes, the general tourism taxes account for the largest portion of total tax revenue. Among the general taxes, excise duties have been the single major contributor until the introduction of the GST. Since its inception, the GST has become the major contributor. A comparison of tourism tax revenue with that of two comparable sectors suggests that the tourism sector makes a significant contribution. While the total tax revenue of all sectors grows over time, an above average growth is evident in the tourism sector.

4.1. Introduction

This chapter examines the current tourism tax structure in Australia, estimates the total tax revenue generated through such taxes and levies, and assesses the significance of tourism taxes for Australia's total tax revenue.[*] The chapter consists of six sections. Section two outlines the Australian general tax structure focusing on the tax structure before and after the tax reforms of 2000. Section three examines the Australian tourism tax structure under two broad headings: general tourism taxes and special tourism taxes. Section four looks at data sources and the methodology applied in the estimation of tourism tax revenue. Section five presents the estimates of tourism taxes over the 1993-2003 period and compares them with tax revenue attributable to two comparable sectors: mining and retail. The final section concludes the chapter.

4.2. Australian General Tax Structure

Before we commence our discussion on the Australian tourism tax structure, it is important to outline briefly Australia's general tax structure which we do in this section under three sub headings: (i) an historical overview of the Australian general tax structure, (ii) the general tax structure before the year 2000 and (iii) the general tax structure after the year 2000. The latter two serve mainly to distinguish the general tax structure before and after the introduction of the new tax system in 2000.

[*] Publications associated with this thesis which are listed at the outset are drawn manly from the material in this chapter.

4.2.1. An Historical Overview of the Australian General Tax Structure

Australia's taxation history began in 1788, the year that Australia's first Governor arrived in New South Wales (NSW), empowered with Royal instructions to impose taxes. The first tax was imposed to help pay for the completion of Sydney's gaol and provide for the orphans in the colony. After 1824, the Government of NSW collected extra revenue from customs and excise duties and these dominated government income throughout the 19th Century. In 1880, the Colony of Tasmania imposed a tax on income received from the profits of public companies. Four years later, the first general tax on income was introduced in South Australia. This tax was imposed at a flat rate of 1.25 per cent on income from personal exertion, 2.5 per cent on income from property and 0.2 per cent on landholdings (Australian Taxation Office, 2003a, henceforth ATO). Victoria imposed an income tax in 1895 under the Land and Income Tax Assessment Act 1895 (Woellner *et al.* 2002). After the first unsuccessful attempt to introduce an income tax in 1886, NSW also introduced an income and land tax in 1895. In Western Australia, a tax on company dividends and profits was introduced in 1899 and was followed by the introduction of a general tax on income and land in 1907. Queensland and Tasmania did not introduce a general tax on income until 1902.

The Commonwealth Government's involvement in income tax started in 1915 when it introduced the Income Tax Assessment Act (ITAA) 1915 and imposed that income tax be collected for the Commonwealth Government via collection by respective State governments. In 1910, a land tax was introduced by the Commonwealth Government and in 1930, the first consumption tax: Wholesale sales tax (WST) was introduced on certain goods produced in Australia and imported into Australia. In 1942 the Commonwealth Government began collecting all income tax on a uniform basis and redistributed a significant component of the tax income among the states and territories. Two years later, the Government introduced a Pay-As-You-Earn (PAYE) system of income tax. In a move to stop tax avoidance, the Capital Gains Tax (CGT) and Fringe Benefit Tax (FBT) were introduced in 1985 and 1986, respectively. As a part of income tax, the Government imposed the Medicare Levy in 1986.

As shown in the previous paragraphs, the Australian tax system has been subject to continuous change. The most recent and perhaps most important change in the

Australian taxation system, from the tourism sector viewpoint, is the introduction of A New Tax System (ANTS) in July 2000.

4.2.2. General Australian Tax Structure before the Year 2000

The tax system before ANTS comprised a large number of Commonwealth, State and local government taxes which can be categorized into five major areas: (i) taxes on income, (ii) employers' payroll tax, (iii) taxes on property, (iv) taxes on provision of goods and services and (v) taxes on the use of goods and performance of activities. Table 4.1 shows the different taxes that represent these categories at all levels.

Table 4.1: The General Australian Tax Structure Before & After 2000

Taxes before	Taxes after
Commonwealth Government	
Company income tax	Company income tax
Personal income tax	Personal income tax
Fringe benefits tax	Fringe benefits tax
Wholesale sales tax	Goods and services tax
Customs duty	Customs duty
Excise duty	Excise duty
Petroleum resource rent tax	Petroleum resource rent tax
Superannuation tax	Superannuation tax
Withholding taxes	Withholding taxes
	Wine equalisation tax
State Government	
Payroll tax	Payroll tax
Land tax	Land tax
Stamp duties	Stamp duties
Levies on statutory corporations	Gambling taxes
Taxes on gambling machines	Casino taxes
Casino taxes	Race betting taxes
Race betting taxes	Insurance taxes
Petroleum products franchise taxes	Motor vehicle taxes
Tobacco franchise taxes	Other
Liquor taxes	
Motor vehicle taxes	
Bed tax/Accommodation tax	
Other	
Local Government	
Municipal rates	Municipal rates
Fines & charges	Fines & charges

At the State government level, there were more than ten taxes, duties and charges including payroll, property, financial and capital transactions, gambling, insurance, and motor vehicle taxes and other taxes and fees. This shows that the State tax structure during this period was complex with many taxes and different rates. For example, stamp duties were applicable to a range of transactions including transfer of property, transfers of shares, financial assets transfers, transfer of motor vehicles, life insurance, general insurance, leases, mortgage and loan security. In addition to stamp duties, financial institutions duty and bank accounts debit tax are also categorized under the common stamp duty label for the sake of convenience and continuity (Sood and Scutella 1997). At the local government level, taxes were municipal rates, fines and charges.

Table 4.2: Total Tax Revenue, All Levels of Government 1995-2000

Types of tax	Percentage distribution of total tax revenue				
	1995-96	1996-97	1997-98	1998-99	1999-00
Personal income tax	41.8	42.1	42.8	42.6	43.3
Company tax	12.9	13.8	13.5	14.3	15.0
Payroll tax	4.7	4.6	4.7	4.6	4.5
Fringe benefit & other employers tax	2.0	2.0	1.9	1.7	1.8
Land tax	1.0	1.0	1.0	1.1	1.0
Municipal rates & other property taxes	3.7	3.6	3.6	3.4	3.3
Taxes on financial & capital transactions	4.2	4.4	4.6	4.7	4.9
Wholesale sale tax	8.8	8.3	8.4	8.4	8.0
Excise & levies	9.5	9.0	8.6	8.0	7.5
Taxes on international trade	2.1	2.1	2.2	2.0	1.9
Gambling taxes	2.2	2.2	2.3	2.3	2.3
Insurance taxes	1.2	1.1	1.2	1.1	1.1
Motor vehicle taxes	2.2	2.1	2.2	2.2	2.0
Franchise taxes & Other	3.7	3.7	3.2	3.7	3.5
Total tax revenue ($ bn)	147.8	159.7	167.9	180.0	196.0

Source: Own compilation using ABS (Cat. No. 5506, various issues)

Table 4.2 presents total Australian tax revenue by the type of taxes for the period 1995-2000.[1] According to the table, total tax revenue at all government levels increased from $148 billion to $196 billion, more than a 30 per cent increase, during this period. One noticeable factor about the tax structure is the Commonwealth Government's heavy reliance on direct taxes. The contribution of taxes on income, which include personal income tax and company tax, in the total tax revenue was 55 per cent in 1995-96 and this increased up to 58 per cent in 1999-00. Property taxes including land tax, municipal rates and taxes on financial and capital transactions account for only 9 per cent of the total tax revenue and this remains largely unchanged for the period. This suggests that the contribution of the other indirect taxes, including commodity taxes, declined from 36 per cent in 1995-96 to 33 per cent by 1999-00.

[1] In this section, the five-year period before the introduction of ANTS was selected just to highlight the major changes that took place in the Australian tax system with specific reference to the commodity tax system.

4.2.2.1. Wholesale Sales Tax[2]

In 1930, the Wholesale Sales Tax (WST) was introduced as a single-rate tax with a limited number of exemptions and subsequently developed into a multi-rate tax with a whole range of exemptions. The tax was imposed on most goods that were consumed in Australia, whether produced locally or imported. It was paid on the wholesale price of goods and generally applied at the last sale from the wholesaler to the retailer. The general rate of the tax was 22 per cent (1997-2000). However, there were also special rates at 12 per cent, 32 per cent (for selected goods) and 45 per cent (luxury motor vehicles). Exemptions were given for a large number of goods including most food items, all the services, medicines and surgical items, some building materials, clothing, books, magazines, periodicals, and newspapers (ATO 1999).

The exemptions given suggest that most goods and services consumed by visitors in Australia enjoyed exemption from the WST. For instance, as noted in the previous chapter, a large portion of visitor expenditure (almost 75 per cent) is spent on accommodation, air transport, food and beverages, entertainment, and other services, which were exempt. Against this background, the abolition of the WST and its replacement with the GST was an important change for the Australian tourism sector.

As shown in Table 4.2, the WST is the single largest commodity tax and, on average, it accounts for about 8 per cent of total tax revenue. The relatively small contribution of the WST is primarily due to the limited tax base. This was one of the major arguments for ANTS i.e. the tax system should be changed so that it no longer relied heavily on taxes of income but on commodity taxes which have a much broader base.

4.2.3. General Australian Tax Structure after the Year 2000

The Commonwealth Government introduced ANTS in July 2000. The proponents of ANTS argued that the tax system before 2000 was no longer appropriate because it lacked the fundamental features that fit with the modern economic structure. In a Commonwealth report on 'Tax Reform: Not a New Tax, a New Tax System' (Commonwealth of Australia 1998), it was argued that the system was outdated,

[2] We selected the WST since it was the major commodity tax in the tax regime prior to ANTS and commodity taxes have significant implications for the Australian tourism sector.

unfair, ineffective and unnecessarily complex. This system consisted of taxes introduced in 1930s, including the WST. Over the years, the Australian economy has rapidly changed its structure and size. Although the tax rates had been changed, the tax structure and the tax base had not been changed to cater for modern economic needs.

ANTS introduced two major changes to the tax system that have direct relevance to the current study. The first was the reduction of the company tax rate from 36 per cent to 34 per cent for the 2000-01 income year and down to 30 per cent for the 2001-02 income year and thereafter. This was a significant reduction in the company tax rate with substantial positive effects for the business sector and, in particular, the tourism sector. The reductions were encouraging for tourism service suppliers.

The second was the introduction of the GST of 10 per cent replacing a number of Commonwealth and State taxes and duties.[3] One of the important Commonwealth taxes that was replaced by the GST was the WST. The WST was viewed as inefficient due to its limited tax base, too many exemptions, and complex differentiated rates for different product categories. The GST was introduced to simplify this tax structure. Table 4.1 shows taxes after the introduction of ANTS.

Table 4.3 shows total Australian tax revenue for the three-year period after the introduction of ANTS (2000-2003). Total tax revenue increased by 11 per cent from \$214 billion in 2000-01 to \$237 billion in 2002-03. After the introduction of ANTS, the proportion of taxes on income declined sharply from 58 per cent of total Australian tax revenue to 55 per cent in 2002-03. The ANTS reduced the reliance on income tax and provided more incentives to income tax payers. Property taxes remained at 9 per cent of total tax revenue. The proportion of commodity (indirect) taxes in total increased from 33 per cent in 1999-00 to 36 per cent of the total in 2002-03. Compared to the relatively small contribution of the WST (8-9 per cent), the GST

[3] The GST replaced nine types of State taxes. They include Financial institutions duty; Debit tax; Stamp duty on marketable securities; Conveyancing duties on business property; Stamp duties on credit arrangements, installment purchase arrangements and rental agreements; Stamp duties on leases; Stamp duties on mortgages, bonds, debentures and other loan securities; Stamp duties on cheques, bills of exchange and promissory notes; and Bed tax/Accommodation tax.

contribution to total tax revenue increased from 11 per cent in 2000-01 to 13 per cent by 2002-03.

Table 4.3: Total Tax Revenue, All Levels of Government 2000-2003

Types of tax	Percentage distribution of total tax revenue		
	2000-01	2001-02	2002-03
Personal income tax	36.8	40.2	39.0
Company tax	19.8	14.6	16.3
Payroll tax	4.3	4.3	4.2
Fringe benefit tax & other employers tax	1.7	1.7	1.3
Land tax	1.0	1.0	1.1
Municipal rates & other property taxes	3.3	3.4	3.3
Taxes on financial & capital transactions	4.6	4.5	4.6
Wholesale sale tax	0.9	0.4	0.4
Goods & services tax	11.2	12.6	13.2
Excise & levies	9.1	9.3	9.0
Taxes on international trade	2.2	2.4	2.3
Gambling taxes	1.7	1.7	1.6
Insurance taxes	1.1	1.3	1.3
Motor vehicle taxes	1.9	2.0	2.0
Franchise taxes & Other	0.7	0.5	0.4
Total tax revenue ($ bn)	213.7	216.9	237.5

Source: Own compilation using ABS (Cat. No. 5506, various issues)

4.3. Australian Tourism Tax Structure

As shown in the preceding section, there is no such thing as "tourism taxes" in the Australian general tax regime that can be readily identified. This raises the question as to what constitutes tourism taxes in Australia? How can we identify them and estimate the tax revenue attributable to the Australian tourism sector? Following the definition presented in Section 2.2.1, we identify two categories of tourism taxes in Australia: general tourism taxes and special tourism taxes.[4] In this chapter, only taxes, duties and levies, which are clearly identifiable, are considered. Table 4.4 shows the types of general and special tourism taxes in Australia.

[4] Tourism taxes are "taxes which could be described as applicable specifically to tourists and the tourism sector or, alternatively, if not specific to the tourism sector, those which are applied differently in tourist destinations" (WTO 1998b, p.16). A more detailed discussion on tourism tax typology is given in Chapter Two.

Table 4.4: Australian Tourism Tax Structure

General tourism taxes	Special tourism taxes/charges/levies
Company tax	Passenger movement charge/Departure tax
Personal income tax	Visa charges
Fringe benefit tax	Air craft noise levy
Goods and services tax	Air passenger ticket levy
Payroll tax	Environmental management charge/Surf tax
Gambling taxes	Accommodation levy
Excise duties	Duty on car rental
Wine equalisation tax	Vehicle registration recovery fee
	Airport tax
	Passenger service charge
	Safety & security charge
	Miscellaneous

4.3.1 General Tourism Taxes in Australia

According to Table 4.4, general tourism taxes include the GST, company tax, personal income tax, payroll taxes, fringe benefit tax (FBT), gambling taxes, excise duties and wine equalisation tax (WET).[5] Both the Commonwealth Government and State governments impose these taxes. The following sub sections will provide a brief discussion of each of these taxes.

4.3.1.1. Goods and Services Tax (GST)

The Commonwealth Government introduced the GST under A New Tax System (Goods and Services Tax) Act 1999 with effect from 01 July 2000. According to the Act, a GST of 10 per cent is imposed on taxable supplies and taxable importations. For GST purposes, a taxable supply includes:

i. A supply of goods and services;
ii. Provision of advice or information;
iii. A grant, assignment or surrender of real property;
iv. A creation, grant, transfer, assignment or surrender of any right;
v. A financial supply; and
vi. An entry into, or release from, an obligation to do anything, to refrain from an act or to tolerate an act or situation.

A taxable importation includes all importations of goods into Australia for local consumption, as long as they are specified as taxable in the Act.

[5] General tourism taxes are "those imposed generally on the supply of tourism goods and services, income arising from tourism businesses, and compensation to employees of tourism businesses".

According to the Act, non-taxable supplies are food, health services, education, childcare, and exports and related supplies that are for overseas consumption, religious services, non-commercial activities of charitable institutions, raffles and bingo conducted by charitable institutions, water and sewerage, supplies of going concerns, transport and related matters, precious metals, supplies through inwards duty free shops, grants of freehold and similar interests by governments, farm land, and cars for use by disabled people.[6]

The GST is a consumption tax and thus it changed the entire intermediate tax structure in Australia. As it is charged on the value added, manufacturers and firms can claim input tax credits. The Act introduced entitlements to input tax credits arising from creditable acquisitions and creditable importations. As manufacturers and firms are entitled to input tax credits, ultimately the consumer pays the GST. Therefore, in the production process there are no taxes other than duties, excise and charges.

As far as tourism-related goods and services are concerned, a significant portion of the composite tourism product is taxed under the GST. This includes all commercial accommodation, takeaway and restaurant meals, beverages, other recreation services, and local transport-related services. While international travel is exempt domestic air travel is taxed. This clearly shows that the introduction of the GST was a new tax for the tourism sector.

With the introduction of the GST, it was argued that the Australian tourism sector was affected significantly. The post-GST cost of the tourism product is higher than the pre-GST cost and this may have reduced demand for Australian tourism which may have led to a reduction in tourism receipts and a loss of employment opportunities. Some empirical studies were undertaken to estimate the impact of the GST on the Australian tourism sector (see, for example, Divisekara 2001, Dixon and Rimmer 1999a). However, the current GST rate in Australia is one of the lowest in the Western world and most European Union countries impose more than 15 per cent

[6] See Chapter Three, Division 38 of the GST Act for more details and schedules regarding the GST exempted items.

Value Added Tax (VAT). The standard VAT rates in EU countries could range from 6.5 per cent to 25 per cent.

4.3.1.2. Company Tax

Companies are considered as separate entities for taxation purposes. Therefore, every resident and non-resident company that derives assessable income from Australian sources is required to pay company tax. The legislation applied for company tax is the Income Tax Assessment Act (ITAA) 1915 and the current legislation is the ITAA 1997. For the purpose of company income tax, private, public, non-profit, and cooperative companies, registered organizations, and pooled development funds are considered to be companies. The current company tax rate that applies to most companies is 30 per cent. However, for certain companies special rates are also applied (for more information see Income Tax Rates Act 1986 and ITAA 1997).[7]

4.3.1.3. Payroll Tax

Payroll tax was first introduced as a Commonwealth Government tax and was later changed over to a State government tax. Payroll tax is imposed on wages paid or payable to employees and it applies in all states and territories in Australia. Wages comprise most forms of personal exertion income, such as salaries, bonuses, commissions and allowances (whether in cash or in kind) paid or payable to an employee (State of Victoria 2001). A payroll tax of a flat rate is collected and administered by all Australian states and territories. However, each state has its own tax rates and tax-free general exemption levels of wages paid to employees. In most states, the payroll tax is payable on a monthly basis (for example in Victoria, by the seventh day of each month following the month in which wages paid to employees exceeded the general exemption level). There are number of exemptions such as wages paid to religious organizations, public hospitals, non-profit hospitals, and non-profit, non-government schools.

The payroll tax is the single largest tax in almost all states in Australia. There are some contradictory arguments about payroll tax. Some argue that it is a tax on employment while others argue that payroll tax has little effect on employment.

[7] For example, different tax rates are 15-30 per cent for retirement savings account providers and 30-45 per cent for credit unions.

However, the evidence suggests that the burden of payroll tax can be shifted to either employees or to consumers (State of Victoria 2001). Regardless of the size of the burden on each party, what is clear is that a part of payroll tax comes from the tourism sector and hence constitutes a tourism tax.

4.3.1.4. Personal Income Tax

Personal income tax is a Commonwealth Government tax, which is administered by the ATO under the provisions of ITAA and its subsequent legislations. Australian residents and non-residents who receive a taxable income in Australia are required to pay income tax on salaries and wages, government pensions and benefits, income from investment and income from businesses. Taxable income for an individual is estimated by making certain deductions specified in income tax legislation from assessable income. As a part of personal income tax a Medicare levy is charged to partially fund the Medicare scheme that gives Australian residents access to health care. The rate of the Medicare levy in 1999-00 was 1.5 per cent of the taxpayer's taxable income for that year. In the case of tourism, we consider the personal income taxes paid by Australian taxpayers from their income arising from businesses in the Australian tourism sector.

4.3.1.5. Fringe Benefits Tax (FBT)

The FBT is administered by the ATO and was introduced in 1986 in order to contain tax avoidance. The legal provisions for the FBT come from the Fringe Benefits Tax Assessment Act 1986 and the Fringe Benefits Tax Act 1986. FBT is the tax payable by employers on non-salary benefits provided to employees or associates of employees. Employees do not pay income tax on the fringe benefits they receive. FBT is paid by employers irrespective of whether they are sole traders, partnerships, trusts, corporations, unincorporated associations or government bodies and irrespective of whether they are liable to pay other taxes such as income tax. The tax rate is 48.5 per cent of their fringe benefit taxable amount and is collected through a self-assessment system.

4.3.1.6. Excise Duties

Under the Excise Tariff Act 1921, the Commonwealth Government imposed excise duties on specific goods that are manufactured in Australia. Tobacco products, beer, spirits, other alcoholic products that are not subject to the wine equalisation tax, petroleum products, and crude oil are subject to excise duties. The ATO administers the excise duty and manufacturers or dealers calculate the duty payable. Excise duty is subject to indexation and is changed twice a year, in tandem with changes of the CPI. Imported goods that would be subject to excise duty if manufactured in Australia have customs duties at an equivalent rate (Woellner *et al.* 2002). Excise duties underwent some changes with the introduction of ANTS in 2000 and they include the reduction of duty on petroleum, the introduction of the wine equalisation tax and the introduction of the per stick excise on cigarettes.

There are two types of fuel duties that are relevant to travel and tourism. They are the petrol tax and the aircraft fuel tax. Fuel excise was first introduced in 1901 as a customs duty on imported petroleum (Commonwealth of Australia 2002). The prime objective was to fund the development and maintenance of the road network. There has been a considerable restructuring of fuel tax during the last century. Excise on domestically-produced petroleum was introduced in 1929 and in 1957 the government imposed a specific duty on imported and domestically-produced aviation fuel. Aviation fuel excise was introduced as a part of a funding scheme for the aviation industry. As both of these have been linked with specific projects, they can be considered as earmarked travel taxes.[8]

4.3.1.7. Gambling Taxes

Gambling taxes are a second kind of state tax relevant to tourism and they are imposed on lotteries, electronic gaming machines (EGMs), the casino, racing and some minor forms of gambling. With the exemption of lotteries, taxes are generally applied to the margins of the gambling operators. In the case of lotteries, the tax is on turnover (State of Victoria 2001). As the taxes are imposed on the margin of the suppliers, gambling taxes are viewed as taxes imposed on user businesses. Demand for casino and gambling services can be relatively inelastic. Therefore, it is argued that the imposition of taxes would not change demand significantly. Often gambling service providers may operate in a reasonably monopolistic market and hence

[8] As at 2 February 2004, fuel excise rates were for unleaded petrol $0.38143 per litre and for aircraft fuel $0.03114 per litre.

entertain market power. This makes it possible for them to manipulate the price to shift the tax to gamblers.

4.3.1.8. Wine Equalisation Tax

The wine equalisation tax (WET) was introduced under the A New Tax System (Wine Equalisation Tax) Act 1999. This imposes a tax on sales, importations and certain other dealings that take place after 1 July 2000. It was introduced to replace the tax void created with the abolishment of the WST and the introduction of GST. The WET applies to alcoholic products with more than 1.15 per cent volume of ethyl alcohol, including grape wine, grape wine products, fruit wines or vegetable wines and cider, perry, mead and sake (ATO 2002b). Twenty nine per cent of the wholesale price of WET (excluding GST) is applied at the last wholesale point of wine sale where wine is sold to a reseller by a wholesaler. This is calculated before the GST sale price.

4.3.2. Special Tourism Taxes in Australia

In addition to general taxes, there are also special or other tourism taxes. Most of these taxes and charges are directly imposed on either user businesses or tourists. Therefore, taxes under this category are much more relevant to the current study. Table 4.4 shows the special tourism tax typology for Australia. By considering the nature of the tax and the particular sector on which the tax is imposed, special tourism taxes can be recognised as those imposed on the travel sector and those imposed on the tourism sector. Accordingly, it is clear that most of the special tourism taxes are imposed on the Australian travel sector. This implies that there is a high likelihood that the cost of Australian travel could increase since most taxes tend to be shifted. A brief introduction to each of the special taxes is presented in the following sections.

4.3.2.1. Passenger Movement Charge (Departure Tax)

A passenger movement charge (PMC) of $38 (from 1 July 2001), commonly known as the departure tax, is imposed on each passenger leaving Australia for an overseas destination. PMC is levied under the Passenger Movement Charge Act 1978 and collected under the Passenger Movement Charge Collection Act 1978. The Australian Customs Service administers the PMC, which was first imposed in 1978 as the $10 departure tax. This charge was introduced as a cost recovery measure to cover the costs of customs, immigration and quarantine processing of inward and outward passengers (Parliament of Australia 2001).

The PMC is payable by all air and sea passengers leaving Australia. However, exemptions are given to 12 categories in which flight crewmembers, diplomats and children under 12 are included. Airlines and shipping companies collect the charge and remit it to the government. In the case of travel agents issuing air tickets, the practice is that the agent collects and remits the charge to the relevant airline. The Australian Customs Service pays the administration cost to the collecting agents for collecting and remitting the PMC.

4.3.2.2. Visa Charges

Before entering Australia, all applicants in all categories must obtain entry clearance by way of a visa. When applying for a visa, applicants are charged a visa fee, which is also known as an Entry Clearance fee. From the government's point of view, this is charged to cover the expenses involved with processing the visa application. However, the visa fee has been widely recognised as a tourism tax due to two reasons: (i) this is a compulsory payment collected by the government and is raised for government purposes (ii) the imposition of charges on visas might distort international travel behaviour.

4.3.2.3. Aircraft Noise Levy (ANL)

In August 1995, the Commonwealth Parliament passed the Air Craft Noise Levy Act 1995. Under this act, a levy is imposed at declared airports to cover the costs of the Commonwealth-funded noise amelioration programs which involve the acquisition and insulation of homes and certain public buildings in affected high-noise areas near airports. The levy was effective from 1 October 1995 and is payable by all jet aircraft landing at Sydney airport irrespective of whether the aircraft concerned is operating on international or domestic routes and whether it is carrying passengers or not. The levy is based on the noise characteristics of each aircraft and in most cases airlines operating jet aircraft into Sydney Airport are levied a charge of $3.40 per passenger. Common practice is that airlines pass the levy on to passengers. Six years later, the levy was extended to apply at Adelaide Airport with effect from 1 May 2001 to cover the cost of a similar insulation program for noise-affected areas around the airport. The airport noise levy is an earmarked special tourism tax.

4.3.2.4. Environmental Management Charge (Surf Tax)

The Environmental Management Charge (EMC), commonly known as the Surf tax, is charged on those who make a living from the Great Barrier Reef Marine Park. The surf tax of $4.50 is imposed on a per person basis under the Great Barrier Reef Marine Park Regulations 1983, effective from 1 July 1993. The charge is payable by commercial operators such as tour operators in the marine park. However common practice is to shift the charge to tourists which increases the cost of the composite tourism product. The prime objective of imposing the surf tax is to finance increasingly urgent research and improved management techniques in the park. As the revenue of the surf tax is allocated for research and improved management in the marine park, this can be considered as an earmarked special tourism tax.

4.3.2.5. Air Passenger Ticket Levy and Accommodation Levy[9]

The Air Passenger Ticket Levy was introduced under the Air Passenger Ticket Levy (Imposition) Act 2001. This levy was introduced to partially cover the cost of payments of basic entitlements to employees of Ansett airline after its collapse. The Commonwealth Government, in ensuring the employee's right to receive their basic entitlements, viewed that it was appropriate that air passengers bear the cost of these entitlements that included unpaid wages, leave, pay in lieu of notice and up to eight weeks' redundancy payments. A fund was established under the Special Employee Entitlements Scheme and the government provided a loan to settle entitlements. The levy was introduced to cover the loan.

A $10 levy was imposed on air passenger tickets purchased on or after 1 October 2001 and before the end of the final levy month. It was imposed on all air passenger tickets for regular passenger flights originating in Australia regardless of their destination. However, infants not occupying a seat, employees of the operator of an Australian flight travelling as a passenger as part of the employee's duties and

[9] These two special tourism taxes (accommodation levy and air passenger ticket levy) have now been abolished. However, since these two taxes were operative during the period under consideration, they were considered in the study and their contribution was accounted for in the estimation.

diplomatic, overseas mission, consular, and international organization personnel were exempt from the levy (Department of Transport and Regional Services 2002, henceforth DOTARS). The levy was not imposed on inbound travellers so that international tourists were also exempt. Ticketing airlines and travel agents collected the levy and remitted it to the government on a monthly basis. From 2001 to 2003, the levy collected $335 million advanced to 12,900 former Ansett employees and the levy ceased on 01 July 2003.[10]

An accommodation levy was imposed by the New South Wales (NSW) Government in 1997 under the Accommodation Levy Act 1997. The NSW Government imposed this levy to partially fund the 2000 Sydney Olympic Games. A 10 per cent levy on the room rate was applicable to all establishments that provide accommodation services in the central area of Sydney defined in the Act. For the purpose of the Act, such establishments include a hotel, a motel, a bed and breakfast establishment, a holiday flat, a serviced apartment, a guesthouse and a vessel used to provide such facilities. However, accommodation services provided in establishments such as boarding houses, backpacker hostels and youth hostels were exempt from the levy. As noted earlier, the accommodation levy was replaced by the GST.

4.3.3. Miscellaneous Taxes, Duties and Charges

In addition to the above-mentioned general and special tourism taxes, there are a number of other taxes, duties and charges. They are not taken into account in estimating the revenue of Australian tourism taxes in this study due to a lack of accurate and reliable data.[11] This miscellaneous group includes a duty on car rentals, vehicle registration recovery fee (VRRF), airport concession recovery fee (ARCF), passenger service charges, safety and security charges and land tax.

[10] In delivering the announcement of the cessation of the levy, the Minister for Transport and Regional Services said that the removal would save air passengers around $13 million a month and would boost the tourism sector (DOTARS 2003). This comment concurs with the arguments of academics and tourism sector representatives that tourism taxes constitute a burden on the sector.

[11] Some of these are simply charges imposed by relevant private sector authorities such as passenger service charges and safety and security charges and are not contributions to the central government fund. Thus, such charges are not included in the estimation.

All the state governments except Tasmania impose a Duty on Car Rental under the provisions of Duty on Hire of Goods. If a business receives income from hiring out goods, a duty is payable, and this includes hiring out of electrical appliances, motor vehicles, building plant and equipment, computer-related equipment and office equipment. The Tasmanian Government abolished this duty from 1 July 2002. Each of the other states has its own rate for car rental duty and its own duty-free threshold. The duty is payable by the company and subsequently the company passes the duty on to consumers. The current effective rates as at 30 September 2004 are 0.43 per cent in Queensland, 0.75 per cent in Victoria, 1.5 per cent in New South Wales, Western Australia and the Australian Capital Territory and 1.8 per cent in the Northern Territory and South Australia.

The VRRF is charged on those who use rental car services and is charged on top of the car rental fee. Car rental companies impose this as a way of recovering the annual vehicle registration fee. The common practice is to impose a daily charge for the rental period of a car. ARCF, commonly known as Airport Tax on Car Rental (Premium location surcharge), is applied when a rental car is picked up at an international airport terminal in Australia. Fees vary from 3 to 10 per cent of the total rent across airports and are collected from clients by rental companies and remitted to airport authorities.

A passenger service charge (Domestic & International) is imposed by airports to cover expenses in providing services to aircrafts. Expenses include landing charges, parking charges, terminal charges and other relevant aeronautical charges. In the past, airports imposed separate charges for these, however a recent trend has been for airports to charge airlines a lump sum per passenger to cover all these charges. The airlines then pass this on to passengers. Most Australian international and domestic airports have a passenger service charge for both international and domestic travellers. In 2003, this charge ranged from $4.40 (Hobart) to $19.15 (Sydney) per passenger and the airports adjust the charge in line with changes in expenses.

After September 11 and the Bali bombing, all airports have been forced to undergo new security measures. This involves significant increases in capital and overhead costs. In order to cover these, a per passenger safety and security charge (Domestic &

International) for each departing passenger is imposed. The charge ranges from $3.40 (Melbourne) to $6.17 (Adelaide).

4.4. Data Sources and Methodology

As we have seen so far, it is clear that the general tax structure does not specify tourism taxes. Therefore, one major problem associated with the estimation of tourism taxes in Australia is that there is no single source from which data can be extracted. Tax revenue attributable to the sector, in particular general tourism taxes, needs to be extracted from general statistical sources. Among the various sources, one key data source used in the current study is *Taxation Statistics*, an annual publication compiled by the ATO (various issues).

Taxation Statistics provides details of annual collections of all types of taxes imposed by the Commonwealth Government at different levels of aggregation. In relation to general tourism taxes *viz* company, personal income and fringe benefit taxes, tax yields are available by the type of industry/business activity. This industry/activity classification of tax collections follows the standard industrial classification based on the System of National Accounts (SNA) and thus is the most useful for the purpose at hand.

However, the above source does not identify taxes generated from the tourism sector as such. This is mainly because tourism is not recognised as a single industry/economic sector in the SNA. As a consequence, tourism taxes are not readily distinguishable and are hidden among general taxes. Given the multifaceted nature of tourism and the non-recognition of this activity in the SNA, the estimation of tourism taxes is problematic. We overcame this problem by applying a recent methodological development, the Tourism Satellite Accounts (TSA).

Satellite accounts allow an expansion of national accounts for selected areas of interest such as tourism, while maintaining the fundamental concepts and structures of the core accounts. They present specific details on a particular topic (both monetary and physical terms) in an account, which is separate from, but linked to, the core accounts. Therefore, the TSA highlights the contribution of tourism to the economy within the parameters of the SNA although it is not a direct part of it (ABS 2000, p.10). This is structured in layers of information, the main layer presenting key monetary measures of tourism in the economy.

The development of TSA is a result of the efforts of tourism researchers and industry representatives such as the WTO and WTTC in the search for an acceptable methodological tool to measure tourism's contribution to the macro economy. Canada was one of the first countries to develop TSA in 1994. The WTO and United Nations Statistical Commission have adopted the Canadian model as the recommended conceptual starting point for further work on TSA (Delisle 1999, Meis 1999). This was followed by countries such as the UK (Cooper and Wilson 2002), Mexico (Rivera 1999), Switzerland (Rutter and Berwert 1999), Germany (Alhert 2004), Turkey (Coskun 2004) and Tanzania (Sharma and Olsen (2005).[12]

The first Australian Tourism Satellite Account (ATSA) was developed in 2000 for 1997-98 and was then updated for five additional years up to 2002-03 (ABS 2004a).[13] Two key elements of the ATSA need elaboration. First, it recognises three types of tourism industries: (i) tourism characteristic, (ii) tourism connected, and (iii) all other industries. Tourism characteristic industries are those industries that would either cease to exist in their present form, or would be significantly affected if tourism were to cease.[14] Tourism connected industries are those, other than tourism characteristic industries, for which a tourism-related product is directly identifiable.[15] The outputs of these industries are consumed by tourists in volume, which are significant for the tourist or the producer. The remaining industries are classified as all other industries (ABS 2002a, p.27).

[12] A recent development in this area is the development of regional/state satellite accounts based on country accounts (Barber-Dueck and Kotsovos 2002, Canada 2004).

[13] Most recently, Dwyer *et al.* (2005b) developed TSA for the state of New South Wales.

[14] In the Australian TSA, for an industry to be "characteristic" at least 25% of its output must be consumed by visitors. Six tourism characteristic industries identified in ATSA are Travel agency and tour operator services; Taxi transport; Air and water transport; Motor vehicle hiring; Accommodation; and Cafes, restaurants and takeaway food outlets.

[15] There are 14 tourism-connected industries in the Australian TSA. They are, Clubs, pubs, taverns and bars; Other road transport; Rail transport; Food manufacturing; Beverage manufacturing, Transport equipment manufacturing; Other manufacturing; Automotive fuel retailing; Other retail trade; Casinos and other gambling services; Libraries, museums and arts; Other entertainment services; Education and Ownership of dwellings.

Second, the ATSA develops key economic indicators for the Australian tourism sector. They are tourism gross value added[16], tourism GDP, tourism share of the gross value added of major tourism-related industries, total tourism consumption of different sectors of the economy, tourism-related factor income (profit and wages) and employment generated by the tourism sector (see ABS 2002a). Overall, the ATSA provides a logical basis to identify the direct contribution of tourism to the national economy within the SNA framework. It provides a basis from which to compare the performance of tourism with other sectors/industries. A satellite account builds a database that is comprehensive, internally consistent and balanced. Thus, data become justifiable and credible (Meis 1999).

The principal methodology applied for the estimation is based on the ATSA database and we followed the following procedure. First, shares of gross tourism value added in tourism characteristics, tourism connected and all other industries are calculated as shown in Equation (4.1).

$$(4.1) \qquad \alpha_j = GTVA_j / TGVA$$
$$(j = 1, \ldots\ldots\ldots, n)$$

Where, α_j is the share of gross tourism value added for the tourism industry j (j represents the tourism characteristic, tourism connected and all other industries), $GTVA_j$ is the gross tourism value added for tourism industry j, and $TGVA$ is the total gross tourism value added for the Australian tourism sector for a given year. These aggregates are obtained from the ATSA.

Second, the estimated tourism industry shares of gross value added (α_j) are then used to estimate the tax revenue attributable to the broader tourism sector as given in the following equation:

$$(4.2) \qquad TTR_{ti} = \sum \alpha_j TTX_{tij}$$
$$(t,\ i, \text{ and } j = 1, \ldots\ldots\ldots, n)$$

[16] Tourism gross value added is measured as the value of the output of tourism products by industries less the value of the inputs used in producing these tourism products. ATSA recommends that tourism gross value added should be used when making comparisons with other industries or countries (ABS, 2002a).

Where, TTR_{ti} is the total tourism tax revenue for the period t of the tax type i, TTX_{tij} is the industry j's total tax revenue for the period t of the tax type i.

Using the available secondary sources noted above, we identify total tax revenue by the type of industry. For example, *Taxation Statistics* compiles a comprehensive breakdown in the collection of company tax, personal income tax and fringe benefit by industry type. Accordingly, we applied Equation (4.2) in the estimation of revenue from general tourism taxes including company tax, personal income tax and fringe benefit tax. In situations where tax collections by the type of industry are not available, the share of tourism in the total gross value added which is available in ATSA is used to estimate tax revenue.

Our method of estimating tax yields attributable to the tourism sector is similar to the one applied by Barber-Dueck and Zhao (2003) in their study on the estimation of government revenue attributable to tourism in Canada. Furthermore, Salma (2001, 2003) used the ATSA to estimate the indirect effects of tourism consumption and to study the trends in tourism investment in Australia.

In relation to tourism sector tax yield in the GST, gambling taxes and excise duties, the ATSA estimates on net taxes on tourism products are used. ATSA has estimated net taxes on tourism products (total taxes minus subsidies) that include GST, gambling taxes and excise duties since 1997-98 (ABS 2004a).[17]

In addition to ATO tax statistics, several supplementary data sources are used. They include publications such as Taxation Revenue: Catalogue No. 5506.0 (ABS, various issues), Visa Charges and Fact Sheets (Department of Immigration and Multicultural and Indigenous Affairs), Annual Reports (DOTARS, various issues), Annual Reports (Office of State Revenue, NSW Treasury, various issues), Passenger Movement Charge Amendment Bill 2001 (Parliament of Australia 2001), and Annual Reports (Australian Customs Service, various issues).

[17] Taxes on tourism products in ATSA have been estimated using the tourism product ratio. Fact Sheet-Net Taxes on Products 2002-03, provided by the ABS, gives a breakdown of total net taxes on tourism products into three different types of taxes: the GST, gambling taxes and excise duties for 2002-03 and percentage changes of each tax over the previous year. Based on this information, we estimate the tourism sector contribution in those taxes.

4.5. Tourism Tax Estimation: An Overview

Estimates of tax yields attributable to the Australian tourism sector for the period 1993-94 to 2002-03 are presented in this section. Before a detailed discussion on the tax yield attributable to the Australian tourism sector in each type of tax, this section provides a broader view of tax contributions by the type of broad industry in a number of selected taxes. This would highlight the importance of the tourism sector contribution to tax revenue among the other broad economic sectors. In estimating tax revenue from other sectors, the contribution of these sectors in tourism taxes has been accounted for.

Table 4.5 presents the tax contribution by sector to the GST, company tax, payroll tax, personal income tax and FBT for 2002-03. It appears that most services sectors, including tourism, have accounted for a higher tax yield in 2002-03. For instance, the finance and business services, wholesale trade and tourism sectors are the three highest contributors to the GST. They account for 32 per cent, 20 per cent and 16 per cent in the total GST, respectively. It is interesting to note that some sectors *viz* mining, education and government administration, health and community services have made negative contributions and this is due to higher input tax credits than the GST payable by each sector.[18]

The percentage contribution of the tourism sector to the total of each of the other taxes is comparatively low. For example, the sector accounts for 2 per cent of total company tax, 4 per cent of total payroll tax, one per cent of total personal income tax and 6 per cent of total FBT. The finance and business services sector remains the highest contributor to company tax, FBT and payroll tax, accounting for 46 per cent, 27 per cent and 23 per cent of each total, respectively. The largest contribution to personal income tax, 61 per cent of the total, comes from other industries followed by the primary production (11 per cent) and finance and business services (8 per cent) sectors.

The five taxes disaggregated into broad economic sectors in total only represents 45 per cent of total Australian tax revenue ($107,313 million) for the year. The

[18] As noted earlier, the output of these sectors is considered to be non-taxable supplies.

penultimate column of the table summarises the total tax revenue attributable to each sector in selected taxes and the percentage of the sub total in the Australian total tax revenue ($237,477 million). Among the sectors, the finance and business services, manufacturing and wholesale trade sectors are the single largest sectors accounting for 13 per cent, 5 per cent and 4 per cent, respectively. The tourism sector contribution is almost 3 per cent and is higher than the contribution of the other eleven sectors (except the category called "other" that represents industries that are not stated).

In addition to the tourism sector yield in the five taxes considered, the sector incurs other special tourism taxes and other general tourism taxes which have little relevance to other sectors (these are defined as 'other tourism taxes' in the table). These general taxes include gambling taxes and excise duties and when the total of these other tourism taxes is counted, the tourism sector tax contribution rises to 4 per cent of Australian total tax revenue. Accordingly, the tourism sector becomes the fifth largest contributor to total tax revenue, ahead of 11 other sectors.

The broad comparison presented above shows that the Australian tourism sector makes a substantial contribution to total tax revenue. However, one major limitation of the above comparison is that the sectors are different altogether in every aspect. More importantly, they are different in their economic contribution (i.e. the size of the gross value added of each sector). A meaningful comparison of their tax contribution can only be done if similar sectors in terms of size (based on value added) are considered.

Table 4.5: Tax Revenue by the Type of Broad Industry ($ mn) 2002-03

	GST		Company tax		Payroll tax		Personal income tax[a]		FBT		Sub total		Rank
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%[e]	
Primary production	87	0.3	429	1.2	181	1.8	2,762	10.8	31	1.1	3,489	1.5	10
Mining	-891	-2.9	2,009	5.7	256	2.5	45	0.2	153	5.4	1,571	0.7	12
Manufacturing	2,871	9.4	5,370	15.3	1,681	16.6	423	1.6	437	15.4	10,781	4.5	3
Electricity, gas, & water	727	2.4	101	0.3	175	1.7	5	0.0	33	1.2	1,042	0.4	13
Construction	2,761	9.0	1,092	3.1	625	6.2	1,445	5.6	105	3.7	6,028	2.5	6
Wholesale trade	6,266	20.4	2,361	6.7	886	8.7	125	0.5	258	9.1	9,896	4.2	4
Retail trade	2,531	8.2	1,817	5.2	936	9.2	470	1.8	149	5.3	5,903	2.5	7
Accommodation & restaurants	262	0.9	298	0.9	344	3.4	52	0.2	27	1.0	984	0.4	14
Transport & storage	761	2.5	939	2.7	735	7.2	307	1.2	94	3.3	2,835	1.2	11
Communication	2,320	7.6	1,777	5.1	332	3.3	90	0.4	65	2.3	4,584	1.9	9
Finance & business services	9,842	32.1	16,161	46.1	2,288	22.6	2,107	8.2	758	26.8	31,156	13.1	1
Education	-356	-1.2	28	0.1	179	1.8	109	0.4	95	3.4	56	0.0	15
Govt. admin., health, community	-5,665	-18.5	327	0.9	475	4.7	1,114	4.3	186	6.6	-3.563	-1.5	16
Cultural, recreational & other	2590	8.4	1,049	3.0	609	6.0	733	2.9	91	3.2	5,072	2.1	8
Other industries	1,977	6.4	619	1.8	-	-	15,616	61.0	172	6.1	18,384	7.7	2
Tourism sector[b]	4,619	15.0	702	2.0	436	4.3	210	0.8	178	6.3	6,145	2.6	
Other tourism taxes											2,950[c]	1.2	
Total tourism taxes											9,095	3.8	5
Total	30,702	100.0	35,079	100.0	10,137	100.0	25,613	100.0	2,832	100.0	107,313	45.2	
Revenue from all other taxes[d]											130,164	54.8	
Total Australian tax revenue											237,477	100.0	

Source: Estimated using ATO (Taxation Statistics, various issues), ABS (Cat. No. 5506.0, various issues)

(a) Personal income tax only includes income tax paid by Australian taxpayers from their business income. Income tax paid from salaries and wages are not included.
(b) Tourism sector tax contribution in each tax has been drawn from relevant tourism related sectors shown in the table. Thus, when estimating tax revenue attributable to other sectors tourism sector tax yield has been accounted for.
(c) Other tourism taxes represents general tourism taxes such as excise duties, gambling taxes and special tourism taxes.
(d) Revenue form all other taxes is the difference between $237,477 million and $107,313 million and it represents revenue from all other taxes and levies, which have not been disaggregated in the table.
(e) Percentage shares shown in this column is the share of sub total in the total Australian tax revenue ($237,477 million).

In the following sections, the tourism sector's tax contribution and its trends are closely compared with two broadly comparable economic sectors/industries (mining and retail) to further assess the relative tax burden. This choice of these two sectors is motivated by several factors: The mining sector is similar in size (in terms of gross value added) to the tourism sector, and the retail sector is similar both in terms of its size and, most importantly, as a labour-intensive sector like the tourism sector.[19] Tax estimates are presented under two broad categories 'general' and 'special' tourism taxes.

4.5.1. General Tourism Taxes

4.5.1.1. Goods and Services Tax (GST)

Table 4.6 shows the yields from GST for the three sectors considered in the comparison. The tourism sector accounts for the single largest contribution to the GST totaling $4,382 million in 2000-01. This contribution is almost 13 times greater than that of the retail sector, which accounted for $349 million in the same period. By the end of 2002-03, the tourism sector's contribution has increased by 5 per cent after a marginal decline of 3 per cent the year before. At the same time, the retail sector's contribution increased substantially to $2,531 million during 2002-03. Nevertheless, the tourism sector's contribution is still considerably greater than that of the retail sector. Note that the mining sector's contribution has been negative and this is due to the high input tax credits enjoyed by the Australian mining sector as an exporter of its output. Overall, the tourism sector contributes the lion's share of tax revenue generated through the GST and the yields are considerably higher than those of the comparable sectors.

Table 4.6: Sectoral Comparison of the GST ($ mn)

Period	Tourism Sector	Mining Sector	Retail Sector
2000-01	4,382	-253	349
2001-02	4,249	-801	2,346
2002-03	4,619	-891	2,531

Source: Estimated using ABS (2004a) and ATO (2002a, 2003b) data.

[19] On average, the share of gross value added of these sectors for the past few years is 4.3 per cent (tourism), 4.8 per cent (mining) and 5.5 per cent (retail). Therefore the choice of these sectors in terms of size is appropriate.

4.5.1.2. Company Tax

In Table 4.7, the tourism sector's contribution to company tax revenue is compared with those of the other two sectors. Company tax is the second largest in terms of yield from general taxes with yields from tourism ranging from $257 million in 1993-94 to $702 million in 2002-03.[20] However, the contribution by the tourism sector to company tax revenue is considerably lower than that of the mining and retail sectors. For instance, in 1993-94 the yields of company tax revenue attributable to these two sectors are almost three times higher than that of the tourism sector ($736 million and $666 million, respectively) and this pattern remains unchanged throughout the period under consideration. The relatively small contribution from the tourism sector may reflect the very nature of the tourism sector which is dominated by small-scale firms (i.e. restaurants, cafes, travel agents, tour guides, and many accommodation services) compared with, for example, a few but very large mining companies.

Table 4.7: Sectoral Comparison of Company Tax Revenue ($ mn)

Period	Tourism Sector	Mining Sector	Retail Sector
1993-94	257	736	666
1994-95	306	876	793
1995-96	347	993	898
1996-97	385	1,103	997
1997-98	418	1,311	898
1998-99	409	1,190	996
1999-00	513	1,394	1,726
2000-01	747	2,139	1,935
2001-02	569	1,629	1,473
2002-03	702	2,009	1,817

Company tax revenue attributable to the tourism sector grew consistently over the period at an annual average of about 17 per cent before a sharp drop in 2001-02. The increases reflect both the increased profitability and the expansion of the tourism sector during the period under consideration. On the other hand, the decline is due to two factors: the reduction in the statutory company tax rate from 36 per cent to 30 per cent and the disruption to global tourism following the September 11 attacks in the US, which led to a significant fall in the demand for tourism.

[20] For comparative purposes, company tax is the second largest in relation to the amount of tax among the taxes. However, if only tourism sector is considered, excise duties account for the second largest.

4.5.1.3. Payroll Tax

Payroll tax is the third in significance among general tourism taxes and Table 4.8 records comparative figures for the three sectors for the period in question. The figures show that while each sector's contribution continues to grow, the retail sector makes the largest contribution, followed by the tourism and mining sectors. For instance, in 1993-94 the tourism sector accounts for $261 million and this increases to $436 million in 2002-03 showing an increase of 84 per cent during the period. The retail sector's contribution is more than twice as high when compared with that of the tourism sector. A relatively higher contribution from the tourism and retail sectors reflects the labour-intensive nature of these two sectors compared with the mining sector, which is capital-intensive.

Table 4.8: Sectoral Comparison of Payroll Tax Revenue ($ mn)

Period	Tourism Sector	Mining Sector	Retail Sector
1993-94	261	153	560
1994-95	284	167	610
1995-96	306	179	657
1996-97	328	193	705
1997-98	347	203	744
1998-99	363	213	780
1999-00	385	226	827
2000-01	408	240	877
2001-02	416	244	893
2002-03	436	256	936

4.5.1.4. Personal Income Tax

The fourth in significance among general tourism taxes is personal income tax and the tourism sector's contribution to this is estimated based on personal income taxes paid by Australian tax payers from income earned by engaging in a business in tourism.[21] Table 4.9 summarises personal income tax revenue attributable to tourism and the other sectors. Tourism's contribution to this category is $210 million in 2002-03, an almost 90 per cent increase compared with the 1993-94 figure of $112 million. Although personal income tax revenue from the tourism sector continues to grow at an annual average of 7 per cent, it is comparatively low compared with the higher average annual growth of company tax revenue from the tourism sector (17 per cent).

[21] Taxation Statistics compiles the personal income tax revenue of individual taxpayers from different sources such as salaries & wages, interest income and business income. It even classifies business income by the type of industry. In estimating personal income tax revenue attributable to tourism and other sectors in this study we used the personal income tax revenue from the business income source by the type of industry.

Table 4.9: Sectoral Comparison of Personal Income Tax Revenue ($ mn)

Period	Tourism Sector	Mining Sector	Retail Sector
1993-94	112	24	250
1994-95	121	26	269
1995-96	135	29	299
1996-97	148	32	328
1997-98	163	27	329
1998-99	151	42	342
1999-00	178	31	392
2000-01	177	37	396
2001-02	201	42	449
2002-03	210	45	470

A comparison of tax revenues between sectors indicates that while the tourism sector's contribution continues to grow, the retail sector remains the dominant contributor with yields ranging from $250 million to $470 million. The mining sector makes the least contribution with yields ranging from $24 million to $45 million. The relatively smaller contribution from the mining sector and the larger contributions from the retail and tourism sectors give an indication of the composition of the sources of income among Australian taxpayers. It appears that they receive a relatively small portion of their earned income from businesses in mining, and this is not surprising since there are only a few large mining firms in the country. By contrast, taxpayers receive a comparatively large income from retail and tourism businesses since more individual taxpayers engage in such businesses.

Table 4.10: Sectoral Comparison of FBT Revenue ($ mn)

Period	Tourism Sector	Mining Sector	Retail Sector
1993-94	89	79	73
1994-95	171	152	141
1995-96	190	169	156
1996-97	198	176	164
1997-98	222	195	174
1998-99	216	169	168
1999-00	179	166	176
2000-01	218	186	182
2001-02	231	198	194
2002-03	178	153	149

4.5.1.5. Fringe Benefit Tax

Estimated fringe benefit tax (FBT) revenue is reported in Table 4.10. Among the three sectors, the tourism sector is the largest contributor to FBT with a contribution ranging from $89 million in 1993-94 to $231 million in 2002-03. The tourism sector's contribution has grown at an annual average of 16 per cent before a sharp drop of 23 per cent in the terminal year. The contribution of the mining and retail sectors accounts for $153 million and $149 million in 2002-03, respectively.

4.5.1.6. Excise Duties & Gambling Tax

Excise duties and gambling tax are two general taxes which have no direct relevance to the mining and retail sectors. Thus, estimations of the tourism sector's yields in these two taxes are presented in Table 4.11 and are discussed in this section. Next to the GST, total excise duties are the second largest component of general tourism taxes accounting for $1,132 million in 1993-94 and, by 2002-03, the tax yields rise to $2,176 million, a little over a 90 per cent increase during the ten-year period.

Among the excise duties fuel duty is the most significant as there are two types of fuel duties: petrol tax and aircraft fuel tax. On average, fuel tax accounts for 70 per cent of total excise duties attributable to the tourism sector and has increased on average by about 8 per cent over the last ten years. The second and third components of excise duties, alcohol and tobacco, account for 24 per cent and 6 per cent (on average) of the total, respectively. This implies that in 1993-94 the tourism sector accounts for $303 and $72 million in alcohol and tobacco duties, and by 2003-03 these increased to $582 and $138 million, respectively.

Table 4.11: Excise Duties & Gambling Tax from the Tourism Sector ($ mn)

Period	Excise duties				Gambling tax
	Fuel	Alcohol	Tobacco	Total	
1993-94	757	303	72	1,132	116
1994-95	841	336	80	1,257	133
1995-96	900	360	86	1,345	149
1996-97	931	372	88	1,391	157
1997-98	951	380	90	1,421	171
1998-99	1,212	206	51	1,469	187
1999-00	1,272	203	50	1,525	199
2000-01	1,383	506	125	2,014	161
2001-02	1,447	518	133	2,098	167
2002-03	1,456	582	138	2,176	173

Source: Adapted and estimated using data from ABS and ATO (various issues)

Table 4.11 also presents gambling tax revenue attributable to the Australian tourism sector and it is similar in size to the contribution of this sector to personal income tax. In 1993-94 the tourism sector's contribution to gambling tax revenue is $116 million, growing at an annual average of 10 per cent before a considerable decline of almost

20 per cent in 2000-01. However, during the last two years tourism's contribution starts increasing moderately.

4.5.2. Special Tourism Taxes

This section covers the estimation of special tourism taxes and taxes considered in the estimation include the Passenger Movement Charge (PMC), visa charges, Aircraft Noise Levy (ANL), Environmental Management Charge (EMC), accommodation levy and the air passenger ticket levy. Estimates of all these taxes and levies are reported in Table 4.12.

Table 4.12: Estimates of Special Tourism Taxes[22] ($ mn)

Period	PMC[a]	Visa charges[b]	Aircraft noise levy[c]	EMC[d]	Accomm. levy[e]	Air passenger ticket levy[c]	Total
1994-95	64	-	-	2	-	-	66
1995-96	148	-	22	2	-	-	172
1996-97	175	-	39	2	-	-	215
1997-98	189	112	39	3	17	-	360
1998-99	200	160	38	5	57	-	460
1999-00	226	205	38	6	69	-	544
2000-01	243	107	40	6	8	-	404
2001-02	284	109	41	6	1	113	554
2002-03	291	103	38	7	-	169	608

Source: (a) Australian Customs Service (2003, 2004), Parliament of Australia 2001, (b) estimated from information provided by DIMIA, (c) DOTARS (various issues), (d) Great Barrier Reef Marine Park Authority (various issues), (e) Office of State Revenue: NSW Treasury (various issues).

Among the special tourism taxes, the most significant in terms of yield is the PMC. The levy was imposed initially to recover costs in handling passengers at airports (immigration and customs). However, it is a major source of government revenue at present. For instance, the total revenue collected through the PMC has risen from $64 million in 1994-95 to $291 million in 2002-03, recording an increase of over 350 per cent. As the single largest special tourism tax, the PMC currently represents almost 50 per cent of the annual total of special taxes and it has grown at an annual average of 25 per cent, the highest growth recorded among all tourism taxes. The sharp increase

[22] Tax estimates are presented from 1994-95 depending on data availability. Some taxes and levies were either operative for several years or were imposed some time during the period. For instance, the accommodation levy was operative during 1997-2000 (revenue after the abolition shows the collection of outstanding debts. We have recorded these figures as the collections of each year since accurate information on relevant years are unavailable) while the air passenger ticket levy was operative during 2001-2003.

in revenue from the PMC is due both to increases in the tax itself (for example, when it was first introduced in 1978, the tax was $10 per passenger and the current rate is $38 per passenger) and the rapid increase in inbound and outbound visitors.

The revenue from visa charges is the second most significant among the currently operative special tourism taxes. This charge has been in operation for many years and varies according to the type of visa. Detailed historical data in relation to all the types of visa charges are unavailable from official sources and thus we focus on the short-term visitor, working holiday and short-term business categories. The total revenue from these categories almost doubled from $112 million in 1997-98 to $205 million in 1999-00. The increase in revenue from visa charges reflects both increases in the charge itself as well as in the number of visas granted. For instance, the number of visas granted has increased significantly from 3 million in 1997-98 to 3.3 million in 1999-00 and the charge for visitor visas has increased from $35 to $60 during this period.

Despite increases in visitor numbers and visa charges, a sharp decline in revenue collected from this category is evident in recent years. This is due to one important procedural change, the introduction of the Electronic Travel Authority (ETA). The system was first introduced in 1996 on a small scale and later extended worldwide through the Internet for the passport holders of 33 selected countries from which the bulk of tourists were visiting Australia. Since its inception, the ETA has become very popular among business and holiday visitors and by the end of 2002, almost 98 per cent of visa applicants from ETA-eligible countries have been issued with ETAs. An important change following the introduction of the new system is that visitors only have to pay a $20 service charge for the use of the facility.[23]

The ANL is the third most significant of the currently operative special taxes. Total revenue from this levy has grown at an annual average of 11 per cent from $22 million in 1995-96. While there were a few periods during which revenue from the

[23] While the visa charges for visitors from ETA-eligible countries declined to $20, the reverse occurred in the case of non-ETA countries and working holidaymakers. For example, visa charges for these two categories have increased to $65 (non-ETA: sub class 676) and $160 (sub class 417), respectively, since July 2002. At the same time, the number of visas granted for these subclasses is increasing. For example, in 2001-02 more than 440,000 visas have been granted for these two sub classes.

levy declined, it appears that the government has raised a substantial amount from the levy for its purpose.

Among the special tourism taxes, the contribution of EMC (Surf tax) to total special tourism tax revenue is considerably low. It accounts for about $2 million in 1994-95 and, over the period, the contribution increases by more than three times to $7 million in 2002-03. In addition to the taxes and levies discussed above, the accommodation levy and the air passenger ticket levy have made a significant contribution to total revenue from special tourism taxes.

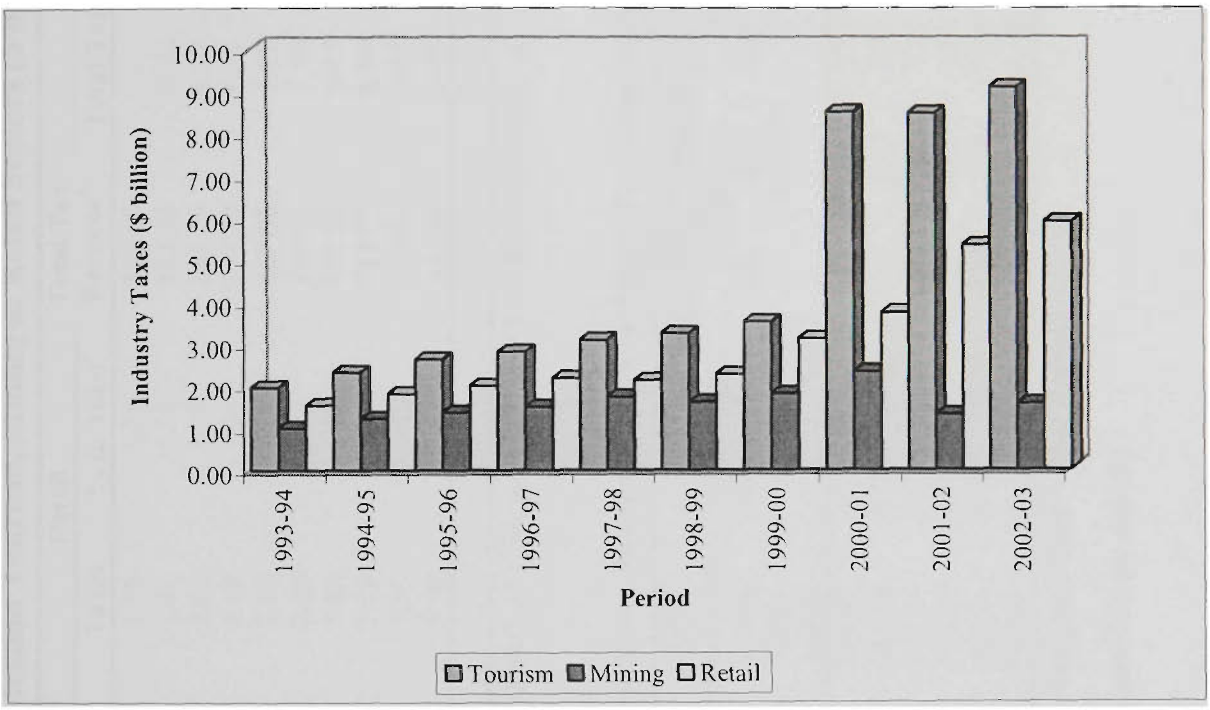
In summary, it is clear that the contribution of special tourism taxes continues to grow. For example, total revenue from these taxes was $66 million in 1994-95 and has grown at an annual average of 60 per cent before dropping sharply in 2000-01. This decline in revenue is primarily due to the abolition of the accommodation levy. However, in the following two years, total revenue starts growing at a higher rate again, mainly due to the introduction of the air passenger ticket levy to help former Ansett employees. Overall, total revenue from special tourism taxes has grown at an annual average of 40 per cent during the period 1994-95 to 2002-03.

4.5.3. Total Tourism Taxation

Figure 4.1 and Table 4.13 summarise total tax revenue attributable to the tourism sector along with those of selected comparable sectors as well as total national tax revenue. Comparative figures show that the tourism sector makes a significant contribution to total national tax revenue and its contribution continues to increase. For instance, the sector's contribution to total tax revenue increases from 1.6 per cent ($1.97 billion) to 3.8 per cent ($9.10 billion) during the decade under study. Furthermore, the relative contribution of the tourism sector to total tax revenue is constantly higher than the two comparable sectors, namely, mining (ranging from 0.6 per cent to 1.1 per cent) and retail (ranging from 1.3 per cent to 2.5 per cent).

Moreover, on average, tourism tax revenue has grown at a higher rate (23.4 per cent) than the national growth rate (7.7 per cent), and of the two comparable sectors (mining 7.9 per cent and retail 16.8 per cent). This indicates that not only is the tourism sector a significant contributor to national tax revenue but also that it has experienced an above average growth rate. This has particularly been the case since the introduction of the GST. For instance, tax revenue from tourism soared from $3.5 billion (in 1999-00) to $8.5 billion (in 2000-01), a 141.6 per cent increase over the previous year. Of the increase, the GST contribution is as much as 124 per cent (i.e. $4.4 billion). Note that the GST is a consumption tax and that most consumer goods and services once exempt from taxes under the previous regime became taxable under the new system.

Figure 4.1: Total Tax Revenue



In the face of rising overall tax revenue following the introduction of the GST, the rate of growth of total tax revenue attributable to the tourism sector seems to have grown disproportionately. For instance, the contribution of the tourism sector to total tax revenue increases from 1.8 per cent (in 1999-00) to 3.8 per cent (by 2002-03), while the share of the retail sector only increases from 1.6 per cent to 2.5 per cent. Unlike the case of the tourism sector where the tax contribution jumps significantly when the GST came into full effect, the mining sector's contribution declines sharply by almost half (i.e. from 1.1 per cent to 0.7 per cent). Thus, the new tax system seems to have had a very significant effect on the tourism sector and the disproportionately higher tax yield is an indication of the unfavourable implications of the tax on the tourism sector.

Table 4.13: Total Tax Revenue attributable to the Australian Tourism, Mining & Retail Sectors ($ bn)

Period	Tourism		Mining		Retail		Total Tax Revenue[b]	Annual Growth Rates (%)			
	Taxes	% in Total[a]	Taxes	% in Total[a]	Taxes	% in Total[a]		Total Tax	Tourism	Mining	Retail
1993-94	1.97	1.61	0.99	0.81	1.55	1.26	122.60	-	-	-	-
1994-95	2.34	1.73	1.22	0.90	1.81	1.34	135.25	10.31	18.74	23.08	17.04
1995-96	2.64	1.79	1.37	0.93	2.01	1.36	147.83	9.30	13.13	12.20	10.87
1996-97	2.82	1.77	1.50	0.94	2.19	1.37	159.67	8.01	6.77	9.78	9.15
1997-98	3.10	1.85	1.74	1.03	2.15	1.28	167.92	5.17	9.89	15.43	-2.23
1998-99	3.25	1.80	1.61	0.89	2.29	1.27	180.51	7.50	4.92	-7.03	6.57
1999-00	3.52	1.80	1.82	0.93	3.12	1.59	196.15	8.67	8.27	12.58	36.53
2000-01	8.51	3.98	2.35	1.10	3.75	1.75	213.77	8.98	141.58	29.28	20.06
2001-02	8.49	3.91	1.31	0.60	5.36	2.47	216.92	1.47	-0.32	-44.15	42.91
2002-03	9.10	3.83	1.57	0.66	5.90	2.49	237.48	9.48	7.26	19.82	10.23
Average Annual Growth Rate (1993-03)								7.65	23.36	7.89	16.79

Notes: (a): Industry Taxes as % of National Total Tax Revenue, (b): National Total Tax Revenue from all sources

Table 4.14: Industry Share in Total Gross Value Added & the Share of Taxes in Industry Gross Value Added

Period	Industry Gross Value Added ($ bn)						Total Australian Gross Value Added	Total Industry Taxes ($ bn)						Ratio of taxes/Value Added		
	Tourism		Mining		Retail			Tourism		Mining		Retail		Tourism	Mining	Retail
	Total	% of Total[a]	Total	% of Total[a]	Total	% of Total[a]		Tax	% of IGVA[b]	Tax	% of IGVA[b]	Tax	% of IGVA[b]			
1997-98	21.89	4.25	24.59	4.78	29.98	5.82	514.83	3.10	14.16	1.74	7.06	2.15	7.16	3.33	1.48	1.23
1998-99	23.05	4.25	24.26	4.47	31.54	5.81	542.83	3.25	14.09	1.61	6.65	2.29	7.25	3.32	1.49	1.25
1999-00	23.99	4.17	26.70	4.64	33.01	5.74	575.24	3.52	14.66	1.82	6.81	3.12	9.45	3.52	1.47	1.65
2000-01	25.04	4.09	34.05	5.56	32.77	5.35	612.25	8.51	33.97	2.35	6.90	3.75	11.43	8.30	1.24	2.14
2001-02	25.23	3.87	33.82	5.18	36.03	5.52	652.64	8.49	33.63	1.31	3.88	5.36	14.86	8.70	0.75	2.69
2002-03	25.88	3.76	34.94	5.08	39.41	5.73	687.81	9.10	35.15	1.57	4.50	5.90	14.98	9.34	0.89	2.61

Notes: (a): Industry Gross Value Added as % of Total Australian Gross Value Added

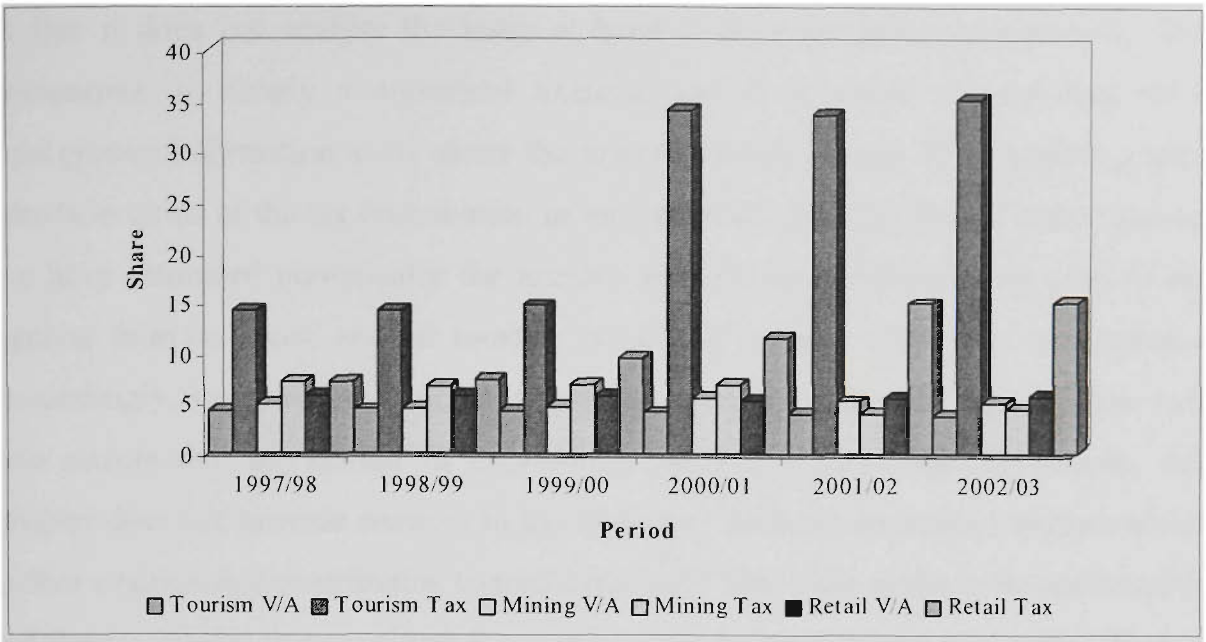
(b): Total Industry Taxes as % of Total Industry Gross Value Added

The general inference one can draw from the data analysed above is that the tourism sector has experienced a disproportionate tax burden. However, judging whether a particular sector is subject to disproportionate or over-taxation is a difficult task as there is no particular base one can use as justification. One alternative measure would be to consider the tax burden relative to the contribution of the sector to the national economy. In this respect, we use and compare each industry's percentage share in the Total Gross Value Added (TGVA), which is an indicator of the relative contribution of a given sector to national output.

Table 4.14 and Figure 4.2 summarise each industry's share in the TGVA and the corresponding shares of taxes in Industry Gross Value Added (IGVA). On average, tourism's share in TGVA is 4 per cent and for the mining and retail sectors, between 5 to 6 per cent. While the shares of each sector in the TGVA remain fairly constant during the period under consideration, a significant variation in sector shares of taxes in IGVA is evident. Most importantly, the tourism sector's share of taxes is considerably higher than the two other sectors. For instance, taxes as a percentage of IGVA ranged from 14 per cent to 35 per cent for tourism while for the other two sectors these were 4 per cent to 7 per cent (for mining) and 7 per cent to 15 per cent (for retail). What is startling is the fact that following the introduction of the GST, over one third of the tourism industry value added accounts for taxes. Thus, the GST seems to have worsened the already disproportionate tax burden experienced by the tourism sector. This is reflected in the changing magnitudes of the ratio of taxes to industry value added. Prior to the introduction of the GST, the ratio of taxes/value added in the mining and retail sectors ranges from 1.2 to 1.6, and in the tourism sector it is around 3 until 1999-00. This disparity widens following the tax reforms in 2000-01, the ratio rises from 3.5 to 9.3 for tourism while the retail sector ratio rises marginally from 1.6 to 2.6 (mining sector ratio declines by almost half).

To summarise, the evidence we assembled and analysed above lends support to the proposition that the Australian tourism sector has been subject to disproportionately high levels of taxes and that the tax burden continues to rise. In particular, following the tax reforms in 2000, the tourism sector has been subject to increased and disproportionate taxation.

Figure 4.2: A Comparison of Shares of Value Added and Industry Taxes



4.6. Conclusion

In this chapter, we attempted to review the Australian tourism tax structure and quantify the total tax revenue attributable to the Australian tourism sector. Two types of tourism taxes were identified: general tourism taxes and special tourism taxes. The GST, company tax, payroll tax, personal income tax, fringe benefit tax, excise duties and gambling taxes constitute general taxes while the PMC, visa charges, ANL, EMC, accommodation levy and air passenger ticket levy constitute special taxes. Among the general tourism taxes, excise duties account for the most significant portion of tax revenue in the 1990s. Since the introduction of the GST in 2000, it is the single largest contributor to tourism tax revenue. Among special tourism taxes, the PMC accounts for the single largest component, followed by visa charges.

The tourism sector makes a significant contribution to national tax revenue and its contribution is increasing over time. Besides the continued growth of the tourism sector yielding increased revenue, an important contributor to the sharp increase in the tax revenue evident in recent years is the GST. With its introduction, tax revenue attributable to the tourism sector grew more than double and has become the third largest contributor to total national GST revenue. A comparison of tax revenue attributable to the tourism sector with that of the mining and retail sectors indicates that the tourism sector bears a disproportionate tax burden and that the burden is increasing.

However, one major limitation of the sectoral comparison undertaken in this chapter is that it does not analyse the issue at hand from a tax policy perspective. This comparison is simply a numerical exercise and it is aimed at providing some background information as to where the tourism sector, among other similar sectors, stands in terms of the tax contribution in total taxation. In other words, in this chapter we have estimated numerically the tourism sector's tax contribution in each of the general tourism taxes, special tourism taxes and in total Australian tax revenue. Accordingly, we have made a preliminary comparison of the tax contribution with two sectors that are similar in importance. Beyond a numerical comparison, this chapter does not provide answers to the question "does the Australian tourism sector makes a reasonable contribution to total taxation?" This issue needs to be addressed in a different context that considers the cost of negative externalities in tourism, the cost of public goods provided to tourists and the issue of rent extraction. The next chapter will address this issue.

CHAPTER FIVE
AN ASSESSMENT OF TOURISM TAXES

The current state of Australian tourism tax structure is assessed in the context of three important policy issues: recovering the external cost of tourism, funding tourism-related public goods and maximising government revenue. Overall, the assessment shows that there may be a case for further increase in tourism taxes and thus some changes in the current tourism tax structure are suggested.

5.1. Introduction

In the previous chapter, the Australian tourism tax structure was examined and the total tax revenue attributable to the tourism sector was estimated. Overall, this chapter concluded that the Australian tourism sector has made a significant contribution to national tax revenue. This discussion gives rise to several questions that could be central to the main issues addressed in this thesis. Does the Australian tourism sector make a fair contribution to national tax revenue? Can the tourism sector be subject to further taxation? These issues need further discussions beyond the simple quantitative comparisons undertaken in the previous chapter. Therefore, the aim of this chapter is to address these issues from a different policy perspective.

In addressing issues raised above, one can consider various aspects. Among these, the scale of externality cost associated with tourism is an important aspect in the present discussion. This means that the cost of externalities of Australian tourism could be assessed against the tax contribution of the Australian tourism sector. As outlined in Chapter Two (cf. Section 2.3), tourism is said to be responsible for generating two types of costs in the host society. The first is the tourism-related external cost. As conceptualised in Section 2.3.1.1, the external cost of tourism arises as a result of negative externalities in tourism in relation to negative environmental effects. It is believed that international tourism in particular incurs a considerable cost on the host society. The second is the cost of provision of public goods consumed by visitors. Considering the large number of tourists in a destination within a period of one year and the amount of public goods that they could consume, the cost of public goods could also be very significant. Against this background, the tourism sector's tax contribution may not be sufficient to cover the total cost arising from above mentioned two situations. However, without empirical estimations of this effect, reasonable inferences cannot be made. Accordingly, in this chapter, the Australian tourism sector's tax contribution will be assessed against the tourism-related external cost and the cost of provision of public goods consumed by tourists. Additionally, the current tourism tax structure will also be assessed with a view to maximising government tax revenue. Tourism taxation is commonly seen as an easy option to augment government revenue and thus the current tourism pricing structure will be explored to ascertain whether it allows for further increases in government revenue.

This chapter is organised as follows: Section two addresses the issue of internalising the tourism-related external cost, Section three presents the issue of financing the cost of provision of public goods, Section four delineates the case for government revenue maximisation via international tourism and the last section draws some conclusions.

5.2. Tourism Taxes and the Cost of Negative Externalities

Section 2.3 described how negative externalities arising from tourism could be internalised through tourism taxes. It was argued that a Pigouvian tax equivalent to the marginal external cost of tourism might be imposed to internalise a negative externality. On the other hand, Chapter Four documented a number of general and special tourism taxes that are operative in Australia for various purposes. Following this, the aim of this section is to make a general assessment to ascertain whether the current tourism tax revenue is sufficient to cover the external costs of tourism. Accordingly, this assessment will determine whether there is a case for further taxes to internalise negative externalities.

The aim of tourism tax policy is not to restrict visitor numbers to avoid an externality, but to cover the cost of environmental damage.[1] In Australia there appears to be no immediate threat of a negative externality related to tourism that requires a restriction of visitor numbers. According to the theory of negative externalities, the marginal private cost has already been accounted for when visitors decide to travel. What is not considered at the current level is the external cost of tourism. Following Pigouvian tax

[1] Forsyth *et al.* (1995, p. 271) held a supportive view to this stating "the problems of environmental management and tourism management are separable: marketing should aim to maximise (or more accurately, optimize) tourism numbers while the environmental policy should aim to internalize all external environmental costs".

theory, the current tourism tax structure should include a tax (taxes) that is (are) sufficient to cover the external cost to bring about a socially optimal level of tourism.

In this context, in the assessment, there are two important aspects to be considered: (i) the total external cost of tourism in Australia (cost of negative externalities), and (ii) the total collection of taxes, levies and charges operative in the current tourism tax structure for the purpose of financing such costs. However, one of the main limitations of an assessment of this nature is the unavailability of information about the external cost of tourism.

Tourism-related environmental effects are well-known (Forsyth *et al.* 1995, IAC 1989b, Pigram 1980, Sinclair and Stabler 1997, Tisdell 1987). There is a well-established view concerning tourism's contribution to negative environmental effects that would give rise to external costs. However, there appears to be little empirical data with which to quantify these external costs of tourism. Forsyth *et al.* (1995) described the problems involved with the evaluation of the external costs of tourism. Among the problems, they argued that there is a great uncertainty in measuring externalities making evaluation difficult. Tisdell (1988) noted that informational constraints are a general problem in economic evaluation of external costs and thus recommended alternative techniques of approximations.[2]

5.2.1. Estimation of the External Cost of Tourism

The external cost of tourism was estimated using currently available information from several sources. It is assumed that the estimated cost is a reasonable proxy to represent the actual cost. Of the various aspects of tourism-related external costs, this assessment considered four aspects for which secondary data sources were available for the estimation. They are traffic congestion, aircraft noise, air pollution by motor traffic and marine pollution.

The Auslink White Paper (DOTARS 2004) is the first key source used. This estimates that the total cost of traffic congestion to the Australian economy was $12.8 billion in

[2] Tisdell (1988) argued that given data constraints, it may be useful to search for (optimal) rules of thumb, approximations, qualitative assessments and short-cut techniques that can be used rationally to approximate the cost of pollution.

1995 and forecast that this would increase to $29.7 billion by 2015. According to this estimation, on average, the cost of congestion increases by nearly 7 per cent a year. Furthermore, it estimates that the cost of urban air pollution from motor vehicles in Australia was approximately 0.2 to 0.3 per cent of the GDP.

Following DOTARS (2004), the costs of traffic congestion and air pollution attributable to the Australia tourism sector were estimated and are presented in Table 5.1. Since this source does not quantify the external cost by the type of industry, some rational base should be used to extract the tourism sector contribution. We used a similar approach to that applied to estimate of tourism tax revenue in Chapter Four. We allocated a portion of the total cost of congestion and air pollution to the tourism industry based on the industry's value added share (ATSA shares).[3]

The cost of aircraft noise was estimated based on available information about the ANL (Aircraft Noise Levy). As noted in Section 4.3.2.3, a levy is imposed on each passenger arrival in a jet aircraft to specified Australian airports.[4] The levy is based on the noise levels (noise characteristics) of aircraft and thus it is reasonable to assume that the monetary value of the levy represents the external cost of aircraft noise. It was assumed that the total collections from the levy are equal to the total external cost of noise pollution due to tourism in the surrounding areas. Similarly, we assumed that the total amount collected from the EMC (Environmental Management Charge) is also equal to total pollution at the Great Barrier Reef Marine Park due to tourism (see Section 4.3.2.4).

Table 5.1 shows the estimated total external cost associated with the four aspects of externality attributable to the Australian tourism sector. The total cost was disaggregated into domestic and international tourism based on the share/weight of each tourism sector in the total tourism consumption. Table 5.1 shows that $668

[3] We used the same share of Australian tourism in the total gross value added derived from the Australian Tourism Satellite Account (c.f. Table 4.14). By applying the same base for both tax revenue and cost estimations, we are able to maintain the consistency in our arguments and calculations.

[4] The levy is $3.40 per passenger currently and is operative only at Sydney and Adelaide airports. These two are currently recognised as airports that generate excessive noise in surrounding areas (See Section 4.3.2.3).

million in total external costs is attributed to the Australian tourism sector out of which international tourism accounts for $154 million in 1997 (base year).

Table 5.1: External Cost of the Australian Tourism Sector 1997 ($ mn)

Type of cost	International tourism	Domestic tourism	Total
Traffic congestion[a]	141	481	622
Air pollution of motor traffic[a]	1	4	5
Aircraft noise[b]	11.6	27.4	39
Marine pollution[c]	0.5	1.5	2
	154.1	513.9	668.0

Source: (a) estimated using data from DOTARS (2004), (b) Ministry of Transport & Regional Services (2004), (c) Great Barrier Reef Marine Park Authority (1997)

The cost of negative externalities attributable to domestic tourism was disregarded in the assessment of tourism taxes since domestic tourists (Australian residents) make a significant contribution to the Commonwealth, State and local government tax revenues whereby approximately 40 per cent of total tax revenue is derived from personal income tax. This is an important difference between domestic visitors and international visitors since the latter do not contribute to personal income taxes. In this context, it is reasonable to disregard domestic visitors in the current assessment.[5]

Based on the number of visitor arrivals (4,318,000) in the base year, the per visitor external cost of international tourism was estimated at $35.66. Within the context of the above conceptual framework, this implies that each international visitor to Australia would be liable to pay a tax of $35.66 to compensate for the external cost arising from their presence as visitors.

However, these estimations are subject to some limitations since they could over/under estimate the actual cost. In addition to the four aspects considered in the estimation, there appears to be several other causes of tourism-related negative externalities such as pollution of beaches, national parks, marine parks, heritage sites, and pollution or negative impact on the man-made environment. One major problem in relation to the estimation of such externalities, to the best our knowledge, is the

[5] The above approach could be the most appropriate when this issue is addressed at the national level. However, in the case of the regional or state level, interstate visitors should be considered. For instance, if the tourism tax structure in Victoria is assessed, the external cost of interstate visitors to Victoria should be considered. The reason is obvious in that these visitors do not contribute to the Victorian State or local government tax revenue.

lack of reliable sources of information, similar to the ones we used in the current estimation. Moreover, the theory of externality implies that zero pollution in general is not socially desirable. The socially optimum level of tourism occurs at some positive level of external cost relating to externalities (Rosen 2005). Therefore, in summary, the estimation of the total external cost arising from all possible pollutants and the imposition of taxes to cover the cost seems to be beyond the scope of the current study, and, moreover not necessary.

As noted earlier and estimated in Chapter Four, international visitors have already contributed to Australian tax revenue. Therefore, in the current assessment, the second aspect that should be considered is their total contribution to tax revenue that would cover the estimated external costs. In the estimation of tax contribution, those taxes and charges which are directly identifiable as being imposed upon international visitors for the purpose of recovering the cost of environmental damage, are considered. There are two such taxes in Australia and these are the ANL and the EMC.[6] The total revenue generated from these two tourism taxes is given in Chapter Four (see Table 4.12).

The total revenue collected from the ANL was \$38.7 million for the base year out of which international visitors paid \$11.6 million (Section 7.5.2.4 provides a disaggregation of ANL by domestic and international tourism).[7] Moreover, a total of \$2 million has been collected from the EMC for the base year and the contribution of international visitors is \$0.4 million (based on share of international tourism in total tourism consumption).

In addition to the above two taxes, the PMC (Passenger Movement Charge) paid by international visitors which totals \$99.5 million for the base year was also considered

[6] There may be other numerous entry fees and charges that apply in various tourism facilities in Australia and to a certain extent they may help internalize the cost of externalities. However, in this study we do not take into account such user fees.

[7] The total amount collected from ANL for the base year was \$38.7 million. Based on international visitor arrivals, interstate visitor arrivals and arrivals of Australian residents to NSW, we disaggregate the total into domestic and international tourism. Accordingly, domestic and international tourism account for, respectively, \$27.09 million and \$11.61 million in ANL in 1996-97.

in the assessment.[8] Although, PMC is not officially labelled as a tax to cover external costs, as the largest special tourism tax paid by international visitors in Australia, it is reasonable to consider PMC as a part of the total tax revenue in this assessment.

The total revenue from these three taxes, i.e. ANL, EMC and PMC, advanced from international visitors, is estimated to be $111 million for the base year and this suggests that the per visitor tax contribution is $25.70. Our early estimations showed that the per visitor external cost of tourism is $35.66 and thus a tax equivalent should be imposed. Subsequently, these estimations suggest that the current tourism tax revenue appears insufficient to cover the external cost of international tourism. In this context, the evidence gathered and assembled above leads us to derive the following policy scenario:

Policy Scenario One

"The current tax contribution of the Australian international tourism sector seems to be inadequate to cover the external cost of the international tourism sector, and, accordingly, there is a case for further taxing international visitors."

If further government intervention is desired, what is the appropriate policy change? It is clear that the current tourism tax structure may be extended further. According to the above estimations, the tax increase could be $9.96 per international visitor in Australia (i.e. the balance between $35.66 - $25.70). Upon deciding the size of the tax, the next task is to decide the most suitable tax tool. Simulation one that will be carried out in Section 8.2 is in relation to policy scenario one outlined above and the selected tax tool for this simulation will also be described in the same section.

5.3. Tourism Taxes and Cost of Public Goods

As outlined above, the second assessment is in the context of the cost of the provision of public goods to international visitors. Section 2.3 conceptualised the issue of provision of public goods to international visitors. It was argued that international visitors' consumption of public goods generates a free rider problem due to non-excludability from public goods and visitors' non-contribution to government funds

[8] Total PMC collected was $174.5 million for 1996-97. Based on departures of short-term international visitors and short-term Australian residents, the total was disaggregated into international tourism ($99.45 million) and domestic tourism ($70.67 million) (refer Section 7.5.2.4 for more information about the disaggregation).

via direct taxes such as income tax. Thus, the efficient provision of public goods can be affected by the existence of free riders. While there is no direct price-based instrument that can be used in relation to the free rider problem of residents, Clarke (1997) argued that tourism taxes could be imposed on international visitors to cover the cost of public goods.

Following the above theoretical framework, in this section, our aim is to make an assessment to determine whether tourism tax revenue from international tourism would be sufficient to correct the free rider problem. This requires that: (i) the total cost of public goods consumed by international visitors is estimated; and (ii) the total tax revenue attributable to international tourism is compared with the cost of public goods. Based on this, it can be ascertained whether there is a case for further government intervention in taxing international tourism.

5.3.1. Estimation of Cost Public Goods

In estimating this cost, it is important to recognise the types of goods consumed by international visitors that are public goods. The issue of public goods in relation to international tourism becomes important since the number of international visitors to Australia has been increasing considerably. For example, in 2003 there were 4.7 million international visitors, which is a large number compared with the resident population. The Australian population in the same year was 20 million (ABS 2005a) and thus international visitor numbers were equal to almost 24 per cent of the Australian population. In terms of the provision of public goods, this is equivalent to a situation where Australia's population is almost 25 million for whom public goods must be provided.[9] This suggests that the visitors' presence could generate a considerable extra demand for infrastructure facilities and public goods. When these facilities are designed and when public funds are allocated, the presence of visitors is accounted for, since these facilities can usually accommodate them. This suggests that in the absence of international visitors, public funding for such facilities could have been less than the current level of funding.

[9] However, international visitors do not stay in Australia for the whole year and at one point in time visitor numbers are much less than the total.

As outlined in Chapter Two, public goods consumed by visitors can include defence, public safety, law and order, road networks, free parking facilities, public transport networks, utilities, communication networks, parks and recreation, and general health. These are provided and are heavily subsidized by the Commonwealth, State and local governments. Given the large number of international visitors to Australia, the extra demand for public goods means that they might generate a considerable burden on Australian taxpayers. Wong (1996) showed that the degree of reliance of the economy on tourism does have a statistically significant impact on the level of government current and capital outlays.

However, to the best of our knowledge, there is no empirical evidence in the tourism literature or government statistical sources that quantify the total cost of the provision and maintenance of public goods consumed by visitors. In the absence of this, the cost of public goods consumed by visitors in Australia is estimated using available information.

The major source used is *Government Financial Estimates* compiled by the ABS (1998a, Cat. No. 5501.0). This provides government current and capital outlays categorised by the broad purpose of expenditure. Current outlays are defined as net current expenditure on goods and services plus transfer payments of government authorities that do not result in the creation of capital stock (ABS 1998a). Table 5.2 presents the total government current outlays by purpose for 1996-97. In the estimation, capital outlays of general government authorities in each category were not considered.

Table 5.2: Total Government Current Outlays & Estimations ($ mn)

Purpose of outlay	Total[a]	International	Domestic
General public services	13,797	129	437
Defence	6,381	-	-
Public order & safety	6,548	61	207
Education	22,255	-	-
Health	27,652	258	876
Social security & welfare	52,163	-	-
Housing & community amenities	2,392	22	76
Recreation & culture	3,703	35	117
Transport, communication & oth. economic affairs	9,610	90	304
Public debt transactions	13,862	-	-
Other purpose	4,896	46	155
Total	163,259	639	2,173

Source: ABS (1998a)

In the estimation of the cost of public goods, two assumptions were made. First, current outlays in some selected categories have been allocated for the provision, maintenance and upgrading of public goods. They include general public services, defence, public order and safety, health, housing and community amenities, recreation and culture, transport, communication, and other economic affairs and other purposes. Second, the cost of public goods is equivalent to the current outlay of the selected category. Following these assumptions and the non-excludable nature of public goods, it is also reasonable to deduce that a portion of these outlays has been used to provide public goods to international and domestic visitors in Australia.

The tourism industry's share of the total gross value added was used to estimate the total cost of public goods attributable to the Australian tourism sector. The total cost attributable to the tourism sector then was disaggregated into international and domestic tourism based on tourism consumption share of each tourism sector (domestic and international). The estimations are presented in Table 5.2 for the base year. The estimated total cost of public goods attributable to the Australian tourism sector was $2,812 million ($639 + $2,173) out of which $639 million is accounted for by the international tourism sector. Domestic visitors are not considered in the assessment for the same reasons explained in the preceding section.[10]

Based on the above estimation, it appears that international visitors incur a significant cost on Australian society in terms of public goods. This not only exerts a burden on the public budget but also it reduces possible welfare gains from international tourism. Once the cost of public goods is approximated, the next issue is to consider whether current tourism tax revenue is sufficient to cover the estimated cost. As noted earlier, international visitors make no contribution to direct tax revenue, but as estimated in Chapter Four, they make a significant contribution to total commodity taxes through the GST, excise duties and gambling taxes. In the absence of direct tax contributions by international visitors, it is reasonable to consider their indirect tax contribution in the assessment.[11]

[10] The rationale is that domestic visitors make a significant contribution to direct taxation and thus it is assumed that a sufficient contribution may have been made to cover the cost of public goods.

[11] Clarke (1997) held a similar view that indirect taxes are better alternatives than direct taxes to fund tourism-related public goods.

In the base year, the total amount of commodity taxes paid by international visitors was $529 million, excluding the total of ANL and PMC that has already been considered in the previous experiment.[12] The comparison between the estimated total cost of public goods consumed by international visitors ($639 million) and total commodity taxes collected from them ($529 million) indicates that the current tax contribution is not sufficient to fund international tourists' share of public goods. Based on these estimations, the following policy scenario is derived.

Policy Scenario Two

"The current tax contribution made by the Australian international tourism sector seems to be insufficient to fund tourism-related public goods in Australia, thus there appears to be a case for further government intervention in the taxation of international tourism."

Given that further government intervention is desired, among the different strategies the best may be the use of the current tax structure. The approximations show that there is a gap of $110 million between the estimated cost of public goods ($639 million) and the tax contribution ($529 million). The gap can be considered as an indication of the amount that should be raised and thus a change in tourism taxes is proposed. What could be the appropriate tax tool for the proposed change? Simulation two presented in Section 8.3 is in relation to policy scenario two derived above, and the appropriate tax tool will be explained in detail in this section.

5.4. Tourism Taxes and Maximisation of Government Revenue

Tourism taxation might be an appealing option for governments as a revenue-generating source. One of the important factors that determine a government's ability to generate revenue in tourism is the prevailing tourism pricing structure. The tourism sector faces a downward-sloping demand curve. On the other hand, the tourism product is supplied in a fairly competitive market structure. Accordingly, in this section, the prevailing tourism pricing structure will be explored to see whether it can be used to maximise government revenue.

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[12] $529 million was the tax contribution by international visitors as appeared in the TTM. For more information see Section 7.5.

The relevant parameters of the current tourism pricing structure in relation to international tourism were estimated based on tourism consumption data that has been incorporated into the CGE model (TTM) developed in Chapter Seven. The policy scenario was designed subsequently. Table 5.3 presents the estimated average tourism consumption/tourism price and the average tourism cost in relation to the international tourism sector for the base year. Average tourism consumption was $2,712 and this was estimated using total tourism consumption ($11,710 million) that has been incorporated into our model.[13] The average tourism consumption was also the average price paid by an international visitor for the composite tourism product. This includes a per visitor tax of $148 and thus, the tax exclusive average price of international tourism is $2,564.[14]

Table 5.3: International Tourism Pricing Structure

Description	Value
Total international visitor numbers (base year)	4,318,000
Total tourism consumption ($ million)	11,710
Average tourism consumption/average tourism price ($)	2,712
Total tourism tax revenue ($ million, international visitors)	639
Average tourism tax per visitor ($, international visitors)	148
Total cost of tourism excluding taxes ($ million, international visitors)	11,072
Average tourism cost per visitor ($)	2,564

It is assumed that the Australian tourism sector operates in a fairly competitive market structure. This appears to be a reasonable assumption since the tourism product around the world is supplied by a large number of suppliers in various industries (IAC 1989a, Divisekara 1995). The competitive market structure implies that tourism suppliers do not realise economic profits. Given the competitive market structure, we assume that Australian tourism suppliers are charging a price similar to the marginal cost of supplying tourism goods and services.

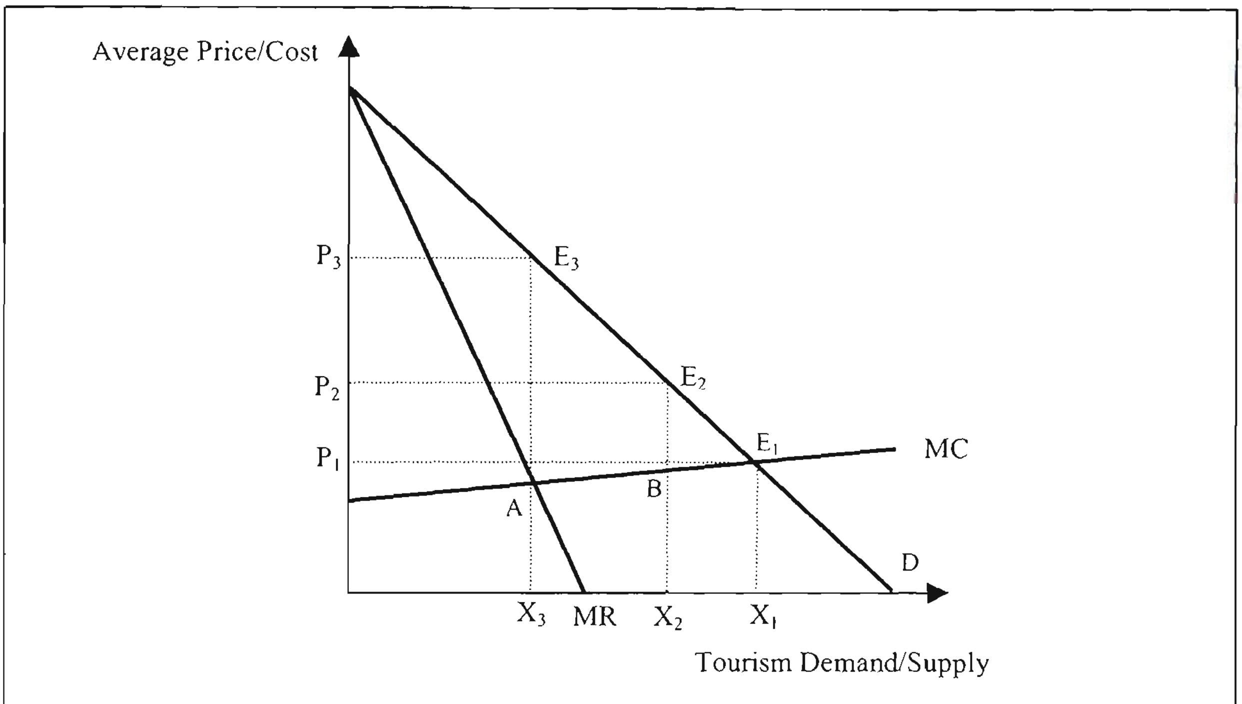
Figure 5.1 below illustrates the conceptual framework of the pricing structure of international tourism in Australia. The downward-sloping curve '*D*' represents the demand for international tourism in Australia and the curve '*MC*' represents the

[13] This figure is closely in line with ATSA estimations of average tourism consumption by international visitors. For example, average tourism consumption for an international visitor in 2002-03 was $3,579.6 (ABS 2004a). Our estimation is derived from total tourism consumption that we have adjusted to the base year level from the 2002-03 level.

[14] $2,564 is the average price received by Australian tourism suppliers.

marginal cost schedule of tourism sector suppliers. The prevailing competitive market structure in the tourism sector drives them to charge a price P_1 (\$2,564) equal to the marginal cost (tax exclusive price/cost) at point E_1. If the competitive price were operative, the Australian tourism sector should have realised the equilibrium international visitor numbers as shown in level X_1.[15] However, as noted earlier, the current average tourism price P_2 (estimated to be \$2,712) inclusive of government taxes (i.e. per visitor tax of \$148) seems to be above the competitive price. Due to the tax inclusive higher price, the tourism sector received international visitor numbers as represented by the level X_2 at point E_2 (the current international visitor arrivals).

Figure 5.1: Price Structure of International Tourism in Australia



The most important policy implication revealed in the above framework is that even with the prevailing level of government intervention (including current tourism taxes), the current tourism price structure appears to be below the efficient level. A profit-maximising pricing structure is one which sets the price where the marginal revenue equals the marginal cost. This implies that the current pricing structure could be used to maximise government revenue via international tourism.

[15] Our search process with the demand elasticity of −1.75 shows that Australia would have attracted 4,730,375 international visitors for the base year if the average price of \$2,564 were charged. This is considerably higher than the current level of 4,318,000 visitors.

In order to maximise government revenue, the optimal tax rate that can be imposed should be determined by using the pricing parameters estimated above. It is assumed that any price increase above the competitive price level is due to government intervention and thus it increases government tax revenue.[16] The revenue-maximising tax rate was estimated based on the average price and the average cost of tourism shown in Table 5.3. Moreover, the weighted average of tourism demand elasticity for Australia was estimated following Divisekara (2003) and used in the search process. The average tourism demand elasticity is –1.75.[17]

The search process carried out shows that increasing tourism taxes might increase revenue via the international tourism sector in Australia. Table 5.4 illustrates the results of the search process for the maximum level of government tax revenue under three different scenarios. The table shows how these results differ from the current level of price-tax structure in international tourism in Australia. The current level is presented in the last row for easy comparison.

Table 5.4: Revenue Maximising Tax Rates: International Tourism Sector

Alternative scenario (Demand elasticity)	Changed price $	Total tourism consumption ($ mn)	Projected tax rate %		Total tax revenue ($ mn)	Change in tax revenue ($ mn)
			A	B		
Scenario 1 (-1.75)	3,412	8,078	25.0	17.0	2,008	1,369
Scenario 2 (-2.00)	3,317	7,932	23.0	15.4	1,801	1,162
Scenario 3 (-2.75)	3,132	7,764	18.0	12.0	1,408	769
Current level	2,712	11,710	5.5		639	n.a.

(A = tax rate as a percentage of projected tourism consumption, B = tax rate as a percentage of current tourism consumption).

For instance, under scenario 1 (demand elasticity –1.75), the government can maximise tax revenue by imposing the maximum tax increase (i.e. where the marginal revenue curve intersects the marginal cost curve at point A in Figure 5.1).[18] With the

[16] Since a competitive market structure is assumed, the tourism sector does not gain from price increases.

[17] The two alternative elasticity values applied were –2.75 and –2.00. The former was used as a higher end demand parameter and the latter was used to maintain the consistency in simulations in the CGE model. We have applied –2.00 for tourism demand elasticity for all other simulations.

[18] Using a similar model, Tisdell (1988) showed how a government could maximise its tax revenue by imposing a tax based on the efficient pricing structure.

increase in tourism taxes, the average price of international tourism could increase to \$3,412, a significant increase in tourism prices (about 26 per cent). As shown in column 6, this increase in taxes could maximise government tax revenue more than any other alternative scenario. For instance, government tax revenue may increase by \$1,369 million.[19] This implies that a maximum tax of 25 per cent on total projected tourism consumption can be imposed on international visitors, an almost five-fold increase. In other words, under scenario 1, Australia is able to impose a maximum tax of 17 per cent on current international tourism consumption. Given that the current structure has a 5.5 per cent tax on tourism consumption, scenario 1 implies that tourism taxes could increase by 11.5 percentage points.[20]

Table 5.4 also presents the results for the other two alternative scenarios for which two different price elasticities were applied. The results suggest the greater the elasticity of demand for international tourism the smaller the amount of government tax revenue that can be raised. Overall, the above analysis and the results derived appear to be very useful in addressing the issue raised at the introduction to this section i.e. whether the prevailing pricing structure in international tourism can be used to maximise government tax revenue. The following policy scenario is derived.

Policy Scenario Three

"The analysis of the current pricing structure in international tourism shows that the current international tourism price seems to be below the efficient level thus it can be used to increase government tax revenue via increased tourism taxes."

Unlike the previous two assessments, in this one the proposed tax change and the tax tool are evident. As explained above, an ad valorem tax change at the rates specified on total tourism consumption will be tested and simulations in relation to this test are presented in Section 8.4.

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[19] In estimating the change in total tax revenue for each scenario, we have deducted the total tourism taxes appearing in our database (\$639 million) from the total tax revenue appearing in Column 5.

[20] Proposed tax changes as a percentage of projected tourism consumption shown in Table 5.4 (Column A) appear to be somewhat high. However, tax rates as a percentage of the total current tourism consumption, given in column B are significantly less than those appearing in column A. Therefore, one might perceive that an imposition of tourism taxes of 17 per cent to be reasonable.

5.5. Concluding Remarks

In this chapter, the Australian tourism tax structure was assessed against the background of three different tax policy issues. In the first two assessments, it was considered whether current tourism tax revenue is sufficient (i) to cover the tourism-related external costs and (ii) to fund tourism-related public goods. In both cases, the main emphasis was on international tourism. In the last assessment, the prevailing pricing structure in international tourism was explored to ascertain the possibility of maximising government revenue via tourism taxes.

In the first assessment (in relation to tourism-related external cost), the external cost arising from international tourism was estimated based on available information. The estimated cost was assessed against the tax contribution by international visitors. In this case, the international visitor's contribution in three special tourism taxes, namely, ANL, EMC and PMC, was considered. In the second assessment, the cost of public goods was estimated based on available information and evaluated against the total tax contribution by the international visitors (excluding their contribution to ANL, EMC and PMC). The first two assessments showed that current tourism tax revenue is not sufficient to cover the external cost of tourism nor to fund tourism-related public goods. Based on such findings, it appears that there is a case for further taxing international tourism in each case. Therefore, some changes in tourism taxes, based on estimations in each case, are proposed i.e. increases in tourism taxes.

In the last assessment, the current tourism tax structure was explored for opportunities to maximise government revenue. To achieve this, the prevailing pricing structure of the international tourism sector was analysed and pricing parameters were derived using tourism consumption data. They were used to ascertain the levels that maximise government tax revenue via the Australian tourism sector. Tax rates that maximise government revenue were estimated for three different scenarios based on different demand elasticities. Overall, this assessment showed that the current tourism pricing structure may be used to optimise government tax revenue. Subsequently, changes in the current tourism tax structure to increase international tourism taxes are suggested.

In summary, the assessment of the tourism tax structure revealed that there appears to be a case for further government intervention in the cases of the external cost of tourism, of tourism-related public goods and of government revenue generation through the current tourism tax structure. However, such policy interventions can only be considered after a careful scrutiny of their effects on the tourism sector in particular, and on the economy in general. The next three chapters are designed to address these broader issues in relation to the proposed policy changes. For instance, in the next chapter (Chapter Six), the related literature will be reviewed to identify the most appropriate methodology to measure changes in the tourism tax structure, and in Chapter Seven a model that can be applied to analyse broader policy issues in tourism such as tax changes will be developed. Simulations in relation to proposed policy changes to analyse the effects of these tax changes will be carried out in Chapter Eight.

CHAPTER SIX

ALTERNATIVE MODELLING FOR TOURISM

This chapter reviews the available literature in relation to alternative modelling tools for tourism policy analysis. Three major alternatives, namely partial equilibrium, input output (IO) and general equilibrium (GE) or computable general equilibrium (CGE) models are identified. Of these three models, CGE models appear to be better than the other two models for tourism policy issues due to both the existing limitations of such models and the multifaceted nature of the tourism sector. Despite CGE being the better tool for tourism policy issues (and these are being applied mostly in tourism impact studies), one notable limitation of CGE modelling in tourism is the lack of explicit tourism sectors. Most available models appear to be dependent upon the existing structure in modelling tourism. Against this background, the dummy sector approach applied in a number of recent Australian studies stands as a novel and innovative technique that suits the nature of the tourism sector.

6.1. Introduction

Those tax changes proposed in the previous chapter are most likely to result in changes in the sector as well as in the Australian economy. These changes should be measured and evaluated to develop appropriate tourism tax policies. This raises an important question: "What are the appropriate modelling tools to measure such changes?" Therefore, the objective of this chapter is to review the available literature in relation to various modelling tools for tourism policy issues and to identify the most suitable modelling tool.

This chapter comprises five sections. Section two introduces the available major alternative policy tools and draws upon the existing literature on partial equilibrium and input-output (IO) models by highlighting their relevance to address tourism policy issues and existing limitations. Section three mainly reviews the literature relating to CGE modelling. In particular, the nature, characteristics, strengths and limitations of CGE models applied in tourism research are explained. Section four elaborates on new perspectives of CGE modelling in tourism and discusses in detail one of the new modelling techniques in tourism known as the "dummy sector approach". Section five concludes the chapter.

6.2. Alternative Models for Tourism Tax Studies

There are three alternative analytical tools that can be used to examine and evaluate tourism tax policy issues and these are, respectively:[1]

i. partial equilibrium models;

ii. input-output models; and

iii. applied general equilibrium or computable general equilibrium models.[2]

Each of these methodologies has its own strengths and weaknesses and the suitability and appropriateness of the selected methodology depends on, among other things, the nature of the policy issue that is to be analysed and the objectives of the project. In this section our aim is to provide an overview of the first two: partial equilibrium, and IO models. These models are examined as to their suitability for application in the current study taking into account the possible limitations and relative merits of each model.

6.2.1. Partial Equilibrium Models and Their Limitations

Partial equilibrium models have been widely used in tourism tax studies (Combs and Elledge 1979, Divisekara 2001, 2002, Durbarry and Sinclair 2001, Fuji *et al.* 1985, Gooroochurn and Sinclair 2003, Hiemstra and Ismail 1992, 1993, 2001, Mak and Nishimura 1979). One of the reasons for their popularity is their simplicity in addressing and explaining policy issues. It is also apparent that the examination of a selected policy issue in one market at a time is a relatively uncomplicated procedure (Rosen 2005).

As noted in Chapter Two, these models are based on microeconomic underpinnings such as demand and supply theories. Accordingly, they provide comparatively convincing arguments regarding the policy issue at hand. Furthermore, mathematical

[1] These methods, in particular the CGE models, are commonly applied in general tax incidence studies such as income tax, property taxes, excise taxes, sales taxes and value added taxes.

[2] Additionally, some of the issues related to tourism taxation have been previously addressed by using time series models (for example Bonham *et al.* 1992) and sample surveys (Mak 1988, Wanhill 1995). Consumer expenditure surveys (CES) are widely used in general tax incidence studies (in addition to the above). For example, Ring (1989) applied CES data to estimate the proportion of general sales tax paid by consumers and producers in the US. Mazerov (2002) used CES data to analyse the distributional effect of state and local taxes. Younger *et al.* (1999) used household expenditure data to study the incidence of tax in Madagascar. Additionally, some tax incidence studies used income tax returns and property tax refund returns (Minnesota Department of Revenue 1999).

modelling of partial equilibrium tends to be less complex since it involves relatively less economic agents (i.e. mostly the consumer and the supplier), variables and hence parameters. This implies that the modelling does not require a large amount of data.

The importance of partial equilibrium models is that they reveal fundamental changes arising from a tax policy change in a simplistic way. Therefore, those studies noted above make an important contribution to our understanding of theoretical and policy issues in relation to tourism taxation. However they contain several limitations, especially when they are applied to tourism policy issues.

First, when these models establish the theoretical framework in the context of demand and supply theories, behavioural aspects both in consumption and in production (i.e. utility maximisation and cost minimisation) are not given enough attention. In order to incorporate such theoretical aspects, substitution both in consumption and in production arising from price changes should be incorporated. However, because of the nature of the model, these aspects cannot be incorporated. Second, the concentration on only one market implies that the model cannot grasp the feedback effects of other markets or the economy-wide effects of tax changes. This could lead to a relatively incomplete picture of the policy change (Creedy 1997, Rosen 2005). Third, the tourism sector, by its nature, is a multifaceted sector which has many forward and backward linkages. Accordingly, any single tax-induced change in the sector might affect a large number of other tourism-related and connected industries, generating a much wider final effect. Therefore, a partial approach to address policy issues in such a sector might be insufficient.

6.2.2. Input-output Models

IO models are being widely used in tourism policy research, particularly in tourism impact studies (Archer 1985, & 1995, Fletcher 1989, Gamage *et al.* 1997/98, Gamage and King 1999, Ihalanayake 1996, Khan *et al.* 1990, Var and Quayson, 1985). IO models have also been used in general tax incidence studies though their application in tourism tax studies is not common.[3] However, one recent exception is the study by

[3] Scutella (1997) applied an IO model to analyse the incidence of Australian indirect taxes. Rajemison and Younger (2000) used an IO table for Madagascar to study indirect tax incidence. See also Siegfried and Smith (1991), and Derrick and Scott (1993).

Jensen and Wanhill (2002). In this study they applied an interregional IO model within the framework of a Keynesian macroeconomic system to analyse the impact of the value added tax on tourism in Denmark.

The IO models are economy-wide models in that they incorporate into a matrix form all the sectors/industries of the economy, their inter-industry transactions and transactions between final demand and other sectors. The main tool of the IO model is the IO table that consists of valuable information about the economy. The table shows flows of commodities and primary factors among sectors of the economy. Rows of the table represent commodities whereas columns represent sectors of the economy. Along the rows, the sales of each commodity to intermediate (other sectors of the economy) and final users are shown. Final usage comprises domestic absorption including household consumption, government consumption, investment and foreign consumption (exports). On the other hand, along the columns, purchases of intermediate inputs and primary factors, payments of sales taxes, value of imports and use of margin services by the sectors are represented.

IO multipliers are derived using the table and are useful tools for policy analysis purposes. Since the model is in the matrix form, it appears to be easy to solve the model. IO models assume a fixed coefficients technology that is commonly known as Leontief technology. Given the fixed coefficient production technology, it is straight forward to forecast the required output level in each sector in order to meet a planned final consumption level. The direct or first round, indirect or flow-on and induced effects of a policy change, such as increases in tourism expenditure in an economy, can be examined using an IO model. The most common application of the IO model is the analysis of output, employment and household income effects of changes in final demand for a sector.

As explained so far, the overall features of IO models are such that they make them capable of handling policy issues for which an economy-wide representation in the model is needed. Specifically, they are better equipped to analyse issues which are multifaceted in nature. Accordingly, IO models appear to be better than partial equilibrium models for analysing policy issues in tourism.

Limitations of IO Models

Despite the fact that IO models are better alternatives and have had a long standing success in tourism research, they possess a number of shortcomings or limitations. First, it is argued that the underlining assumptions are unrealistic and that they tend to affect the validity of the results obtained by the technique (Dwyer *et al.* 2000b, Dwyer *et al.* 2001, Dwyer *et al.* 2004a). Among these, the linear homogeneity assumption and unsatisfactory treatment of supply constraints are crucial. The model assumes that the money value of goods and services delivered by an industry to another industry is a linear function of the output level of the purchasing industry (West 1991, West and Gamage 1997). This implies a strict proportional relationship between input coefficients and output.[4] Furthermore, there is a linear relationship between exogenously given final demand and industry output levels, and thus output levels are changed in response to demand changes ignoring primary factor constraints (Bandara 1991).

These models also contain no supply-side constraints, and factors of production, labour and capital are assumed to be perfectly elastic. Thus, IO models tend to be demand-driven models. However, the realistic economic view is that there are supply-side constraints in the economy so that factors cannot freely move from one sector to another without causing changes in output of the former (Dwyer *et al.* 2005a).

Second, the assumptions of linearity and infinite supply elasticity imply that IO models do not contain a price mechanism and thus price plays a passive role (Zhou *et al.* 1997). Given that there are changes in demand and supply among sectors for intermediate inputs and for primary factors, constant prices do not provide a realistic view of the economy in question. Changes in primary factor cost should be reflected through the price mechanism in line with the changes in demand for, and supply of, such factors. However, IO models are unable to capture such relative price changes.

[4] This also implies that the production technology of a sector is based on fixed coefficients (Leontief coefficients) and hence each sector requires a fixed amount of intermediate inputs and primary factors in the production of its output. The fixed coefficient assumption does not allow sectors to either change their production technology or substitute factors in line with changes in input prices. Dwyer *et al.* (2000b) argued that the most serious limitation in the use of the IO model relates to the fact that it ignores the interactive effects between economic sectors. The IO model does not allow for the amount of labour drawn from other sectors and consequent reduction in their production.

Third, the treatment of international trade in these models is also recognised as unsatisfactory (Bandara 1991). Exports are a part of exogenously determined final demand and thus, exchange rates play no role in the model. When there are changes in final demand, for example, an increase in exports (increases in tourism demand), exchange rates and terms of trade should reflect such changes followed by the changes in balance of trade. However, there is no mechanism to capture these sensitivities in IO models.

As a result of these limitations, it appears that IO models tend to provide somewhat overestimated (underestimated) results.[5] In particular, changes in output of industries and related changes in factor supplies are somewhat higher (lower) than a priori expectations from a particular policy change.[6] Therefore, the application of this model in a broader policy analysis could be questionable and thus there is a clear need for a better analytical tool that addresses those limitations outlined.

6.3. Computable General Equilibrium Models (CGE): An Overview

An important methodological development that has addressed the above-mentioned limitations of IO models is the use of CGE models in policy analysis research.[7] The very first General Equilibrium (GE) model in tax incidence (general tax incidence) was introduced by Harberger (1962).[8] Harberger presented a theoretical framework in which he developed a two-sector model to analyse incidence of the corporation

[5] Blake *et al.* (2001b) argued that while IO models successfully capture some of the economic impacts of tourism, they tend to provide estimates that can be unreliable and heavily biased.

[6] Zhou *et al.* (1997) applied both IO and CGE models to estimate the economic impacts of a reduction in tourism expenditure in Hawaii. Their findings support the proposition that the results of IO models are greater in magnitude than those of their counterpart, CGE models. In many cases, the effects of tourism expenditure reduction on tourism-related sectors are significantly higher than those of the CGE results. They further argued that there are many advantages of the CGE framework in terms of modelling flexibility. Blake *et al.* (2001b) also observed a considerable overestimation in IO results compared to the results of CGE estimations. Dwyer *et al.* (2004a) noted that in addition to the overestimation problem, IO estimations could even get the direction of the change wrong. This problem arises since the IO technique is unable to capture the feedback effect, which might work in the opposite direction to the initial change.

[7] However, one should not forget the fact that the development of CGE modelling has been a natural extension of conventional IO models (Bandara 1991).

[8] There are only very few examples in the literature of the application of CGE models in tourism tax issues. Available examples include Giesecke *et al.* (1997) who applied a CGE model to analyse the effect of an accommodation duty in Australia and Gooroochurn and Sinclair (2005) who applied a CGE model to analyse tourism taxes in Mauritius.

income tax in the US. This was a pioneering work in this area. Prior to this, GE modelling dominated in the field of international trade. Harberger noted that following the research work in international trade, the main aim of GE modelling in tax incidence was to analyse changes in relative factor prices and subsequent economic implications of tax changes.

Harberger's work was further developed and modified by a series of studies by Ballard *et al.* (1985a), Keller (1980), Mieszkowski (1967, 1969) and Shoven (1976).[9] The most recent development in the area of GE modelling has been the extensive use of computer technology, in particular in the calibration of the model. These are commonly known as CGE models. Our main focus in this study is on CGE modelling, and therefore the following sections will introduce the basic features of a CGE model.

6.3.1. What is a CGE Model?

A CGE model is an economy-wide, multisectoral model that is an empirical counterpart of general equilibrium analysis.[10] In general equilibrium analysis, unlike partial equilibrium analysis, prices and quantities in all markets are determined simultaneously and the feedback effects are explicitly taken into account (Pindyck and Rubinfeld 2001).[11] The model represents the economy as a system of flows of goods and services, and the goods and services include both produced commodities and primary factors (McDougall 1995). In modelling, these flows of goods and services are presented as a series of mathematical equations. These equations are simultaneously solved using a computer software suite and hence are computable.

An essential feature of most of the modern CGE models is that they mainly are based on the neo-classical approach. Therefore, the model has been integrated with some of the important microeconomic theories. The following components can be identified as essential components of such a model (Bandara 1991):

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[9] More applications of CGE models in general tax incidence can be found in Fullerton and Metcalf (2002) and Legislative Revenue Office (2001).

[10] The terms "computable general equilibrium" and "applied general equilibrium" are used interchangeably in this study.

[11] A feedback effect is a price or quantity adjustment in one market caused by price and quantity effects in related markets (Pindyck and Rubinfeld 2001).

i. Specification of the representative agents whose behaviour is to be analysed. In CGE models, all the economic agents such as producers, households and governments are integrated.
ii. Identification of behavioural rules and conditions of agents under which they operate. With the neo-classical flavour of these models, producers maximise profit and minimise costs subject to production functions and households maximise utility subject to a budget constraint.
iii. Specification of the signals, which are used by the agents for their decisions. Price plays an active role in CGE models and hence the behaviour of economic agents in the model is guided by price signals.
iv. Identification of the rules of the game. CGE models assume pure competition and hence allow agents to act as price takers.

In line with the above specifications, a CGE model (a typical Johansen type model, Johansen 1974) consists of mainly five sets of mathematical equations, which can be solved simultaneously. Equations regarding the following are found in a model (Dixon *et al.* 1982):[12]

i. Final demand equations explaining demand for commodities by households, government, investors and exporters;
ii. Equations describing industry demand for primary factors and intermediate inputs;
iii. Pricing equations setting pure profits from all activities to zero;
iv. Market clearing equations for primary factors and commodities; and
v. Miscellaneous definitional equations, for example equations defining GDP, balance of trade, aggregate employment and the consumer price index.

IO and national accounts data for a given year provide the central database for the model. Additionally, some behavioural parameters such as various elasticity estimates

[12] There are two different types of solution methods: level forms (non-linear solution method) and the linearized approximation method (Johansen's method, named in recognition of the contribution of L. Johansen). ORANI and other similar Australian models are examples for Johansen-class multisectoral models. Multi-step procedures are now normally used with the Johansen method to avoid any linearization errors.

(i.e. exports and expenditure elasticities) are sourced from outside.[13] Models developed for special purposes may need further supplementary data. For example, models that deal with tax policy issues often need public finance data and the models designed for issues related to income distribution require data from household expenditure surveys or Social Accounting Matrix (SAM) data.[14] The database developed is then used to calibrate the model. In obtaining a solution to the model, equations of the model are solved simultaneously. Most CGE models can have more variables than equations and thus, the modeller should determine the 'closure' or the economic environment of the model. The closure of the model is the choice of specific variables for exogenous and endogenous variables. This is very crucial and plays an important role in holding theoretical pillars that support the model.

CGE models can be designed mainly in two ways such as comparative static models and dynamic models. A comparative static model compares the economy at two distinct points in time without modelling any explicit time periods or time path. Typically, the two states compared are the state of the economy with a given policy change and the state of the economy without the policy change and hence the model does not provide any details of the adjustment path of the economy between two points in time. Dynamic models, on the other hand, produce time paths of policy effects and these time paths are deviations from an explicit set of base-case forecasts (Dixon and Rimmer 1999a).[15]

By looking at the basic features of CGE models explained so far, there are four major aspects in which CGE models depart from partial equilibrium and IO models (McDougall 1995). First, CGE models are economy-wide and multisectoral, since all sectors of the economy and hence all markets, commodity and factor, are incorporated into a single model (unlike a partial equilibrium model, where only one market is

[13] Bandara (1991) noted that among the methods of sourcing these parameters, literature search, use of own elasticities derived by the modeler and use of best guess are common.

[14] Moreover, SAM data is increasingly used in CGE models designed for most developing countries (Gooroochurn and Sinclair 2005, Naranpanawa 2003).

[15] However, one of the distinctive features of the dynamic model is that it requires more information than its counterpart. For example, changes in all exogenous variables should be specified for a dynamic simulation whereas only the variable that is shocked is specified in comparative static simulation (Horridge 2003).

considered). This implies that all relevant economic agents are represented in the model. Second, these models have a central role with regard to the price mechanism unlike in IO models where prices play a rather passive role. Third, the structure of CGE models recognises the feedback effects arising in other related sectors of the economy and results are adjusted accordingly. One of the major limitations of both partial equilibrium and IO models are the lack of recognition of feedback effects in those models. Fourth, in most CGE models, international trade is modelled to reflect links between exports and imports and foreign exchange markets where changes in the former are reflected by changes in the latter.

These differing aspects of CGE models mean that existing limitations of partial equilibrium and IO models have been adequately addressed in the CGE setting thus they appear to be a better alternative to analyse economy-wide policy issues. In contrast to partial equilibrium models, CGE models allow analysis of policy issues that are multisectoral in nature and the analysis of issues that, while occurring in a single sector, may have effects on other sectors (Blake 2000).

In this context, it appears that they are the most appropriate analytical tools, compared to their counterparts, for tourism sector policy issues. Note that in Chapter Two we defined the tourism sector as a multi-faceted sector. Thus, changes arising in this sector due to increased taxes or price changes may give rise to changes in outputs and factor usages in many other related sectors.[16] Such sectoral changes could generate wider macroeconomic changes in terms of real GDP, employment, capital stock, exports and imports and hence terms of trade and domestic absorption.[17] A CGE model is the only single analytical tool that is capable of grasping all these macroeconomic changes and tracing them back to sectoral changes provided that the

[16] Following the results of tourism studies in which CGE models were applied, Zhou *et al.* (1997) and Adams and Parmenter (1991,1993, 1995), showed that changes in the tourism sector (i.e. changes in tourism expenditure) affect almost all sectors in the economy.

[17] Domestic absorption includes real household consumption, real investment, and real government consumption. Changes in the tourism sector can have changes in these components. Adams and Parmenter (1991, 1993) noted that tourism sector has important linkages with wider macroeconomic variables.

model is based on realistic assumptions and, more importantly, fair treatment is given to the tourism sector in the modelling process.[18]

Dwyer *et al.* (2004a) viewed CGE models as having broad applicability in tourism policy issues. If the research is aiming at analysing the overall economic impact of a change in the size of tourism or a particular change that might affect the tourism sector (i.e. changes in taxes), CGE analysis may provide the most suitable modelling tool.[19] Moreover, Blake *et al.* (2001b) noted that since the CGE model uses the latest methodology that has overcome the shortcomings of its counterpart, the IO model, its estimates and predications are more accurate than those of IO modelling.

As noted earlier, CGE models have a long history in policy research and, in particular, in empirical studies of tax incidence. CGE models have been applied extensively in the UK, the US, Canada, the Netherlands, and Australia.[20] There is also an increasing interest among researchers in applying CGE models to developing countries such as China, India, Sri Lanka, Indonesia, Fiji and Vietnam.[21] A detailed survey of all these CGE applications seems beyond the scope of this thesis and thus some attempts are made in the following sections to outline briefly CGE modelling experiences in Australia, and in particular its application in tourism research in Australia.

6.3.2. CGE Modelling in Australia: A Historical View

The history of general equilibrium modelling in Australia runs back to the early 1970s. The first modelling work of this kind started as an initiative of the Industry Assistance commission (IAC) through the Impact Project, an Australian Government initiative at the University of Melbourne (currently at Monash University). The first

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[18] Devarajan (1988) noted that a general equilibrium model is the appropriate tool for analysing policy issues which have economy-wide effects.

[19] Dwyer *et al.* (2000) argued that CGE models are almost a true representation of the economy and take economic behavior into account in a precise, numerical manner. CGE models reflect more general specifications of all the economic agents such as consumers, producers, and investors than those allowed in their counterparts (IO models).

[20] For examples of CGE applications in tax policy issues in these countries see Ballard *et al.* (1985a), Ballentine (1978), Keller (1980), Morgan *et al.* (1989), Whalley (1975).

[21] Some of the examples of CGE applications in developing countries include de Melo (1988), Devarajan (1988), Warr and Thapa (1999), Wittwer (1999).

comprehensive multi-sectoral model of the Australian economy, ORANI, was developed as part of the Impact Project, for which the first policy simulations were published in 1977 (Powell and Snape 1992).[22] Since then, there has been an extensive use of CGE models for a wide variety of policy issues across most sectors. A large number of such projects were initiated and funded by Australian Government institutions such as the IAC.[23]

In Australia, most of the early applications of CGE models have been in the area of effects of protection. Among other policy areas in which CGE models have been applied are exchange rates, terms of trade, other international trade, supply shocks, macro economic policy, microeconomic reforms, structural adjustments and labour market, immigration, forecasts of industry structure, recycling, effects of government taxes, grants, charges and regulations (Powell and Snape 1992).[24]

Of the policy studies in CGE, tax issues have received greater attention. Recent examples of CGE applications in tax studies include Dixon and Rimmer (1999a; 1999b), Wittwer and Anderson (1999) and Scutella and Johnson (1998). They studied various aspects of the effects of the new tax system (GST) introduced in 2000. Moreover, Meagher (1986), Meagher *et al.* (1985) McDougall (1993) also analysed aspects of Australian taxation.

Additionally, a large number of industry studies with CGE applications are also evident in Australia. Among the broad industries are agriculture, chemicals and plastics, fertilizers, food and beverages, forestry and timber, glass and glassware, iron and steel, motor vehicles and parts, mining, petroleum products, textile and clothing, transport, and travel and tourism (Powell and Snape 1992).[25] However, CGE

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[22] For more information about ORANI, see Dixon *et al.* (1982).

[23] For a more comprehensive review of CGE modelling in Australia see (Powell and Snape 1992). Powell and Snape noted that within a decade after the publication of the first results of ORANI, more than 200 applications of CGE modelling have been recorded of which 177 have been publicly documented.

[24] See for example Dixon *et al.* (2005), Meagher (1986).

[25] For industry studies see, for example, Dixon and Rimmer (2003), McDougall (1993), Meagher *et al.* (1985), Wittwer and Anderson (1999), Wittwer *et al.* (2005),

applications in tourism studies do not have a very long history. Relatively little work undertaken in a general equilibrium context, in particular in the area of tourism taxation, with one or two exceptions (Dwyer *et al.* 2004a, Gooroochurn and Sinclair 2005).

There are two possible reasons as to why there has been little work in tourism with CGE applications compared to other applications such as IO. First, as we noted earlier, until recently the IO model has been the most commonly used technique in tourism policy research. Its simplicity, low cost in terms of time and resource needs, and relatively less data-intensive nature may have encouraged extensive use of IO models in tourism research. Second, in contrast to IO, CGE models are complex, demand more expert knowledge both in theory and application, demand more resources and time and are data-extensive in nature (Bandara 1991). In the following section we will briefly outline some of the examples of CGE applications in tourism in the world, highlighting the important characteristics of such models.

6.3.3. CGE Models Applied in Tourism Research: An Overview

In the recent past there have been a series of studies in tourism with CGE applications in which Australia has played a leading role.[26] Most of these applications are used in tourism impact studies. One of the pioneering studies in tourism in this area was the study by Adams and Parmenter (1991, 1993) on the medium-term economic significance of international tourism for the Australian economy.[27] In this study, they used tourism expenditure data, airfares and data on expenditures made in Australia by foreign airlines to calculate shares of consumption by foreign tourists in identified domestically-produced commodities. Then, an export shock equivalent to 10 per cent expansion of tourism expenditure was induced into the identified commodities with the assumption that an increase in tourism expenditure is similar to an increase in expenditure on those domestic commodities. While this study made an original

[26] Copeland (1991) analysed the effects of an expansion of tourism on welfare, output and factor prices in the host country using a general equilibrium model.

[27] They applied the ORANI-F model with the ORANI regional equation system, in a small-open economy case in the international trade context. (Note that ORANI-F is a static economy-wide CGE model of the Australian economy with some simple dynamic features).

contribution to the literature, one of the major limitations was the lack of an explicit sector or sectors to represent tourism activity in the economy.

The study by Zhou *et al.* (1997) is another important contribution in tourism research. They constructed and applied both a CGE model and an IO model to analyse the impact of a decline in tourism expenditure in the state of Hawaii. The main data source for the study was SAM data for Hawaii. In this model, the Hawaiian economy was disaggregated into 14 sectors, some of which were recognised as tourism-related sectors. The CGE model is similar to most of the other models discussed in this section. This study did not recognise tourism as a separate sector. The assumption was that tourism is already embedded in existing sectors and thus simulations were carried out through tourism-related sectors identified in the model such as hotel, transportation, and eating and drinking.

Dixon and Rimmer (1999a) analysed the effects of tax reform in Australia. In this study they used their dynamic CGE model of the Australian economy, MONASH, which is regarded as the most comprehensive model currently available in Australia. Based on the MONASH results, they argued that those tax reforms such as the introduction of the GST and other related reforms had considerable negative effects on international tourism. While the results of this study and the model applied are highly regarded for their contribution to CGE analysis, one limitation of the model is the lack of an explicit tourism sector.

In the MONASH model, international tourism was modelled via demand for exports (Dixon and Rimmer 2002). Four categories of exports are identified: traditional, non-traditional, tourism and special. The tourism export category includes commodities such as air transport, entertainment and leisure, restaurants and hotels and personal services. [28] Demand for tourism exports depends on tourism prices. Tourism demand modelling in MONASH differs in two aspects from similar approaches. First, the model applies a common demand elasticity value for tourism, which is different from

[28] While the tourism commodities recognised in the model are the major commodities, they represent only a part of total international tourism consumption. In addition to these commodities (i.e. air transport, entertainment and leisure, restaurants and hotels and personal services), international tourism consumption of food and beverages, local transport, and shopping items (i.e. clothing, footwear, electrical and other household items) could represent a considerable portion. Thus, the exclusion of such commodities could underestimate the true size of the tourism sector.

demand elasticities applied for the other three exports categories. Second, the model assumes that tourism demand is dependent on a single price variable. This price variable is the average price of all tourism commodities identified. The intuition is that international visitors are buying a bundle of commodities and thus it depends on the cost of the bundle. It is clear that the second aspect is realistic given that the tourism product is a composite one. In summary, it shows that in this model tourism is modelled via a final demand sector.

Blake (2000) analysed the effects of tourism in Spain applying a CGE model.[29] A CGE model of the Spanish economy has been applied and calibrated using the 1992 IO table. Of the existing intermediate and final demand sectors in this model, 2 final demand and 12 intermediate sectors were considered as tourism sectors as they are related to tourism. Intermediate sectors including tourism-related sectors have been modelled in a similar fashion. Domestic tourism expenditure has been modelled in the same way as private household consumption. This model departs considerably from the models explained in proceeding paragraphs since it modelled domestic and international tourism demand separately as final demand sectors. However, it appears that the model lacks explicit supply side modelling of tourism sectors.

Sugiyarto *et al.* (2003) undertook a study to examine the economic impact of tourism and globalisation in Indonesia. A CGE model of Indonesia using SAM data was applied. The SAM database used was an aggregated version, in which 18 production categories are modelled. Final demand includes household demand, government consumption, investment demand and exports. Export demand comprises two components: services and other commodities. Other commodities include agriculture and manufacturing. The services exported are assumed to be consumed totally by foreign tourists and thus tourism consumption is services exported. Therefore, tourism in the model was treated as a final demand sector that consumes a range of exported services. Accordingly, fluctuations in service exports were treated as fluctuations in tourism expenditure.

[29] He used a 49-sector Spanish Tourism IO table for 1992. This comprises 12 sectors that are related to tourism of which six tourism sectors and six travel sectors are identified. The IO table also consists of 6 final demand sectors such as private consumption, public consumption, investment, export, domestic tourist expenditure and foreign tourist expenditure.

Narayan (2003, 2004) applied the Fiji CGE model, a model of the ORANI family, to analyse the economic impact of tourism on Fiji. The 35-sector model was used to simulate a 10 per cent increase in tourism expenditure. Sectors include 23 agricultural and industrial sectors and 12 service sectors. The latter consists of most tourism-related sectors such as hotels, cafes and restaurants. The simulation of tourism expansion might have been carried out through these tourism related sectors since the model does not appear to have any explicit tourism modelling.

One of the most recent applications of CGE in tourism is the study by Gooroochurn and Sinclair (2005) on tourism taxation in Mauritius. The focus of the study was on efficiency and equity effects. The model was calibrated using SAM data for 1997. On the supply side, it consists of 17 intermediate sectors. The demand side includes eight households, the government, investment demand and tourism demand. Total tourism demand is divided into two categories: (i) micro tourism demand representing domestic tourism, modelled similarly to household demand, (ii) macro tourism demand representing international tourism, modelled similarly to exports. The study identified five tourism-related sectors based on the proportion of tourism consumption in total demand. Simulations are carried out via these tourism-related sectors.[30]

Studies examined so far in this section play a pioneering role in tourism research. They make an original contribution to tourism research by applying CGE models in a new discipline: tourism.[31] While these studies make a significant contribution to our understanding of the general equilibrium effects of various tourism policy issues, one major drawback of these studies is the lack of appropriate modelling in the tourism sector. As evident from the above discussion, tourism has been modelled through either existing tourism-related intermediate sectors or through final demand sectors such as households and exports.

[30]The sectors are hotels and restaurants (95%), transport and communications (61%), retail and wholesale (3%), other manufacturing (12%) and other services (12%). The proportion of tourism consumption in total is shown in brackets. As shown in the tourism proportions, except for the first two sectors all the other sectors account for a rather insignificant tourism proportion. This may raise some problems about simulation results when they are interpreted as arising from changes in the tourism sector.

[31] Other tourism studies with CGE applications include Blake *et al.* (2001a) and Mabugu (2002).

In most previous studies, tourism-related sectors such as hotels, accommodation and transport are defined as tourism and then simulations are carried out. While these sectors cater mainly to tourists, non-tourism consumption of the outputs of these sectors may be significant and hence cannot be neglected. Against this background, such an approach towards tourism may have a limited capacity to address the policy issues related to tourism. On only a few occasions is tourism recognised as a separate final demand sector. Therefore, it appears that none of these models utilises an explicit tourism sector or sectors that combine both the demand and supply side of tourism. The problem with this type of treatment in modelling is that the model is unable to recognise the true size and behaviour of the tourism sector within the economy. Thus, it may not be able to capture the true nature of the tourism sector.

One notable exception to those models examined above is the study by Alavalapati and Adamowicz (2000). They analysed the interactions among tourism, other economic sectors, and the environment by developing a simple two-sector, two-factor general equilibrium model. The modelling aspect of this study departs considerably from most of the other studies discussed so far. They explicitly incorporated a composite tourism sector into the model. Furthermore, they modelled negative environmental externalities caused by both the tourism sector and the other sector. Although the model is limited in its capacity to be used for policy analysis, their modelling work provides very useful insights into tourism research, particularly research into tourism-related environmental issues. In addition to Alavalapati and Adamowicz, there are several Australian tourism studies with CGE applications in which a new convention in tourism modelling is introduced. The following section briefly looks at these studies.

6.4. CGE Modelling in Tourism: A New Perspective

Madden *et al.* (2000) applied a novel approach towards tourism in their model which departed considerably from other approaches in defining tourism sectors. Madden *et al.* extended the FEDERAL model to incorporate 'intermediate tourism sectors' that combine adequately both the demand and supply sides of tourism.[32] Six tourism

[32] FEDERAL is a two-region multisectoral fiscal model of the Australian Economy and it contains 37 industries and commodities. The two regions are Tasmania and the Rest of Australia that combines all the other states. For more information on the FEDERAL model please see Madden (1990).

sectors have been incorporated into the model and they labelled this the "dummy sector/industry" approach (defined in the following section). They applied a modified version of FEDERAL to assess the contribution of tourism to the Tasmanian economy. Their approach towards tourism in the model recognises two most important features of the tourism sector: (i) tourism is a multifaceted sector that offers a composite product to the market, and (ii) the tourism sector does not produce a commodity as such, rather it purchases its components from a wide range of other sectors and on sells the composite product to its consumers. This new approach by Madden *et al.* is an important contribution to CGE modelling in tourism.

Madden and Thapa (2000) applied a similar method to develop a CGE model with tourism sectors to assess the contribution made by tourism to the New South Wales economy.[33] In addition to the standard sectors in the model, twelve tourism sectors were introduced. They cover overseas, interstate and intrastate tourists and four major purposes of visit such as holiday, visiting friends and relatives, business and conference and other.

Woollet *et al.* (2002) followed the same convention to develop a CGE model of tourism called the Queensland General Equilibrium Model (QGEM-T).[34] Eighteen new tourism expenditure categories that represent tourism sectors were incorporated. In addition to inbound tourism, this model includes outbound tourism by Queensland residents. Thus, major tourism categories are intrastate, interstate, foreign inbound, going interstate, foreign outbound, and foreign imports. These six categories were further divided on the basis of purpose of visit: holiday, VFR, and business.

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[33] A CGE model has been developed for this study with the use of both the FEDERAL model and MMRF. MMRF is a multiregional, multisectoral model of the Australian economy developed at the Centre of Policy Studies at Monash University (Peter *et al.* 1996). This model is also a two-region model of the Australian economy as in Madden *et al.* (2000). The two regions are New South Wales and the Rest of Australia. Each region in the model has 50 standard industries.

[34] This is also a regional model, similar to the two previous examples, that identifies Queensland and the Rest of Australia as two regions. The model comprises 108 commodities and 108 industries in its standard form. The database for the model is based on the 1996-97 IO tables for Australia.

More recently, Dwyer *et al.* (2003b) applied a M2RNSW model to assess the contribution of tourism to the New South Wales economy.[35] Following the same approach, fourteen tourism sectors were incorporated into the existing 42-sector core model. These sectors were disaggregated based on source of the visitor and purpose of travel. Tourism sectors are dummy intermediate sectors that incorporate both the demand and supply aspects of international and domestic tourism in Australia.

In summary, it appears that the dummy sector approach applied in studies by Madden *et al.* (2000), Madden and Thapa (2000), Woollet *et al.* (2002) and Dwyer *et al.* (2003b) is a considerable departure from alternative approaches applied in the studies examined in the previous section (Section 6.3.3). It adequately addresses the need to have explicit tourism representation in CGE models and is certainly a better alternative method than simulating via tourism-related sectors or related final demand sectors. The following sub section will define a "dummy sector" and will outline the appropriateness of this approach to model tourism in a CGE setting.

6.4.1. The 'Dummy Sector Approach': An Alternative to Model Tourism

In preceding sections, we have reviewed the literature relating to appropriate modelling tools for tourism policy issues. This concluded that CGE models are the most appropriate among the three models reviewed. However, one major limitation of most available CGE models which are applied in tourism research is the lack of explicitly defined tourism sector/sectors. This is because tourism is not conventionally recognised as an economic sector/industry in national accounts. Thus, IO tables that are commonly used as the database for most CGE models do not contain a tourism sector. Against this background, the best strategy to apply CGE in tourism policy studies is to define a tourism sector explicitly that would be comparable to any other sector in the model. However, construction of a database for such a tourism sector is not an easy task. It demands considerable time and expertise knowledge in CGE modelling. Given the time constraint, this alternative appears to be well beyond the scope of the current study. In this context, the second best alternative available to us is the use of "the dummy sector approach".

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[35] M2RNSW is a two-region CGE model of the Australian economy and is a modified version of the M2R model (multiregional CGE model of the Australian economy). Both these models are adaptations of the standard MMRF model. See also Dwyer *et al.* (2004b, 2004c).

A dummy sector can be defined as a sector that purchases a range of commodities from other sectors within the economy, combines them and then on sells the composite commodity to a relevant final demand sector. Such a sector has no explicit and active production of an output as such, thus it does not purchase primary factors. However, this sector purchases intermediate inputs, utilises margin services and pays taxes on purchases (Madden *et al.* 2000, Woollet *et al.* 2002).

There is a principal difference between a dummy sector and a conventional (intermediate) sector of a CGE model. A conventional sector purchases intermediate inputs from other sectors, primary factors such as labour, land and capital and then produces an output. This output is sold to other sectors as their intermediate input - to household sector for consumption, to the government sector for their use and to the rest of the world as exports. For example, the automobile sector of the Australian economy purchases relevant intermediate inputs and primary factors and then it produces motor vehicles. The production of this sector is sold to other sectors, households, the government sector and to the rest of the world. In summary, the operation of a sector (conventional) in a CGE model is based on its production or the output (supply side).

The tourism dummy sector operates in a somewhat different way. Its operation could not be defined based on its production or the output since there is no active production process and an identifiable output as such. Rather, it should be defined based on what tourists purchase (demand side) while visiting a destination. Therefore, the dummy sector is defined based on its purchases of different components of composite tourism product from other sectors. These components include accommodation, transport, food, entertainment and other components of the tourism product from relevant sectors. Once the tourism sector combines the composite product, it is only sold to particular visitor categories, which are final demand sectors. Unlike the conventional sectors, this sector does not sell the output to other sectors as intermediate input and neither this sector purchases primary factors.

The dummy sector concept is closely in line with the concept of the tourism sector. In Section 2.1.2, the tourism sector is defined as a multifaceted sector that combines a range of goods and services (ABS 2000, Wilson 1998). Tourists are viewed as purchasing and consuming a composite product. The dummy sectors purchase components of the tourism product from domestic industries and import the rest. The sectors then sell the composite product to different visitor categories such as international, interstate and intrastate. The demand for the composite product of the dummy sector is theoretically consistent. Dixon and Rimmer (2002) and Adams *et al.* (2003) argued that the demand for each component of the tourism product is tightly linked, each being determined not by movements in their individual prices, but by movements in the average price of the composite.

This approach recognises the real nature of tourism in an economy-wide setting where the tourism sector/sectors interact with other intermediate and final demand sectors while responding to relative price changes. The central issue addressed in this thesis is tourism taxation and thus it requires an economy-wide model. Furthermore, this model should have a reasonably well-defined tourism sector to capture sector- specific changes in taxes and other variables. It is clear that the tourism sector cannot be modelled as other conventional sectors whose existence in the model is determined by output. The tourism sector should be modelled based on what it purchases from other sectors, rather than on production.

It was observed earlier that tourism sectors are modelled either via final demand sectors or more commonly via tourism-related sectors without explicit recognition. In most cases, this could lead to an underestimation of the true size of the tourism sectors. However, since the dummy sector approach combines demand and supply aspects adequately, the size of the tourism sectors can be established accurately. Moreover, with the availability of TSAs (tourism satellite accounts), the tourism dummy sector approach becomes even more relevant as TSA provides compatible data with the core databases (most commonly core databases are IO data). As revealed so far in this section, it appears that the dummy sector approach is a better way to define tourism sectors within the conventional system of economic sectors in a CGE model.

However, this approach appears to have two major limitations. First, it is clear that with the use of the dummy sector, the tourism sectors' primary factor usage can not be modelled. The tourism sector as a whole is a labour intensive sector and any change of the sector may have significant implications in the usage of primary factors, in particular to labour usage. However, such implications cannot be reflected and analysed with the use of a dummy sector. Second, the database for tourism sectors is constructed using tourism expenditure data. The accurate reflection of the size of the sector in the model is entirely dependent upon the availability of accurate reliable tourism expenditure data. However, subject to these limitations, it appears that the dummy sector approach is still a reasonable alternative to model tourism in the CGE setting compared to what has been commonly applied in tourism policy research.

6.5. Summary and Major Highlights

Three alternative modelling tools: partial equilibrium, IO and CGE models have appeared in the current literature as suitable to examine and evaluate tourism tax policy issues. Of the three alternatives, the partial equilibrium models have been the most widely-used in previous tourism tax studies. IO models, on the other hand, have been the leading methodology in general tourism policy studies such as tourism impact studies. Despite their popularity in tourism research and their relative merits, they possess some limitations. Therefore, it is suggested that CGE models are well-suited to address policy issues such as tourism taxation given the multifaceted nature of the sector. They appear to be better equipped than their counterparts with the required theoretical and technical underpinnings necessary for such purposes. More importantly, it appears that most of the existing limitations of both the partial equilibrium and IO models are being adequately addressed in CGE models.

While the value and appropriateness of CGE modelling in tourism are well recognised, its application in the empirical context has received relatively less attention, with several exceptions. While those tourism studies with CGE applications have made a significant contribution to our understanding of general equilibrium issues in tourism, one notable limitation highlighted in such applications is the lack of explicit tourism sectors in those models applied. Until recently, the common practice has been the use of the existing structure of the model.

In a number of the most recent CGE applications in tourism research in the Australian context, a novel and innovative technique that mostly suits the nature of the tourism sector has been applied. This is the incorporation of explicit tourism sectors into the

CGE setting, known as the "tourism dummy sector approach". It appears that this approach adequately recognises the existence of a tourism sector or sectors within the conventional sectors while maintaining the multifaceted nature of the tourism sector.

In the next chapter, this approach will be applied to develop the Tourism Tax Model: A Modified Version of ORANI-G by incorporating two tourism sectors, and a finance module to examine tourism tax policy issues in the current study.

CHAPTER SEVEN
DEVELOPMENT OF A TOURISM TAX MODEL:
A Modified Version of the ORANI-G Model

Tourism Tax Model (TTM): a CGE model of the Australian economy is developed. Our TTM is a considerably modified version of ORANI-G developed for our specific purposes. We modified the ORANI-G by explicitly incorporating two tourism sectors to study the effects of tourism taxation in Australia. The tourism sectors are incorporated following a recent methodological advancement in CGE modelling, namely, the "tourism dummy sector approach". In the process, the Australian Tourism Satellite Accounts are used to construct tourism consumption vectors for the domestic and international tourism sectors within the CGE setting. As well as the incorporation of two tourism sectors, following Parmenter (1988) and Adams et al. (2003), a government finance module is also incorporated into the core CGE module.

7.1. Introduction

In searching for alternative tourism models in Chapter Six, it was found that tourism tax policy issues are better analysed and explained in a general equilibrium setting. Moreover, the evidence suggested that a little attention has been paid to the general equilibrium aspects of tourism taxation, with a few notable exceptions. Therefore, the aim of this chapter is to develop a Tourism Tax Model (TTM): a modified version of the ORANI-G model.

The chapter contains six sections. Section two provides an overview of the development of the TTM and outlines the general theory of the ORANI-G model. Section three describes the incorporation of two tourism sectors with special reference to the tourism sectors' theoretical structure. Section four outlines the structure of the government finance module. Section five describes the relevant database modifications including the GST modification, construction of tourism consumption databases and the finance database. The final section concludes the chapter.

7.2. Development of Tourism Tax Model (TTM): An Overview

The TTM was developed based on the ORANI-G single country generic model of the Australian economy, developed at the Centre of Policy Studies at Monash University. The first general equilibrium model, ORANI: A Multisectoral Model of the Australian

Economy was developed by Dixon *et al.* (1982).[1] ORANI-G is an aggregated version of ORANI, modified and extended by Horridge (2003). The choice of this model is motivated by a number of factors and they are as follows:

First, the model is the first comprehensive model of the Australian economy developed almost three decades ago and thus it has undergone continuous improvements and developments. The theoretical structure, applications and methods are well-documented and as a consequence the model user is well informed about all aspects of the model. Second, ORANI has been well-recognised in academia, industry and government circles. The model has been applied in several policy studies across various sectors of the Australian economy.[2] Powell and Snape (1992) noted that during the first ten years after the publication of first results, 190 out of 203 known CGE applications have used some version of ORANI. Thus, there is a considerably rich body of literature on ORANI. This suggests that ORANI has the ability to convince all interested observers due to a modelling capacity that has real world relevance.

Third, ORANI is the first such model that has a large number of special purpose versions.[3] The model is flexible in its adaptation and application to various policy issues. Furthermore, ORANI has been adapted to develop country-specific CGE models for more than 15 countries.[4] Fourth, most importantly, ORANI has been applied in several tax policy research studies in Australia. For example, McDougall (1993), Meagher (1986), Meagher and Agrawal (1986) and Meagher *et al.* (1985) applied various versions of ORANI to various tax policy issues. Among these issues, special tax policies, indirect taxation, tax reforms, and taxation and income

[1] The model has been continuously subject to changes and improvements and it is also available at different levels of aggregations. The original ORANI database developed using the 1968-69 IO tables for Australia consists of 115 commodities and 113 industries.
[1] See, for example, Agrawal and Meagher (1988).

[2] See, for example, Agrawal and Meagher (1988).

[3] Among the special purpose versions, ORANI WINE, ORANI TAS, ORANI MILK, ORANI-F MILK, ORANI CHEM, ORANI TRUCK, ORANI NT, ORANI LFT, and ORANI MINE are a few to name (Powell and Snape 1992).

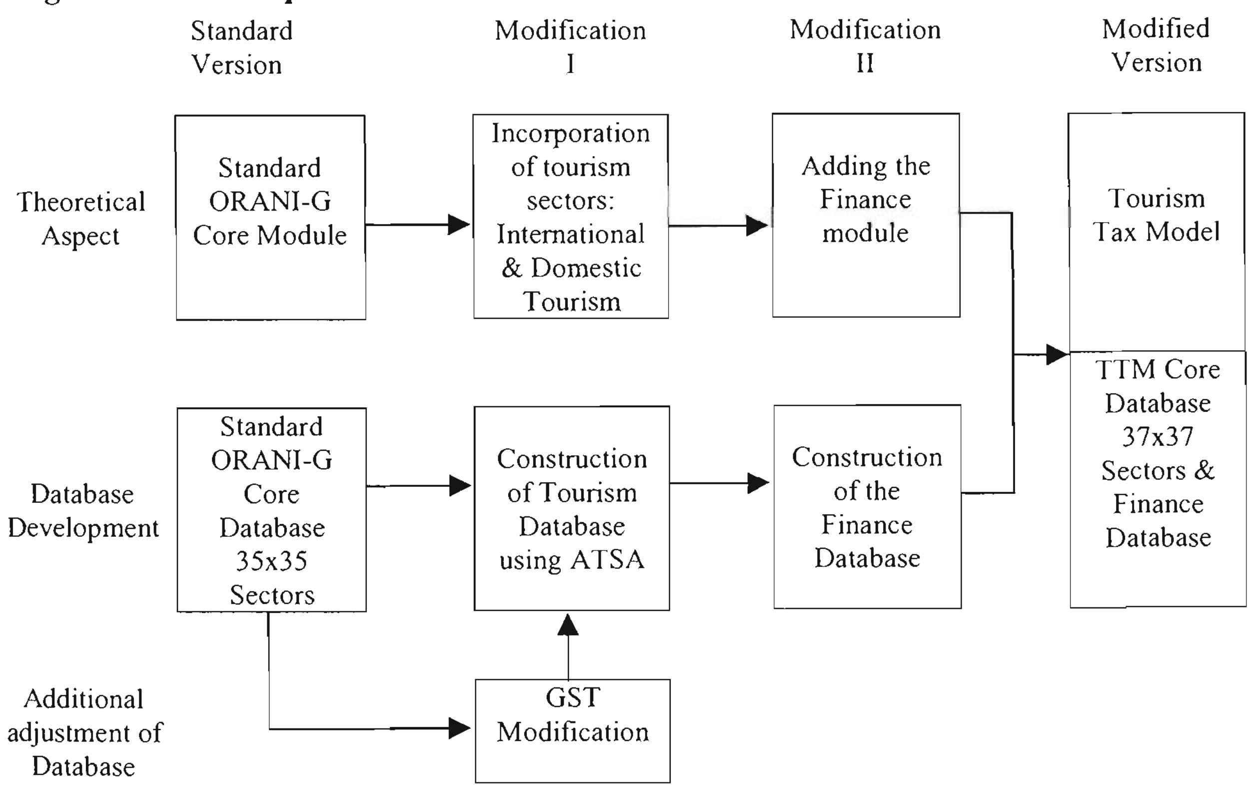
[4] Countries include China, South Africa, Indonesia, Iran, Taiwan, Denmark, Thailand, Brazil, Vietnam, Pakistan, Japan, Malaysia, India, Korea, Fiji, and Sri Lanka. For more information see also Bandara (1991), Horridge *et al.* (1995), Naranpanawa (2003), Narayan (2004) and Wittwer (1999).

distribution are a few to mention. Most recently, Johnson *et al.* (1998b) applied the ORANI model to analyse the equity and efficiency effects of the New Tax System (GST package) introduced in 2000.[5]

ORANI-G does not include either tourism sectors or a government finance module, two features essential to the current study since it involves tourism taxation. Therefore, as shown in Figure 7.1, two major modifications to the ORANI-G model are made in developing the TTM and they are:

i. Incorporation of two tourism sectors; and
ii. Adding a government finance module.

Figure 7.1: Development Process of TTM



The modifications require both a treatment of theory and construction of databases and thus, in this chapter, they are outlined both from the theoretical perspective and the perspective of database development. However, before the modifications are outlined, it is important to outline the current theoretical structure of the ORANI-G model. Thus, the following subsection will present current ORANI-G theory.

[5]See also Johnson *et al.* (1997, 1998a).

7.2.1. General Theoretical Structure of ORANI

The theoretical structure was directly adapted from Dixon *et al.* (1982) and the model equations are presented in Appendix B. As noted above, ORANI-G is a CGE model of the Johansen class.[6] The model consists of five groups of equations describing final demand (by households, government, investors, and exporters), industry demand for primary factors and intermediate inputs, pricing structure, market clearing conditions, and miscellaneous macroeconomic conditions. An essential feature of the model is that it is based on the neoclassical assumptions of pure competition. On the supply side, the model includes 35 industries/sectors each producing a single commodity.

The industries/sectors are faced with the problem of cost minimisation. Production technology in general is explained by a system of nested combinations. The input demand functions for current production are derived in three levels. At the top level of input functions, producers choose a combination of commodities, primary factors including land, labour, capital and other costs. These commodities and factors are combined using a Leontief production function. This implies that they are chosen in fixed proportions. At the second level, the commodity composite and primary factor composite are selected. The commodity composite is selected using a CES (constant elasticity of substitution) function. The commodities are supplied from two sources: domestically produced and imported.[7] The primary factor composite is also a CES aggregation of land, composite labour and capital. In the lower level of the input structure, the producers select the composite labour from a range of occupational labour types using a CES function.[8] Each industry is assumed to choose its input for a given level of activity to minimise the cost of production.

The demand-side is represented by investment demand, a single representative household, the government, and exports demand. The industry demand for inputs for

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[6] As noted in Chapter Six, Johansen type models are special in that the model is represented as a system of linear equations in percentage changes of the variables.

[7] ORANI adapts the Armington (Armington 1969) assumption that imports are imperfect substitutes for domestic supplies. Elasticities used to model substitution are known as Armington elasticities.

[8] Labour is further categorized into nine occupational and skill categories. They include managerial and administrative, professionals, associate professionals, trade persons, advanced clerical service, intermediate clerical service, intermediate production & transport operators, lower clerical service and labourers.

capital formation is explained by a nesting structure, which has two levels. At the lower level of nesting, it is assumed that investors choose from domestically produced and imported goods in order to minimise total cost subject to the CES production function. At the top level of the production structure, investors are assumed to be minimizing the total cost of commodity composite subject to a Leontief production function.

The single representative household is faced with the problem of utility maximisation subject to budget constraints and thus household demand is formulated using two the level-nesting structure similar to investment demand. At the lower level, consumers are assumed to be choosing source-specific commodities subject to the household budget using a CES aggregation. At the top level, consumers choose the right combination of composite commodities (selected from domestic and imported sources) subject to a Klien-Rubin utility function[9]. In formulation of household demand, the model is based on the following assumptions (Dixon *et al.* 1982):

i. Consumers behave as if they maximise a single utility function subject to a budget constraint.
ii. The utility function is assumed to be Klein-Rubin and this assumption simplifies the estimation of the outside demand elasticities.
iii. The consumption of commodity *i*, in general, is defined by a CES aggregate of the consumption of commodity *i* from domestic and foreign sources. In response to the relative price changes of commodity *i* from the two sources, consumers are assumed to substitute between the two sources of supply of commodity *i*.[10]

Government demand describes the demand for locally produced and imported commodities by government institutions. Government demand in the model is assumed to be moving with real aggregate household consumption. Export demand for Australian-made commodities is determined by the foreign currency prices of

[9] Refer Appendix B for more information on household demand.

[10] Substitution between domestically produced and imported commodities is modelled using Armington elasticities.

exports. Thus, export demand is assumed to be inversely-related to the foreign currency prices of exports.

Margin services such as road, rail, and water transport services and wholesale and retail trade, are essential to deliver other commodities from producers to consumers. The demand for the output of these service industries for margin purposes should be modelled separately since it cannot be modelled in the same way as the direct demand for commodities. The demand for margin services is dependent upon the demand for related commodities for which margin services play the vital role of transferring commodities between producers and consumers.

In ORANI, there are two types of prices: basic prices and purchaser's prices. Basic prices for domestically produced commodities are the prices received by producers which excludes taxes and cost of margin services. Basic prices for imported commodities are the prices received by the importers which excludes sales taxes and cost of margin services but include import duties. In deriving price equations, it is assumed that pure competition exists which implies that there are no pure profits in any economic activity. Furthermore, uniform basic prices across users are assumed.

The model includes import tariffs and sales taxes on intermediate consumption, investment, household consumption and exports. Tariffs and sales taxes are treated as *ad valorem* on basic values, with the tax variable in the linearised model being percentage change in powers of the taxes.

The allocation of investment across industries in ORANI is obtained through a six-step process by which allocations of investment by two main classes of investors is explained. The two classes of investors are private investors whose investment is determined by the relative rate of return, and investors whose investment is not determined by the relative rate of return. The investment decisions of these investors may be made on the basis of other factors such as government policies. For example, sectors such as government administration, health, defence and education can be included in this category and their decisions are mainly driven by government policies.

In addition to the basic structural components of the model given above, it also includes several other economic aggregates. Among these, aggregate volume of imports, exports and the balance of trade, consumer price index, aggregate employment and aggregate capital stock are important. Finally, the model assumes that wages and other costs are indexed to the consumer price index.[11]

7.3. Incorporation of Tourism Sectors

Two tourism sectors: International Tourism (*IntToursm*) and Domestic Tourism (*DomToursm*) are incorporated. The choice to introduce two separate sectors was supported by a number of theoretical and practical issues. In principle, the tourism sector is not a supply-driven sector, but rather a demand-driven sector. The demand or expenditure pattern of the two groups is different from one another. For instance, international visitors spend a large portion of their budget on long distance travel while for domestic visitors long distance travel accounts for a relatively small portion. Given the disparity in consumption patterns between the two categories, our aim is to reflect this different buying behaviour in modelling tourism sectors. Furthermore, from a modelling viewpoint, particularly for simulation purposes, two separate sectors in the model provide the modellers with greater flexibility. Following earlier examples of tourism modelling in a CGE setting explained in Chapter Six, Section Four, the dummy sector approach is applied to incorporate the tourism sectors.

7.3.1. Tourism Theoretical Structure

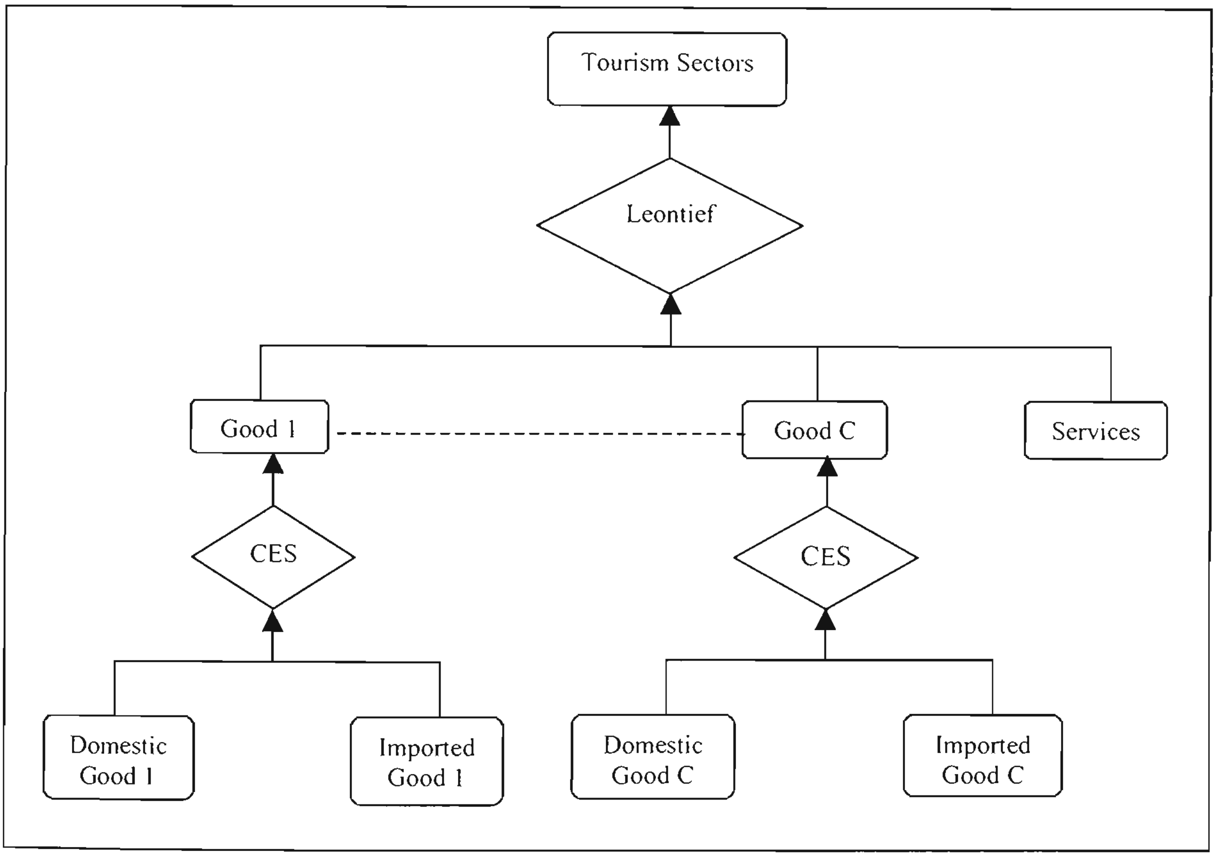
On the supply side, there are two tourism sectors (domestic tourism and international tourism) in the model and they are incorporated into the intermediate matrix. Thus, the production technology of the tourism sectors is very similar to that of other conventional sectors in the model. For instance, the input technology of these sectors follows the same theory as that of conventional sectors.

Figure 7.2 below is a schematic view of the input technology of the tourism sectors. The input technology is modelled in a two-level nesting structure. At the top level,

[11] The last assumption noted here is known as full wage indexation (Dixon *et. al.* 1982). This means that real wages are fixed in all occupations and industries. In short-run ORANI simulations, the real wage is assumed to be exogenously detrmined. This implies that the nominal wage and the other costs are changed with the consumer price index. However, in the long-run simulations, since the real wage rate is flexible, the changes in the CPI are not reflected in nominal wages and other costs.

tourism sectors purchase a composite product (a range of goods and services) from tourism-related sectors.[12] The composite product is selected using a Leontief production function. This implies that the proportion of each good and service within the composite tourism product is fixed. The second level explains the technology that deals with the cost minimisation issue. This implies that the tourism sectors can substitute between domestically produced and imported goods in response to relative price changes. The commodity composite is selected using a CES (constant elasticity of substitution) function. However, as shown in Figure 7.2, the theory of substitution is not applied to services since they are only sourced domestically. Furthermore, the figure shows that tourism sectors do not use primary factors in production, as they are dummy sectors.

Figure 7.2: Input Technology of Tourism Sectors



Equations (7.1) and (7.2) explain the demand for intermediate commodities from the domestic and international tourism sectors. The variables in the equations have four

[12] In Figure 7.2 Good 1 to Good C represent all the goods available for the tourism sector to choose from. This includes goods such as food, beverages, textiles, clothing, footwear and other manufactured goods. Services include accommodation, travel, transport, education, entertainment, gambling, and other services. International and domestic visitors purchase a range of such goods and services.

subscripts indicating from where demand arises. The variables indicate that it is the intermediate demand (subscript 1) for commodity i (i = 1 to 35) from source s (s = 1 domestic, s = 2 imported) by each tourism industry (DT = domestic tourism, IT = international tourism).[13]

$$(7.1) \quad x_{1(is)DT} = z_{DT} - \sigma_{1(i)DT}\left(p_{1(is)DT} - \sum_{s=1}^{2} S_{1(is)DT}\, p_{1(is)DT} \right) + a_{1(is)DT}$$

$i = 1, \ldots, 35,\ \ s = 1, 2,$ $\qquad DT = Domestic\ Tourism$

$$(7.2) \quad x_{1(is)IT} = z_{IT} - \sigma_{1(i)IT}\left(p_{1(is)IT} - \sum_{s=1}^{2} S_{1(is)IT}\, p_{1(is)IT} \right) + a_{1(is)IT}$$

$i = 1, \ldots, 35,\ \ s = 1, 2,$ $\qquad IT = International\ Tourism$

Where, $x_{1(is)DT}$ and $x_{1(is)IT}$ denote the percentage change in demand for intermediate commodities from the domestic and international tourism sectors respectively, z is the activity level of each tourism sector (DT or IT) and p's, $\sigma_{1(i)}$ and $S_{1(is)}$ are price variables, substitution elasticities and cost shares of each tourism sector, respectively. The technical change variables of each tourism sector are denoted as a's.

The equations indicate that in the absence of changes in the relative prices of commodities and technical changes, the intermediate demand for the commodities of each tourism sector is a function of the activity level of the relevant tourism sector.[14] This reflects the constant returns to scale assumption in production. This means that if a tourism sector wants to increase its output by one per cent, it has to increase its aggregate use of intermediate commodities by one per cent. However, in a situation where relative prices change, the percentage change in a tourism sector's demand for a commodity from a particular source would differ from the percentage change in the sector's activity level. For example, if the price of domestically produced commodities increases relative to imported commodities, the tourism sectors will substitute away from domestically produced commodities towards imported commodities. Thus, the demand for domestically-sourced commodity i by a tourism

[13] The model includes 35 commodities produced by 35 sectors, excluding composite tourism commodities. Tourism sector's demand can be for any of these commodities.

[14] The activity level is the total capacity or the total output of a sector.

sectors $x_{1(i1)v}$ (v = DT, IT), will rise by an less than the activity level z_v.[15] Moreover, the tourism sectors' demand for services is a linear function of the activity level since services are supplied only domestically.

Demand for Domestic and International Tourism

On the demand side, tourism demand consists of two categories: domestic tourism demand and international tourism demand. Domestic tourism demand is modelled similarly to household demand.[16] ORANI household demand theory is briefly explained in Section 7.2.1 and general equations are given in Appendix B. The assumption is that domestic visitors are assumed to be choosing commodities to maximise utility subject to budget constraints.

Therefore, domestic tourism demand equations are derived from a two-level nesting structure. Of the two levels, the lower level is not relevant to domestic tourism demand since the household sector purchases a composite tourism product. The lower level applies only to other commodities that the household sector demands. Therefore, domestic tourism demand is derived from the top-level of the nest. Following Dixon *et al.* (1982), the demand for domestic tourism can be specified as follows:

$$(7.3) \quad x_{3DT} = \varepsilon_{DT} c + \sum_{k=1}^{37} \eta_{ik} p_{3k} + a_{3DT}$$

Where, x_{3DT} is the percentage change in the demand for domestic tourism, c is the percentage change in aggregate household nominal consumption, p_{3k} is the percentage change in the price of commodities, a_{3DT} is a taste change variable and ε_{DT} and η_{ik}'s are expenditure and own and cross price elasticities.[17]

[15] As noted earlier, the substitution between domestic and imported commodities is modelled based on Armington's (1969) assumption of imperfect substitutability and thus the degree of substitution depends on substitution elasticities.

[16] Blake (2000), and Gooroochurn and Sinclair (2005) modelled domestic tourism demand similarly to household demand in that domestic visitors maximise utility subject to budget constraint.

[17] Variable ε_{DT} measures how responsive household demand is for domestic tourism to the changes in average household expenditure (c) while the change in household demand for domestic tourism to the changes in general price of good k is given in η_{ik} (where for $i = k$, η_{ik} is the own price elasticity and for $i \neq k$ η_{ik} is the cross price elasticity).

As noted earlier, in deriving Equation (7.3), the model assumes the Klein-Rubin utility function. This implies that Equation (7.3) is derived using a linear expenditure system (LES) and it reflects that demand is a linear function of prices and expenditure. Accordingly, the demand for domestic tourism is divided into two parts: subsistence demand and supernumerary or luxury demand. Subsistence demand is fixed in the model (hence, elasticity of demand for subsistence is zero). Changes in demand for domestic tourism could arise only as a result of changes in luxury demand. The responsiveness of demand for domestic tourism to such changes is determined by the size of demand elasticity.[18]

On the other hand, international tourism demand is modelled similarly to export demand and thus it is assumed that tourism demand is inversely related to the foreign currency price of international tourism. Following Dixon *et al.* (1982), the demand for international tourism in Australia is specified as follows:

(7.4) $$x_{4IT} = -\beta_{IT} p_{4IT} - f_{4IT}$$

Where, x_{4IT} is the percentage change in demand for international tourism, β is the price elasticity of demand for international tourism, p_{4IT} is the percentage change in the purchaser's (foreign currency) price of international tourism in Australia and f_{4IT} is a shift variable that allows an exogenous change in international tourism demand.

In the equation, the percentage change in demand for international tourism in Australia is a function of the percentage change in the foreign currency price of international tourism. For instance, a tax-induced increase in the percentage change of price will have a negative impact on the percentage change of demand for international tourism. The degree of the demand responsiveness to price changes is determined by the size of parameter β (price elasticity of demand). The equation is flexible in the model enabling it to source appropriate elasticity parameters from the

[18] The second part of demand, supernumerary demand, is modelled as Cobb-Douglas and thus demand elasticity is near −1 in the model. Dixon *et al.* (1982) argued that one advantage of assuming a Klein-Rubin utility function is the model's ability to source outside elasticities. Expenditure elasticities are sourced from the literature and price elasticities (η_{ik}) are estimated using the Frish formula for relating price elasticities to expenditure elasticities in the context of an additive utility specification.

literature. The use of elasticity parameters for international tourism in the model is discussed in Section 7.5.4 below.

The purchaser's price of international tourism (p_{4IT}) reflects the price of a composite international tourism product. This facilitates the implementation of our idea that international visitors are buying a bundle of goods and services and that their decisions are motivated by the single price term. A similar approach to model international tourism has been adapted by Adams *et al.* (2003), Blake (2000), Dixon and Rimmer (2002), Gooroochurn and Sinclair (2005) and Sugiyarto *et al.* (2003).

In this section, so far we have outlined the theoretical aspect of our major modification to modelling: the incorporation of two tourism sectors. We have explained in detail both the supply and demand side of the tourism sectors and relevant equations were derived. Equations in relation to tourism prices, taxes and the market clearing conditions of the tourism sectors are derived similarly to other intermediate sectors. These are given in Appendix B.

7.4. Addition of a Finance Module

As noted earlier (in Section 7.2), the standard version of the ORANI (ORANI-G) model does not include government finance. ORANI-G includes only indirect commodity taxation and government expenditure on final goods and services. In order to examine policy issues such as tourism taxation, the model should incorporate government finance features including government outlays, government revenue and the budget status.

There have been several special versions of ORANI, developed later on, with more enhanced features. Among such developments, the fiscal model: NAGA, which is described in Meagher and Parmenter (1985) and Parmenter (1988), is a significant enhancement in terms of incorporating government finance in the model. NAGA is a comprehensive fiscal module that was developed based on 1984-85 government finance data.[19] This was used in conjunction with the ORANI model in empirical applications. The combined model later became known as ORANI-NAGA and was

[19] ORANI-F, another specific version of ORANI, has adapted NAGA module (Parmenter 1988).

applied in several tax policy studies (Agrawal and Meagher 1988, Meagher and Agrawal 1986). More recently, Scutella and Johnson (1998) incorporated a fiscal sector into the standard ORANI model based on 1993-94 government finance data and they applied the modified version in analysing the tax package introduced in 2000. Adams *et al.* (2003) modified the MMR model with an enhanced tax and government expenditure module and developed the MMRF-GREEN model.[20]

Following Parmenter (1988) and Adams *et al.* (2003), a government finance module is added to the ORANI-G core module in the development of TTM. The finance module is a system of equations, which imposes accounting identities between variables identified in the structure of government accounts. This system also relates its variables to the rest of the core module and it may provide additional behavioural assumptions where required. This section sets out the relevant equations of the finance module. The equations are written in linearised form (percentage change form).[21] The percentage change form of all variables is written in the lower case. Both new variables as well as existing variables sourced from the ORANI model (shown in Table 7.1) are used to write the equations.

Table 7.1: Existing ORANI Variables used in the Module

Variable	Description (all variables are percentage change nominal variables)
l_p	Aggregate payments to labour
k_p	Aggregate payments to capital
l_{np}	Aggregate payments to land
gdp	Nominal GDP from expenditure side
$t_{(c)i}$	Commodity taxes[a]
ξ_3	Consumer price index
w_5	Aggregate nominal government consumption
w_2	Aggregate nominal private investment expenditure
$y_{(h)f}$	Aggregate primary factor payments
l	Aggregate employment: wage bill weights
c_R	Real aggregate household consumption

(a) ORANI contains ordinary changes of these variables and they are sourced and converted into percentage change variables.

[20] MMRF-GREEN is a model that combined features of the MMR (Multi Regional Model of the Australian Economy) and the dynamic MONASH model. The MMRF model is a six regional model that includes five regional governments and one federal government.

[21] See Appendix B, Section 2 for derivation of percentage form of equations.

The following major features are included in the government finance module:

i. Total government revenue: this includes direct taxation, commodity taxation, government interest receipts and other government revenue.

ii. Total government outlays: this covers government expenditure on final goods and services, government investment expenditure, interest paid, personal transfer payments including unemployment benefits, other government transfers and subsidies.

iii. Financing transactions and public sector borrowing requirement.

iv. Household disposable income and its components.

7.4.1. Government Revenue

Total government revenue comprises total direct tax revenue, total indirect tax revenue and other government revenue. Equation (7.5) below defines the percentage change in total government revenue. Equation (7.5) shows that the percentage change in total government revenue is a weighted sum of percentage changes of total direct taxes, total commodity taxes, and other government revenue. These three components are defined in the following three sub sections.

(7.5) $$g_{(r)} = \beta_{(r)1} t_d + \beta_{(r)2} t_c + \beta_{(r)3} g_m$$

Where, $g_{(r)}$ is total government revenue, t_d is total direct taxes, t_c is total indirect taxes, and g_m is other government revenue (miscellaneous). $\beta_{(r)i}$ represents shares of each revenue component in total government revenue.

Direct Taxes

Direct taxes (t_d) consist of income taxes and other direct taxes that include payroll, property, land and other taxes. Equation (7.6) shows that the percentage change in direct taxes is a weighted sum of income taxes and other direct taxes. Income taxes ($t_{(d1)}$) include PAYE taxes and taxes on non-wage primary factor income.

(7.6) $$t_d = \sum_{i=1}^{2} \beta_{(d)i} t_{(d)i}$$

Where, $t_{(d)i}$ represents income taxes and other direct taxes (i.e 1 = income taxes, 2 = other direct taxes) and $\beta_{(d)i}$ represents shares of each income tax component in total direct tax revenue.

As given in Equation (7.7), the percentage change in income tax is equal to the weighted sum of percentage changes in PAYE taxes and taxes on non-wage primary factor income.

(7.7) $$t_{(d)1} = \sum_{i=1}^{2} \beta_{(d1)i} t_{(d1)i}$$

Where, $t_{(d1)i}$ represents PAYE taxes ($i = 1$) and taxes on non-wage primary factors ($i = 2$) and $\beta_{(d1)i}$ represents shares of each tax in total income tax revenue.

Equation (7.8) defines the percentage change in PAYE taxes as equal to the sum of changes in aggregate payments to labour and PAYE tax rate.

(7.8) $$t_{(d1)1} = l_p + \alpha_l$$

Where, l_p is the aggregate payments to labour (ORANI variable) and α_l is the PAYE tax rate.

The percentage change in income from taxes on non-wage factor income is equal to the percentage change in gross operating surplus and the change in tax rate on non-wage factor income (Equation (7.9)).

(7.9) $$t_{(d1)2} = su + \alpha_k$$

Where, su is the gross operating surplus and α_k is the rate of tax on non-wage factor income.

Equation (7.10) defines the percentage change in gross operating surplus as the weighted sum of percentage changes in aggregate payments to capital and land.

(7.10) $$su = \beta_{(su)1} k_p + \beta_{(su)2} l_{np}$$

Where, k_p and l_{np} are aggregate payments to capital and aggregate payments to land (ORANI variables) respectively and $\beta_{(su)i}$ represents shares of each component in total gross operating surplus.

As defined in (7.6) above, total direct taxes consists of other direct taxes, in addition to income taxes. According to Equation (7.11), the percentage change in other direct taxes is assumed as a function of the change in expenditure-side nominal GDP and the shift variable allows for exogenous shifts in other direct taxes.

(7.11) $$t_{(d)2} = gdp + f_{(r)1}$$

Where, *gdp* is the expenditure side nominal GDP (ORANI variable) and $f_{(r)i}$ is the shift variable.

Indirect Taxes

Total indirect taxes that include total commodity taxes and other indirect taxes are defined in Equations (7.12) – (7.14). Equation (7.12) shows that the percentage change in total indirect taxes is a weighted sum of changes in commodity taxes and other indirect taxes. The total commodity $t_{(c)1}$ taxes collected are equal to the sum of total taxes on intermediate consumption, taxes on investment, taxes on household consumption and taxes on exports. These are sourced from the ORANI core module and the database.

(7.12) $$t_c = \sum_{i=1}^{2} \beta_{(c)i} t_{(c)i}$$

Where, $t_{(c)i}$'s represents commodity tax (i = 1) and other indirect tax (i = 2) and $\beta_{(c)i}$ shows the shares of each component in total indirect tax revenue.

Equation (7.13) shows that the percentage change in commodity taxes is equal to the weighted sum of changes in these taxes.

(7.13) $$t_{(c)1} = \sum_{i=1}^{4} \beta_{(c1)i} t_{(c1)i}$$

Where, $t_{(c1)i}$ represents commodity taxes from all sources including intermediate usage, investment, household consumption, and exports and $\beta_{(c1)i}$ shows the shares of each commodity tax in total commodity taxes.

The percentage change in other commodity taxes $t_{(c)2}$ is assumed as moving directly with expenditure-side nominal GDP (Equation 7.14). The shift variable allows the exogenous shift of other commodity taxes.

(7.14) $$t_{(c)2} = gdp + f_{(r)2}$$

Where, $t_{(c)2}$ and $f_{(rr)2}$ are the percentage change in other commodity taxes and the shift variable.

Other Government Revenue

Other government revenue sources are classified into interests received by the government and other revenues and they are given in the following two equations. Equation (7.15) defines interests received by the government as a function of the consumer price index while Equation (7.16) below shows that other government revenue is a function of expenditure-side nominal GDP. In both equations, shift variables are introduced to allow for exogenous changes.

(7.15) $$g_{(m)1} = \xi_3 + f_{(r)3}$$

Where, $g_{(m)1}$, and ξ_3 are the interest received and the CPI (ORANI variable), and $f_{(r)3}$ is the shift variable.

(7.16) $$g_{(m)2} = gdp + f_{(r)4}$$

Where, $g_{(m)2}$, is other government revenue and $f_{(r)4}$ is the shift variable.

7.4.2. Government Outlays

Total government outlays include government expenditure, personal benefit payments, government subsidies, interest payments by the government, and other government outlays. Equation (7.17) defines the percentage change in total government outlays as the weighted sum of percentage changes in all the government expenditure components mentioned above, which are introduced in Equations (7.18) – (7.23).

(7.17) $$g_{(tu)} = \sum_{i=1}^{5} \gamma_{(tu)i} g_{(tu)i}$$

Where, $g_{(tu)}$ is total government outlays, $g_{(tu)i}$ represents five components in total government outlays including government expenditure (i = 1), personal benefit payments (i = 2), subsidies (i = 3), interests paid (i = 4) and other government outlays (i = 5). $\gamma_{(tu)i}$'s shows the shares of each expenditure component in the total outlays.

Government expenditure on goods and services comprises total government consumption expenditure and government investment expenditure and thus the percentage change in government expenditure depends on the changes in these two expenditure components, which is defined in Equation (7.18).[22]

(7.18) $$g_{(tu)1} = \gamma_{(tu1)1} w_5 + \gamma_{(tu1)2} g_{in}$$

Where, w_5 and g_{in} are the aggregate nominal government consumption (ORANI variable) and government investment expenditure, respectively. $\gamma_{(tu1)i}$'s are shares of each component in the total government expenditure.

Government investment expenditure is assumed to be directly linked with aggregate nominal private investment and is defined in Equation (7.19).

(7.19) $$g_{(in)} = w_2$$

Where, w_2 is the aggregate nominal private investment expenditure (ORANI variable).

Personal benefit payments comprise unemployment benefits and payments of other personal benefits. Accordingly, the percentage change in personal benefit payments is the weighted sum of these two variables (Equation (7.20)).

(7.20) $$g_{(tu)2} = \sum_{j=1}^{2} \gamma_{(tu2)j} g_{(tu2)j}$$

Where, $g_{(tu2)j}$ shows unemployment benefit payments (j = 1) and other personal benefit payments (j = 2) and $\gamma_{(tu2)j}$'s represent the weights of each payment in total personal benefit payments.

As shown in Equation (7.21), the percentage change in government subsidies is changed with the CPI.

(7.21) $$g_{(tu)3} = \xi_3 + f_{(tu)1}$$

Where, $g_{(tu)3}$ is the percentage change in government subsidies.

[22] Total government consumption expenditure and the aggregate nominal government consumption (w5) are derived in the ORANI core module. Thus, such variables are sourced from the core module.

Government interest payments are assumed to be changed with expenditure-side nominal GDP (7.22) while the other government outlays are dependent on total government outlays (7.23). Shift variables are added in each equation to allow for exogenous changes.

(7.22) $$g_{(tu)4} = gdp + f_{(tu)2}$$

Where $g_{(tu)4}$ is the percentage change in government interest payments.

(7.23) $$g_{(tu)5} = g_{(tu)} + f_{(tu)3}$$

Where $g_{(tu)5}$ is the percentage change in other government outlays.

7.4.3. Government Budget Status

In this section, the nominal and real government budget deficits are defined based on the total government revenue and total government outlays introduced in the above two sections. According to Equation (7.24), the percentage change in nominal budget deficit is the difference between the percentage change in government outlays and government revenue.

(7.24) $$d_b = \lambda_{(b)1} g_{(tu)} - \lambda_{(b)2} g_{(r)}$$

Where, d_b is the percentage change in the budget deficit and $\lambda_{(b)i}$ represents total government outlay and government revenue as a fraction of total budget deficit.

The nominal budget deficit has been deflated by the consumer price index to derive the real budget deficit as shown in Equation (7.25).

(7.25) $$d_b^* = d_b - \xi_3$$

Where d^*_b is the real budget deficit.

The Public Sector Net Borrowing Requirement (PSBR) is defined as a percentage point change in the total outlays in Equation (7.26).

(7.26) $$p_{(b)} = \gamma_{(pb)} * \left(d_{(b)} - g_{(tu)}\right)$$

Where, $p_{(b)}$ is the percentage point change in PSBR in terms of the total government outlays and $\gamma_{(pb)}$ is the share of the budget deficit in the total government outlays.

7.4.4. Household Income and Components

In addition to government outlays, revenue and the budget status, changes in household income arising from changes in government expenditure and taxes are also defined in the finance module. Equation (7.27) defines the percentage change in nominal household disposable income as the difference between the household income received from primary factors, personal benefits, and other household income, and direct taxes paid.

(7.27) $$y_{(hd)} = \theta_{(d)1} y_{(h)f} + \theta_{(d)2} g_{(u)2} + \theta_{(d)3} y_{(h)m} - \theta_{(d)4} t_{(d)}$$

Where, $y_{(hd)}$ is the nominal household disposable income, $y_{(h)f}$ is the aggregate factor income (ORANI variable), $g_{(u)2}$ is personal benefit payment (defined in Equation (7.20)), $y_{(h)m}$ is other household income and t_d is direct taxes paid (defined in Equation (7.6)). $\theta_{(d)i}$ represents shares of each item in total household disposable income.

In Equation (7.28), the real disposable household income is derived deflating the nominal household income by the CPI. Equations (7.29) – (7.31) below explain the variables which appear in household disposable income (Equation (7.28)).

(7.28) $$y^{*}_{(hd)} = y_{(hd)} - \xi_3$$

Where, $y^{*}_{(hd)}$ is the real household disposable income.

As shown in Equation (7.29), changes in unemployment benefits are determined by percentage changes in the CPI plus the percentage change in labour supply minus the percentage change in level of employment.

(7.29) $$g_{(u2)l} = \xi_3 + \pi_{ls} l_s - \pi_l l$$

Where, $g_{(u2)l}$ is unemployment benefit payments (introduced in Equation (7.21)), l_s is the labour supply, and l is the aggregate employment (ORANI variable). π_{ls} and π_l are the coefficient of labour supply and the coefficient of employment, respectively.[23]

[23] The coefficient of labour supply is estimated as (Labour Supply/Labour Supply – Employment) and the coefficient of employment is estimated as (Employment/ Labour Supply – Employment). Here, employment is the number of people employed.

Equation (7.30) defines that other personal benefits are changed with the CPI, and other household income that is defined in Equation (7.31) is determined by the changes in the nominal expenditure-side GDP.

(7.30) $$g_{(tu2)2} = \xi_3 + f_{(h)1}$$

Where, $g_{(tu2)2}$ is the percentage change in other personal benefits.

(7.31) $$y_{(h)m} = gdp + f_{(h)2}$$

Where, $y_{(h)m}$ is the percentage change in other household income.

Other Miscellaneous Equations

Equations describing post-tax nominal and real wages, a link between the consumption function and household disposable income and relative income tax rates are also introduced in the finance module. Equation (7.32) defines post-tax wage income as a residual of percentage changes in aggregate payments to labour and PAYE taxes.

(7.32) $$l_p = \lambda_{(l)1} y_w - \lambda_{(l)2} t_{(d1)1}$$

Where, l_p is the aggregate payments to labour (ORANI variable), y_w is the post-tax wage income, $t_{(d1)1}$ is PAYE taxes (defined in Equation (7.8)) and $\lambda_{(l)l}$' s represent shares of each component in the aggregate payments to labour.

The post-tax nominal wage rate is equal to the percentage change in post-tax wage income minus the percentage change in aggregate employment (Equation (7.33)) and the post-tax real wage rate is defined in Equation (7.34) as the post-tax nominal wage rate deflated by the CPI.

(7.33) $$w = y_w - l$$

Where, w is the post-tax nominal wage rate.

(7.34) $$w^* = w - \xi_3$$

Where w* is the post-tax real wage rate.

(7.35) $$c_R = y^{*}_{hd} + f_{(h)3}$$

Where, c_R is real aggregate household consumption (ORANI variable).

(7.36) $$\alpha_l = \alpha_k + f_{(h)4}$$

Equation (7.35) establishes the link between consumption and real disposable household income while Equation (7.36) defines the relative income tax rates.
This concludes our outline of the behavioural structure of the finance module.

7.5. Development of the Database for TTM: An Overview

The preceding two sections explained the theoretical aspects of two major modifications that we have made in the preparation of TTM. Subsequently, TTM includes two interrelated modules: the CGE core module and the government finance module, each with its own database. As shown in Figure 7.1, these modifications mean that the ORANI-G core database needs to be modified. The relevant modifications are explained below.

The current study involves a contemporary tourism policy issue, and thus it needs to be examined within a modelling environment that represents the current economy. Thus, the database of the model should also represent the current economy, in particular the current commodity tax structure that has a greater relevance to tourism taxation. In the absence of the latest IO tables which have not been made available (i.e. IO tables compiled after 1996-97), constructing a database with a very recent economic structure is not possible. However, the existing database can be modified to include the current commodity tax structure (with the GST) and such a modification in the commodity tax structure could replicate the current economy. Accordingly, this section outlines the following database modifications:

i. Changing the tax structure to incorporate the GST;
ii. Construction of a tourism database and incorporating it with the standard database; and
iii. Construction of the database for the finance module.

The Standard ORANI-G Database

The ORANI-G standard database is based on the 1996-97 IO tables, the latest available and a schematic representation of the model database is as shown in Figure 7.3. According to Figure 7.3, the database consists of all economic agents (identified as in column headings) including 35 producers, 35 investors, a representative household, the government, an aggregate of exporters, and changes in inventories.

Figure 7.3: Standard ORANI-G Database

		1	2	3	4	5	6
		Producers	**Investors**	**Household**	**Export**	**Govt.**	**Inventories**
	Size	**I**	**I**	**H**	**1**	**1**	**1**
Basic Flows domestic	**C**	*V1BAS*	*V2BAS*	*V3BAS*	*V4BAS*	*V5BAS*	*V6BAS*
Basic flows imported	**C**	*V1BAS*	*V2BAS*	*V3BAS*	*NA*	*V5BAS*	*V6BAS*
Margins	**CxSxM**	*V1MAR*	*V2MAR*	*V3MAR*	*V4MAR*	*V5MAR*	*NA*
Taxes	**CxS**	*V1TAX*	*V2TAX*	*V3TAX*	*V4TAX*	*V5TAX*	*NA*
Labour	**O**	*V1LAB*					
Capital	**1**	*V1CAP*					
Land	**1**	*V1LND*					
Other costs	**1**	*V1OCT*					
Production Tax	**1**	*V1PTX*					

C = Number of Commodities
I = Number of Industries
S = 2: Domestic, Imported
O = Number of Occupation Type
M = Number of Commodities used as Margins
H = 1: Number of Household Types

Note: Export column is for domestic goods only

Source: Adapted from Horridge (2003)

The entries in each column represent the structure of the purchases of commodities made by the agents identified in the relevant column heading. Each commodity (35 commodities) is available both from domestically produced and imported sources. The source-specific commodities (domestically produced or imported) are used by industries as inputs in current production (*V1BAS*), and capital formation (*V2BAS*), are consumed by households (*V3BAS*), and the government (*V5BAS*), are exported (*V4BAS*) or are added to, or subtracted from, inventories (*V6BAS*).

Five domestically produced services including wholesale and retail trade, road, rail and water transport are used as margin services to transfer commodities from their sources to producers (*V1MAR*), investors (*V2MAR*), households (*V3MAR*), Australian ports for exports (*V4MAR*) and the government (*V5MAR*). Commodity taxes are payable by producers (*V1TAX*), investors (*V2TAX*), households (*V3TAX*), exporters (*V4TAX*) and the government (*V5TAX*).

In addition to intermediate inputs, current production utilizes primary factors including labour (*V1LAB*), fixed capital (*V1CAP*), agricultural land (*V1LND*) and other costs (*V1OCT*). Other costs include various miscellaneous expenses of production. The main part of Figure 7.3 (excluding primary factors) is known as the absorption matrix and each cell of this represents a matrix of data identified by the name which appears in the figure. For instance, *V1BAS* is a two-dimensional matrix (35x35) of the flows of C commodities (35) to I industries (35).

As revealed in the discussion and shown in Figure 7.3, the proposed database modifications are essential because the standard database does not include tourism sectors, the GST system and government finance data. A significant reconstruction of the standard ORANI-G database is required to develop the TTM core database since the incorporation of tourism sectors changes all the matrices shown in each cell of Figure 7.3 under the column headings of producers (including matrices V1BAS, V1MAR & V1TAX), household (V3BAS, V3MAR, V3TAX) and exports (V4BAS, V4MAR, V4TAX). However, before we embark on the modifications to incorporate tourism sectors, it is essential that we change the commodity tax structure of the ORANI-G standard database (shown in *TAX* cells in Figure 7.3) to include the GST system.

7.5.1. Updating the Database to include the GST

As outlined in Chapter Four, the GST was introduced in 2000-01 replacing a number of indirect taxes including the wholesale sale tax. The main objective of our modification is to construct an updated core database for ORANI-G to include the GST in the existing commodity tax structure. Due to the unavailability of IO tables developed after 2000 (post-GST), the best alternative was to undertake the above modification since the modification is important for the current study for a number of reasons.[24]

First, the central theme of this thesis is tourism taxation and the GST is the single most important tax.[25] Available evidence suggests that the introduction of the GST had significant implications for the Australian tourism sector and thus any current discussion about the Australian tourism sector, in particular tourism taxation, should account for changes brought by the GST.[26] Second, prior to the GST, the intermediate tax structure of the model consisted of indirect taxes such as wholesale sales tax, excise duties and other indirect taxes. The introduction of the GST changed this structure. As the GST replaced taxes such as the WST, most of the intermediate taxes and taxes on investment were removed. Taxes on most commodities consumed by the household sector increased while taxes on a few products such as food and beverages declined.

With our proposed GST modification, the following major changes will be incorporated into the updated database:

i. Tax changes: It has been shown that with the incorporation of the GST system into the commodity tax structure, both intermediate-input taxes and taxes on private investment have declined while taxes on consumption have increased.

ii. Other compositional changes: With the above tax changes, it is also expected that the composition of intermediate, investment and household demand will change accordingly. For instance, in terms of household consumption, the introduction of the GST may lead to a reduction in consumption of most services, and an increase in consumption of zero-rated goods and services including basic foods, housing and education. This modification may also lead to a reduction of exports, in particular a considerable reduction of goods and services consumed by international visitors.

[24] The modification needs to be done before we start the incorporation of the tourism sectors since it involves identifying a significant amount of taxes paid by international and domestic visitors, including the GST.

[25] Note that in Chapter Four we observed that more than fifty percent of total general tourism taxes are accounted for by the GST. For more details regarding the GST and its implications refer to Section 4.4.

[26] See, for example, Dixon and Rimmer (1999a) and Divisekara (2001).

Following the recent literature on the effects of the GST, likely changes in the pre-GST tax structure in the ORANI-G database can be ascertained. There have been a number of studies analysing the economic effects of the GST in the Australian economy. Among these studies, Dixon and Rimmer (1999a) is important as they analysed the GST package in a dynamic general equilibrium model.[27] Based on Treasury estimations of the tax package, they noted that as result of the GST, taxes on intermediate and private investment goods declined by 40 per cent and 4 per cent, respectively while taxes on consumption, on average, increased by 5.2 percentage points.

Based on the current tax structure of the standard ORANI-G database, current rates of taxes on intermediate inputs, private investment and consumption were estimated. Then, following the above-mentioned changes in taxes, the post-GST tax rates for each commodity in intermediate consumption, private investment and household consumption were also estimated. In estimating the post-GST rates of taxes for these, every effort was made to comply with the major changes described in Dixon and Rimmer and broader GST rules. For instance, in estimating the post-GST rates of taxes on consumption, most services which were exempt under the previous regime were taxed by almost 10 per cent and consumption of basic food, housing and education were zero rated. For all other taxable commodities tax rates were increased to match the GST rate and taxes on commodities such as alcohol, tobacco, and petrol were left mostly unchanged.

Using these pre and post-GST tax rates, rates of changes in taxes for each commodity were estimated and a simulation was carried out to update the tax structure. Based on the pre and post-GST rates, total changes in taxes on intermediate inputs, private investment and household consumption were estimated. Table 7.2, Column 2 shows targeted change in each category as a share in the total cost of each demand category. For instance, a 40 per cent reduction in intermediate input taxes implies that the share of tax reduction in the total industry cost is equal to a 0.38 per cent. Similarly, 5.2 per cent increase in taxes on household consumption implies that the share of consumption tax increase in the total household expenditure is 1.96 per cent.

[27] See also Johanson *et al.* (1998b).

Table 7.2: Targets and Achievements in the GST Modification

Description	Targeted % change	Realised % change
Share of intermediate tax reduction in total industry cost	0.38	0.39
Share of investment tax reduction in total cost of investment	0.12	0.12
Share of consumption tax increase in total household expenditure	1.96	1.93

The updated database should reflect these changes in the commodity tax structure. Table 7.2, Column 3 shows the extent to which this proposed modification of the core database has been successful. According to the shares presented in column 3, it appears that targeted changes in the commodity tax structure of the standard ORANI-G database have been realised within a reasonable degree of accuracy. For instance, we intended to increase consumption taxes by an amount equivalent to 1.96 per cent of total household expenditure and the updated database shows that the consumption taxes have increased by an amount equivalent to 1.93 per cent of total household consumption. This indicates that the post-simulation database represents the post-GST commodity tax structure.

In the context of general equilibrium, particular tax changes that have been incorporated into the standard database should bring about subsequent changes in demand for relevant commodities. This means that tax reductions i.e. reductions in taxes on intermediate inputs and investment, tend to initiate reductions in prices of intermediate inputs and investment goods.[28] Such price reductions on the one hand can encourage demand for those commodities while on the other hand they can initiate general price reductions.[29] The updated database should have captured these relative price changes and subsequent compositional changes. In contrast, adapted changes in consumption taxes tend to generate increases in consumer prices.

[28] For instance, based on the Treasury estimations, Dixon and Rimmer noted that intermediate tax reductions generated a 3.2 per cent reduction in business costs that brings a reduction in basic commodity prices, and that investment tax reductions bring about 7 per cent reduction in the price of investment goods.

[29] Although taxes on intermediate inputs and investment goods decline by 40 per cent and 4 per cent, respectively, the resulting effects of such tax changes may not be that significant since the effective tax reductions arising from these changes are relatively small. This is because these taxes represent relatively small portions of total commodity taxes in the standard database. For instance, taxes on intermediate inputs and investment goods represent 34 per cent and 4 per cent in total commodity taxes, respectively, when compared with 53 per cent of consumption taxes in total. Therefore, in the overall effect of tax changes, it is possible that increases in consumption taxes can outweigh the reductions in taxes on intermediate inputs and investment goods.

Therefore the updated database should reflect changes in household demand composition. For instance, the updated database shows that household consumption of most services declined, while the consumption of zero-rated commodities such as basic foods, education and housing shows a clear increase. Moreover, it shows that the volume of exports declined mostly due to the reduction in consumption of goods and services by international visitors.

As explained so far in this section, it is clear that the updated version of the standard database has captured both changes in the commodity tax structure and resulting compositional (structural) changes that could have appeared in the economy after the introduction of the GST. However, the scale of the database remains largely unchanged. As noted earlier, in the absence of the latest IO tables, an update of the database to arrest this problem is not possible. While the scale of the database is an important issue, it does not hinder the validity of the model solution. This is because the scale of the database plays a minor role in the solution as long as the database has captured the essential structural or compositional changes.

7.5.2. Construction of Tourism Database: An Overview

This is the most important modification in the development of a database for TTM. We incorporated two tourism sectors: Domestic Tourism (*DomToursm*) and International Tourism (*IntToursm*) as intermediate dummy sectors into the updated version of the core database (hereafter we refer to the updated version of the core database as the core database). With this change, the absorption matrix shown in Figure 7.3 is changed considerably and thus the matrices that show current production in the standard database now appear as shown in Figure 7.4. This means that the core database of TTM consists of 37 sectors each producing one commodity (in the case of tourism a composite product is compiled) and thus, the model is a 37x37 model.

As defined in Section 6.4.2, the two tourism sectors (dummy) purchase the components of their composite product from all the other industries/sectors and also import goods, pay taxes for each commodity purchased and utilize margin services. However, the other intermediate sectors do not purchase from the tourism sectors.

Furthermore, dummy sectors do not purchase primary factors and hence primary factor flows are the same as in the standard database.[30]

Figure 7.4: Model Database after Incorporating Tourism Sectors

	Size	Producers		
		I		
		35 Industries	*DomToursm*	*IntToursm*
Basic Flows domestic	**C**	*V1BAS*		
Basic flows imported	**C**	*V1BAS*		
Margins	**CxSxM**	*V1MAR*		
Taxes	**CxS**	*V1TAX*		
Labour	**O**	V1LAB		
Capital	**1**	*V1CAP*		
Land	**1**	*V1LND*		
Other costs	**1**	*V1OCT*		
Production Tax	**1**	*V1PTX*		

The main task in incorporating the tourism sectors is the construction of tourism consumption vectors for the domestic and international tourism sectors. We constructed tourism consumption vectors from the Australian Tourism Satellite Accounts (ATSA). The choice of ATSA is supported by three factors. First, note that ATSA is compatible with the SNA and therefore incorporating ATSA with a database derived from an IO table provides an accurate database. Second, the other alternative sources, such as the international visitor survey and the national visitor survey are limited in their capacity to be used for this purpose. Third, ATSA is developed according to international conventions on TSAs laid down by WTO and the UN.

[30] This is based on the premise that the components of the tourism product are produced by other sectors somewhere else in the economy and supplied to the tourism sector for compilation and sales. Thus, primary factors are not utilized.

The following procedure was applied in the process of constructing international and domestic tourism consumption vectors and merging them with the updated version of the core database:

i. Obtain total international and domestic tourism consumption data from ATSA.

ii. Disaggregate tourism consumption data into basic values, taxes and use of margin services as original tourism consumption data represents purchasers' values. Disaggregate them further into domestic and imported sources based on the source from which the components of the tourism product are supplied.

iii. Map disaggregated tourism consumption data with 35 sectors of the core database.

iv. Extract consumption figures from the core database. They should be extracted from the household sector and exports as tourism consumption is embedded in these.

v. Merge the new tourism database with the updated version of the core database. This will form the TTM database with tourism sectors.

The above procedure can further be explained with the use of a simple model that includes three intermediate sectors each producing a single commodity and two final demand sectors: a household sector and an aggregate of exporters. Consider the main part of Figure 7.5A that shows the structure of a hypothetical standard database. Domestic and international tourism consumption data are embedded in household consumption and exports, respectively, under the relevant commodities. This needs to be extracted from the two final demand sectors and merged with the intermediate sector when dummy sectors are incorporated.

As shown in Figure 7.5A, in the standard database, tourism consumption data is embedded in the two final demand sectors. After following steps 1-3 mentioned above, both domestic and international tourism consumption vectors can be constructed (see the hypothetical vectors in Figure 7.5A). Consumption figures in these two vectors should then be extracted from household and exports vectors of the standard database. Figure 7.5B shows that following the extraction, new domestic and international tourism dummy sectors: '*DomToursm*' and '*IntToursm*' are merged with the standard database. In the new structure, tourism sectors purchase components of their composite products from related sectors, compile them and on sell the products to domestic and international visitors. Accordingly, domestic and international tourism are now seen as the direct sale of domestic and international tourism sectors to households and the foreign sector. The development of both international and domestic tourism consumption vectors is explained in detail in the following two sections.

Figure 7.5A: Database without Domestic & International Tourism Sectors

	Intermediate sectors			Final demand	
	Sector 1	Sector 2	Sector 3	House.	Exports
Com. 1	10	2	4	16	8
Com. 2	13	22	12	30	35
Com. 3	8	28	32	40	30
Total	31	52	48	86	73

DomToursm vector	IntToursm vector
3	2
12	15
15	10
30	27

Com. = Commodity

Figure 7.5B: Database after Merging

	Intermediate sectors					Final demand	
	Sector 1	Sector 2	Sector 3	DomToursm	IntToursm	House.	Exports
Com. 1	10	2	4	3	2	13	6
Com. 2	13	22	12	12	15	18	20
Com. 3	8	28	32	15	10	25	20
DomToursm	-	-	-	-	-	30	-
IntToursm	-	-	-	-	-	-	27
Total	31	52	48	30	27	86	73

In the construction of tourism vectors, it is necessary to use a tourism database that is, preferably, compatible to the updated version of the standard database. This database should reflect the tourism consumption/expenditure pattern that represents the current commodity tax system i.e. the GST. For this purpose, the latest available data from ATSA: 2002-03 (ABS 2004, Catalogue No. 5249.0) was used.[31] This source provides the most recent tourism consumption data for both domestic and international tourism. Furthermore, the tourism consumption data represents the post-GST consumption pattern and thus it is consistent with the updated version of the standard database that represents the post-GST structure. However, the 2002-03 tourism consumption data needs to be adjusted to match the size of the standard ORANI (updated version)

[31] Tourism consumption data for 1996-97 is unavailable since the first ATSA appeared in 1997-98. Even if it was available it is unsuitable for our purposes as we need post-GST tourism consumption to be consistent with the updated version of the standard database. Although 1997-98 tourism consumption could be a close proxy to represent 1996-97, it cannot be used for the very same reason. Therefore the best alternative is to use the latest data available with necessary adjustments.

database. In adjusting this we used a tourism consumption and GDP ratio for the year 2002-03 and adjusted to the 1996-97 level.[32]

7.5.2.1. Construction of International Tourism Consumption Vectors

ATSA provides very detailed tourism consumption data for both international and domestic tourism. The data is very comprehensive and it explains the overall expenditure pattern by tourists in Australia by type of tourism products/industry: tourism characteristics, tourism connected and other tourism goods and services. Table 7.3 shows international tourism consumption figures by each tourism product category and these figures present purchasers' price that includes taxes and expenditure on margin services. Our next step is to disaggregate international tourism consumption figures into basic values, taxes and expenditure on margin services. This disaggregation should be done for both domestic and imported sources.

Table 7.3: International Tourism Consumption ($ mn)

Tourism Product	Consumption ($ mn)
Travel agency & tour operator services	218.53
Taxi fares	81.51
Long distance passenger transportation	3,379.77
Motor vehicle hire & lease	160.91
Accommodation services	1,575.35
Takeaway & restaurant meals	838.97
Shopping (including gifts & souvenirs)	1,548.65
Local area passenger transportation	132.10
Repair & maintenance of motor vehicles	9.84
Fuel (petrol, diesel)	129.29
Food products	790.49
Alcoholic beverages & other beverages	380.84
Motor vehicles, caravans, boats etc	85.02
Recreational, cultural & sports services	244.52
Gambling & betting services	111.72
Education	1,093.33
Actual & imputed rent on holiday houses	219.93
Other tourism goods & services	709.68
Total	11,710.40

Source: ABS (2004, adjusted figures)

Tourism supply ratios/weights shown in Table 7.4 were used to disaggregate the figures in Table 7.3. We estimated these ratios/weights using tourism supply data (Table No. 8, ABS 2004, Catalogue no. 5249.0) provided in ATSA. The tourism

[32] Tourism Consumption 96-97 = (Tourism Consumption 2002-03/GDP 2002-03)*GDP 1996-97. This is a reasonable approximation of the tourism consumption figure for 96-97 which is not otherwise available.

supply table provides a comprehensive disaggregation of tourism consumption figures into tourism product output (basic prices), imports purchased by tourists in Australia, net taxes on tourism products and tourism margins.[33]

Table 7.4: Tourism Supply Ratios to Disaggregate Tourism Consumption

Tourism Product	Domestic basic	Imported basic	Net taxes	Margin
Travel agency & tour operator services	99.16	0.0	0.84	0.0
Taxi fares	96.88	0.0	3.12	0.0
Long distance passenger transportation	100.00	0.0	0.0	0.0
Motor vehicle hire & lease	95.35	0.0	4.65	0.0
Accommodation services	95.24	0.0	4.76	0.0
Takeaway & restaurant meals	91.99	0.0	8.01	0.0
Shopping (including gifts & souvenirs)	20.49	25.31	7.57	46.63
Local area passenger transportation[34]	138.80	0.0	-38.80	0.0
Repair & maintenance of motor vehicles	100.00	0.0	0.0	0.0
Fuel (petrol, diesel)	57.43	0.0	34.10	8.47
Food products	64.38	6.29	1.55	27.78
Alcoholic beverages & other beverages	58.08	5.84	24.85	11.23
Motor vehicles, caravans, boats etc	57.38	18.55	6.99	17.08
Recreational, cultural & sports services	88.56	1.48	9.96	0.0
Gambling & betting services	69.09	0.24	30.67	0.0
Education	98.45	1.55	0.0	0.0
Actual & imputed rent on holiday house	100.00	0.0	0.0	0.0
Other tourism goods & services	74.51	7.37	13.12	5.00

Source: Adapted from ABS (2004).

However, in the process of disaggregation, it was essential that some adjustments be made in some product categories to maintain compatibility between the two databases without the adjustment affecting the validity of the outcome. This is important since the two different databases are combined in this modification. Some supply ratios were adjusted accordingly. For instance, the amount that should be allocated to negative net taxes in the long distance passenger transportation category was adjusted against domestic basic amount. The disaggregated figures of international tourism consumption into domestic basic, imported basic, net taxes and tourism margins are shown in Table 7.5.

[33] Tourism margin services are those used in transferring tourism goods to tourists and they include wholesale and retail sales, road, rails and water transport services.

[34] Local area passenger transportation includes a significant amount of government subsidies that appear as negative net taxes in column 4 and thus the basic value is greater than 100.

Table 7.5: Disaggregated International Tourism Consumption ($ mn)

Tourism Product	Dom. basic	Imp. basic	Net Taxes	Margin	Total
Travel agency & tour operator services	216.70	0.0	1.83	0.0	218.53
Taxi fares	78.97	0.0	2.54	0.0	81.51
Long distance passenger transportation	3,379.77	0.0	0.00	0.0	3,379.77
Motor vehicle hire and lease	153.43	0.0	7.48	0.0	160.91
Accommodation services	1,500.35	0.0	75.01	0.0	1,575.35
Takeaway and restaurant meals	771.81	0.0	67.16	0.0	838.97
Shopping (including gifts & souvenirs)	317.29	391.90	117.29	722.16	1,548.65
Local area passenger transportation	183.35	0.0	-51.25	0.0	132.10
Repair & maintenance of motor vehicles	9.84	0.0	0.0	0.0	9.84
Fuel (petrol, diesel)	74.25	0.0	44.08	10.95	129.29
Food products	508.95	49.72	12.22	219.60	790.49
Alcoholic beverages & other beverages	221.20	22.25	94.63	42.76	380.84
Motor vehicles, caravans, boats etc	48.78	15.77	5.94	14.52	85.02
Recreational, cultural & sports services	216.56	3.62	24.34	0.0	244.52
Gambling and betting services	77.19	0.27	34.26	0.0	111.72
Education	1,076.34	16.99	0.0	0.0	1,093.33
Actual & imputed rent on holiday houses	219.93	0.0	0.0	0.0	219.93
Other tourism goods and services	528.78	52.28	93.12	35.48	709.68
Total	9,583.49	552.79	528.67	1045.49	11,710.45

The next step involved the mapping of international tourism consumption in each product category with the standard database (35 sectors). In the process, the tourism product concordance provided in ATSA was used (for more information about concordance refer to Appendix A). This shows the concordance between tourism-related products in the ATSA and products in the Australian New Zealand Standard Product Classification (ANZSPC). However, one limitation of this source is that the share of each ANZSPC product in the relevant tourism product category of ATSA is not available. This created a difficulty in the disaggregation process.

In situations where direct mapping is available, we allocated one hundred per cent of the tourism consumption to the relevant sector. In situations where direct mapping is not available, we used the mapping ratios used by Madden (2000) and Madden and Thapa (2000) and ratios estimated from the standard database.[35] For instance, long distance passenger transportation and local area passenger transport were allocated based on shares estimated using transport expenditures of the standard database. Table 7.6 shows the concordance of ATSA tourism products with 35 sectors of the standard database.

[35] In the case of long distance transport and local area transport, we estimated ratios of each transport category based on transport expenditures that appear in the standard database.

Table 7.6: Mapping of International Tourism Consumption

	ATSA Products	Allocation to 35 Sectors	
		%	Sector No. & Category
1	Travel agency & tour operator services	100	26 Transport services
2	Taxi fares	100	22 Road transport
3	Long distance passenger transportation	63	25 Air transport
		9	22 Road transport
		14	24 Water transport
		14	23 Rail transport
4	Motor vehicle hiring	100	28 Finance service
5	Accommodation	100	21 Hotels & cafes
6	Takeaway & restaurants meals	100	21 Hotels & cafes
7	Shopping	5	6 Textiles
		30	7 Clothing & footwear
		43	8 Other manufacture
		12	11 Chemicals
		10	9 Wood & paper
8	Local area passenger transport	23	23 Rail transport
		39	22 Road transport
		38	24 Water transport
9	Repair & maintenance of motor vehicles	100	20 Repairs
10	Fuel	100	10 Petrol refinery
11	Food products	100	4 Food products
12	Alcoholic beverages & other beverages	100	5 Beverages & cigarettes
13	Motor vehicles, caravans, boats etc.	100	14 Motor vehicles, parts & other tran. equipment manufacturing
14	Recreational, cultural & sport services	30	33 Libraries, museums and arts
		40	34 Gambling & recreation
		30	32 Other entertainment
15	Gambling & betting services	100	34 Gambling & recreation
16	Education	100	31 Education
17	Actual & imputed rent on holiday houses	100	29 Ownership of dwelling
18	Other tourism goods & services	5	5 Beverages & cigarettes
		5	11 Chemicals
		25	30 Public service
		24	27 Communication service
		25	28 Finance service
		16	35 Other service

After mapping, the disaggregated international tourism consumption vector is as shown in Table 7.7. It shows international tourism consumption of commodities in the Australian economy from both domestic and imported sources, payment of taxes on consumption and the use of margin services. For instance, international visitors in Australia have purchased $509 million worth of domestically produced goods and $50 million worth of imported goods from the food products sector (columns 2 & 3) and incur indirect taxes of $12 million (out of which $11 million is from domestic consumption, columns 4 & 5). Furthermore, the table shows that the total expenditure for the use of margin services to deliver the output of the food products sector to international visitors is $220 million (column 6).

Table 7.7: International Tourism Consumption Vectors ($ mn)

ORANI Sectors	Basic		Taxes[36]		Margin[37]	Total
	Dom	Imp	Dom	Imp		
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
Forestry & fishing	0.00	0.00	0.00	0.00	0.00	0.00
Mining	0.00	0.00	0.00	0.00	0.00	0.00
Food products	508.95	49.72	11.13	1.09	219.60	790.49
Beverages & cigarettes	247.64	24.86	90.23	9.06	60.51	432.30
Textiles	15.86	19.60	2.62	3.24	36.11	77.43
Clothing & footwear	95.19	117.57	15.74	19.44	216.65	464.60
Other manufacture	136.46	168.52	22.56	27.87	310.53	665.92
Wood, paper etc.	31.73	39.19	5.25	6.48	72.22	154.87
Petroleum refinery	74.25	0.00	44.08	0.00	10.95	129.29
Chemicals	64.51	49.64	10.59	8.15	104.40	237.29
Non-metallic minerals	0.00	0.00	0.00	0.00	0.00	0.00
Metal production	0.00	0.00	0.00	0.00	0.00	0.00
MVPOthTrn equipment	48.78	15.77	4.49	1.45	14.52	85.02
Aircraft	0.00	0.00	0.00	0.00	0.00	0.00
Electricity, gas, water	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Wholesale	0.00	0.00	0.00	0.00	0.00	0.00
Retail	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	9.84	0.00	0.00	0.00	0.00	9.84
Hotel & cafes	2,272.16	0.00	142.17	0.00	0.00	2,414.33
Road transport	623.64	0.00	-17.45	0.00	0.00	606.20
Rail transport	346.35	0.00	-11.79	0.00	0.00	334.56
Water transport	542.84	0.00	-19.48	0.00	0.00	523.37
Air transport	2,019.18	0.00	110.08	0.00	0.00	2,129.25
Transport services	216.70	0.00	1.83	0.00	0.00	218.53
Communication	126.91	12.55	20.34	2.01	0.00	161.81
Finance service	285.63	13.07	29.42	1.35	0.00	329.46
Ownership of dwelling	219.93	0.00	0.00	0.00	0.00	219.93
Public service	132.20	13.07	21.19	2.09	0.00	168.55
Education	1,076.34	16.99	0.00	0.00	0.00	1,093.33
Other entertainment	64.97	1.09	7.27	0.04	0.00	73.36
Library & museums	64.97	1.09	7.30	0.00	0.00	73.36
Gambling & recreation	163.81	1.71	44.00	0.00	0.00	209.53
Other services	84.61	8.37	13.55	1.35	0.00	107.87
Total	9,473.42	552.79	555.12	83.62	1,045.49	11,710.45

7.5.2.2. Construction of Domestic Tourism Consumption Vectors

A similar approach was applied to develop domestic tourism consumption vectors, using domestic tourism consumption data from ATSA. Table 7.8 presents domestic tourism consumption by Australian households in each tourism product category.[38]

[36] Total international tourism taxes shown in this table amount to $638.74 million and this is different from the figure that appeared in Table 7.5. This arises as a result of incorporating the two special tourism taxes and will be explained in the following section.

[37] The expenditure figures in the margin column should be further disaggregated into five margin sectors of the standard database: wholesale trade, retail trade, road transport, rail transport and water transport.

Table 7.8: Domestic Tourism Consumption ($ mn)

Tourism Product	Consumption ($ mn)
Travel agency & tour operator services	994.11
Taxi fares	132.42
Long distance passenger transportation	3,097.64
Motor vehicle hire & lease	314.49
Accommodation services	2,073.04
Takeaway & restaurant meals	6,463.69
Shopping (including gifts & souvenirs)	6,361.78
Local area passenger transportation	122.95
Repair & maintenance of motor vehicles	321.48
Fuel (petrol, diesel)	2,693.49
Food products	3,278.47
Alcoholic beverages & other beverages	2,034.84
Motor vehicles, caravans, boats etc	795.49
Recreational, cultural & sports services	1,495.07
Gambling & betting services	479.17
Education	68.29
Actual & imputed rent on holiday house	1,185.91
Other tourism goods & services	1,984.45
Total	33,896.77

Source: ABS (2004, adjusted figures)

Domestic tourism consumption figures shown in the Table 7.8 represent purchaser's value. As with the previous case, these needed to be disaggregated into basic value, taxes and margin services in order to be incorporated into the standard database. Disaggregation was performed using the tourism supply ratio estimated using data provided in Table No. 8, ABS (2004, Catalogue No. 5249.0). Table 7.9 presents supply ratios and they are very similar to the ratios used in international tourism expenditure disaggregation except in a few instances where we needed to make adjustments to suit both the domestic consumption pattern and the standard database. As noted earlier, such individual adjustments are essential in balancing the final database.

For instance, in the case of other tourism goods, the amount allocated to the use of margin services was required to be adjusted to match the figures in the standard database. Similarly, the amount allocated to domestic basic in recreational, cultural and sport services was also adjusted. Thus, the ratios in these product categories are marginally different from those of international tourism.

[38] We used total domestic tourism consumption data for 2002-03 provided in ATSA (Table 11, ABS 2004, Catalogue No. 5249.0) and adjusted for 1996-97. Total domestic tourism consumption data was adjusted according to the ratio of tourism consumption and GDP in 2002-03 as follows:
Tourism Consumption 96-97 = (Tourism Consumption 02-03/GDP 02-03)*GDP 96-97

Table 7.9: Tourism Supply Ratios to Disaggregate Tourism Consumption

Tourism Product	Domestic basic	Imported basic	Net taxes	Margin
Travel agency & tour operator services	99.16	0.00	0.84	0.00
Taxi fares	96.88	0.00	3.12	0.00
Long distance passenger transportation	100.16	0.00	-0.16	0.00
Motor vehicle hire & lease	95.35	0.00	4.65	0.00
Accommodation services	95.24	0.00	4.76	0.00
Takeaway & restaurant meals	91.99	0.00	8.01	0.00
Shopping (including gifts & souvenirs)	20.49	25.31	7.57	46.63
Local area passenger transportation[39]	138.80	0.00	-38.80	0.00
Repair & maintenance of motor vehicles	92.08	0.00	7.92	0.00
Fuel (petrol, diesel)	54.26	3.17	34.10	8.47
Food products	64.38	6.29	1.55	27.78
Alcoholic beverages & other beverages	58.08	5.84	24.85	11.23
Motor vehicles, caravans, boats etc	57.38	18.55	6.99	17.08
Recreational, cultural & sports services	90.94	0.00	9.96	0.00
Gambling & betting services	69.09	0.24	30.67	0.00
Education	98.45	1.55	0.00	0.00
Actual & imputed rent on holiday house	100.00	0.00	0.00	0.00
Other tourism goods & services	78.28	7.37	13.12	1.23

Source: Adapted from ABS (2004).

Using the supply ratios shown in Table 7.9, domestic tourism consumption figures shown in Table 7.8 were disaggregated and Table 7.10 summarises these disaggregated consumption figures in each of the tourism product categories.

Table 7.10: Disaggregated Domestic Tourism Consumption ($ mn)

Tourism Product	Dom. basic	Imp. basic	Net Taxes	Margin	Total
Travel agency & tour oper. services	985.79	0.00	8.31	0.00	994.11
Taxi fares	128.29	0.00	4.13	0.00	132.42
Long distance passenger transport	3,102.48	0.00	-4.84	0.00	3,097.64
Motor vehicle hire and lease	299.87	0.00	14.62	0.00	314.49
Accommodation services	1,974.34	0.00	98.70	0.00	2,073.04
Takeaway and restaurant meals	5,946.24	0.00	517.44	0.00	6,463.69
Shopping	1,303.41	1,609.92	481.83	2,966.61	6,361.78
Local area passenger transportation	170.65	0.00	-47.70	0.00	122.95
Repair motor vehicles	296.01	0.00	25.47	0.00	321.48
Fuel (petrol, diesel)	1,461.55	85.38	918.41	228.16	2,693.49
Food products	2,110.83	206.19	50.66	910.78	3,278.47
Alcoholic & other beverages	1,181.86	118.86	505.63	228.49	2,034.84
Motor vehicles, caravans, boats etc	456.43	147.57	55.60	135.90	795.49
Recreational, cultural & sports	1,346.22	0.00	148.85	0.00	1,495.07
Gambling and betting services	331.07	1.14	146.95	0.00	479.17
Education	67.22	1.06	0.00	0.00	68.29
Actu. & imput. rent (holiday houses)	1,185.91	0.00	0.00	0.00	1,185.91
Other tourism goods and services	1,533.41	146.20	260.40	24.40	1,984.45
Total	23,901.59	2,316.32	3,184.47	4,494.34	33,896.77

[39] This is due to government subsidies offered to the local area transportation.

Table 7.11: Mapping of Domestic Tourism Consumption with 35 Sectors

	ATSA Products	Allocation to ORANI 35 Sectors	
		%	Sector No. & Category
1	Travel agency & tour operator services	100	26 Transport services
2	Taxi fares	100	22 Road transport
3	Long distance passenger transportation	81	25 Air transport
		11	23 Rail transport
		5	22 Road transport
		3	24 Water transport
4	Motor vehicle hiring	100	28 Finance service
5	Accommodation	100	21 Hotels & cafes
6	Takeaway & restaurants meals	100	21 Hotels & cafes
7	Shopping	5	6 Textiles
		30	7 Clothing & footwear
		43	8 Other manufacture
		12	11Chemicals
		10	9 Wood & paper etc
8	Local area passenger transport	40	23 Rail transport
		37	22 Road transport
		23	24 Water transport
9	Repair & maintenance of motor vehicles	100	20 Repairs
10	Fuel	75	10 Petrol refinery
		25	19 Retail trade
11	Food products	100	4 Food products
12	Alcoholic beverages & other beverages	100	5 Beverages & cigarettes
13	Motor vehicles, caravans, boats etc.	100	14 Motor vehicles, parts & other tran. equipment manufacturing
14	Recreational, cultural & sport services	30	33 Libraries, museums and arts
		40	34 Gambling & recreation
		30	32 Other entertainment
15	Gambling & betting services	100	34 Gambling & recreation
16	Education	100	31 Education
17	Actual & imputed rent on holiday houses	100	29 Ownership of dwelling
18	Other tourism goods & services	5	5 Beverages & cigarettes
		5	11 Chemicals
		25	30 Public service
		5	22 Road transport
		20	27 Communication service
		20	28 Finance service
		20	35 Other service

Disaggregated tourism consumption in each product category was then mapped with the 35 sectors of the standard database. The tourism product concordance given in Table 7.11 was used for mapping. In situations where there is no direct mapping, shares similar to those applied in the previous exercise were used. However there were few tourism products that needed special treatment. For example, long distance passenger transportation and local area passenger transportation were allocated based on shares derived from the National Visitor Survey (NVS) and transport expenditures of the core database. Similarly, a portion of domestic tourism consumption of fuel was allocated to the retail sector in addition to the allocation made to the petrol refinery sector.[40] Table 7.12 presents domestic tourism consumption vectors, for each commodity of the standard database.

Table 7.12: Domestic Tourism Consumption Vectors ($ mn)

ORANI Sectors	Basic		Taxes[41]		Margin	Total
	Dom	Imp	Dom	Imp		
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
Forestry & fishing	0.00	0.00	0.00	0.00	0.00	0.00
Mining	0.00	0.00	0.00	0.00	0.00	0.00
Food products	2,110.83	206.19	46.16	4.51	910.78	3,278.47
Beverages & cigarettes	1,248.53	144.45	464.87	53.78	240.71	2,152.34
Textiles	65.17	80.50	10.78	13.31	148.33	318.09
Clothing & footwear	391.02	482.98	64.67	79.88	889.98	1,908.53
Other manufacture	560.47	692.27	92.69	114.49	1,275.65	2,735.57
Wood, paper etc.	130.34	160.99	21.56	26.63	296.66	636.18
Petroleum refinery	1,096.16	64.03	867.72	50.69	228.16	2,306.76
Chemicals	223.08	218.78	35.77	35.07	368.21	880.91
Non-metallic minerals	0.00	0.00	0.00	0.00	0.00	0.00
Metal production	0.00	0.00	0.00	0.00	0.00	0.00
MVPOthTrn equipment	456.43	147.57	42.01	13.58	135.90	795.49
Aircraft	0.00	0.00	0.00	0.00	0.00	0.00
Electricity, gas, water	0.00	0.00	0.00	0.00	0.00	0.00
Construction	0.00	0.00	0.00	0.00	0.00	0.00
Wholesale trade	0.00	0.00	0.00	0.00	0.00	0.00
Retail trade	365.39	21.34	0.00	0.00	0.00	386.73
Repairs	296.01	0.00	25.47	0.00	0.00	321.48
Hotel & cafes	7,920.58	0.00	616.15	0.00	0.00	8,536.73
Road transport	425.82	7.31	-1.77	0.00	0.00	431.36
Rail transport	409.93	0.00	-21.88	0.00	0.00	388.05
Water transport	132.55	0.00	-11.74	0.00	0.00	120.82
Air transport	2,415.25	0.00	97.76	0.00	0.00	2,513.01
Transport services	985.79	0.00	8.31	0.00	0.00	994.11
Communication	315.57	29.24	47.66	4.42	0.00	396.89
Finance service	615.44	29.24	63.77	3.03	0.00	711.38
Ownership of dwelling	1,185.91	0.00	0.00	0.00	0.00	1,185.91
Public service	394.46	0.00	65.10	0.00	0.00	459.56
Education	67.22	1.06	0.00	0.00	0.00	68.29
Other entertainment	403.87	0.00	44.65	0.00	0.00	448.52
Library & museums	403.87	0.00	44.65	0.00	0.00	448.52
Gambling & recreation	869.56	1.14	206.22	0.27.	0.00	1,076.92
Other services	315.57	29.24	47.66	4.42	0.00	396.89
Total	23,804.82	2316.33	2,878.16	404.08	4,494.39	33,897.77

[40] This adjustment was made in order to maintain the balance in total household expenditure in the standard database. The total amount of domestic tourists' consumption of fuel is considerably higher (i.e $2,693.5 million) than that of international tourism ($129.3 million). If 100 per cent of this amount is allocated to the petrol refinery and then is extracted from household consumption, it certainly could generate an imbalance within household consumption. Therefore, in order to avoid this, it was decided to allocate a portion to another possible compatible industry and thus the retail industry was selected.

[41] Total taxes appearing in the table amounts to $3,282.24 million and this differs from total taxes shown in Table 7.10 ($3,184.47). This is primarily due to the incorporation of two special tourism taxes. This will be explained further in the next section.

Figures in this table represent the transactions of the domestic tourism dummy sector: '*DomToursm*' with the rest of the economy. Like *IntToursm*, this sector does not produce a commodity. Nevertheless, it purchases different components of the composite domestic tourism product from related sectors and on sells the composite product to Australian domestic visitors. For example, Australian domestic visitors spend $2,111 million on domestically produced food products and $207 million on imported foods. In total, domestic visitors pay $51 million on indirect taxes for food purchases (total taxes on domestic and imported goods). Expenditure on margin services incurred on the same transaction is $911 million.[42]

7.5.2.3. Merging the Tourism Database with the Core Database

As explained in the previous two sections, tourism consumption vectors for international tourism and domestic tourism were constructed. Before the tourism database is merged with the core database, figures appeared in the tourism database needed to be extracted from the relevant sectors (commodities) of the export and the household sectors of the core database (updated version) since they are embedded in these two final demand sectors. For example, exports and household consumption of food products in the core database include $509 million worth of international tourism consumption and $2,111 million worth of domestic tourism consumption of food products. Accordingly, we extracted these figures from the exports and the household sectors, respectively. The same procedure was performed for all expenditure vectors such as domestic basic, domestic imported, taxes and margins.

After this extraction, the new tourism database (all vectors) was merged with the core database. Once merged, two new dummy sectors called "*IntToursm*" and "*DomToursm*" appeared in the intermediate matrix. The incorporation of the tourism sectors basically changes the entire core database. Accordingly, after merging the two databases, it was essential to thoroughly check for consistency and accuracy in each matrix and vector of the database. This was vital to ensure that the database is balanced before any simulation is carried out.

[42] Expenditure on margin services shown in the penultimate column in the table was further disaggregated into five margin sectors, namely, wholesale trade, retail trade, road transport, rail transport, and water transport.

In addition to the above-mentioned checks on the database for accuracy and balance, several tests (debugging strategies) were conducted to check the validity and accuracy of the database. They included a price homogeneity test, a real homogeneity test, a test to check whether GDP from both the income and expenditure sides changes by the same amount, and a test to check whether the updated data file is balanced (Horridge 2003).[43]

This concludes the major database modification (incorporation of two tourism sectors) carried out in the development of the database for TTM. Selected matrices of the TTM core database after incorporating tourism sectors are given in Appendix C. The next important aspect in terms of the database development is the development of the database for the finance module. This will be explained in Section 7.5.3. Before moving on to that section, it is essential here that we outline the amounts and the types of tourism taxes appearing in the newly-created tourism sectors and establish the link between our estimations in Chapter Four with such taxes. The following section (Section 7.5.2.4) will cover this aspect.

7.5.2.4. Tourism Taxes in the Database

In Chapter Four, tax revenue attributable to the Australian tourism sector was estimated under two main categories: general and special tourism taxes. In the process of the development of the tourism sectors, some of these relevant taxes were incorporated into the database. These include the GST, excise duties, gambling taxes (general tourism taxes) and the PMC (Passenger Movement Charge) and ANL

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[43] The price homogeneity test tests the property of neoclassical models that a uniform increase in all prices does not affect any quantity variables. A simulation is carried out for this test with a shock to the numeraire (nominal exchange rate) and the expectation is that all domestic prices and flows change by the same amount as the shock while real variables remain unchanged. The real homogeneity test tests another property of neoclassical models: constant return to scale. This implies that when all exogenous real variables are shocked, all endogenous real variables change by the same amount. However, price variables are unchanged in this simulation.

We carried out another simulation to increase real consumption (by 10 percent) and the prior expectation is that both the nominal GDP variables, income side and the expenditure side, change by the same amount (Horridge 2003).

In addition to the above tests, the model includes a few self-checks to confirm that the database is balanced. This is done via some of the assertions written to the main theory file. If these assertions are not true, the GEMPAK does not solve the model and thus the simulation does not provide a solution file. We confirmed all these tests were successfully carried out.

(Aircraft Noise Levy, special taxes).[44] Among these taxes, general tourism taxes were already embedded in tourism consumption and thus in the disaggregation they have been redefined in the tourism sectors. However, it is important at this point to outline the link between our estimations of tourism taxes (in the types of taxes mentioned above) and the tax amounts appearing now in the disaggregated tourism sectors. Our estimation of the tourism sectors' contribution to the GST, excise duties and gambling taxes is based on ATSA estimations. Thus, the tax amount incorporated in the database and the amount appearing in the tax estimations are the same.

Tourism consumption utilized in the disaggregation includes net taxes paid on tourism products and this should include the GST, gambling taxes and excise duties. In the case of the GST, the total GST attributable to the tourism sector in 2002-03 is $4,619 million.[45] Since the tourism consumption figures used were for the same year, consistency can be maintained by considering the latest available tourism GST. A similar adjustment should be done to estimate the amount of GST applicable to the core database.[46] Accordingly, total GST that should be included in total tourism consumption is $2,873.6 million.

Chapter Four also estimated excise duties and gambling taxes attributable to the Australian tourism sector for 1996-97. The total amount of excise duties and gambling taxes that should be included in total tourism consumption is $1,231 million

[44] Only these taxes can be incorporated into the database since they represent taxes paid by international and domestic visitors in Australia. Other taxes appearing in the chapter, such as company taxes, personal income taxes, FBT and payroll taxes, are paid by tourism sector. The dummy sectors introduced are based on tourism consumption, not tourism supply.

[45] We have estimated this based on data provided by ABS (Fact Sheet-Net Taxes on Products 2002-03). See, also, for example (ABS 2004a).

[46] We adjusted the total GST for 2002-03 up to the 1996-97 base year level using the same GDP ratios. For instance, the amount of GST amounts to {(4619/GDP 02-03)*GDP 96-97} $2,873.65. This also represents the right proportion of tax for total tourism consumption. The total amount of tourism consumption incorporated was $45,607.2 million representing $11,710.45 million in international tourism consumption and $33,896.77 million in domestic tourism consumption. This represents 88.5% of total tourism consumption for the year since we did not extract domestic tourism consumption by Australian business and government. We did not undertake this disaggregation for three reasons: (i) ATSA does not provide a disaggregation between business domestic tourism consumption and government domestic tourism consumption; (ii) all these possible disaggregations are beyond the scope of this project given the limited time; and (iii) domestic tourism from business and government represents a relatively small proportion and thus the absence of it would not change the results to a grater extent. However, we have incorporated the entire international tourism sector, which is the most important sector for the current study.

and $139.4 million, respectively.[47] Accordingly total gross tourism taxes from tourism consumption are $4,244.05 million as shown in Table 7.13.

Table 7.13: Total Gross and Net Tourism Taxes ($ mn)

Description	Value ($ mn)
GST	2,873.65
Excise duties	1,231.00
Gambling taxes	139.40
Total gross tourism taxes	4,244.05
Adjusted subsidies given to tourism	(532.48)
Total net tourism taxes	3,711.57

In the tourism consumption disaggregation explained in the previous two sections, the tourism supply table from ATSA and weights estimated from it were used. The supply table disaggregates tourism consumption into basic value, net taxes, and tourism margins.[48] Net taxes represent gross taxes minus subsidies provided to the Australian tourism sector. The total amount of subsidies that should be adjusted from gross tourism taxes in our experiment is $532.48 million.[49] In summary, $3,711.57 million in net tourism taxes should be included in total tourism consumption that has been disaggregated above.

Special Tourism Taxes in the Database

In addition to the general tourism taxes represented in the database, as outlined in the previous section, two special tourism taxes were also incorporated. They include the PMC and ANL. These two taxes are of extremely important for the issue at hand since they represent the largest portion of special tourism taxes.[50] Of the two taxes, ANL is

[47] Unlike the GST, our estimations in Chapter Four provide excise duties and gambling taxes attributable to the tourism sector for 1996-97. Of the total amount of taxes in each of these two, the relevant proportion that should represent tourism consumption is 85.5% of the estimated amount.

[48] For more information see (ABS 2004a, Catelouge No. 5249.0, Table 8).

[49] Total subsidies given to the tourism sector for 2002-03 was $855.9 million (ABS Fact Sheet-Net Taxes on Products 2002-03). Tourism subsidies for 1996-97 were not available. In the absence of the relevant data, we used the latest available, 2002-03. Similar to earlier occasions, we adjusted total subsidies attributable to tourism based on GDP ratio. Furthermore, since total tourism consumption that has been incorporated is 88.5 per cent, the appropriate proportion of subsidies is estimated as $532.48 million.

[50] In fact for 1996-97 our estimations include only these two taxes as special tourism taxes due to unavailability of data for the other taxes. Furthermore, PMC is the single largest special tourism tax in Australia and thus it is essential that we incorporate it into the database.

imposed on arriving passengers at Sydney Airport and the total amount collected for 1996-97 was $38.7 million.[51] In order to incorporate ANL into the domestic and international tourism sectors, it should be disaggregated based on the type of arrivals at Sydney airport for which there are four possible categories.

The four possible categories of arrivals include international visitor arrivals, interstate visitor arrivals, Australian resident arrivals (including both short-term and long-term) and permanent migrant arrivals. Based on available information, it was established that migrant and long-term Australian resident arrivals are negligible (they both represent less than 0.5 percent of the total). However, three significant arrivals categories are interstate visitor arrivals (62 percent), international visitor arrivals (27 percent) and short-term Australian resident arrivals (11 percent).[52] It is clear that ANL portions for the first two categories should be incorporated into the domestic tourism and international tourism sectors, respectively. In the case of short-term Australian visitor arrivals, a decision should be made before these are incorporated.

According to ATSA, domestic tourism consumption by Australian households includes some expenditure by outbound Australian residents before and after international trips. Australian outbound visitors purchase return air tickets before their trips and thus ANL is being paid before the trip. Accordingly, it is reasonable that we incorporate the proportion of ANL attributable to Australian residents into the domestic tourism sector. Consequently, we incorporated $27.09 million (70 per cent) into the domestic tourism sector and $11.61 million (30 per cent) into the international tourism sector.

PMC is imposed on all departures from Australian airports and seaports and thus this should also be disaggregated among sectors based on departures. Total PMC attributable to the Australian tourism sector for 1996-97 was $174.5 million.[53]

[51] ANL is applicable to Adelaide Airport since 2001, for information on ANL, refer to Chapter Four.

[52] We estimated that in 1996-97 the number of arrivals at Sydney airport was 37,291 migrant (0.41 per cent), 27,261 long-term Australians (0.30 per cent), 947,274 short-term Australians (11 per cent) 2,400,000 international visitors (27 per cent) and 5,559,000 interstate visitors (62 per cent).

[53] For more information on PMC, please refer Chapter Four.

Accordingly, we incorporated $99.47 million into the international tourism sector and $70.76 million into the domestic tourism sector.[54] Total special tourism taxes incorporated to each sector is given in Table 7.14 below.

Table 7.14: Total Special Tourism Taxes Incorporated ($ mn)

Special tourism tax	DomToursm	IntToursm
Aircraft noise levy	27.09	11.61
Passenger movement charge	70.67	99.47
Total	97.76	111.07

When incorporating these special tourism taxes, it was assumed that they were already embedded in the tourism consumption figures that were derived from the ATSA since such taxes are included in air tickets. Since both the ANL and PMC are based on air travel, we incorporated them into the air transport commodity of both the domestic and international tourism sectors. As shown in Table 7.14, a total of $208.83 million in special tourism taxes were incorporated into the database.

Table 7.15: Total Tourism Taxes in the Database ($ mn)

Type of tourism tax	DomToursm	IntToursm	Total
General tourism taxes (net)	3,184.47	528.67	3,713.14
ANL	27.09	11.61	38.70
PMC	70.67	99.47	170.14
Total	3,282.23	639.75	3,921.98

Table 7.15 provides a summary of general and special taxes that are included in the two tourism sectors in the database. The two tourism sectors in the database include a total of $3,922 million in tourism taxes paid by both domestic and international visitors.

7.5.3. Construction of Government Finance Database

In Section 7.4, the behavioural (theoretical) aspect of the finance module was presented. As noted earlier, the finance module is interrelated to the CGE core module yet it operates separately from it. Therefore, a separate database needed to be

[54]Based on ABS departure figures (ABS, Catalogue No. 3401.0, various issues), we estimated that there were 57 per cent international visitor, 41 per cent short-term Australian resident, and 2 per cent long-term Australian resident departures. PMC was disaggregated based on these shares. However, the proportion of PMC attributable to long-term Australian resident departures (2 per cent) is assumed to be embedded in the household vector of the standard database.

developed for the finance module.[55] The behavioural aspect of the finance module was designed in a way that it sources all possible data from the core database. In this way we have sourced data from the core module (database) for total payments to labour, total payments to capital, total payments to agricultural land, all commodity taxes (i.e. taxes on intermediate inputs, investment goods, household consumption and exports), total government consumption, and total primary factor payments. This enables the model to maintain compatibility between the core module and the government finance module and hence between databases.

The necessary additional data for the finance module could not be sourced from a single source thus a number of alternative sources were used. Among these, the main source was Adam *et al.* (2003, MMRF database). The MMRF database is based on 1996-97 data and the MMRF finance data we obtained provided an accurate source. It was supplemented by Government Financial Estimates 1997-98 (ABS 1997, Catalogue No. 5501.0), Commonwealth Budget Estimates (Department of the Treasury 1997), Taxation Revenue (ABS 1998, Catalogue No. 5506.0) and Input-Output Tables (ABS 2001, Catalogue No. 5209).

7.5.4. Elasticity Parameters

The main database for CGE models is derived from IO tables of the country concerned. In addition to the core data sourced from the IO tables, numerous elasticity parameters are required. These include elasticities of substitution between domestic and imported sources (Armington elasticities) of commodities, elasticities of substitution between primary factors, and skill and occupations categories, household expenditure parameters, and export demand elasticities. All these parameters except demand elasticity of international tourism were sourced form the ORANI-G standard database.

In the case of demand elasticity of international tourism, following Divisekara (2003) we used –2 as the elasticity. Divisekara estimated own and cross price elasticities (uncompensated and compensated) for tourism demand in Australia from four major

[55] We constructed a separate HAR file for the finance module. HAR (Header Array) files store IO data, all the behavioral parameters and government finance data.

markets: New Zealand, the UK, the US and Japan. Uncompensated own price elasticity parameters in this study range from -1.37 to -2.24. Furthermore, Dixon and Rimmer (1999a) used –2 as the elasticity of demand for international tourism. Based on evidence from the literature, -2 seems to be reasonable. This figure was applied for all standard simulations unless otherwise specifically mentioned.[56]

7.6. Summary and Concluding Remarks

This chapter explained the development of the TTM: a modified version of ORANI-G. The TTM was developed by following a new approach: the "tourism dummy sector approach". In the development of the TTM, two major modifications to the ORANI-G model were done. They include the incorporation of two tourism sectors and the addition of a finance module. The dummy sector approach was applied to incorporate two tourism sectors: domestic tourism and international tourism. Moreover, following Parmenter (1988) and Adams *et al.* (2003), a government finance module was added to the CGE core module. In line with these two modifications, the ORANI-G standard database was modified considerably to develop the TTM database.

Among the database modifications, updating the entire commodity tax structure to include the GST system is crucial since the current study is involved with tourism taxation. In the incorporation of the tourism sectors, we used ATSA in constructing tourism consumption vectors and merged them with the standard database. The use of ATSA in a CGE setting provides a comprehensive modelling tool, as it is compatible with the SNA. The database for the finance module was developed sourcing both from the core module as well as from additional sources. Another important aspect of the modified database is that it represents tourism taxes that we have estimated in the study. They include general tourism taxes such as the GST, excise duties and gambling taxes. Additionally, two special tourism taxes, PMC and ANL, were also incorporated into the model database.

The TTM is a 37x37 model of the Australian economy with two interrelated modules: the CGE core module and the government finance module. What are the specific uses

[56] In simulations carried out on maximisation of government revenue, we used two optional parameters. For more information, please see Chapter Eight.

of this model? What policy issues can this model analyse? Like any other multisectoral model of the Australian economy, this model can be applied to analyse most general policy issues that ORANI-family models handle. More specifically, this model has capability to be applied to policy issues in the tourism sector that demand wider economic examination. These may include various tourism impact studies, changes in tourism demand and consumption, tourism tax issues and other related issues.

CHAPTER EIGHT
SIMULATIONS OF TOURISM TAXES

Tourism tax simulations are carried out using the CGE model (TTM) developed in the study and the results are analysed to ascertain the general equilibrium effects of tourism taxes in Australia. The results reveal that taxing international visitors leads to increased tourism prices and thus tourism consumption becomes discouraged. The decline in tourism consumption is passed onto tourism-related sectors and hence output contractions and reductions in employment in those sectors become evident. Therefore, it appears that tourism taxes are contractionary in the short-run. In contrast, in the long-run such taxes seem to be expansionary in terms of overall economic activities. Moreover, the results suggest that tourism taxes tend to be welfare-improving, although international tourism consumption is negatively affected. On the other hand, whenever the tourism sector is supported by way of tax refunds or tax abolitions, the sector and related sectors benefit. Moreover, such policies appear to be welfare-declining.

8.1. Introduction

In Chapter Five, three tourism tax policy scenarios were developed, each proposing some changes to the current tourism tax structure. In this chapter, three sets of simulations are carried out to experiment with proposed tax changes using the TTM developed in the previous chapter. These tax changes include (i) an increase in passenger movement charge (PMC), (ii) an imposition of an ad valorem tax on accommodation services, and (iii) an imposition of an ad valorem tax on the total planned tourism consumption. Two additional sets of simulations are also carried out in relation to a tourism refund scheme (TRS) and a policy change to abolish tourism taxes. Accordingly, the general equilibrium effects of tourism tax changes are analysed. The chapter includes eight sections. In section two, basic assumptions regarding different closures or the economic environments of the model are explained. In sections three to five, simulations in relation to three policy scenarios are carried out. In sections six and seven, the last two simulations based on TRS and tax abolition are carried out and results are analysed. The last section concludes the chapter.

8.2. Basic Assumptions of the Model Structure

The simulations noted above are carried out within two different economic environments, representing the short-run and the long run. In each economic environment, a set of assumptions regarding the model is made. In other words, a set of exogenous variables is specified in each case which is also known as the specification of the closure of the model.[1] The database used in this study contains 37 industries, 37 commodities, a single representative household, the government, an aggregate export demand, 9 skill labour groups, and 6 industries whose investment is determined exogenously.

A list of standard variables, which are commonly assumed as exogenous, is presented in Appendix B (Table B2). Of these variables, tariff terms, ad valorem and sales tax terms, export tax terms, technological and taste change terms, shift variables, and number of households are assumed to be exogenous in both the short-run and the long-run economic environments. Further assumptions regarding the selection of additional exogenous variables in each economic environment are made and the following sub-sections will outline such assumptions.

The Short Run Economic Environment

In a standard short-run simulation, in addition to those exogenous variables noted above, there are several important selections of exogenous variables. Among these, selection of variables relating to primary factors from the supply side and selection of aggregate expenditure variables from the demand side are the most crucial. Of the three primary factors: capital, land and labour, the industry-specific current capital stock is fixed in the short-run closure. This implies that the rate of return on capital is determined endogenously. The use of agricultural land in the production process is also exogenised. Aggregate employment is determined endogenously, while the real wage rate is fixed.

The assumptions regarding the labour market in the short-run have some important implications. When the real wage rate is determined exogenously, aggregate employment should be determined endogenously. This means that the labour is the only mobile factor in the short-run, given that the industry-specific capital stock is exogenous. This implies that the labour usage could change in industries according to changes in output. For example, if the output of an industry declines due to a change in

[1] This is an essential task since the TTM developed in the previous chapter contains more variables than equations. Therefore, a set of variables should be set as exogenous, which means that such variables are determined outside the model. Accordingly, the number of endogenous variables is equal to the number of equations and thus in simulations endogenous variables are determined inside the model.

tax, the factor usage should decline accordingly. Given that the labour is the only mobile factor in the short-run, the reduction in output means that the demand for labour declines in the affected sector. Therefore, there will be unemployed labour in this sector. In a general equilibrium setting, it is understood that, the other sectors would absorb the unemployed labour. For this to happen, the wage rate should decline. This implies that in the short-run, there would be an economy-wide reduction in nominal wage rate given that the real wage rate is fixed. On the other hand, the capital being the fixed factor cannot respond to output contractions thus the capital rental declines in only in the affected sector. Overall, the impact on the labour appears to be very significant.

On the demand side, all components of real gross national expenditure, namely household consumption, private investment, government expenditure and inventories, are exogenised. Changes in the GDP in simulations, on the expenditure side, are adjusted using the balance of trade as the swing variable. Thus, export and import volumes can be endogenously determined. As the small country assumption is adopted in simulations, import prices are fixed, implying the inability of Australian demand to change world market prices. The nominal exchange rate is the numeraire, which is also exogenous.

The Long-run Economic Environment

In the standard long-run simulations, selection of primary factors and expenditure aggregates for the exogenous list differs from that of the short-run. The most important is the selection of the current capital stock to be determined by the model. Instead of the current capital stock, the rate of return on capital is assumed to be exogenous. In the long-run, aggregate employment is assumed to be exogenous since it is determined by other factors such as demographic changes, the natural rate of unemployment and the participation rate. In the case of exogenous aggregate employment, the real wage rate should be determined by the model. However, industry composition of labour can vary according to changes in other related variables. Aggregate expenditure variables, except real demand for inventories, are endogenous while the balance of trade is fixed. The nominal exchange rate is the numeraire in the long-run as well.

The standard short-run closure explained above is applied for all short-run simulations in the study. However, we modified the standard long-run closure and applied for all long-run simulations. The modified version of the long-run closure is different from the standard long-run closure, particularly in the specification of demand-side aggregates, while there is no difference in the supply-side specifications. Real government spending and real investment are assumed to be exogenous. Exogenous real investment implies that Australian savings are only sufficient to maintain domestically-funded investment. Changes in real income available to Australians due to tax changes are reflected by changes in real household consumption and thus real household consumption is endogenous.

These assumptions mean that changes in capital stock purely reflect changes in foreign-owned capital. For example, if the capital stock is increased as a result of tax changes, there is an increase in the quantity of foreign-owned capital. Subsequently, the trade surplus is set to equal the increase in returns to capital, to pay foreign capital owners for additional capital that they finance. Thus, real household consumption is the only endogenous variable in the domestic absorption in this closure. The most important policy implication of this particular closure is that the changes in real consumption provide a valid indicator of the welfare changes arising from tax simulations. As this study is involved with tourism taxation, changes in real consumption can easily be interpreted as welfare changes of tourism tax changes.

Other Assumptions and Model Solution

In relation to government finance, all tourism tax simulations are carried out as budget neutral simulations. Thus, the real budget deficit is exogenous while the income tax rate (both the rate of tax on wages and salaries/PAYE tax rate and the rate of tax on non-labour income) is endogenous. This implies that changes in tourism taxes and subsequent changes in government tax revenue are reflected in changes in income tax rates. For example, if tourism taxes are increased, income tax rates tend to fall given the exogenous budget deficit. This is similar to a situation where increased tax revenue is redistributed among households. Subsequently, the after-tax wage rate and household disposable income will represent the effects of changes in income tax rates arising from tourism tax simulations.

Both the after-tax real wage rate and real disposable household income are introduced in the finance module (c.f. Section 7.4.4). Furthermore, a link between real household disposable income and real consumption was also established and thus real consumption in our model is a good measure of tax-induced welfare changes.

The model is solved using the GEMPAK software (Harrison and Pearson 1996). GEMPAK can carry out simulations using specified databases. In simulations, setting the relevant closure and identifying the right variable/variables to induce shock are two important steps. Moreover, since the model developed is a comparative static model, in solutions the model generates a linearisation error. It is observed that the extent of the error is greater when the policy change is larger. Thus, in order to minimise the linearisation error, a multi-step solution method should be applied. In our simulations, the Euler multi-step solution technique was applied.

8.3. Simulation One: An Increase in PMC

In Chapter Five, Section Two, the first policy scenario was developed and this is that "the current tax contribution of the Australian international tourism sector seems to be inadequate to cover the external cost of the international tourism sector, and accordingly, there is a case for further taxing international visitors". Furthermore, Chapter Five suggested that an increase of the international tourism tax by $9.96 per international visitor in Australia could be used to internalise the negative externality. The current simulation is based on this policy scenario.

What are the available alternative tax tools in the current structure to implement the above-mentioned tax change? As far as the current tax structure is concerned, the ANL (aircraft noise levy) is the only major tax imposed in relation to the internalisation of negative externalities. The levy is earmarked for the noise insulation projects at two identified airports. Thus, there would be difficulties in justifying increases in ANL, as it is a project-specific tax and therefore, a different tax should be considered. This leaves us only PMC and visa charges, as other possible candidates. The current policy of the Australian Government towards the visa-issuing process is to expedite the process by allowing applicants to use electronic applications. With this change, visa charges have been significantly reduced (see Section 4.5.2). This leads us to suggest that the appropriate existing tax for this purpose is the PMC.

The choice of PMC for the experiment is supported by two factors: (i) it has been increased on several occasions since its introduction in 1978, and (ii) administration is relatively easy as it is collected through respective airlines and shipping companies (see Section 4.3.2.1 for more information about the PMC). We assume an increase in PMC by $10 per international visitor. The PMC as a unit tax is imposed on each departing passenger from Australian airports and seaports. Based on the number of visitor departures in the base year (Australia had 4,217,000 international visitor departures), this would raise $42 million, which is sufficient to cover total external costs. Two alternative policy scenarios are considered:

i. The principal policy: tax is increased for international visitors only assuming that an exemption is given to Australian residents departing.
ii. The alternative policy: as an alternative the increase in PMC is considered for both international visitors and Australian residents to see whether there are major differences in results.[2]

8.3.1. Simulation Results of an Increase in PMC

Simulation experiments are carried out to ascertain the short-run and long-run effects of a change in tourism taxes on prices, industry outputs and factor usage, household consumption and its welfare, and macro variables. These results can be interpreted as the percentage change in the relevant variable under the increase of PMC on international visitors in each alternative scenario (in the case of the principal policy) and the increase of PMC on both international visitors and Australians departing for short-term visits (in the case of the alternative policy), relative to what would otherwise have been without such an increase of PMC.

These experiments are carried out within two economic environments (closures) representing short-run and long-run effects. Assumptions that are made in each economic environment are explained in Section 8.2. In the discussion we mainly focus on results of the principal policy change. Wherever necessary, a highlight of results of the alternative policy that could differ from those of the principal policy is given

[2] An increase in PMC for international visitors only is not difficult to implement. The PMC is currently administered through airlines and shipping companies and thus when foreigners purchase air tickets in their own countries the increase can be easily implemented.

separately. Moreover, in the discussion, short-run results are presented first followed by the long-run results.

8.3.1.1. Changes in Prices

The percentage change in price variables from the base year values for the above simulation experiments are summarised in Table 8.1. Under the principal policy where the proposed tax change (increase in PMC) is only applicable to international visitors, the consumer price of the composite international tourism product has increased by 0.334 per cent in the short-run. The average nominal wage declines by 0.017 per cent signalling that the tax increases have some effects in the labour market. However, in the short-run real wage is exogenous and thus nominal wages move with the consumer price index (CPI) in the model. Table 8.1 shows that the nominal wage rate declines by the same rate as the CPI reduction.

Further to changes in wages, average capital rental has also been affected. The increased price of the international tourism product means a decline in international tourism demand and such a decline in tourism demand can generate an output contraction in tourism-related commodities. This is because the composite tourism product is supplied by these tourism-related sectors.[3] When the output of these sectors declines, the demand for the primary factors of the tourism-related sectors should decline.

Table 8.1: Percentage Changes in Prices: Simulation 1

Variable description	Principal Policy		Alternative Policy	
	SR	LR	SR	LR
Domestic tourism (consumer price)	-0.020	-0.014	0.076	0.069
International tourism (consumer price)	0.334	0.345	0.348	0.344
Average nominal wage	-0.017	-0.022	0.007	-0.025
Real wage (before tax)	n.a.	-0.007	n.a.	-0.018
Real wage (after tax)	n.a.	0.010	n.a.	0.011
Average capital rental	-0.025	-0.014	-0.019	-0.015
Consumer price index	-0.017	-0.015	0.007	-0.007
GDP price index (exp)	-0.010	-0.010	0.012	-0.006
Absorption price index	-0.016	-0.015	0.005	-0.011
Export price index	0.031	0.028	0.040	0.027
Terms of trade	0.031	0.028	0.040	0.027
Real devaluation	0.010	0.010	-0.012	0.006

SR = short-run & LR = long-run effects.

[3] In Chapter Seven, we recognised tourism-related sectors in the development of TTM based on tourism dummy sectors. Tourism dummy sectors (international and domestic) purchase components from related sectors. The chapter shows that there are 26 (ORANI) such sectors in the case of domestic tourism, supplying their outputs to compile the tourism product.

According to general equilibrium theory, a special tourism tax (the tax change that we induced in the simulation) is analogous to a partial commodity tax. A partial commodity tax in one sector is similar to a general factor tax in the taxed sector (McLure and Thirsk 1975). This implies that such a tax can reduce the net return of all factors employed in the sector. Depending on the factor mobility, there could be an economy-wide reduction in factor returns. For example, in the case of full factor mobility, the return of all factors declines in all sectors. On the other hand, in the partial mobility case, the return of the mobile factor/factors declines economy-wide while the return of the immobile factor declines only in the affected sector/sectors.

In this simulation, the short-run closure represents partial mobility (i.e. the industry-specific current capital stock is fixed and the labour is the slack variable). As the output declines (tourism-related sectors), the usage of factors declines too. Labour being the slack variable (mobile factor) responds to this change by reducing the usage in the affected sectors (this will be further explained in the next section), with an economy-wide reduction in nominal wages as the real wage is fixed. Capital, on the other hand, is fixed (immobile factor) and cannot respond to the output contractions. Thus, the capital rental declines only in the affected sectors.

Moreover, the results indicate that, in order to maintain full employment, the gross rate of return declines as a result of the reduction of the capital rental. This implies that consumers of the taxed commodity (international visitors) and suppliers of factors (labour and capital) by which the taxed commodity is produced, together bear the price burden of the tax increase.

Table 8.1 shows that the CPI declines. However the result relating to the CPI slightly departs from general expectations regarding tax increases (i.e. tax increases result in CPI increases).[4] The CPI in the model is an index that reflects changes in consumer

[4] This is one of the advantages of explicitly defining the tourism sectors in the model. In the absence of tourism sectors in the model, tax changes such as those we experiment with should be induced into the model via an exiting tourism-related sector. Although international visitors consume a relatively large portion of the output of such sectors, household sector consumption is not negligible. Hence, tax increases induced via such sectors may increase the price of the commodity to both domestic households and international visitors. Subsequently, such simulations may provide results showing increases in the CPI. Gooroochurn and Sinclair (2005) carried out tourism tax simulations using some of the tourism-related sectors in their model and observed that the CPI increases.

prices of commodities and weights of each commodity in total household consumption. Since the tax increase in the principal policy is applied to international visitors only, only the consumer price of international tourism rises. Because of reductions in capital rental, prices of intermediate commodities and other cost tickets, household prices decline and subsequently the CPI declines.

The results also suggest that the export price index rises and this is totally due to the increased price of the international tourism product. While the export price of other commodities declines due to reduced costs of production, the increased tourism price is so substantial and it outweighs the reduction in prices of other commodities. Price indices of exports and imports determine the terms of trade in the model and the results suggest that the terms of trade have improved. Given that import prices are constant (as the small country assumption is made) the increase in the export price index improves the terms of trade. Table 8.1 further shows that there is an increase in real devaluation of domestic prices relative to foreign prices. This implies a favourable relative price effect in international trade for Australia. What brings the real devaluation? In the model, the real devaluation moves with the GDP price index and the import price index. Given that the import price index is constant, a reduction of the GDP price index by 0.0105 per cent leads the real devaluation by the same amount.[5]

So far we have discussed short-run price effects of the proposed tax increase. How do these results differ in the long-run? The changes in most price variables in the long-run are similar in direction but marginally different in magnitude. There are a few noteworthy points regarding the long-run results. First, the price increase in the composite international tourism product is marginally higher than in the short-run. This may suggest that tax shifting in the long-run is more pronounced than in the short-run. One of the major reasons for this difference is that both labour and capital are flexible in the long-run and hence less affected.

Second, the before-tax real wage rate (0.007 per cent) declines marginally (endogenous in the long-run). This marginal decline is because of the reduction in the CPI (0.015 per

[5] The real devaluation is defined in the model as $p0realdev = p0cif\_c - p0gdpexp$, where *p0realdev*, *p0cif_c*, and *p0gdpexp* are real devaluation, import price index and the GDP expenditure-side price index.

cent) although the nominal wage shows a greater reduction (0.022 per cent). However, what is more important in our simulations is the after tax real wage rate and the results show that it increases marginally by 0.010 per cent. This can be explained by looking at our closure selection. Note that these are budget neutral simulations and thus increased tourism taxes result in reduced income tax rates. Therefore, an improvement in the after-tax real wage rate can be expected. Third, unlike in the short-run, there is an economy-wide reduction in capital rental. This is because the restrictive assumption about the current capital stock has been relaxed in the long-run and accordingly a flexible current capital stock is assumed, while aggregate employment is fixed. Given these assumptions, output reductions cause reductions in the demand for current capital stock and hence the economy-wide reduction in capital rental.

The Alternative Policy

In the alternative policy in which there is no tax exemption for Australian residents, price changes are somewhat different. Unlike the principal policy, the consumer price of both domestic and international tourism commodities rises. In the short-run, an increase in PMC has led to a marginal increase in the CPI and thus the average nominal wage rises with the CPI. The average capital rental falls due to the reasons explained above. Moreover, results indicate that the reduction in nominal capital rental in the short-run is the second highest reduction among the simulations. This implies that there can be significant reductions in the rate of return.

8.3.1.2. Industry Effects

One of the important implications of a change in tax is that it distorts the producers' choice of production technique and factor employment. These distortions arise since producers respond to tax-induced changes in demand for commodities and hence output changes. In this section, these sectoral effects in our experimental simulations are examined.

Table 8.2 records changes in outputs and employment of mostly tourism-related industries. These industries are selected based on tourism sector purchases of the components of its composite product. Table 8.3, on the other hand, presents the industry results of all other industries. Some of the industries such as other manufactures, chemicals, and textiles shown in Table 8.3 are also tourism-related but are less affected by tourism activities.

Table 8.2: Industry Results (% changes)- Tourism-related Industries: Simulation 1

Industry	Narrow base				Broad base			
	Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Food products	0.001	0.002	0.004	0.006	-0.014	-0.019	0.003	0.005
Bev. & Cigarettes	-0.008	-0.020	-0.012	-0.009	-0.021	-0.051	-0.018	-0.014
Clothing & footwear	-0.001	-0.001	0.002	0.003	-0.019	-0.021	0.001	0.001
Petroleum & refinery	-0.016	-0.057	-0.013	-0.008	-0.027	-0.096	-0.018	-0.013
Retail	-0.009	-0.010	-0.002	-0.002	-0.009	-0.010	-0.003	-0.002
Repairs	-0.006	-0.008	0.001	0.003	-0.009	-0.012	0.001	0.003
Hotels & cafes	-0.051	-0.067	-0.048	-0.047	-0.064	-0.084	-0.058	-0.056
Road transport	-0.019	-0.024	-0.014	-0.013	-0.029	-0.036	-0.015	-0.014
Rail transport	-0.027	-0.032	-0.018	-0.018	-0.037	-0.044	-0.020	-0.019
Water transport	-0.139	-0.266	-0.164	-0.161	-0.155	-0.296	-0.165	-0.162
Air transport	-0.113	-0.142	-0.116	-0.115	-0.131	-0.165	-0.123	-0.122
Transport services	-0.016	-0.032	-0.016	-0.014	-0.026	-0.051	-0.018	-0.016
Communications	-0.005	-0.009	0.000	0.002	-0.010	-0.020	0.000	0.003
Finance services	-0.004	-0.005	0.002	0.003	-0.010	-0.014	0.002	0.003
Public service	-0.001	-0.001	0.001	0.001	-0.002	-0.002	0.002	0.002
Education	-0.022	-0.024	-0.020	-0.020	-0.028	-0.030	-0.019	-0.018
Other entertainment	-0.010	-0.013	-0.006	-0.005	-0.020	-0.027	-0.010	-0.008
Lib., museums & Arts	-0.018	-0.021	-0.015	-0.015	-0.025	-0.028	-0.020	-0.020
Gambling & recreation	-0.009	-0.015	-0.003	-0.002	-0.011	-0.017	-0.004	-0.002
Other services	-0.004	-0.005	0.003	0.004	-0.004	-0.005	0.004	0.005
Domestic tourism	0.001	n.a.	0.008	n.a.	-0.036	n.a.	-0.033	n.a.
International tourism	-0.665	n.a.	-0.686	n.a.	-0.692	n.a.	-0.684	n.a.

Emp. = employment.

In the short-run simulation, the increase in PMC has contractionary effects among the tourism-related sectors. As explained in the previous section, the tax increase leads to an increase in the price of international tourism and this increase in price reduces international tourism consumption. The reduction is almost two times higher than the price increase.[6] The international tourism (dummy) sector sells its output only to the export sector and thus the entire reduction in tourism consumption is reflected in the output contraction of the international tourism sector (see Table 8.2).

[6] This can be explained by looking at the international tourism demand equation of our model (Equation (7.4)) and the international tourism demand parameter applied. In the model we used –2 for the demand elasticity of international tourism in Australia. Given that demand elasticity is –2, the tax induced price increase leads to a reduction in tourism demand by almost two times (-2*0.334 = -0.665 a close proxy of the value given).

As the demand for international tourism contracts, the tourism-related sectors (being the main suppliers of the tourism sectors incorporated into our model) show similar output contractions. For instance, it is mostly the tourism-related sectors such as hotels & cafes, transport, beverages & cigarettes, petroleum & refinery, clothing & footwear, transport services, communications, finance services, education, other entertainment, library, museums and arts, gambling & recreation and other services sectors that are affected and contracted. Moreover, these industries can be considered mostly as non-traded industries in the absence of tourism. They are strongly influenced by changes in local demand patterns rather than changes in export demand. Following output contractions, these sectors then experience contractions in factor employment. As noted in the previous section, in the short-run labour is the mobile factor (industry-specific capital is fixed) and thus employment falls in each of these sectors. As shown in Table 8.2, the reduction in employment is greater than the output reductions.

The only exception shown in the table is the food products industry which experiences a marginal increase in output. As a strong tourism-related industry, tourism demand for food products declines but an increase in exports outweighs the reductions caused by the tourism contraction. Output changes of a similar pattern are evident among some of the other tourism-related sectors shown in Table 8.3 such as textiles and chemicals.

Table 8.2 also presents the long-run industry results and the results indicate that contractionary effects are somewhat moderate in the long-run. International tourism demand declines at a fractionally higher rate than in the short-run but most sectors show marginally less reduction in output. For instance, even hotel and cafes and some transport sectors (except air transport) that are strongly tourism-related are affected moderately. In fact, several sectors experience a marginal increase in output while one sector (communication) is unaffected. For example, the finance, public and other services sectors show very little increase in output and these sectors receive a relatively lesser proportion of total international tourism consumption. As expected, the employment effects are fully in line with output changes.

The output effects of all the other industries are recorded in Table 8.3 and the results indicate that most industries have shown expansions. Most of the industries shown in Table 8.3 are traded industries except for a few non-traded sectors such as electricity, gas and water supply, wholesale and retail.[7] Output of the traded industries is strongly driven by movements in competitiveness. As shown in Table 8.1 above, a favourable change in real devaluation is the reason for the contrasting industry results outlined above. It shows that real devaluation increases in all simulations that provide a favourable price advantage for traded industries in the world market. Among the industries that expand, relatively significant output increases are recorded in the textiles, agriculture, other manufacture and mining industries and, in fact, the share of exports in the total output of these industries is relatively higher than all the other industries.[8]

Table 8.3: Industry Results (% changes) - All Other Industries: Simulation 1

Industry	Narrow base				Broad base			
	Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Agriculture	0.010	0.021	0.015	0.024	-0.004	-0.008	0.016	0.026
Forestry & fishing	0.003	0.004	0.007	0.008	-0.009	-0.012	0.007	0.008
Mining	0.009	0.025	0.045	0.048	-0.002	-0.005	0.044	0.048
Textiles	0.016	0.019	0.024	0.025	-0.009	-0.010	0.025	0.026
Other manufacturing	0.010	0.012	0.017	0.018	-0.009	-0.011	0.017	0.018
Wood, paper etc.	0.002	0.002	0.007	0.009	-0.008	-0.012	0.007	0.009
Chemicals	0.012	0.018	0.020	0.022	-0.006	-0.009	0.020	0.023
Non-metallic mineral	0.005	0.007	0.009	0.011	-0.003	-0.005	0.009	0.012
Metallic products	0.016	0.002	0.028	0.030	-0.005	-0.007	0.029	0.031
Motor vehicle & parts	0.013	0.021	0.028	0.030	-0.005	-0.008	0.028	0.031
Aircraft	-0.044	-0.051	-0.051	-0.050	-0.071	-0.083	-0.054	-0.053
Electricity, gas, water	-0.002	-0.005	0.006	0.008	-0.005	-0.016	0.007	0.010
Construction	0.001	0.001	0.000	0.001	0.004	0.005	0.000	0.001
Wholesale	-0.001	-0.001	0.005	0.005	-0.009	-0.011	0.005	0.005
Owner dwelling	0.000	-0.002	0.012	0.015	0.000	-0.001	0.018	0.021

Emp. = employment.

In the short-run, the main components of domestic absorption: household, government and investment demand, are exogenised. Therefore, the available alternative in order for the industries to expand their output is to increase exports and intermediate sales, and it is essential that these industries reduce output prices. The results indicate that the output prices of all industries fall. This is the logic behind the outcome for the industries. Traded industries (shown in Table 8.3) face a relatively elastic demand while non-

[7] Industries could be categorized as traded (industries with a larger export share) and non-traded (industries whose sales mainly depend on local demand).

[8] The output results presented here are generally in line with prior expectations. In a CGE setting, the taxed sector output contracts due to a decline in demand and the untaxed sector (sectors) expands as a result of increased demand. More specifically, our results confirm those of Alavalapati and Adamowicz (2000). They found a tax imposed on the tourism sector leads to a significant contraction in the sector (price of tourism product increases, demand declines and thus output contracts) while the other sector expands (two sector model).

traded or tourism-related industries face inelastic demand. As the short-run supply curves of all industries shifts down due to the reduction in variable costs, traded industries manage to expand output considerably (given the elastic demand) while non-traded industries experience a relatively small increase in output expansion with high price reduction. As explained above, non-traded industries face a severe reduction in demand, crippling net output effects.

What makes it possible for industries to reduce their input costs in the short-run? As explained in the previous section, both nominal wages and nominal capital rental declines in the short-run. Reductions in factor prices lead to an economy-wide reduction in input cost. Lower input costs, then, lead to a fall in output prices/costs for all industries. Subsequently, such a reduction in the output prices of all industries can bring the CPI further down, initiating another cycle of wage reduction. This process of changing interrelated wages, the CPI and output prices occur until final equilibrium is achieved in the general equilibrium setting. This process has two types of effects: the impact and the second-round effects (Horridge *et al.* 2003). The first reduction in the CPI due to tax changes is the impact effect and the successive changes are the second-round effects.

There are a number of exceptional cases where the industry results reveal an unexpected outcome. For instance, aircraft; electricity, gas and water and wholesale sectors that are not directly tourism-related, experience output contractions. This can be explained as an induced effect of a reduction in tourism consumption. Among these industries, the first two, particularly the aircraft industry, are heavily dependent on their supply to intermediate sectors. For instance, the aircraft sector supplies 74 per cent of its output to intermediate sectors out of which 81 per cent is sold to the air transport sector. As explained above, the air transport sector is among the hardest hit by tourism demand reduction. Given the heavy reliance on one of the affected sectors, the aircraft sector's intermediate demand declines heavily resulting in a contraction in the sector. The electricity, gas, and water sector experiences a similar condition. Moreover, the wholesale sector's contraction is mainly caused by reductions in demand for the wholesale sector as a margin service sector. The wholesale sector is the largest margin service sector among the five margin service sectors.

The Alternative Policy

As far as the results of the alternative policy are concerned, there are two important points that need to highlight. First, the results suggest that the short-run contractionary effects among tourism-related sectors are greater than those of the principal policy. Table 8.2 shows that both the domestic and international tourism sectors contract. Although the domestic tourism sector contraction is comparatively very small, it can also generate significant negative effects given that the domestic tourism sector is almost three times larger than international tourism in Australia. When the strong domestic tourism sector and the international tourism sector contract, all the tourism-related sectors are badly affected. Thus, high unemployment rates are also observed among tourism-related sectors in the short-run.

Second, the results show that even traded industries experience output contractions (in the short-run) unlike in the principal policy where those sectors expand (c.f. Table 8.3). In the alternative policy simulation, the increase in PMC is applied to all departures and hence it has a greater influence than the principal policy. The output contractions of these sectors are mostly due to increased output prices in the short-run. As shown in Table 8.1, this simulation generates an increase in the CPI and thus nominal wages and the price of other cost tickets increase as they are indexed to the CPI in the short-run. Although the nominal capital rental of most industries declines, the output prices are driven by increased wages and the price of other cost tickets (short-run variable cost). Accordingly, increased output prices tend to discourage exports and hence output contractions. Moreover, the short-run supply curves of most industries might have shifted upward following the increases in the short-run variable cost. When supply curves shift upward, traded industries tend to experience output contractions.

8.3.1.3. Household Consumption Effects and Welfare Changes

The tax induced changes in commodity and factor prices explained in earlier sections alter household income and thus changes in household consumption can be expected. In this section, using results of the single representative household in our model, changes in household consumption and subsequent welfare changes are examined.[9] In the short-run, the model assumes that real household consumption is fixed. Therefore, tax-

[9] Refer Section 7.2.1 and Appendix B for more information about household demand.

induced relative price changes can only change the composition of household demand in our model. Thus, short-run changes in household consumption have very few policy implications against the background of tax changes. Therefore, in this section, short-run household demand changes are not presented. In contrast, the model assumes that real household consumption is determined endogenously in the long-run. Subsequently, results relating to household consumption reveal changes in household consumption of commodities in response to both price changes as well as changes in household expenditure. Thus, such changes not only alter the composition of the consumption of commodities but also the level of the consumption. In this context, long-run results carry vital policy implications.

Table 8.4 presents percentage changes in the purchaser's prices of commodities and subsequent changes in consumption of commodities. Results show that the prices of all commodities decline except the price of domestic tourism in the alternative policy. As explained in previous sections, output price reductions cause consumer price reductions. Following price reductions, household consumption of those commodities responds by increasing. However, the extent of the percentage changes in prices and consumption in the alternative policy is marginally higher than those of the principal policy.

Table 8.4: Changes in Household Consumption (% changes): Simulation 1

Industry/Commodity	Narrow base long-run		Broad base long-run	
	Consumer prices	Consumption	Consumer prices	Consumption
Agriculture	-0.011	0.005	-0.013	0.008
Forestry & fishing	-0.014	0.004	-0.016	0.006
Mining	-0.016	0.008	-0.016	0.012
Food products	-0.013	0.002	-0.014	0.003
Beverages & Cigarettes	-0.011	0.003	-0.011	0.004
Textiles	-0.013	0.005	-0.014	0.007
Clothing & footwear	-0.013	0.002	-0.014	0.003
Other manufacturing	-0.012	0.008	-0.013	0.012
Wood, paper etc.	-0.014	0.008	-0.015	0.012
Petroleum & refinery	-0.010	0.006	-0.011	0.009
Chemicals	-0.015	0.008	-0.016	0.012
Non-metallic mineral	-0.013	0.008	-0.014	0.012
Metallic products	-0.012	0.008	-0.013	0.012
Motor vehicle & parts	-0.011	0.007	-0.012	0.010
Aircraft	-0.002	0.001	-0.002	0.004
Electricity, gas, water	-0.015	0.008	-0.016	0.012
Construction	-0.015	0.007	-0.016	0.010
Wholesale	-0.015	0.008	-0.016	0.012
Retail	-0.018	0.010	-0.019	0.014
Repairs	-0.016	0.009	-0.017	0.012
Hotels & cafes	-0.014	0.008	-0.015	0.012
Road transport	-0.012	0.001	-0.013	0.002
Rail transport	-0.014	0.003	-0.015	0.004
Water transport	-0.009	0.001	-0.009	0.002
Air transport	-0.009	0.010	-0.009	0.017
Transport services	-0.010	0.005	-0.010	0.009
Communications services	-0.015	0.008	-0.016	0.012
Finance services	-0.017	0.009	-0.018	0.013
Owner dwelling	-0.017	0.015	-0.018	0.021
Public service	-0.018	0.010	-0.020	0.014
Education	-0.019	0.011	-0.021	0.015
Other entertainment	-0.013	0.007	-0.013	0.010
Library, museums & Arts	-0.017	0.009	-0.018	0.013
Gambling & recreation	-0.015	0.009	-0.015	0.012
Other services	-0.018	0.009	-0.019	0.013
Domestic tourism	-0.014	0.008	0.069	-0.033
International tourism	n.a.	n.a.	n.a.	n.a.

Different measures of welfare changes in relation to tax changes are presented in Chapter Two. Among these measures, Laspeyre cost difference (LCD) and Paasche cost difference (PCD) were applied to estimate tax induced welfare changes in the current study.[10] In addition to these two measurements, the percentage change in real consumption is also used as a welfare measure. In our model, real consumption should

[10] Note that Chapter Two outlines the advantages of these two measures over the others and, in particular, these measures are easy to interpret and less tedious to estimate. Most of the other methods require the use of parameters from utility functions. Practically, accurate and reliable information of this nature is not easy to obtain.

reflect a legitimate measurement of welfare changes in simulations because real consumption measures the changes in volume of consumption in the long-run.

Table 8.5 records welfare changes estimated using all measures and they indicate a general improvement in domestic consumer welfare in the long-run.[11] Percentage changes of domestic welfare were converted to a money measure in 1996-97 and 2002-03.[12] The results suggest that an increase in tourism taxes (PMC in this case) to recover the external cost of tourism could improve domestic welfare during the long-run even though the same tax change might negatively affect international tourism consumption in Australia.

Table 8.5: Welfare Changes (% of consumption expenditure): Simulation 1

Description	Narrow	Board
PCD (% of consumption expenditure)	0.0084	0.0075
LCD (% of consumption expenditure)	0.0084	0.0075
Real consumption (percentage change)	0.0084	0.0075
Money measure (96/97)		
PCD ($ million, 96/97)	27.46	24.49
LCD ($ million, 96/97)	27.46	24.46
Real consumption ($ million, 96/97)	27.46	24.47
Money measure (2002/03)		
PCD ($ million, 2002/03)	38.31	34.14
LCD ($ million, 2002/03)	38.30	34.12
Real consumption ($ million, 2002/03)	38.30	34.13

Furthermore, results show that the extent of welfare improvement in the alternative policy is moderately less than the principal policy. This is not surprising as in the alternative policy household consumption of domestic tourism declines due to price increase and hence the welfare improvement is less.

[11] Our results on welfare changes arising from tourism taxes confirm earlier claims by Gooroochurn and Sinclair (2003, 2005). They argued that tourism taxes tend to be welfare-improving and noted that the extent of welfare improvements arising from a narrow base tourism tax policy is higher than a broad base policy. Additionally, Blake (2000) found an increase in the accommodation tax in Spain to be welfare-improving.

[12] We estimated a money measure of welfare in 1996-97 using total consumption expenditure, since measurements are percentage changes of consumption. This measurement for 1996-97 is then used to estimate welfare change in 2002-03 using the GDP figures in two years (welfare change/GDP 96-97*GDP 2002-03). This is reasonable, as we have adjusted tourism consumption figures from 2002-03 to 1996-97 using GDP ratio in a similar manner.

There are two highlights in the estimation of welfare changes. First, welfare changes measured both by PCD and LCD tend to be almost identical in size. Dixon and Rimmer (1999a) pointed out that there is very little difference between the paths of PCD and LCD. They estimated changes in welfare based on policy and forecast simulations of the dynamic CGE model: MONASH. In the current study, our simulations are carried out using a static CGE model and thus very fine differences in estimations may not be evident. Second, changes in welfare estimations are also identical to changes in real consumption. Of these two measures, PCD in particular is a measurement of change in income (that could occur due to tax changes), which would enable a new bundle of commodities to be purchased after the tax change, based on existing prices of commodities. The estimation of percentage change in real consumption in our model takes almost the same form. Thus, in the current study changes in real consumption provides a very close approximation of welfare changes arising from tourism tax changes[13].

8.3.1.4. Macroeconomic Effects

Table 8.6 presents the macroeconomic results of all simulation experiments in the percentage change form. The results suggest that, under the principal policy, the short-run yields a decline in GDP (by 0.005 per cent). This implies that the PMC increase has generated overall negative effects within the economy.[14] The contraction in GDP can be explained/justified mainly in two ways: from the income side and from the expenditure side. From the income side, the macroeconomic results show that aggregate employment declines (0.007 per cent). Real GDP at factor cost has declined by 0.005 per cent. This is the same as the variable aggregate primary factor use. What causes this

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[13] PCD is estimated using $PCD = \sum_{i=1}^{n} \beta_i * \Delta x_i$

Where β_i measures the share of household budget (pre-tax) accounted for by commodity i and Δx_i represents percentage changes in household consumption of commodity i.

Real consumption in the model (*x3tot*) is estimated using $x3tot = \sum\left[\left(V3PUR_s^c / V3TOT\right) * x3_s^c\right]$

Where *V3PUR* and *V3TOT* are the purchaser's value on commodity c from source s and total household expenditure on all goods and services and *x3* is the percentage change in household consumption in commodity c from source s. The first element in the right-hand side of the second equation is the same as β in the first equation.

[14] Short-run contractionary results confirm the earlier similar results by Gooroochurn and Sinclair (2005).

decline in GDP at factor cost/aggregate primary factor use?[15] The model assumes that the percentage change in real GDP at factor cost is equal to the sum of change in employment and change in capital. As the stock of capital is fixed in the short-run, GDP at factor cost/aggregate primary factor use should move with aggregate employment.

Table 8.6: Macroeconomic Results (% change): Simulation 1

Variable description	Narrow base		Broad base	
	SR	LR	SR	LR
Real GDP (expenditure side)	-0.005	0.001	-0.011	0.001
Real GDP (at factor cost)	-0.005	0.002	-0.011	0.002
Aggregate employment	-0.007	-	-0.016	-
Aggregate capital stock, rental weights	-	0.005	-	0.006
Real household consumption	-	0.008	-	0.008
Real household disposable income	0.005	0.012	0.000	0.012
Income tax rates	-0.045	-0.061	-0.065	-0.101
Export volume	-0.044	-0.031	-0.076	-0.029
Import volume	-0.015	-0.010	-0.015	-0.011
Contribution of BOT to real GDP (expenditure side).	-0.005	-0.004	-0.011	-0.003

The most important macro explanation for the changes in aggregate employment is that it depends on the real producer price of labour or the marginal product of labour (MP_L), a variable that has increased as a result of increase in PMC in the short-run. The increase in the marginal product of labour results in reduced aggregate employment.[16]

[15] This can be explained using a back-of-the envelope macro equation (BOTE). These equations are derived based on the equations of the ORANI model and are considered as parts of simplified models of the model. These are very useful to explain macroeconomic results.

BOTE 1: $V1PRIM\_I * x1prim\_i = V1LAB\_I * employ\_i + V1CAP\_I * x1cap\_i - V1LAB * a1lab\_i$

Where V1PRIM_I, V1LAB_I, and V1CAP_I are the total primary factor payment, total labour payment and total capital payments for all industries, respectively, and the lower case variables are percentage change in each of these coefficients, a1lab_i is a technical change variable.

This equation defines the change in real GDP at factor cost as the sum of change in employment and change in capital plus cost savings from technological progress. In the short-run, capital stock and all technological changes are fixed and thus, the last two components of the equation are redundant. The share of labour in total factor use/aggregate value added (V1LAB_I/V1PRIM_I) is 67.35 per cent. Given that the percentage change in aggregate employment (employ_i) declines by 0.0072, GDP at factor cost declines by 0.0048 (0.6735*-0.0072).

[16] The following equation describes the change in the marginal product of labour,

BOTE 2: $\left[(p1lab\_io + a1lab\_io) - p1prim\_i\right] = -\frac{S_K}{S_L}(p1cap\_i - p1prim\_i)$

where *p1lab_io, p1cap_i* and *p1prim_i* are average nominal wage, aggregate capital rental, and index of factor cost, respectively, and a1lab_io is the labour augmenting technical change variable. S_K (V1CAP_I/V1PRIM) and S_L (V1LAB_IO/V1PRIM_I) are the shares of capital and labour in aggregate value added.

The above equation describes that the percentage change in MP_L is determined by the percentage change in the marginal product of capital multiplied by minus the capital labour ratio. As shown in Table 8.1, aggregate capital rental and index of factor cost figures are –0.0170 and –0.0191, respectively, and labour and capital shares are estimated as 31.5 and 67.3 per cent, respectively. The technical change variable

What are the reasons behind the increase in MP_L? In order for MP_L to increase (the real producer wage), real consumer wages should increase. However, the short-run closure assumes that real consumer wages remain unchanged. In the absence of real consumer wage changes, MP_L (the real producer wage) is driven by changes in the terms of trade and indirect taxes.[17] Given that the increase in PMC increases the terms of trade and indirect taxes, MP_L (the real producer wage rate) rises.

From the expenditure side, in the short-run closure, all components of the domestic absorption (household consumption, investment, government consumption and inventories) are fixed and the trade balance is the swing variable. In this context, the reduction in GDP can be explained by a worsening trade balance (severe reductions in exports). This means that balance of trade should move towards a deficit in the short-run. The impact of the balance of trade deficit in changing GDP is explained by the variable, contribution of BOT to the real expenditure side GDP, as it declines by the same rate as GDP decline (0.005). The reduction of this variable is initiated by the

appearing in the right hand side is fixed. When these figures are substituted in Equation 2, it suggests that MP_L increases by 0.0021 per cent.

[17] The following equation defines how MP_L changes.
BOTE 3: $MP_L = realwage + (p3tot - p0gne) + (p0gne - p0gdp\exp) + (p0gdp\exp - p1prim\_i)$
where *p3tot*, *p0gne* and *p0gdpexp* are consumer price index, GNE price index and GDP expenditure side price index.

This equation describes that MP_L is moving with a number of variables. The most important is real wage presented in the right-hand side and it is assumed that real wage is exogenous. In the absence of real wage changes, the above equation describes MP_L as a function of two ratios (p0gne/p0gdpexp and p0gdpexp/p1prim). The former is a function of the terms of trade while the latter (p0gdpexp/p1prim) is a function of the rates of indirect tax. The results show that the terms of trade improve and with increased terms of trade, the ratio of p0gne/p0gdpexp declines. This is because p0gne includes the prices of imports but not exports while p0gdpexp includes the prices of exports but not imports. In the simulation, due to increased tourism taxes on international visitors, export prices increase. This leads to an increase in the terms of trade and hence the p0gne/p0gdpexp ratio declines (by 0.0057). On the other hand, as a result of increased tourism taxes the p0gdpexp/p1prim ratio increases (by 0.0085). In the absence of the terms of trade, MP_L should rise by 0.0085 and increased MP_L implies that capital/labour ratio (K/L) increases as well (This is because MP_L is a positive function of K/L whereas MP_K is a negative function). In the short-run capital is exogenous and hence labour should fall.

However, changes in the terms of trade in the short-run generates opposite effects on labour. When the terms of trade increase, p0gne/p0gdpexp ratio decreases. A decline in p0gne/p0gdpexp causes a similar decline in MP_L, signalling a decrease in the capital/labour ratio. Given that capital is fixed, this should result in an increase in labour. Final results, however, show that aggregate employment declines. This is because as a result of increased terms of trade the p0gne/p0gdpexp ratio increases only by 0.0057 less than the p0gdpexp/p1prim ratio (0.0085). This suggests that MP_L is increased virtually only by 0.0028, much less than what would have otherwise been in the absence of the terms of trade changes. An increase in MP_L results in an equal increase in the K/L ratio and given the fixed capital in the short-run this suggests that labour should decline. This also explains the fact that the improved terms of trade had its effect on MP_L to slow down its possible growth.

contribution of exports to GDP by –0.0081 and the contribution of imports to GDP by 0.0027.

It was observed earlier that the increase in the price of the composite international tourism product has pushed the export price index up by 0.031 per cent. Such an increase in export price index leads to a significant reduction in export volume by 0.044 per cent which is more than the increase in the price index. The model assumes an elastic demand for exports, including international tourism. This results in a considerable change in export volume to a smaller change in export prices. On the other hand, the import volume has declined by 0.015 per cent. What is the impact of these changes on the real foreign trade balance? These changes generate a considerable deficit in the trade balance and GDP should decline to restore the equilibrium on the expenditure side. The significant reduction in export volume can also be explained as mainly due to a reduction in international tourism consumption. Moreover, the contraction in export volume causes the terms of trade to rise, as shown in Table 8.1.

In contrast to the short-run contractionary effects, an increase in PMC, leads to a marginal expansion of the economy in the long-run. This is represented by an increase in real GDP of 0.001 per cent. As explained above, changes in GDP can be analysed in two aspects: income side and expenditure side. In the income side, it can be explained due to changes in primary factors. In our model, aggregate employment is fixed in the long-run. Thus, the major contributory factor for the GDP increase is aggregate capital stock. Table 8.6, column 3 shows that aggregate capital stock has increased by 0.005 per cent which leads the GDP increase.

Changes in aggregate capital stock may be explained by referring to the changes of marginal product of capital (MP_K).[18] In order for aggregate capital stock to rise, MP_K should fall. In our model, MP_K is a negative function of the terms of trade. This implies that if the terms of trade rise, MP_K would fall. Our results confirm that the terms of trade rise by 0.028 per cent (Table 8.1) and thus it can cause a decrease in MP_K. A decrease in

[18] BOTE 4: $MP_K = RR + (p0gne - p0gdp) + (p0gdp - p1prim\_i)$, where RR is the rate of return on capital and the other two ratios are as in MP_L in BOTE 3.
The rate of return on capital is fixed in the long-run and hence MP_K moves with the other two ratios. The first ratio is a negative function of the terms of trade whereas the second ratio is a positive function of the rates of indirect taxes.

MP_K requires that the K/L ratio to improve. Given that aggregate employment is fixed in the long-run, the capital stock increases. It should also be mentioned here that the increase in the capital stock is not a part of domestically-financed capital but a part of foreign-financed capital since we have explicitly linked changes in capital with the foreign capital.[19]

From the expenditure side, the GDP increase can be explained by referring to the changes of the domestic absorption. In our model, only real household consumption is endogenous. The other two components of the domestic absorption, real government spending and real investment, are assumed to be exogenous. Therefore, the major contributory factor behind the GDP increase is the increase in real household consumption (see for example, Table 8.6 shows that real household consumption has increased by 0.008 and this can be considered as the welfare improvement of tourism taxes).

What is the reason behind the increase in real household consumption? This could be linked to the improved K/L ratio due to increased terms of trade. As noted above, the aggregate capital stock increased because of improvements in the K/L ratio. The K/L ratio and MP_L change in the same direction. This implies that MP_L in the long-run increases and such increases result in a rise in the after-tax real wage rate. Our results confirm that the after-tax real wage rate improves by 0.010. Thus, the increased income arising from increased MP_L causes an increase in real consumption. Moreover, the improvement in the terms of trade implies that more imports can be obtained for a given level of exports for local consumption. In summary, our results suggest that the total improvement of the terms of trade due to tourism taxes is reflected in increased real consumption and it fully represents a welfare improvement. This justifies our earlier estimations of welfare changes based on real consumption and alternative estimations.[20]

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[19] This is the nature of our modified long-run closure where aggregate investment is fixed. This implies that Australians undertake no extra investment, purchase no extra capital and owes no extra debt. This could guarantee that extra resources generated from a higher terms of trade would not leak into investment, or to acquire extra capital Thus, all changes in capital are foreign capital.

[20] Note that the long-run closure adopted in this simulation assumes that only real consumption is flexible among the components of domestic absorption. This implies that any cost or benefit arising from tax changes is represented by a change in consumption. Accordingly, changes in consumption arising from tourism tax changes provide a valid indicator of the welfare effects of such tax changes. Dixon and

Another positive aspect of a tourism tax increase, which has some important long-run implications, is the improvement in real household disposable income. The results show that in the long-run, real household disposable income rises by 0.012 per cent. This improvement results from both reductions in income tax rates and the CPI. The results show that income tax rates fall by 0.061 per cent due to the redistribution of increased government tax revenue arising from tourism taxes. As our model has created a link between real household disposable income and real consumption, the increase in real consumption explained above can also be linked to improved household income.

The Alternative Policy

As expected, the results of the alternative policy simulation show that all macroeconomic variables change in the same direction in the short-run but the results are more pronounced than in the principal policy. For instance, real GDP reduction is more than twice as high in the alternative policy than in the principal policy. The reduction in real GDP is driven by higher unemployment. By contrast, the alternative policy in the long-run has mostly generated similar results as in the principal policy. For instance, real GDP rises by the same amount and from the expenditure side this is represented by a similar increase in real consumption. It is also noticeable that contraction in exports volume is marginally less in the alternative simulation. Overall, as emphasised earlier, although the alternative policy brings similar changes in most macro variables in the long-run, considering short-run severe reductions in GDP, employment, and exports, including international tourism consumption, it appears that the principal policy is a better alternative.

8.3.1.5. A Summary of Results

In preceding sections, we presented detailed results of simulation one in which we considered an increase in tourism taxes i.e. an increase in PMC. Results are presented under changes in prices, industry effects, household consumption effects and welfare changes and macroeconomic effects. This section provides a summary of results.

An increase in tax on international tourists could increase the price of international tourism in Australia. This can also lead to an increase in the export price index.

Rimmer (1999a) and Wittwer and Anderson (1999) adopted a similar closure in their studies that measure impact of GST tax package.

Resulting from the increase in the export price index, the terms of trade improves. Moreover, results suggest that the average nominal wage and average capital rental decline. If the tax increase is effective for both international and domestic visitors, the price effects tend to be moderately high.

The industry results are consistent with prior expectations that increased tourism taxes can cause reductions in tourism consumption and hence tourism-related sectors are adversely affected. Adverse effects are explained in terms of both output reductions and increased unemployment in these sectors. However, the results suggest that in the long-run such adverse effects are easing to a certain degree due to relaxation of some of the assumptions. Overall, the industry results highlight several important points. First, it appears that tourism taxes (based on a PMC increase) can be expansionary for traded industries. Second, such expansionary effects are more pronounced in the long-run than in the short-run. Although industries gain output expansions in the short-run, only the labour market is flexible enough to respond to an increased demand for labour. Thus, it may supply enough labour to those industries (mainly traded industries). However, as there are capital constraints in the short-run, positive output effects are less pronounced. Third, tourism taxes can be contractionary for tourism-related (or non-traded) industries. Fourth, these contractionary effects are more pronounced if the tax increase is effective for both international and domestic tourists.

As far as macroeconomic effects are concerned, the short-run results indicate that the Australian economy experiences a contraction when tourism taxes are increased. The economic contraction is in the nature of reduced GDP and increased unemployment. In contrast, the long-run macroeconomic results show that the economy benefits marginally from the increase in tourism taxes. Real GDP increases and the aggregate capital stock rise because of increased foreign-owned capital in Australia. From the expenditure side, real household consumption increases resulting from an increase in the terms of trade. Moreover, when increased government tax revenue is redistributed as reductions in income taxes, real household disposable income tends to rise. Subsequently, real household consumption is encouraged by improved household disposable income. Based on such favourable results, it appears that tourism taxes are welfare-improving in the long-run.

8.4. Simulation Two: A Tax on Accommodation Services

In Chapter Five, Section Two, the second policy scenario was formulated as "the current tax contribution made by the Australian international tourism sector seems to be insufficient to fund tourism-related public goods in Australia, thus there appears to be a case for further government intervention in international tourism". Furthermore, this assessment suggests that approximately $110 million could be raised from international visitors via tourism taxes to cover the gap in the estimated cost of public goods consumed by international visitors.

An important decision concerns the appropriate tax tool for this purpose. With regard to the cost of public goods, the existing commodity tax structure may be the best possible alternative. For instance, an increase in the GST could better serve the purpose. However, one major limitation of the use of a general commodity tax such as the GST is its inability to discriminate. Moreover, a general increase in a commodity tax such as the GST may not be a viable alternative as it would lead to domestic inflationary pressures and hence a domestic welfare loss.

Given the problems with the general taxes, the second best alternative is to use a special tourism tax. When the recent literature is explored, it is evident that the accommodation tax is a well-placed alternative. Accommodation tax is a common and popular tax with governments around the world.[21] Giesecke *et al.* (1997) noted that an accommodation tax is justified on efficiency grounds as such taxes provide a means of collecting revenue to fund the provision of public goods used by visitors to a region. Moreover, they argued that if properly evaluated, the accommodation tax is a relatively benign tax in terms of its effect on regional economic development.[22]

The choice of a tax on accommodation services consumed by tourists for the purpose at hand may be justifiable due to a number of reasons. First, traditionally income taxes from local taxpayers are the main source of funding for the provision of public goods. However, a direct tax such as income tax cannot be imposed upon international visitors and hence is not an alternative. Second, the imposition of indirect taxes on

[21] This has been used in the US, Canada, Japan, India and most of the other countries.

[22] In Australia, the government of New South Wales imposed an accommodation tax in the preparation to 2000 Olympic Games. Refer Section 4.3.2.5 for more information.

complementary goods associated with public goods, such as taxes on accommodation, can be considered the same as charging for public goods (Clarke 1997). Third, an accommodation tax is easy to implement, has a relatively large tax base and it is more likely that a considerable tax income can be raised with a small tax change. This is the case for international visitors in particular as they spend a large portion of their total tourism expenditure on accommodation.

In this simulation experiment, an ad-valorem tax of 4.5 per cent on accommodation services is assumed and the tax rate is determined to raise \$110 million (the gap in the estimated cost of public goods) based on the current expenditure on accommodation by international visitors (i.e. the expenditure by international visitors on accommodation that appeared in Tourism Tax Model). Two alternative policy scenarios are considered, the narrow base and broad base:

i. The principal policy: the imposition of an accommodation tax is only applied to international visitors in all states and territories in Australia.
ii. The alternative policy: as an alternative the imposition of the accommodation tax is considered for both international visitors and domestic visitors to see whether there are major differences in results.

Both short-run and long-run simulations are carried out to analyse the effects of an accommodation tax on prices, industry outputs and factor usage, household consumption and its welfare and macro variables.[23] In the discussion we mainly focus on results of the principal policy change. Wherever necessary, a highlight of results of the alternative policy that could differ from those of the principal policy is given separately. Moreover, in the discussion, short-run results are presented first followed by the long-run results.

8.4.1. Changes in Prices

This section presents changes in prices of experimental simulations carried out and the results are presented in Table 8.7. It shows that tax-induced price changes are in line with the theoretical expectations. Moreover, the results suggest that percentage changes

[23] We applied the same two economic environments (closures) representing the short-run and the long-run effects, as in simulation one. All simulations are budget neutral. Detailed information about the assumptions is given in Section 8.2.

in most price variables are similar in direction to those of simulation one, but considerably different in magnitude. For instance, the price of the composite international tourism product (taxed commodity) increases in the short-run by 0.876 per cent. This is almost three times higher than that in simulation one. However, it is not surprising given that the tax increase in this simulation is considerably higher than in simulation one. Although, the price increase in international tourism is around one per cent, this is significant as it reflects the change in price of a composite commodity.

Among the price variables, both the average nominal wage and the average capital rental decline and the reasons behind such reductions are the same as explained in simulation one. The reduced factor prices, however, have been transferred into lower commodity prices. As reflected in the CPI, local commodity prices have shown an economy-wide reduction. Therefore, the rise in real income that would arise as a result of reduced commodity prices may offset the negative effects of a low factor return on factor suppliers. In contrast to local commodity prices, the price of exports has risen, as shown by the export price index. The increased export price index is also instrumental in bringing about increased terms of trade.

Table 8.7: Percentage Changes in Prices: Simulation 2

Variable description	Principal policy		Alternative policy	
	SR	LR	SR	LR
Domestic tourism (consumer price)	-0.053	-0.037	1.270	1.103
International tourism (consumer price)	0.876	0.903	1.062	0.889
Average nominal wage	-0.044	-0.057	0.286	-0.101
Real wage (before tax)	n.a.	-0.019	n.a.	-0.168
Real wage (after tax)	n.a.	0.026	n.a.	0.030
Average capital rental	-0.065	-0.037	0.016	-0.050
Consumer price index	-0.044	-0.038	0.286	0.067
GDP price index (exp)	-0.027	-0.026	0.283	0.029
Absorption price index	-0.042	-0.039	0.246	0.017
Export price index	0.080	0.073	0.202	0.065
Terms of trade	0.080	0.073	0.202	0.065
Real devaluation	0.027	0.026	-0.282	-0.029

SR = short-run & LR = long-run effects.

During the long-run, the price effects of the accommodation tax show the same pattern as in the short-run though the percentage changes are marginally different. For instance, the increase in price of the international tourism product is marginally higher in the long-run than that of the short-run. Moreover, the nominal wage rate changes independently from the CPI, since there is no wage indexation (with the CPI). Given that the real wage is flexible, reduction in the nominal wage causes deterioration in the before-tax real wage and this is worsened further as the general price level increases, to an even at a lesser extent than in the short-run. However, the results suggest that the after-tax real wage improves.

The Alternative Policy

The price results of the alternative policy appear to differ slightly from those of the principal policy in three occasions. First, a tax on accommodation has resulted in an increase of the prices of both domestic and international tourism products in Australia. Second, unlike the principal policy, the increase in the price of domestic tourism could result in increased domestic price levels and, accordingly, as shown by the CPI, domestic commodity prices are adversely affected. Third, average capital rental also shows a marginal increase in the short-run. The marginal increase is due to the increase in capital rental in some of the capital-intensive sectors such as owner dwellings and construction.[24]

8.4.2. Industry Effects

Table 8.8 presents the industry results of the accommodation tax experiment. The results of this simulation, particularly the direction of changes in variables, are similar to the results of simulation one. However, output reductions among tourism-related sectors are considerably higher in this experiment than those of simulation one. Understandably, such reductions are initiated by the significant reduction in the output of the tourism sectors due to the imposition of a higher tax. For instance, the output of the international tourism sector declines by 1.7 per cent (the principal policy). Accordingly, the tourism-related sectors shown in Table 8.8 are affected. The most

[24] Analogous to what is seen in the principal policy, reductions in employment push the price of capital of the relevant sectors down given the fixed capital. Industry results confirm these changes. Capital rental is determined by labour and capital share in total primary factor cost, composite primary factor cost and nominal wages, as shown in the following equation.

$plcap = \frac{1}{SK}\left(p1prim - SL * p1lab\_o\right)$, where p1cap and p1lab_o are capital rental and nominal wages, SK and SL are the shares of capital and labour in total primary cost, and p1prim is the composite primary factor cost.

As explained earlier, nominal wages increase and, given that almost all these service industries are more labour intensive, this leads to an increase in the composite primary factor cost. Thus the reduction of employment does not reduce capital rental in the other relatively capital intensive sectors. Therefore, the average rental of capital, shown in Table 8.7, increases marginally.

affected are the transport service sectors, and hotels and cafes. Employment levels contract according to the output contractions.

Table 8.8: Industry Results (% changes)- Tourism-related Industries: Simulation 2

Industry	Principal policy				Alternative policy			
	Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Food products	0.003	0.004	0.011	0.015	-0.199	-0.276	-0.009	0.000
Bev. & Cigarettes	-0.021	-0.053	-0.030	-0.022	-0.192	-0.474	-0.118	-0.100
Clothing & footwear	-0.001	-0.002	0.006	0.008	-0.254	-0.275	-0.018	-0.016
Petroleum & refinery	-0.041	-0.148	-0.033	-0.022	-0.190	-0.686	-0.104	-0.080
Retail	-0.025	-0.025	-0.006	-0.005	-0.024	-0.025	-0.013	-0.012
Repairs	-0.016	-0.020	0.003	0.007	-0.058	-0.075	0.005	0.012
Hotels & cafes	-0.133	-0.174	-0.124	-0.122	-0.310	-0.407	-0.259	-0.253
Road transport	-0.051	-0.061	-0.038	-0.035	-0.187	-0.227	-0.050	-0.044
Rail transport	-0.071	-0.084	-0.047	-0.046	-0.201	-0.238	-0.070	-0.067
Water transport	-0.363	-0.690	-0.425	-0.418	-0.576	-1.095	-0.446	-0.430
Air transport	-0.295	-0.370	-0.301	-0.298	-0.539	-0.676	-0.402	-0.396
Transport services	-0.043	-0.083	-0.041	-0.036	-0.178	-0.349	-0.079	-0.066
Communications	-0.012	-0.023	0.001	0.006	-0.089	-0.170	0.002	0.015
Finance services	-0.010	-0.014	0.004	0.007	-0.098	-0.128	0.007	0.014
Public service	-0.003	-0.003	0.003	0.004	-0.013	-0.014	0.009	0.011
Education	-0.057	-0.062	-0.052	-0.052	-0.135	-0.145	-0.033	-0.031
Other entertainment	-0.025	-0.035	-0.016	-0.013	-0.162	-0.225	-0.067	-0.060
Lib., museums & Arts	-0.047	-0.055	-0.039	-0.038	-0.135	-0.157	-0.111	-0.107
Gambling & recreation	-0.025	-0.039	-0.009	-0.004	-0.044	-0.070	-0.023	-0.013
Other services	-0.010	-0.012	0.007	0.009	-0.015	-0.018	0.024	0.029
Domestic tourism	0.004	n.a.	0.019	n.a.	-0.505	n.a.	-0.535	n.a.
International tourism	-1.729	n.a.	-1.782	n.a.	-2.091	n.a.	-1.754	n.a.

Emp = employment.

As evidenced in simulation one, the output effects among sectors are comparatively small in the long-run. Moreover, several sectors even enjoy marginal output expansions. For instance, sectors such as clothing and footwear, repair and communications are among those have expanded output. These sectors may have benefited from increased household consumption and increased exports in the long-run. The results also suggest that contraction in employment in those affected sectors is relatively less than in the short-run. This can be explained by looking at the long-run closure of the model. Both labour and capital are flexible in the long-run and thus, as output contracts both primary factors tend to contract.[25]

[25] The long-run closure is analogous to full factor mobility case in general equilibrium analysis. Since both primary factors are mobile (labour and capital) they respond by reducing the factor usage in the affected sectors when the output contracts. Therefore, contraction in one factor is relatively low. Unlike partial mobility case (for example labour is flexible: the short-run closure), it is only labour that responds for output contractions and hence labour shows a significant contraction.

The changes in output and employment of the other sectors are shown in Table 8.9. The results indicate that almost all sectors have shown positive growth in terms of output and employment generation. Unlike the tourism-related sectors, which are mostly non-traded sectors, these sectors are mostly traded sectors and they are generally stimulated by increased exports. The results show that the exports of these sectors increase both in the short-run as well as in the long-run. Exports are stimulated by reduced commodity prices and the subsequent favourable relative price effect in international trade, as shown in increase in real devaluation.

Table 8.9: Industry Results (% changes) - All Other Industries: Simulation 2

Industry	Principal policy				Alternative policy			
	Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Agriculture	0.027	0.054	0.039	0.063	-0.175	-0.347	0.0510.	0.084
Forestry & fishing	0.008	0.010	0.017	0.021	-0.159	-0.207	017	0.023
Mining	0.023	0.065	0.117	0.125	-0.127	-0.350	0.111	0.129
Textiles	0.041	0.048	0.062	0.065	-0.299	-0.350	0.081	0.086
Other manufacturing	0.027	0.031	0.044	0.047	-0.239	-0.281	0.049	0.054
Wood, paper etc.	0.004	0.006	0.018	0.023	-0.131	-0.194	0.021	0.032
Chemicals	0.030	0.047	0.052	0.057	-0.211	-0.328	0.058	0.069
Non-metallic mineral	0.012	0.018	0.023	0.028	-0.099	-0.150	0.027	0.038
Metallic products	0.042	0.057	0.074	0.077	-0.247	-0.336	0.084	0.093
Motor vehicle & parts	0.035	0.055	0.073	0.078	-0.223	-0.353	0.079	0.091
Aircraft	-0.114	-0.133	-0.133	-0.131	-0.489	-0.570	-0.171	-0.167
Electricity, gas, water	-0.004	-0.014	0.015	0.022	-0.048	-0.156	0.027	0.044
Construction	0.003	0.003	0.001	0.003	0.047	0.054	0.000	0.005
Wholesale	-0.003	-0.003	0.012	0.013	-0.118	-0.133	0.013	0.016
Owner dwelling	0.000	-0.006	0.032	0.038	0.000	0.005	0.103	0.123

Emp. = employment.

The Alternative Policy

There are two major highlights regarding the alternative policy. First, the alternative policy results in more adverse effects than the principal policy does. This is because, as noted above, in the alternative policy, in addition to the international tourism sector the domestic tourism sector also contracts due to reduced tourism consumption. Driven by the contractions of the tourism sectors, all the other sectors shown in Table 8.8 also experience severe output reductions more than in the principal policy. Second, unlike in the principal policy where only tourism-related sectors contract, in the alternative policy, all industries experience output contractions in the short-run. This is closely linked with changes in short-run variable cost and exports of commodities. The mechanism behind this contrasting result is the same as explained in simulation one in Section 8.3.1.2.

Table 8.10: Changes in Household Consumption (% changes): Simulation 2

Industry/Commodity	Principal policy long-run		Alternative policy long-run	
	Consumer prices	Consumption	Consumer prices	Consumption
Agriculture	-0.030	0.013	-0.046	0.052
Forestry & fishing	-0.038	0.010	-0.053	0.034
Mining	-0.041	0.021	-0.046	0.065
Food products	-0.035	0.006	-0.048	0.021
Beverages & Cigarettes	-0.028	0.007	-0.033	0.028
Textiles	-0.034	0.012	-0.048	0.046
Clothing & footwear	-0.034	0.004	-0.050	0.017
Other manufacturing	-0.030	0.020	-0.042	0.078
Wood, paper etc.	-0.037	0.020	-0.050	0.070
Petroleum & refinery	-0.027	0.015	-0.033	0.060
Chemicals	-0.040	0.021	-0.055	0.071
Non-metallic mineral	-0.035	0.020	-0.047	0.072
Metallic products	-0.032	0.020	-0.043	0.075
Motor vehicle & parts	-0.030	0.017	-0.040	0.067
Aircraft	-0.004	0.002	-0.006	0.044
Electricity, gas, water	-0.040	0.022	-0.049	0.067
Construction	-0.039	0.017	-0.055	0.058
Wholesale	-0.039	0.021	-0.052	0.071
Retail	-0.046	0.025	-0.069	0.080
Repairs	-0.042	0.022	-0.055	0.069
Hotels & cafes	-0.038	0.020	-0.048	0.068
Road transport	-0.032	0.003	-0.043	0.011
Rail transport	-0.037	0.007	-0.054	0.024
Water transport	-0.022	0.003	-0.028	0.014
Air transport	-0.023	0.026	-0.031	0.122
Transport services	-0.026	0.014	-0.033	0.058
Communications services	-0.039	0.021	-0.051	0.068
Finance services	-0.045	0.024	-0.060	0.073
Owner dwelling	-0.043	0.039	-0.060	0.124
Public service	-0.048	0.025	-0.076	0.080
Education	-0.049	0.027	-0.080	0.085
Other entertainment	-0.034	0.018	-0.039	0.060
Library, museums & Arts	-0.044	0.023	-0.062	0.073
Gambling & recreation	-0.039	0.022	-0.042	0.068
Other services	-0.046	0.024	-0.066	0.075
Domestic tourism	-0.037	0.019	1.103	-0.535
International tourism	n.a.	n.a.	n.a.	n.a.

8.4.3. Household Consumption Effects and Welfare Changes

Table 8.10 above records the percentage changes in the purchaser's prices of commodities and household demand for commodities in the long-run. The results indicate that the purchaser's prices of all commodities for the household sector decline and these changes are in line with the price changes and industry results analysed in the two previous sections. The household sector has responded to price reductions by increasing the demand for all commodities. As far as the alternative policy is considered, there is only one noticeable difference. That is the price of domestic tourism increases markedly as expected, due to the accommodation tax. Accordingly, household demand for domestic tourism declines.[26]

Table 8.11 presents estimated changes in household welfare using the three measures specified in the study. The results of the principal policy simulation indicate that special tourism taxes imposed on international visitors could improve domestic welfare and all three measures provide identical estimations.[27] On the other hand, the alternative policy reveals that while the tourism taxes improve domestic welfare the extent is considerably lower than that of the principal policy. As we discussed in simulation one, this explains the fact that a tax on domestic visitors could generate a welfare loss. As can be seen from Table 8.10, a tax-induced price increase in domestic tourism discourages household demand for domestic tourism. While the increase in household demand for all other commodities improves welfare, the reduction in demand for domestic tourism generates a welfare loss. Clearly, the total welfare change is considerably lower than the principal policy where there is no any sign of household demand reductions.

Table 8.11: Welfare Changes (% of consumption expenditure): Simulation 2

Description	Principal policy	Alternative policy
PCD (% of consumption expenditure)	0.0215	0.0090
LCD (% of consumption expenditure)	0.0215	0.0083
Real consumption (percentage change)	0.0215	0.0087
Money measure (96/97)		
PCD ($ million, 96/97)	70.02	29.29
LCD ($ million, 96/97)	70.00	27.15
Real consumption ($ million, 96/97)	70.02	28.23
Money measure (2002/03)		
PCD ($ million, 2002/03)	97.66	40.85
LCD ($ million, 2002/03)	97.64	37.87
Real consumption ($ million, 2002/03)	97.66	39.37

The welfare estimations of the alternative policy simulation are in line with another theoretical expectation. Hicks (1942) noted that PCD and LCD as a measurement of welfare are two important indicators and they define the boundaries of actual welfare changes. Furthermore Dixon and Rimmer (1999a) pointed out that LCD defines the

[26] General equilibrium tax incidence theory suggests (Harberger 1962, McLure and Thirsk 1975) that the commodity price of a taxed sector increases while the prices of untaxed commodities decrease. Our results are in accordance with this theoretical view. For instance, in the alternative policy, the price of domestic tourism (taxed commodity) increases while all the other commodities show price reductions (untaxed commodities).

[27] This finding is consistent with Blake's finding (2000) that a tax on accommodation (10 per cent) is welfare improving in the case of a CGE analysis of tourism in Spain.

lower bound while PCD defines the upper bound of welfare changes arising from tax changes. The estimations in the alternative policy show that welfare changes measured in terms of real consumption lies in between two boundaries.

8.4.4. Macroeconomic Effects

The percentage changes in important macroeconomic variables of all simulation experiments are recorded in Table 8.12. Like in simulation one, the results suggest that the imposition of tourism taxes causes a contraction in the Australian economy during the short-run while such taxes are expansionary in the long-run. For instance, the short-run results show that real GDP (expenditure side) declines by 0.014 per cent (the principal policy). From the income side, this contraction is initiated by the reduction in aggregate employment while from the expenditure side, it can be explained through changes in the trade balance. The reasons behind the changes in the aggregate employment and the trade balance are the same as in the simulation one.

Table 8.12: Macroeconomic Results (% change): Simulation 2

Variable description	Principal policy		Alternative policy	
	SR	LR	SR	LR
Real GDP (expenditure side)	-0.014	0.003	-0.095	0.003
Real GDP (at factor cost)	-0.013	0.004	-0.094	0.009
Aggregate employment	-0.019	-	-0.139	-
Aggregate capital stock, rental weights	-	0.014	-	0.028
Real household consumption	-	0.022	-	0.009
Real household disposable income	0.013	0.030	-0.060	0.033
Income tax rates	-0.117	-0.159	-0.389	-0.698
Export volume	-0.116	-0.081	-0.555	-0.051
Import volume	-0.038	-0.025	-0.036	-0.040
Contribution of BOT to real GDPexp.	-0.014	-0.010	-0.095	-0.002
Real government budget deficit	-0.833	-1.128	-2.762	-4.963
Government net borrowing	-0.052	-0.069	-0.169	-0.301

In contrast to the short-run macroeconomic contraction, in the long-run it appears that special tourism taxes can yield a marginal increase in real GDP. For instance, Table 8.12 indicates that real GDP rises by 0.003 per cent. Given the nature of long-run economic environment, the increase in real GDP is initiated via a change in the aggregate capital stock and the results show that it increases by 0.014 per cent. On the expenditure side, the increase in real GDP is reflected by an increase in real consumption. Furthermore, the results suggest that the reduction in export and import volumes is relatively less in the long-run. Reduction in export volume implies that the export price index has increased and thus this may initiate an improvement in the terms of trade. The advantage of the improvement in the terms of trade is that local residents can now consume more than they would have consumed in the absence of tourism taxes.

As noted in simulation one, the results show that real household disposable income increases which may also explain the increase in real consumption in the long-run. The increase in household disposable income results from reductions in both income taxes and the CPI, despite the reductions in nominal wages.

The Alternative Policy

In the case of the alternative policy, there is a noticeable difference in the extent of changes of some macroeconomic variables while the direction of changes is identical. For instance, the short-run contraction of real GDP and aggregate employment is at least seven times greater than that of the principal policy. However, in the long-run, the alternative policy appears to be making exactly the same expansion in real GDP as in the principal policy.

8.4.5. A Summary of Results

In Sections 8.4.1-8.4.4, general equilibrium results of simulation two were analysed. In this simulation, an imposition of an accommodation tax was considered. Effects of the accommodation tax were analysed in terms of changes in prices, industry effects, household consumption and welfare changes and macroeconomic effects. This section is a brief summary of results.

Overall, the results of accommodation tax simulation carried out in this section are similar to those of simulation one. Therefore, we derive following conclusions regarding an imposition of a tax on accommodation services.

A tax on accommodation services consumed by international visitors can result in an increase in the price of the composite international tourism product (taxed commodity). The short-run results show that such a price increase and resulting reduction in international tourism demand tend to generate a fall in both the average nominal wage and the average capital rental. The reduced factor prices have been transferred into lower commodity prices. This is reflected in a reduction of the CPI. In contrast to local commodity prices, the price of exports has risen as a result of an accommodation tax, as shown by the export price index. The increased export price index is instrumental in bringing about increased terms of trade. During the long-run, the price effects of the accommodation tax show the same pattern as in the short-run. However, given that the real wage is flexible, reduction in the nominal wage causes deterioration in the before-tax real wage and this is worsened further as the general price level increases. However, the results suggest that the after-tax real wage improves.

The industry results of this simulation confirm the conclusions derived in simulation one. They include (i) tourism-related sectors experience considerable output contractions due to reduced demand for tourism (as a result of the tourism tax) while other (traded) sectors show some expansions in output, (ii) industry effects are less pronounced in the long-run than in the short-run, (iii) when compared with the alternative policy considered, the policy to impose a tax only on international visitors is relatively less contractionary.

As far as tax induced changes in household welfare are concerned, the results of the principal policy simulation indicate that a tourism tax imposed on international visitors could improve domestic welfare. On the other hand, the alternative policy reveals that while the tourism taxes improve domestic welfare the extent is considerably lower than that of the principal policy.

Macroeconomic results suggest that, the imposition of a tourism tax such as an accommodation tax on international visitors could generate negative economy wide effects during the short-run. Such a tax can tarnish economic growth (reduced real GDP) and stimulate unemployment. These effects could be worsened if taxes are imposed commonly for both domestic and international visitors. However, during the long-run, tourism taxes seem to be stimulating economic growth or at least easing the negative effects that were evident in the short-run. It can be seen that there are domestic welfare improvements arising from tourism taxes at the expense of reduced output and increased unemployment in the tourism-related sectors.

8.5. Simulation Three: Tourism Taxes to Increase Government Revenue

In Chapter Five, Section Four, we developed the third policy scenario that "the analysis of the current pricing structure in international tourism shows that the current international tourism price seems to be below the efficient level and thus it can be used to increase government tax revenue via increased tourism taxes". In the development of this policy scenario, expected changes in total tourism tax revenue from international tourism and relevant tax rates are estimated and they are presented in Table 5.4. Experimental simulations carried out in this section are in relation to those tax changes suggested in Section 5.4.

Three sets of simulations are carried out in a way that they realise changes in total tourism tax revenue from international tourism suggested in Section 5.4 (c.f. the last column of Table 5.4). Accordingly, changes in an ad valorem tax on the total planned tourism consumption (current tourism consumption) are assumed and are induced to the model. The different tax rates applied are 11.5 per cent (Scenario 1), 9.9 per cent (Scenario 2) and 6.5 per cent (Scenario 3).[28] As in the two previous simulations, both short-run and long-run simulations were carried out in each scenario. The assumptions made regarding each economic environment (closures) are the same as in the two previous experiments and are outlined in Section 8.2. The following sections present the results of the three simulations and the results are presented under three headings: Scenario 1 (demand elasticity –1.75), Scenario 2 (demand elasticity –2.00) and Scenario 3 (demand elasticity –2.75).

8.5.1. Changes in Prices

Tax induced price changes of the tourism tax simulations are recorded in Table 8.13 and the results suggest that the changes in the price variables and their direction are analogous to the results of the earlier simulations. However, the most noticeable aspect of these results is the greater magnitude of changes in the price variables than those of the early simulations. For instance, in Scenario 1, the price of international tourism increases by 10.98 per cent (in the short-run) and this is almost twelve times higher than

[28] The current tourism tax structure includes a 5.5 per cent tax on international tourism consumption and the projected tax rates in the three simulations are 17.0 per cent, 15.4 per cent and 12 per cent (c.f. Table 5.4), respectively. Therefore, the tax rates considered in the simulations are the difference between the projected tax rates and the current tax rate.

increases in the price of international tourism in simulation two. However, this should be understood in the context that changes in the taxes considered in the current experiment are significantly higher than those considered in the early simulations.

Changes in factor prices follow the same pattern observed earlier and both the average nominal wage and average capital rental decline in each simulation. A decreasing trend in the general price level in Australia as shown by reductions in the CPI is also evident. Thus, motivated by both the CPI reduction and income tax reductions, the after-tax real wage increases in the long-run. Moreover, the results show that the export price index increases and subsequently, an improvement in the terms of trade is realised.

Table 8.13: Percentage Changes in Prices: Simulation 3

Variable description	Short-run			Long-run		
	Scen. 1	Scen. 2	Scen. 3	Scen. 1	Scen. 2	Scen. 3
Domestic tourism (consumer price)	-0.504	-0.490	-0.446	-0.343	-0.364	-0.377
International tourism (consu. price)	10.983	9.246	5.972	11.279	9.494	6.138
Average nominal wage	-0.418	-0.407	-0.370	-0.529	-0.562	-0.582
Real wage (before tax)	n.a	n.a.	n.a.	-0.173	-0.184	-0.191
Real wage (after tax)	n.a.	n.a.	n.a.	0.300	0.211	0.060
Average capital rental	-0.620	-0.603	-0.549	-0.339	-0.360	-0.373
Consumer price index	-0.418	-0.407	-0.370	-0.356	-0.378	-0.393
GDP price index (exp)	-0.222	-0.244	-0.269	-0.199	-0.259	-0.341
Absorption price index	-0.399	-0.388	-0.353	-0.365	-0.387	-0.402
Export price index	0.976	0.796	0.464	0.914	0.704	0.333
Terms of trade	0.976	0.796	0.464	0.914	0.704	0.333
Real devaluation	0.222	0.244	0.270	0.199	0.260	0.343

8.5.2. Industry Effects

Table 8.14 records the industry results in terms of changes in output and employment in the tourism-related sectors. In relation to the industry results, other than the greater degree of changes in output and employment of sectors, there is no apparent difference between the results of this simulation and the early simulations. Accordingly, in all simulations, most tourism-related sectors are affected by considerable tax-induced reduction in international tourism consumption. However, one noticeable difference between the short-run and long-run results is that in the short-run, almost all the tourism-related sectors are affected by the tax change, while in the long-run, some sectors show marginal improvements. For example, sectors such as clothing and footwear, repairs, communications, finance services, public service and other services tend to experience marginal expansions.

As shown in Table 8.15, other (traded) industries benefit from increased tourism taxes. While international tourism consumption is affected by tourism taxes, traded industries expand due to strong export expansions. The reasons for exports expansions are as explained in the earlier simulations.

Table 8.14: Industry Results (% changes) - Tourism-related Industries: Simulation 3

Industry	Short-run						Long-run					
	Scenario 1 (E_d = -1.75)		Scenario 2 (E_d = -2.00)		Scenario 3 (E_d = -2.75)		Scenario 1 (E_d = -1.75)		Scenario 2 (E_d = -2.00)		Scenario 3 (E_d = -2.75)	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Food products	0.028	0.039	0.027	0.038	0.025	0.035	0.103	0.139	0.118	0.157	0.135	0.176
Bev. & Cigarettes	-0.208	-0.512	-0.202	-0.498	-0.183	-0.453	-0.290	-0.215	-0.282	-0.202	-0.256	-0.174
Clothing & footwear	-0.016	-0.017	-0.016	-0.017	-0.014	-0.015	0.054	0.064	0.071	0.082	0.093	0.105
Petroleum & refinery	-0.395	-1.421	-0.384	-1.382	-0.349	-1.257	-0.320	-0.213	-0.303	-0.190	-0.264	-0.146
Retail	-0.237	-0.245	-0.230	-0.239	-0.209	-0.217	-0.046	-0.041	-0.087	-0.082	-0.143	-0.137
Repairs	-0.150	-0.191	-0.146	-0.186	-0.133	-0.169	0.038	0.069	0.010	0.043	-0.033	0.002
Hotels & cafes	-1.278	-1.673	-1.243	-1.627	-1.130	-1.481	-1.178	-1.156	-1.177	-1.154	-1.118	-1.094
Road transport	-0.488	-0.591	-0.475	-0.575	-0.432	-0.523	-0.363	-0.335	-0.342	-0.312	-0.295	-0.264
Rail transport	-0.682	-0.810	-0.664	-0.787	-0.603	-0.716	-0.458	-0.448	-0.428	-0.417	-0.363	-0.352
Water transport	-3.520	-6.513	-3.423	-6.338	-3.111	-5.776	-4.076	-4.013	-3.944	-3.878	-3.563	-3.494
Air transport	-2.843	-3.544	-2.764	-3.447	-2.514	-3.137	-2.876	-2.850	-2.811	-2.784	-2.583	-2.554
Transport services	-0.409	-0.798	-0.398	-0.776	-0.362	-0.706	-0.390	-0.343	-0.377	-0.327	-0.340	-0.288
Communications	-0.117	-0.225	-0.114	-0.219	-0.104	-0.199	0.009	0.057	-0.005	0.046	-0.026	0.028
Finance services	-0.100	-0.131	-0.097	-0.127	-0.088	-0.116	0.043	0.069	0.033	0.060	0.017	0.045
Public service	-0.027	-0.030	-0.027	-0.029	-0.024	-0.026	0.027	0.035	0.019	0.028	0.007	0.016
Education	-0.552	-0.593	-0.537	-0.577	-0.488	-0.525	-0.500	-0.494	-0.488	-0.482	-0.448	-0.442
Other entertainment	-0.241	-0.336	-0.235	-0.326	-0.213	-0.297	-0.151	-0.121	-0.158	-0.126	-0.160	-0.127
Lib., museums & Arts	-0.453	-0.525	-0.441	-0.511	-0.401	-0.465	-0.369	-0.356	-0.384	-0.371	-0.388	-0.374
Gambling & recreation	-0.236	-0.375	-0.230	-0.365	-0.209	-0.332	-0.070	-0.030	-0.118	-0.076	-0.182	-0.139
Other services	-0.096	-0.114	-0.093	-0.111	-0.085	-0.101	0.075	0.092	0.045	0.063	-0.002	0.017
Domestic tourism	0.036	n.a.	0.035	n.a.	0.032	n.a.	0.199	n.a.	0.138	n.a.	0.042	n.a.
International tourism	-16.671	n.a.	-16.211	n.a.	-14.744	n.a.	-17.059	n.a.	-16.590	n.a.	-15.111	n.a.

Table 8.15: Industry Results (% changes) - All Other Industries: Simulation 3

Industry	Short-run						Long-run					
	Scenario 1 (E_d = -1.75)		Scenario 2 (E_d = -2.00)		Scenario 3 (E_d = -2.75)		Scenario 1 (E_d = -1.75)		Scenario 2 (E_d = -2.00)		Scenario 3 (E_d = -2.75)	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Agriculture	0.261	0.518	0.253	0.504	0.231	0.458	0.369	0.590	0.389	0.623	0.400	0.641
Forestry & fishing	0.072	0.094	0.070	0.091	0.064	0.083	0.161	0.195	0.166	0.202	0.166	0.203
Mining	0.222	0.619	0.216	0.602	0.197	0.548	1.099	1.169	1.167	1.242	1.210	1.288
Textiles	0.396	0.463	0.385	0.451	0.350	0.410	0.585	0.604	0.613	0.634	0.624	0.646
Other manufacturing	0.255	0.300	0.248	0.292	0.226	0.265	0.417	0.438	0.439	0.461	0.449	0.472
Wood, paper etc.	0.041	0.061	0.040	0.059	0.037	0.054	0.169	0.214	0.165	0.213	0.151	0.201
Chemicals	0.288	0.449	0.280	0.437	0.255	0.398	0.486	0.535	0.510	0.561	0.519	0.573
Non-metallic mineral	0.116	0.176	0.113	0.171	0.103	0.156	0.216	0.265	0.220	0.272	0.215	0.269
Metallic products	0.400	0.546	0.389	0.531	0.354	0.483	0.689	0.726	0.728	0.768	0.750	0.791
Motor vehicle & parts	0.333	0.530	0.324	0.515	0.295	0.469	0.684	0.736	0.705	0.760	0.701	0.758
Aircraft	-1.096	-1.276	-1.066	-1.241	-0.970	-1.129	-1.281	-1.262	-1.212	-1.192	-1.054	-1.033
Electricity, gas, water	-0.041	-0.134	-0.040	-0.130	-0.036	-0.119	0.151	0.212	0.132	0.198	0.099	0.167
Construction	0.023	0.027	0.023	0.026	0.021	0.024	0.006	0.025	0.005	0.024	0.002	0.022
Wholesale	-0.025	-0.028	-0.024	-0.028	-0.022	-0.025	0.113	0.128	0.114	0.129	0.109	0.124
Owner dwelling	0.000	-0.054	0.000	-0.052	0.000	-0.048	0.326	0.389	0.228	0.294	0.072	0.141

8.5.3. Household Consumption Effects and Welfare Changes

Table 8.16 shows the changes in household consumption of all commodities in each scenario. The results show that the tourism tax increase has led to a general reduction in the consumer prices of all commodities. Among the commodities, most services show an above-average reduction in consumer prices. As the commodity prices decline, household consumption shows a general increase. Comparatively higher increases in consumption are evident in commodities such as owner dwellings, finance services, air transport and public services.

Table 8.16: Changes in Household Consumption (% changes): Simulation 3

Industry/Commodity	Scenario 1 (E_d = -1.75)		Scenario 2 (E_d = -2.00)		Scenario 3 (E_d = -2.75)	
	Cons. prices	Hou. Consum.	Cons. prices	Hou. Consum.	Cons. prices	Hou. Consum.
Agriculture	-0.278	0.134	-0.296	0.083	-0.308	0.005
Forestry & fishing	-0.351	0.103	-0.372	0.072	-0.386	0.024
Mining	-0.378	0.219	-0.401	0.159	-0.416	0.063
Food products	-0.321	0.059	-0.341	0.040	-0.354	0.010
Beverages & Cigarettes	-0.262	0.077	-0.278	0.046	-0.289	-0.002
Textiles	-0.313	0.129	-0.332	0.086	-0.345	0.018
Clothing & footwear	-0.317	0.046	-0.336	0.031	-0.349	0.007
Other manufacturing	-0.283	0.209	-0.300	0.130	-0.311	0.009
Wood, paper etc.	-0.341	0.208	-0.362	0.144	-0.375	0.043
Petroleum & refinery	-0.248	0.156	-0.263	0.089	-0.273	-0.013
Chemicals	-0.370	0.219	-0.392	0.158	-0.407	0.060
Non-metallic mineral	-0.325	0.210	-0.345	0.142	-0.358	0.036
Metallic products	-0.295	0.208	-0.313	0.134	-0.325	0.018
Motor vehicle & parts	-0.275	0.179	-0.292	0.110	-0.303	0.003
Aircraft	-0.040	0.040	-0.043	-0.032	-0.044	-0.134
Electricity, gas, water	-0.376	0.221	-0.399	0.160	-0.414	0.063
Construction	-0.362	0.176	-0.384	0.125	-0.398	0.045
Wholesale	-0.362	0.219	-0.385	0.156	-0.399	0.056
Retail	-0.425	0.254	-0.451	0.193	-0.468	0.095
Repairs	-0.393	0.227	-0.417	0.167	-0.433	0.072
Hotels & cafes	-0.349	0.210	-0.370	0.147	-0.384	0.048
Road transport	-0.297	0.031	-0.315	0.020	-0.327	0.003
Rail transport	-0.344	0.070	-0.365	0.049	-0.379	0.015
Water transport	-0.207	0.034	-0.220	0.017	-0.228	-0.010
Air transport	-0.213	0.281	-0.226	0.141	-0.235	-0.071
Transport services	-0.242	0.147	-0.257	0.082	-0.266	-0.016
Communications services	-0.367	0.214	-0.389	0.153	-0.404	0.057
Finance services	-0.419	0.244	-0.444	0.184	-0.461	0.088
Owner dwelling	-0.401	0.397	-0.425	0.295	-0.441	0.132
Public service	-0.446	0.254	-0.473	0.196	-0.491	0.102
Education	-0.460	0.272	-0.488	0.212	-0.506	0.115
Other entertainment	-0.317	0.186	-0.337	0.124	-0.349	0.028
Library, museums & Arts	-0.412	0.236	-0.437	0.177	-0.454	0.083
Gambling & recreation	-0.360	0.227	-0.383	0.161	-0.397	0.057
Other services	-0.428	0.245	-0.455	0.187	-0.472	0.093
Domestic tourism	-0.343	0.199	-0.364	0.138	-0.377	0.042
International tourism	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 8.17 records the welfare changes in the current simulation. The results follow the earlier simulations that taxing international tourism tends to improve domestic welfare. However, when compared with previous two simulations, the welfare improvements of the current simulation are of a greater magnitude. In this simulation, assumed tax increases are considerably higher than in the two previous experiments. Accordingly, Tax-induced reductions in international tourism demand (a significant demand reduction as evident above) can relieve pressure on domestic markets and hence a wider availability of commodities for domestic consumption.[29] Moreover, total tourism tax revenue increases significantly and thus a similar reduction in income tax volume can be expected. Such a change in income taxes could enhance household disposable income, hence increased affordability to consume more.

Table 8.17: Welfare Changes (% of consumption expenditure): Simulation 3

Description	Scenario 1 (E_d = -1.75)	Scenario 2 (E_d = -2.00)	Scenario 3 (E_d = -2.75)
PCD (% of consumption expenditure)	0.2206	0.1577	0.0583
LCD (% of consumption expenditure)	0.2207	0.1578	0.0583
Real consumption (percentage change)	0.2206	0.1577	0.0583
Money measure (96/97)			
PCD ($ million, 96/97)	718.28	513.48	189.83
LCD ($ million, 96/97)	718.61	513.80	189.83
Real consumption ($ million, 96/97)	718.28	513.48	189.83
Money measure (2002/03)			
PCD ($ million, 2002/03)	1,001.83	716.18	264.76
LCD ($ million, 2002/03)	1,002.28	716.63	264.76
Real consumption ($ million, 2002/03)	1,001.83	716.18	264.76

8.5.4. Macroeconomic Effects

The percentage changes in important macroeconomic variables are recorded in Table 8.18. The results are consistent with our earlier experiments that taxing international tourism could be contractionary in the short-run while tending to be expansionary in the long-run. The results also suggest that the higher the tax increases the greater would be the contraction in the short-run. In this experiment, we considered the highest tax increase and thus the highest macroeconomic contraction is recorded. This is evident in a considerable real GDP reduction (0.156 per cent) which is primarily driven by a

[29] Gooroochurn and Sinclair (2005) argued that reduced tourism consumption (due to increased taxation) may reduce the crowding out effect on domestic consumption previously caused by tourism consumption and thus it would lead to an increased domestic consumption.

contraction in aggregate employment. On the other hand, on the expenditure side, due to increased tourism taxes a significant fall in export volume is recorded.[30] Although the volume of imports declines marginally, it is insufficient to drive net exports towards a surplus with a marked reduction of tourism consumption.

Table 8.18: Macroeconomic Results (% change): Simulation 3

Variable description	Short-run			Long-run		
	Scen. 1	Scen. 2	Scen. 3	Scen. 1	Scen. 2	Scen. 3
Real GDP (expenditure side)	-0.156	-0.148	-0.130	0.010	0.003	-0.006
Real GDP (at factor cost)	-0.121	-0.118	-0.107	0.044	0.033	0.016
Aggregate employment	-0.179	-0.174	-0.159	-	-	-
Aggregate capital stock	-	-	-	0.139	0.106	0.052
Real household consumption	-	-	-	0.221	0.158	0.058
Real household disposable income	0.157	0.107	0.019	0.331	0.254	0.120
Income tax rates	-1.271	-1.030	-0.588	-1.673	-1.397	-0.886
Export volume	-1.208	-1.160	-1.030	-0.902	-0.752	-0.493
Import volume	-0.364	-0.354	-0.322	-0.236	-0.255	-0.271
Contribution of BOT to real GDP	-0.156	-0.148	-0.130	-0.123	-0.091	-0.041

In contrast to the short-run contractionary effects, the long-run effects of a tourism tax increase seem to be expansionary. For instance, the results suggest that real GDP increases marginally by 0.010 per cent compared to the significant short-run reduction in real GDP by 0.156 per cent. Economic expansion, as explained in the previous simulations, results from the increased aggregate capital stock (income side) and rising real household consumption (expenditure side).

The proposed tax changes considered in this experiment tend to increase government tax revenue significantly (c.f. Table 5.4). With such a significant increase in government revenue, it is reasonable to expect that at least a part of the total tax revenue be redistributed among households. As noted earlier, we carried out budget neutral simulations. The results show that the income tax rate falls considerably (the highest fall among all simulations) leading to an improvement in real household disposable income. Such an improvement can further lead to an increase in real household consumption. Against, this background, the long-run results that tourism taxes are expansionary, and hence are welfare-improving, are consistent with prior expectations.

[30] Note that exports in traded sectors expand because of tourism taxes. However, significant reduction in international tourism consumption has outweighed such export expansion and hence reduced export volume.

8.6. Simulation Four: Tourist Refund Scheme (TRS)

In the previous three sections, simulations are carried out based on the policy scenarios developed in Chapter Five. All these simulations considered increases in tourism taxes (different degree of increases) and subsequently the results were analysed. In this section, and in the following section, two additional simulations are carried out to experiment with changes in tourism taxes in the opposite direction, for tax reductions or refunds and the abolition of taxes.

The introduction of the GST in 2000 attracted the attention of industry representatives, academics and professionals and lead to several studies. Subsequently, there arose a strong claim that the Australian tourism sector, and in particular international tourism, had been negatively affected (Dixon and Rimmer 1999a, Divisekara 2001). More precisely it was argued that expenditure on goods and services by international visitors in Australia has been affected. An early precaution introduced by the government was the tourist refund scheme (TRS). Such tax refund schemes are common in most developed countries and similar schemes to refund GST/VAT paid on specified goods that accompany the visitor are operative in most EU countries such as the UK and France and Canada. Under the Canadian scheme, the GST paid on accommodation can also be claimed as a refund.

Under the TRS in Australia, all international visitors and Australian residents can claim a refund of the GST and the wine equalisation tax (WET) paid on goods purchased while in Australia and subsequently exported. However, there are certain conditions that apply for a claim of refund: (i) a single, invoiced purchase of a minimum of $300 should be made from the one store, (ii) the goods should have been bought within thirty days of the departure, and (iii) the goods should be carried on board.

The aim of the refund scheme is to encourage international visitors to purchase goods from Australia, thereby promoting retail sales in Australia. A refund of 10 per cent GST and 15 per cent of WET is expected to make the items purchased by international visitors price-competitive. The Australian Customs Service administers the TRS and, since July 2000, a total of $163.3 million has been refunded over four years. This refund has been made for goods purchased by international visitors to the value of $1,800 million over the period (Australian Customs Service 2004). On average, a refund of $41 million has been made annually for $450 million worth of retail sales. In this context, it is reasonable to believe that the existence of the TRS has strongly influenced the sale of those goods to international visitors. International visitors consider competitive prices when they make these purchases as they can make the same purchase elsewhere. In this sense, one can reason that TRS leads to an increase in international tourism consumption.

Tourism industry representatives advocate such schemes as the TRS claiming that they help encourage international visitors to spend more money while visiting. This line of argument has weight in the modern context since tourism sectors tend to focus more on yield rather than visitor numbers. On the other hand, refund schemes may be useful in maintaining the price competitiveness of tourism sectors. However, whether refund schemes should be supported or extended has to be determined after a careful analysis of the overall economic implications. In particular, whether they are efficient in resource allocation and whether they would bring more benefits than costs should be measured.

Two simulations are carried out to analyse the general equilibrium effects of a refund scheme similar to the TRS to determine whether such policies should be supported or extended. Assuming that the current state of international tourism consumption is with the TRS operative, short-run and long-run simulations are carried out to analyse the effect on the economy of a scheme such as the TRS ceasing.[31]

8.6.1. Changes in Prices

The percentage changes in the price variables of the two simulations are presented in Table 8.19. Tax refunds are directly given to international visitors for goods they purchase and carry on board. As explained above, it is designed to encourage international visitor consumption in Australia. When a visitor makes the decision to purchase goods (on which the GST and WET are applied), he or she may be fully aware of the possible refund involved. Therefore, the existence of a TRS can work as a reduction of taxes paid by international visitors or as a subsidy given to international

[31] The assumptions regarding economic environments (closures) are the same as in the previous simulations and are outlined in Section 8.2 in detail.

visitors. Thus, in the model it is a tax reduction or a subsidy to the international tourism sector, since taxes paid by international visitors are embedded in the composite tourism sector. Accordingly, such a tax change could bring positive price changes in the international tourism sector.

As expected, Table 8.19 shows that the consumer price of the composite international tourism product declines as a result of the tax refund. For instance, the results show that the price of international tourism declines by 0.329 per cent in the short-run.[32] Understandably, the export price index shows a reduction and this is totally driven by a higher price reduction in international tourism. Given the fixed import prices, deterioration in the terms of trade is evident against the background of increased export prices. The real devaluation moves with the GDP price index and hence it shows a reduction that signals a relatively uncompetitive situation in terms of prices in international trade.[33] Unlike the previous simulations in which tax increases or impositions are analysed, in this experiment, factor suppliers are receiving increased factor prices as shown by increased average nominal wage and average capital rental. For instance, they both increase by 0.014 per cent and 0.021 per cent in the short-run.

Table 8.19: Percentage Changes in Prices: Simulation 4

Variable description	Short-run	Long-run
Domestic tourism (consumer price)	0.018	0.009
International tourism (consumer price)	-0.329	-0.342
Average nominal wage	0.014	0.014
Real wage (before tax)	n.a.	0.005
Real wage (after tax)	n.a.	-0.012
Average capital rental	0.021	0.009
Consumer price index	0.014	0.010
GDP price index (exp)	0.008	0.004
Absorption price index	0.014	0.010
Export price index	-0.032	-0.032
Terms of trade	-0.032	-0.032
Real devaluation	-0.008	-0.004

[32] In partial equilibrium analysis, the effects of a negative tax/subsidy or a tax refund are to reduce the consumer price and to increase the supplier price. In the general equilibrium, setting the increase in supplier price should be reflected by increases of factor payments.

[33] The reduction in the export price index is mainly due to the reduced international tourism price but local prices of all other exports increase. Therefore, given that there is a reduction in real devaluation and an increase in the local price of exports one can expect reductions in exports of commodities. The simulation results in fact disclose that exports of all commodities, except international tourism, decline both in the short-run and long-run. However, the degree of the increase in international tourism is far higher than the reduction of exports of all other commodities and hence total exports increase.

While the long-run price effects of the tax refund policy exhibit an identical pattern to those of the short-run, there are two noteworthy differences. First, the increase in average capital rental is considerably lower in the long-run. This should be understood by referring back to our basic assumptions (c.f. Section 8.2) about two economic environments applied in simulations. In the short-run, it is assumed that the only mobile factor is labour and hence when there are output expansions due to increased tourism demand (tourism demand increases due to reduced tourism price), demand for labour increases resulting a greater increase in capital rental (capital is the immobile factor) than the increase in average wage. In contrast, the capital stock is assumed to be flexible in the long-run, and thus the capital stock responds to output changes resulting in a marginal increase in capital rental. Second, the long-run results show that the after-tax real wage falls despite the increase in nominal wages. This could be explained against the background of the increase in the CPI and the possible increase in income tax rates.[34]

8.6.2. Industry Effects

Those industries that gain and lose from the policy are outlined in this section and the results are recorded in Tables 8.20 and 8.21. The aforementioned price reduction in the international tourism product encourages international visitors to increase consumption and, therefore, the tourism sector's output (dummy sector) increases (0.660 per cent and 0.687 per cent). Most of the tourism-related sectors are beneficiaries of the expansion in the tourism sector since it brings increased intermediate demand for commodities produced by these sectors. Among these sectors, hotel and cafes, water and air transport, education, library, museums and arts, petroleum and refinery and transport services sectors record comparatively higher expansions. Generation of employment in these sectors closely follows the output expansions.

Nevertheless, sectors such as clothing and footwear, retail and domestic tourism have shown contractions in output. The results show that the total sales of the clothing and footwear sector for intermediate purposes have increased due to higher demand from

[34] The household sector and the local market do not enjoy the advantage of the reduction of consumer price of international tourism since this is only consumed by international visitors in Australia. Instead, the results show that they are disadvantaged by local price increases. This is in line with the general equilibrium theory that in unaffected (from the policy change) sectors there is no price advantage, rather there is price disadvantage due to increased factor prices.

international tourism. However, this is a highly import-competing sector. When the demand for clothing and footwear rises there has been a substitution away from locally produced clothing and footwear towards imported clothing and footwear given the higher prices of domestically produced items.[35] As a result, the largest portion of total sales of clothing and footwear for intermediate purposes is imported. Retail sector output is mainly affected by changes in demand for retail as a margin service. Domestic tourism is only affected by changes in household demand since this is only consumed by the household sector.

Table 8.20: Industry Results (% changes) - Tourism-related Industries: Simulation 4

Industry	Short-run		Long-run	
	Output	Employment	Output	Employment
Food products	0.000	0.000	0.000	-0.001
Bev. & Cigarettes	0.007	0.017	0.012	0.010
Clothing & footwear	-0.049	-0.053	-0.051	-0.051
Petroleum & refinery	0.016	0.056	0.016	0.013
Retail	-0.007	-0.007	-0.014	-0.015
Repairs	0.004	0.005	-0.002	-0.003
Hotels & cafes	0.050	0.065	0.047	0.047
Road transport	0.019	0.023	0.017	0.016
Rail transport	0.027	0.032	0.022	0.022
Water transport	0.139	0.267	0.168	0.166
Air transport	0.112	0.140	0.116	0.115
Transport services	0.015	0.029	0.016	0.015
Communications	0.003	0.006	-0.001	-0.002
Finance services	0.002	0.003	-0.002	-0.003
Public service	0.001	0.001	-0.001	-0.001
Education	0.022	0.024	0.022	0.021
Other entertainment	0.008	0.011	0.005	0.004
Lib., museums & Arts	0.018	0.020	0.015	0.014
Gambling & recreation	0.009	0.015	0.003	0.002
Other services	0.004	0.004	-0.003	-0.003
Domestic tourism	-0.001	n.a.	-0.008	n.a.
International tourism	0.660	n.a.	0.687	n.a.

Percentage changes in output and employment in other sectors are presented in Table 8.21. Unlike previous simulations where traded sectors benefit from tourism taxes, they are adversely affected by the tourism tax refund scheme. These sectors are mainly driven by changes in exports although some sectors such as other manufacturing and chemicals are suppliers of the composite tourism product. There has been a considerable reduction in exports of commodities of these sectors driven by high purchaser's prices.

[35] We explained in the previous section that local commodity prices rise due to the tax refund scheme and the model allows the substitution between domestically produced and imported commodities based on relative price changes.

Among the worst affected sectors, textile, other manufacturing and chemicals are noteworthy. Since these sectors are import-competing sectors, it appears that there is a demand shift towards commodities imported by these sectors due to increased local prices. Therefore, these substitution effects can aggravate a situation that has already been affected badly by export reductions.

Table 8.21: Industry Results (% changes) - All Other Industries: Simulation 4

Industry	Short-run		Long-run	
	Output	Employment	Output	Employment
Agriculture	-0.009	-0.018	-0.010	-0.015
Forestry & fishing	-0.003	-0.003	-0.004	-0.005
Mining	-0.008	-0.021	-0.029	-0.031
Textiles	-0.020	-0.023	-0.023	-0.024
Other manufacturing	-0.011	-0.014	-0.014	-0.015
Wood, paper etc.	-0.005	-0.007	-0.008	-0.009
Chemicals	-0.013	-0.020	-0.017	-0.019
Non-metallic mineral	-0.004	-0.006	-0.006	-0.008
Metallic products	-0.014	-0.019	-0.019	-0.020
Motor vehicle & parts	-0.013	-0.021	-0.023	-0.024
Aircraft	0.045	0.052	0.058	0.058
Electricity, gas, water	0.001	0.004	-0.005	-0.007
Construction	-0.001	-0.001	0.000	-0.001
Wholesale	-0.003	-0.004	-0.007	-0.007
Owner dwelling	0.000	0.002	-0.013	-0.015

8.6.3. Household Consumption Effects and Welfare Changes

Table 8.22 presents the percentage changes in household consumption for the long-run simulation only. As expected, purchaser's prices of commodities for households have increased in line with increased output prices. On the one hand, higher consumer prices mean a lower demand for commodities from the household sector and on the other, real consumption is no longer fixed in the long-run and hence records a decline driven by a deteriorated terms of trade.[36] A stronger decline in real consumption than the increase in the CPI has led to a decline in supernumerary demand for commodities. This results in an economy-wide fall in household consumption of all commodities. This is one of the important macro implications of refund schemes and it appears that in the longer term such schemes may not be beneficial to the host community.

[36] This will further be explained under Section 8.6.4: Macroeconomic effects.

Table 8.22: Changes in Household Consumption (% changes): Simulation 4

Industry/Commodity	Consumer prices	Consumption
Agriculture	0.008	-0.006
Forestry & fishing	0.010	-0.004
Mining	0.010	-0.009
Food products	0.009	-0.003
Beverages & Cigarettes	0.007	-0.004
Textiles	0.009	-0.006
Clothing & footwear	0.009	-0.002
Other manufacturing	0.008	-0.009
Wood, paper etc.	0.009	-0.009
Petroleum & refinery	0.007	-0.007
Chemicals	0.010	-0.009
Non-metallic mineral	0.009	-0.009
Metallic products	0.008	-0.009
Motor vehicle & parts	0.008	-0.008
Aircraft	0.001	-0.004
Electricity, gas, water	0.010	-0.009
Construction	0.010	-0.007
Wholesale	0.010	-0.009
Retail	0.012	-0.010
Repairs	0.011	-0.009
Hotels & cafes	0.010	-0.009
Road transport	0.008	-0.001
Rail transport	0.009	-0.003
Water transport	0.006	-0.002
Air transport	0.006	-0.014
Transport services	0.007	-0.007
Communications services	0.010	-0.009
Finance services	0.011	-0.010
Owner dwelling	0.011	-0.016
Public service	0.012	-0.010
Education	0.013	-0.011
Other entertainment	0.009	-0.008
Library, museums & Arts	0.011	-0.009
Gambling & recreation	0.010	-0.009
Other services	0.012	-0.010
Domestic tourism	0.009	-0.008
International tourism	n.a.	n.a.

Unlike previous simulations where international tourists are taxed, a policy change that offers tax refunds to international tourists appears to be inefficient in the allocation of domestic resources. The results of the welfare estimations shown in Table 8.23 suggest that such a policy could generate marginal welfare loss to the household sector in the long-run, as shown by a decline in welfare measured by all three indices. Such a policy could be attractive to international tourists because it can improve the price competitiveness of international tourism and hence benefit the tourism sector and tourism-related sectors. However, the benefit to this sector in particular, and to the economy in general, comes with a domestic welfare loss.

Table 8.23: Welfare Changes (% of consumption expenditure): Simulation 4

Description	Welfare Change
PCD (% of consumption expenditure)	-0.0092
LCD (% of consumption expenditure)	-0.0092
Real consumption (percentage change)	-0.0092
Money measure (96/97)	
PCD ($ million, 96/97)	-29.81
LCD ($ million, 96/97)	-29.81
Real consumption ($ million, 96/97)	-29.81
Money measure (2002/03)	
PCD ($ million, 2002/03)	-41.58
LCD ($ million, 2002/03)	-41.58
Real consumption ($ million, 2002/03)	-41.58

8.6.4. Macroeconomic Effects

Table 8.24 provides the percentage changes in the macroeconomic variables for the two simulations carried out under the TRS policy. In the short-run, the refund policy is able to expand the Australian economy as represented by a marginal increase in real GDP by 0.004 per cent. This expansion in the economy is mainly explained by the increase in aggregate employment since it is the only flexible factor. In order for aggregate employment to increase, the real producer wage or marginal product of labour should decline.

As explained in simulation one in Section 8.3.1.4, the change in MP_L is due to two opposing forces. The first is the change in indirect taxes. The simulation is about tax refunds and hence there is a reduction in indirect tax rates. Therefore, in the absence of changes in the terms of trade, reductions in indirect taxes causes a decline in MP_L requiring a decrease in the K/L ratio. Since capital is fixed in the short-run, labour should increase. The second is the short-run change in the terms of trade. Under the price changes, it was revealed earlier that the terms of trade declines (by 0.032 per cent). The decline in the terms of trade implies that MP_L rises and hence labour usage declines. However, the terms of trade decline is not large enough to change the final outcome of aggregate employment but still it makes its effect on aggregate employment. When the change in the terms of trade is considered, results show that MP_L falls only marginally due to upward pressure on it by the terms of trade.[37]

[37] $MP_L = realwage + (p0gne - p0gdp) + (p0gdp - p1prim\_i)$

Table 8.24: Macroeconomic Results (% change): Simulation 4

Variable description	Short-run	Long-run
Real GDP (expenditure side)	0.004	-0.001
Real GDP (at factor cost)	0.003	-0.001
Aggregate employment	0.005	-
Aggregate capital stock, rental weights	-	-0.005
Real household consumption	-	-0.009
Real household disposable income	-0.007	-0.012
Income tax rates	0.046	0.058
Export volume	0.049	0.048
Import volume	0.026	0.021
Contribution of BOT to real GDPexp.	0.004	0.005

On the expenditure side, the GDP expansion is explained totally by a movement of the trade balance. As shown in Table 8.24, motivated by the increased international tourism demand, net exports have increased. As far as imports are concerned, Australia is assumed to be a small country and thus c.i.f. import prices in foreign currency are treated as exogenous. On the other hand, it is understood that Australia has considerable market power in some commodity exports (i.e. some agricultural and mineral products) and service exports such as tourism and international education. Therefore, for Australia to expand its exports volume, it is essential that world market prices of exports are reduced. Earlier results show that the export price index has declined.

In the long-run, the refund policy generates a marginal contraction in GDP. From the income side, the contraction in real GDP is initiated by a contraction in the aggregate capital stock. The contraction in aggregate capital stock could be explained by referring to the changes of the marginal product of capital (MP_K).[38] As explained in Section 8.6.1 above, the tax refund policy has resulted in a reduction in the terms of trade (by 0.032 per cent). The reduced terms of trade causes an increase in MP_K requiring a decrease in the K/L ratio. In our model in the long-run, aggregate employment is assumed to be fixed and thus, a decrease in the K/L ratio requires that the capital stock declines.

On the expenditure side, a reduction in real GDP can be explained by the reduction in real consumption, the only exogenous variable in the domestic absorption. There are two possible reasons for the reduction in real consumption. First, the reduction in the K/L ratio (as noted above) implies that MP_L falls and this requires a reduction in the after-tax real wage. Therefore, the reduced income driven by reduced MP_L leads to a

[38] It is the opposite mechanism that was explained in the previous three simulations in relation to changes in the aggregate capital stock.

decrease in real consumption. Our results show that the after-tax real wage declines by 0.012 per cent (c.f. Table 8.19). Furthermore, the macroeconomic results show that real household disposable income declines leading to a decline in real consumption. This results from both the rise in the CPI and the fall in income taxes paid by households (the results show that income tax rates fall by 0.058 per cent due to the budget neutrality assumption). Second, deteriorated terms of trade means that less imported commodities are available for domestic consumption and hence real consumption declines. Furthermore, long-run closure implicitly explains that any change in the terms of trade is totally represented by a change in real consumption.

8.6.5. A Summary of Results

In this simulation, we considered the TRS policy. The results suggest that a tax refund can cause a reduction in international tourism prices. Such a price reduction can encourage the demand for international tourism and thus increased international tourism consumption. The tourism-related sectors could gain from the increased tourism demand while the other sectors loose. Overall, it appears that the refund policy is unable to boost the economy as expected. While it stimulates economic growth in terms of real GDP and employment in the short-run, it is virtually a failure in the long-run. It is true that the Australian tourism sector, in particular international tourism (hence related sectors), benefits from increased tourism consumption due to tax refunds. However, it is doubtful whether this increased consumption can be turned into an overall success. While the sector enjoys some expansions, the most crucial limitations of this policy change are the reductions in household consumption and general export contractions.

8.7. Simulation Five: Abolition of Tourism Taxes

As noted in early chapters, there is a view that tourism sectors are being unfairly targeted for taxation and that taxation is an impediment to the development of the sector. Industry representatives including WTO (1998b) and WTTC (2002) are of this view and they continue to call for reduced taxes for tourism sectors around the world. It is doubtful, however, whether these arguments are based on appropriate analysis of the tourism tax structures of those countries concerned. They could well be based on subjective judgements. Furthermore, these arguments may be partial and they may have been based on explicit negative effects of tourism taxes on the tourism sector and related sectors. Thus, the overall effects of tourism taxes may have been overlooked. In particular, implicit positive (possible) effects may have been ignored to a larger extent.

If these arguments against tourism taxation are accurate, abolition of these taxes should drive tourism sectors towards expansions. It is clear that reductions in tourism taxes applied to a particular destination can increase its price competitiveness. Thus, it would attract more tourists hence benefiting the sector and related sectors. This expansion in the tourism sector should then result in an overall economic expansion. Simply stated, such a policy move should increase efficient resource allocation within the economy and it should be welfare-improving. The simulation experiments carried out in this section and explained in following sections are aimed at quantifying these issues.

Three sets of simulations are carried out. The first set of simulations is to abolish all existing tourism taxes applicable to international visitors in Australia.[40] These include both general tourism taxes: the GST, gambling taxes and excise duties and special tourism taxes: passenger movement charge and aircraft noise levy.[41] As far as government revenue is concerned, the abolition of tourism taxes generates a substantial budget deficit. Accordingly, this deficit should be financed from an alternative source, preferably by increasing a tax with a much broader base to make the overall policy change revenue neutral.

For this purpose, an increase in the GST is assumed and the second set of simulations is designed in relation to the GST increase.[42] The relevant rates by which to increase the GST are also estimated by doing another simulation and the results of this simulation reveal that the GST should be increased by 0.40 per cent for all taxable commodities. The last set of simulations is designed to quantify the final effect of both policy

[40] In this case, we abolished all taxes incorporated into our model applied to international visitors. The issue of tourism taxation is more concerned with the international tourism context than with the domestic tourism context.

[41] Note from Chapter Seven that we have incorporated PMC and ANL into our core database since they are two important special tourism taxes and we have assumed that they are embodied in current tourism consumption.

[42] We simulate the increase in the GST as only applicable to the household sector. However, such a policy change may be practically difficult to implement. When the GST is increased, international visitors have to pay the increased rate for applicable purchases. In this experiment, our aim is to analyse the overall economic effect of zero tax policy towards international tourism.

changes: the tax abolition and the GST increase. The simulations are carried out based on the same economic environments: the short-run and long-run, as applied in all previous simulations. The assumptions regarding two economic environments are outlined in Section 8.2.

In Sections 8.7.1 – 8.7.4, we present the results of three simulations. Our discussion will be mainly confined to long-run analysis unless if there is special case to discuss short-run results. We have highlighted variations and differences between the results of the short-run and long-run simulations in our earlier simulations and we do not feel that it is essential that we highlight them again.

8.7.1. Changes in Prices

The percentage changes in the price variables are presented in Table 8.25 for all simulations. As expected, the abolition of all taxes in the international tourism sector significantly reduces the consumer price of composite international tourism. For instance, the results show that the price of international tourism decreases by more than 5 per cent. This may improve the price competitiveness of international tourism in Australia markedly, which might lead to a considerable increase in international tourism demand/consumption. While international visitors benefit from the tax abolition policy, local consumers including domestic visitors seem to be disadvantaged from the increased domestic consumer prices as represented by the increased CPI. This implies that the relative prices of all other commodities have increased.[43]

The results suggest that both average nominal wage (0.329 per cent) and average capital rental (0.211 per cent) increase. However, the after-tax real wage declines because of the increase in the CPI and income taxes. The main reason behind the increase in factor prices is the increased demand for capital and labour followed by an expansion of the output in tourism-related industries. The export price index shows a decline although the purchaser's prices of all commodities increase, except international tourism. This is mainly because the export price index is moved by the strong price reductions of the

[43] These results are theoretically consistent with general equilibrium tax theory. The tax abolition works as negative taxes and hence may be similar to a subsidy. Theoretically, therefore, it may have implications similar to a subsidy or a negative tax. Moreover, this is only applicable to a particular sector (partial subsidy or partial negative tax). Therefore, commodity price reduction is evident only in that particular sector while commodity prices of all other sectors increase.

international tourism product. The reduction of the export price index implies that the terms of trade declines by a similar magnitude. Furthermore, these price changes have brought about a real devaluation.

Table 8.25: Percentage Changes in Prices: Simulation 5

Variable description	Tax abolition		GST increase		Final effect	
	SR	LR	SR	LR	SR	LR
Domestic tourism (consumer price)	0.334	0.213	0.530	0.239	0.864	0.466
International tourism (consumer price)	-5.233	-5.424	0.308	-0.010	-4.941	-5.419
Average nominal wage	0.274	0.329	0.521	-0.052	0.796	0.299
Real wage (before tax)	n.a.	0.107	n.a.	-0.230	n.a.	-0.116
Real wage (after tax)	n.a.	-0.198	n.a.	0.020	n.a.	-0.168
Average capital rental	0.410	0.211	0.121	-0.010	0.531	0.215
Consumer price index	0.274	0.222	0.521	0.179	0.796	0.415
GDP price index (exp)	0.168	0.137	0.491	0.101	0.659	0.255
Absorption price index	0.262	0.227	0.454	0.101	0.717	0.343
Export price index	-0.512	-0.489	0.196	0.000	-0.318	-0.476
Terms of trade	-0.512	-0.489	0.196	0.000	-0.318	-0.476
Real devaluation	-0.168	-0.137	-0.488	-0.101	-0.655	-0.255

When the GST is increased to finance the tax abolition, it is clear that local consumers are penalised. For instance, the results show that the general price level has increased, as shown by the increased CPI, while the price of domestic tourism has increased at an even higher rate than the CPI.[44] Unlike the case of tax abolition, primary factor suppliers are affected, as represented by declines in average nominal wage and average capital rental (in the long-run). The before-tax real wage has declined markedly, more than four times the decline of nominal wages. In contrast, the after-tax real wage shows a marginal improvement.

In summary, it is clear that the final effect is substantial and is mostly dominated by tourism tax abolition since the percentage changes in the variables are of a greater magnitude in the tax abolition case than in the case of a GST increase. The international tourism sector has become price competitive while local commodities, including domestic tourism, are higher in price. For example, the general price level has increased almost by half a per cent. The after-tax real wage falls despite the initial increases in nominal factor prices. The export price index shows a considerable decline and thus a decline in the terms of trade is evident.

[44] In general equilibrium, this is similar to the case of a general commodity tax increase. Thus, the results are theoretically plausible since the increase in the GST increases the consumer prices of all commodities on which the GST is applied as a broad base tax.

8.7.2. Industry Effects

The percentage changes in output of commodities and employment among industries are presented in Table 8.26 (tourism-related industries) and 8.27 (all other industries). The industry results of the tax abolition simulation closely follow the results of the TRS simulation since both tax abolition and the TRS are favourable policy changes towards international tourism. The results show that output of the international tourism commodity increases by almost 12 per cent, responding to the reduced price. Most of the tourism-related sectors are beneficiaries of this expansion. In contrast, most of the tourism-related sectors, except a few sectors such as food products, education and beverages and cigarettes, experience output contractions in the increased GST simulation.[45] As far as the final effects of these two simulations are concerned, it appears that the results of the tourism tax abolition mostly dominate in deciding the direction of the industry results. In short, these interrelated two policies are beneficial mostly to the tourism-related sectors resulting from international tourism expansion.

Table 8.27 shows that most of the other sectors, in particular the traded sectors, are adversely affected by the tax abolition policy while marginal expansions are recorded when the GST is increased. Significant export reductions are the main reasons behind the contraction of these sectors.[46] When the overall results are considered, it is clear that the other sectors are negatively affected by tax changes considered in the simulation.

[45] Some of the sectors that experience output expansions such as food, agriculture, owner dwellings and education had no GST increase since they are zero-rated industries for the GST, resulting in reductions in purchaser's prices to households. Thus, household consumption of these commodities increases, forcing output expansions.

[46] The results show that only international tourism demand increases (under exports) but all the other exports decline. However, the exports volume shows that it increases and this is because a large increase in tourism has outweighed the reductions in exports of other commodities.

Table 8.26: Industry Results (% changes) - Tourism-related Industries: Simulation 5

Industry	Tax abolition				GST increase				Final effect			
	Short-run		Long-run		Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Food products	-0.013	-0.018	-0.048	-0.071	-0.270	-0.375	0.021	0.028	-0.283	-0.392	-0.035	-0.053
Bev. & Cigarettes	0.115	0.285	0.167	0.120	-0.183	-0.452	0.016	0.030	-0.069	-0.170	0.182	0.147
Clothing & footwear	-0.244	-0.264	-0.290	-0.296	-0.348	-0.376	0.012	0.014	-0.592	-0.640	-0.287	-0.292
Petroleum & refinery	0.267	0.977	0.240	0.173	-0.150	-0.542	0.006	0.024	0.116	0.423	0.242	0.188
Retail	0.077	0.080	-0.056	-0.059	0.013	0.014	0.031	0.032	0.090	0.093	-0.005	-0.008
Repairs	0.093	0.118	-0.033	-0.052	-0.130	-0.167	-0.042	-0.037	-0.038	-0.049	-0.061	-0.077
Hotels & cafes	0.865	1.140	0.811	0.797	-0.136	-0.178	-0.038	-0.032	0.724	0.954	0.786	0.776
Road transport	0.328	0.398	0.261	0.244	-0.195	-0.236	0.006	0.011	0.131	0.159	0.262	0.248
Rail transport	0.464	0.552	0.340	0.333	-0.184	-0.218	-0.014	-0.012	0.278	0.330	0.316	0.312
Water transport	2.372	4.629	2.839	2.797	-0.323	-0.614	-0.007	0.005	2.037	3.962	2.816	2.783
Air transport	1.930	2.435	1.990	1.973	-0.232	-0.291	0.023	0.027	1.687	2.127	2.014	2.001
Transport services	0.272	0.534	0.271	0.242	-0.169	-0.330	-0.001	0.009	0.102	0.200	0.268	0.248
Communications	0.072	0.138	-0.010	-0.039	-0.156	-0.299	-0.027	-0.017	-0.085	-0.162	-0.031	-0.052
Finance services	0.059	0.077	-0.031	-0.047	-0.166	-0.218	-0.013	-0.008	-0.108	-0.141	-0.040	-0.051
Public service	0.018	0.020	-0.018	-0.023	-0.045	-0.050	-0.015	-0.013	-0.027	-0.030	-0.029	-0.033
Education	0.378	0.407	0.354	0.350	-0.121	-0.131	0.037	0.038	0.256	0.275	0.390	0.388
Other entertainment	0.155	0.216	0.099	0.081	-0.169	-0.235	-0.016	-0.009	-0.014	-0.020	0.089	0.075
Lib., museums & Arts	0.306	0.355	0.252	0.244	-0.080	-0.093	-0.032	-0.029	0.224	0.260	0.231	0.226
Gambling & recreation	0.161	0.256	0.045	0.020	-0.121	-0.192	-0.097	-0.089	0.040	0.063	-0.029	-0.047
Other services	0.064	0.076	-0.053	-0.063	-0.105	-0.125	-0.056	-0.052	-0.041	-0.049	-0.095	-0.103
Domestic tourism	-0.025	n.a.	-0.144	n.a.	0.007	n.a.	-0.020	n.a.	-0.018	n.a.	-0.137	n.a.
International tourism	11.348	n.a.	11.798	n.a.	-0.613	n.a.	0.020	n.a.	10.666	n.a.	11.788	n.a.

Table 8.27: Industry Results (% changes) - All Other Industries: Simulation 5

Variable description	Tax abolition				GST increase				Final effect			
	Short-run		Long-run		Short-run		Long-run		Short-run		Long-run	
	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp	Output	Emp
Agriculture	-0.171	-0.338	-0.227	-0.362	-0.308	-0.609	0.028	0.048	-0.478	-0.944	-0.213	-0.336
Forestry & fishing	-0.047	-0.061	-0.095	-0.116	-0.271	-0.351	-0.004	0.002	-0.316	-0.410	-0.104	-0.120
Mining	-0.146	-0.405	-0.671	-0.713	-0.235	-0.650	-0.040	-0.026	-0.382	-1.052	-0.754	-0.785
Textiles	-0.308	-0.361	-0.048	-0.433	-0.539	-0.631	0.012	0.016	-0.845	-0.988	-0.428	-0.437
Other manufacturing	-0.180	-0.211	-0.269	-0.282	-0.415	-0.487	-0.001	0.003	0.592	-0.695	-0.285	-0.295
Wood, paper etc.	-0.044	-0.064	-0.123	-0.151	-0.225	-0.332	0.000	0.008	0.268	-0.395	-0.123	-0.145
Chemicals	-0.204	-0.318	-0.320	-0.349	-0.376	-0.585	0.003	0.011	-0.579	-0.899	-0.333	-0.356
Non-metallic mineral	-0.078	-0.118	-0.136	-0.166	-0.179	-0.270	0.003	0.011	-0.256	-0.386	-0.137	-0.162
Metallic products	-0.263	-0.358	-0.424	-0.447	-0.447	-0.609	0.000	0.006	-0.708	-0.963	-0.450	-0.468
Motor vehicle & parts	-0.224	-0.355	-0.436	-0.468	-0.407	-0.644	-0.002	0.006	-0.631	-0.997	-0.456	-0.482
Aircraft	0.758	0.885	0.924	0.911	-0.508	-0.592	0.036	0.039	0.248	0.289	0.941	0.931
Electricity, gas, water	0.025	0.082	-0.099	-0.137	-0.121	-0.396	-0.045	-0.031	-0.096	-0.314	-0.137	-0.163
Construction	-0.015	-0.017	-0.003	-0.015	0.073	0.084	0.001	0.005	0.058	0.067	-0.001	-0.010
Wholesale	-0.009	-0.010	-0.093	-0.101	-0.187	-0.212	0.003	0.006	-0.196	-0.222	-0.091	-0.097
Owner dwelling	0.000	0.037	-0.232	-0.271	0.000	0.028	0.190	0.209	0.000	0.064	0.000	-0.023

8.7.3. Household Consumption Effects and Welfare Changes

The percentage changes in household consumption in the simulations are given in Table 8.28. The results show that the tourism tax abolition has led to a general increase in consumer prices. Similarly, an increase in the GST has caused consumer price increases for commodities, except for zero-rated commodities such as agriculture, food and beverages, owner dwelling, air transport and education. Significant price increases are evident mostly among the services sectors. Increased consumer prices have led to a reduction in household consumption for most commodities.

Table 8.28: Changes in Household Consumption (% changes): Simulation 5

Industry/Commodity	Tax abolition		GST increase		Final effect	
	Consu. price	Consu.	Consu. price	Consu.	Consu. price	Consu.
Agriculture	0.173	-0.100	-0.009	0.009	0.176	0.012
Forestry & fishing	0.218	-0.074	0.312	-0.029	0.545	-0.090
Mining	0.235	-0.156	0.276	-0.039	0.527	-0.170
Food products	0.199	-0.043	-0.008	0.035	0.205	0.000
Beverages & Cigarettes	0.163	-0.058	0.002	0.052	0.176	0.008
Textiles	0.195	-0.094	0.219	-0.007	0.427	-0.082
Clothing & footwear	0.197	-0.034	0.179	0.003	0.389	-0.024
Other manufacturing	0.176	-0.155	0.199	0.002	0.386	-0.119
Wood, paper etc.	0.212	-0.150	0.235	-0.019	0.461	-0.141
Petroleum & refinery	0.154	-0.118	-0.002	0.112	0.162	0.024
Chemicals	0.230	-0.157	0.123	0.042	0.368	-0.088
Non-metallic mineral	0.202	-0.153	0.229	-0.016	0.445	-0.140
Metallic products	0.183	-0.154	0.205	-0.002	0.400	-0.123
Motor vehicle & parts	0.171	-0.133	0.227	-0.015	0.409	-0.117
Aircraft	0.025	-0.045	0.393	-0.102	0.420	-0.114
Electricity, gas, water	0.234	-0.158	0.404	-0.108	0.653	-0.240
Construction	0.225	-0.126	0.353	-0.067	0.593	-0.171
Wholesale	0.225	-0.157	-0.009	0.116	0.231	-0.015
Retail	0.264	-0.178	-0.022	0.123	0.259	-0.030
Repairs	0.244	-0.161	0.397	-0.103	0.658	-0.239
Hotels & cafes	0.217	-0.152	0.399	-0.108	0.631	-0.232
Road transport	0.184	-0.023	0.396	-0.018	0.593	-0.036
Rail transport	0.214	-0.051	0.388	-0.034	0.617	-0.076
Water transport	0.129	-0.026	0.402	-0.028	0.540	-0.047
Air transport	0.132	-0.218	-0.006	0.235	0.135	0.079
Transport services	0.150	-0.112	0.401	-0.106	0.562	-0.189
Communications services	0.228	-0.153	0.383	-0.096	0.626	-0.223
Finance services	0.260	-0.172	0.393	-0.103	0.672	-0.249
Owner dwelling	0.249	-0.281	-0.013	0.195	0.252	-0.043
Public service	0.277	-0.177	0.374	-0.091	0.671	-0.244
Education	0.286	-0.189	-0.032	0.128	0.272	-0.037
Other entertainment	0.197	-0.136	0.408	-0.109	0.619	-0.217
Library, museums & Arts	0.256	-0.166	0.389	-0.099	0.663	-0.240
Gambling & recreation	0.224	-0.163	0.411	-0.120	0.651	-0.254
Other services	0.266	-0.172	0.385	-0.097	0.670	-0.244
Domestic tourism	0.213	-0.144	0.239	-0.020	0.466	-0.137
International tourism	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Consu. Prices = consumer prices, Consu. = consumption

In summary, for most commodities, the final effect on prices is significantly higher since consumer prices have increased in both simulations. Accordingly, household consumption of almost all commodities declines. However, consumption of some commodities such as air transport, agriculture, and beverages and cigarettes show an increase while the consumption of food products is unchanged. Note that these are zero- rated for the GST increase and thus household consumption has increased. Overall, the results suggest that both the tourism tax abolition and the GST increase simulations are unfavourable for domestic consumption in the long-run since they discourage household consumption.

Table 8.29: Welfare Changes (% of consumption expenditure): Simulation 5

Description	Tax abolition	GST increase	Final effect
PCD (% of consumption expenditure)	-0.1579	0.0183	-0.1127
LCD (% of consumption expenditure)	-0.1578	0.0182	-0.1128
Real consumption (percentage change)	-0.1579	0.0182	-0.1129
Money measure (96/97)			
PCD ($ million, 96/97)	-514.13	59.59	-366.96
LCD ($ million, 96/97)	-513.80	59.26	-367.28
Real consumption ($ million, 96/97)	-514.13	59.26	-367.61
Money measure (2002/03)			
PCD ($ million, 2002/03)	-717.08	83.11	-511.81
LCD ($ million, 2002/03)	-716.63	82.65	-512.27
Real consumption ($ million, 2002/03)	-717.08	82.65	-512.72

Welfare changes of all simulations are presented in Table 8.29. The results suggest that the abolition of tourism taxes is welfare-decreasing and the welfare loss is substantial at –0.1579 per cent of consumption expenditure. This finding is consistent with previous studies (Blake 2000).[47] In contrast, the increase in the GST tends to be welfare-improving as shown by marginal improvement of 0.0183 per cent of consumption. The improvement in welfare is mainly driven by increases in the consumption of zero-rated commodities.[48] Understandably, the final effect of the two

[47] Blake (2000) found that an exemption of VAT (value added tax) on accommodation sectors is welfare decreasing.

[48] Agriculture, food, air transport, owner dwellings and education are considered as zero-rated sectors for the GST. The GST increase does not affect these sectors, and thus the price of composite commodities from those sectors declines. Subsequently, it leads to an increase in household demand. Moreover, in household consumption, owner dwellings represents the single largest item in total household expenditure ($56,481 million in basic value) and hence a marginal increase (0.195 per cent increase) in percentage change in household demand for owner dwellings can amount to a significant increase in household demand. Food products also represent a considerable portion of total household expenditure and thus any increase in consumption can lead to a significant increase in total consumption. While household demand declines for most of the other commodities due to the GST

tax changes appears to be welfare-decreasing. Furthermore, it is clear that the higher welfare loss from tax abolition (against the marginal welfare gain from the GST increase) dominates in the final result.

8.7.4. Macroeconomic Effects

Table 8.30 presents the percentage changes in the macroeconomic variables of all simulations.[49] The results show that the two tax changes considered bring opposite effects. For instance, the tourism tax abolition results in an economy-wide contraction as represented by a reduction in real GDP (0.026 per cent, long-run change). On the income side, the real GDP contraction is explained by a reduction in the capital stock. On the expenditure side, it is explained by referring to reduction in real household consumption (for instance, the results show that real household consumption declines by 0.158 per cent in the tax abolition simulation). The reduction in real household consumption could be linked to a reduction in the after-tax real wage (c.f. Table 8.25). Furthermore, Table 8.30 shows that real household disposable income falls, which arises from increases in income taxes paid by the household sector plus the increase in the general price level.

Table 8.30: Macroeconomic Results (% changes): Simulation 5

Variable description	Tax abolition		GST increase		Final effect	
	SR	LR	SR	LR	SR	LR
Real GDP (expenditure side)	0.079	-0.026	-0.131	0.011	-0.052	-0.011
Real GDP (at factor cost)	0.075	-0.029	-0.133	0.015	-0.059	-0.010
Aggregate employment	0.111	-	-0.197	-	-0.087	-
Aggregate capital stock	-	-0.093	-	0.048	-	-0.031
Real household consumption	-	-0.158	-	0.018	-	-0.113
Real household disposable income	-0.102	-0.217	-0.118	0.022	-0.219	-0.185
Income tax rates	0.816	1.077	-0.438	-0.883	0.372	0.184
Export volume	0.751	0.608	-0.708	-0.001	0.041	0.554
Import volume	0.318	0.229	0.009	-0.001	0.326	0.240
Contribution of BOT to real GDP	0.079	0.069	-0.131	0.000	-0.052	0.057

increase, they are unable to outweigh the increase in demand for commodities such as owner dwellings and food products. Real household consumption is measured as an index that represents changes in demand for individual commodities relative to total household expenditure. Thus, a significant increase in demand for one commodity can dominate the index.

[49] In analysing the macroeconomic results, we mainly focus on the long-run results.

The increase in GST seems to be expansionary (long-run), as represented by the marginal increase of real GDP by 0.011 per cent.[50] In terms of the overall effects, it is evident from the above discussion that the two tax changes do not yield an overall positive effect in the macro economy. For instance, Table 8.30 shows that real GDP declines by 0.011 per cent, suggesting that the tourism tax abolition is unable to stimulate economic growth. There is a significant increase in net exports as represented by increases in export and import volumes. However, expansion in exports is driven by the marked increase in international tourism consumption (by 11.78 per cent). This suggests that, as expected, tourism tax abolition stimulates international tourism in Australia thereby benefiting the tourism-related sectors in terms of expanded output and employment generation.

8.7.5. A Summary of Results

In this last simulation experiment, we considered an abolition of all tourism taxes applicable to international visitors in Australia and an increase in the GST in order to finance the tax abolition. In summary, the results show that such tax changes bring substantial reductions in the price of international tourism while the domestic price level shows marginal increase. Due to the improved price competitiveness, the demand for international tourism shows a considerable increase. Thus, the tourism-related sectors experience output expansions while the other sectors experience some contractions. Overall, it appears that the two tax changes considered are not beneficial to the economy as a whole. They result in contraction in overall economic activities and are found to be welfare decreasing.

8.8. Summary of Major Findings and Conclusion

In this chapter, tourism tax simulations were carried out and results were analysed to understand the general equilibrium effects of tourism taxes in Australia. Simulations were aimed at five policy changes in tourism taxation in Australia. Three of these were based on policy scenarios developed in an earlier chapter. The last two policy changes were based on provision of tax refunds to international visitors and abolition of taxes paid by international visitors. In each policy change, alternative simulations

[50] The expansionary effects of real GDP and relevant causes for such changes are as explained in the first three simulations.

were carried out for comparative purposes under two different economic environments: the short-run and long-run. The simulations results were confirmed to be consistent with general equilibrium tax theory.

In relation to the first policy scenario, an increase in PMC (passenger movement charge) was assumed with a view to recover the cost of negative externalities in tourism. Two sets of simulations for two alternative scenarios: principal policy (PMC increase is applied only for international visitor departures) and alternative policy (PMC increase is applied for all departures) were carried out.

The simulation results suggest that an increase in the PMC can result in an increase in the price of the composite international tourism product and reduces the factor prices. The increase in the tourism price seems to have some adverse effect on international tourism consumption and subsequently most tourism-related sectors are negatively affected. However, most of the other sectors, in particular the traded sectors, tend to benefit from the tax change.

The macroeconomic results suggest that during the short-run the proposed policy change could generate a marginal contraction in overall economic activities as represented by a decline in real GDP. This contraction is mainly due to the substantial contraction in exports volume backed by reduced international tourism consumption on the expenditure side and a contraction in aggregate employment on the income side. In contrast, it appears that in the long-run, the same policy change could bring some marginal expansions in overall economic activity. Long-run economic expansion is initiated by an increase in the aggregate capital stock and an increase in real household consumption. Both the capital stock and real consumption are changed due to improvements in the terms of trade and increased indirect taxes. Moreover, the results suggest that real household disposable income has improved against the background of reduced income taxes. In summary, the proposed policy to increase the PMC could cost international tourism and, subsequently, could affect the tourism-related sectors. However, there appears to be some welfare improvements arising from tourism taxes in the long-run. When compared with the alternative policy, it is clear that the principal policy in which the tax change was considered on a discriminatory basis (i.e. only for international visitors) is the better alternative.

In the second policy scenario, an imposition of a tax on the use of accommodation is assumed in order to fund the provision of public goods consumed by international visitors. Two sets of simulations were carried out to analyse the effects of the accommodation tax for two alternative scenarios, each under two different economic environments: the short-run and the long-run. The two scenarios are the principal policy (taxing only international visitors) and the alternative policy (taxing both domestic and international visitors).

The simulation results are very similar in direction to those of the simulation one. The results show that the price of the composite international tourism product increases due to the tax. The tourism-related sectors are adversely affected by the tax increase while other (traded) sectors enjoy some expansion of output due to increased exports. As far as the macroeconomic results are concerned, the short-run results indicate that the proposed policy is economically disadvantaged, as shown by the reduction in real GDP. However, in the long-run, the imposition of taxes on accommodation may bring some marginal economic expansion in the real GDP. Subsequently, such a policy change tends to be welfare-improving although it can affect the national tourism sector. Of the two alternatives, the principal policy appears to be the better alternative, particularly in terms of the short-run negative effects.

The third policy scenario was developed on the premise that government revenue can be maximised through the current tourism tax structure. Accordingly, simulations were carried out to ascertain the short-run and long-run effects of such tax changes. The results of these simulations follow those of the two earlier simulations and are similar, in particular, in the direction of the changes in the variables although the degree of changes are considerably higher in this simulation. It is mainly because of relatively higher tax changes considered in this simulation. The results generally confirm that taxing the international tourism sector tends to be contractionary during the short-run while such a policy may be expansionary with domestic welfare improvement in the long-run.

Next in the analysis, two simulations were carried out in relation to the existing tourist refund scheme to identify the economy wide effects of such a scheme. Tax refunds to tourists are similar to tax reductions hence they could have some easing effect on the price of the relevant commodity. Simulation results confirm this theory and show that the price of international tourism declines irrespective of time periods. Thus, tourism consumption increases and, subsequently, tourism-related sectors benefit. However, other (traded) sectors are disadvantaged by the TRS, due to possible exports contractions. Despite the exports contractions in these sectors, total exports increase mainly due to improved international tourism consumption in the short-run, and thus the TRS can lead to an increase in real GDP. However, in the long-run a marginal contraction in real GDP is reported, suggesting such a policy could be welfare-decreasing in the long-run.

The last policy experiment undertaken was in relation to the abolition of tourism taxes which is financed by an increase of the GST. Three sets of simulations were carried out separately for the tax abolition, the GST increase and the final effect. Abolition of available tourism taxes is clearly an incentive to the sector as shown by reduced prices and subsequent increases in tourism consumption. However, the relative prices of other commodities tend to increase. Therefore, the other sectors experience substantial reductions in output while the tourism-related sectors benefit.

In the case of the GST increase, it brings a short-run contraction in real GDP with a marginal expansion in the long-run. The long-run expansion is driven by improved aggregate capital stock and real consumption. When the GST is increased, commodity prices rise except for zero-rated commodities. Subsequently, most of the sectors, tourism-related and traded, are adversely affected. In response to commodity price changes, household consumption declines for the commodities of which prices rise, while for others consumption increases. Accordingly, a rise in real consumption is reported.

As far as the final effect of the two tax changes is concerned, it is evident that the Australian tourism sector and related sectors gain while the other sectors lose. Overall, the results suggest that these tax changes are contractionary, irrespective of the economic environment (short-run or long-run). In the short-run, however, the extent of economic contraction is even greater than in the long-run. Furthermore, real consumption continues to decline despite the small increase shown in the GST simulation, suggesting that tax changes are welfare-decreasing.

In this chapter, we have reported the results of each simulation, and where possible we have made comparisons between the short-run and the long-run results, and among other alternative forms. However, we have not attempted to draw any policy implications arising from the tourism tax changes considered in the study. It is, practically speaking, very important that we draw such policy implications and the next chapter will be devoted to this purpose.

CHAPTER NINE

AN AUSTRALIAN TOURISM TAX POLICY

Alternative tourism tax policy changes are compared and evaluated. A range of tourism tax policy measures including a complete abolition of tourism taxes, increases of tourism taxes at varying magnitudes and tourism tax refunds are considered. The immediate contractionary effects of such changes on the sector and in the economy and changes in general welfare are taken into account in the evaluation of alternatives, and policy inferences are drawn. It is shown that the economically viable tourism tax policy is the one that both addresses some of the exiting tourism tax issues and minimises the contractionary effects with some welfare improvements.

9.1. Introduction

In Chapter Eight, all simulations in relation to tourism tax policy scenarios were carried out with the use of the TTM. The general equilibrium effects of changes in tourism taxes were analysed. Following the analysis of simulation results, policy implications need to be drawn and in such a context there are some questions that need to be answered. They include: Is there a need to change the current Australian tourism tax structure? What are the policy options available? What is the appropriate policy that Australia can adopt towards the tourism tax structure? The aim of this chapter is to explore these issues. The chapter is organized as follows: in Section two, summary measures of all tourism tax policy changes are presented and compared. Section three evaluates alternative tax policy directions and draws policy inferences. Section four outlines some suggestions for an appropriate tourism tax policy for Australia and the final section concludes the chapter.

9.2. A Comparison of Alternative Tourism Tax Policies

A summary of experimental simulations, including the various tax changes considered are given in Table 9.1. The tax changes include increases of current taxes, impositions of new taxes, tax refunds and abolition of existing taxes. The changed taxes consist both of unit tourism taxes and ad valorem tourism taxes. The changes were of different magnitudes based on the targets of the policy changes considered. Where possible, alternative simulations were carried out. For instance, as shown in Table 9.1, in the first two experiments, two alternatives, the principal policy (taxing only international visitors) and the alternative policy (taxing both domestic and international visitors) were tested for comparative purposes. Furthermore, all simulations were carried out to analyse the short-run and long-run effects of variables.

Table 9.1: Summary of Policy Simulations

	Policy scenario	Simulation	Number of simulations
1	Internalising the cost of negative externalities of the Australian international tourism sector	Increase in PMC by $10 under two alternative scenarios: principal policy (only international visitor departures) and alternative policy (all departures)	Two sets of simulations each under two different closures: short-run and long-run
2	Funding the cost of tourism-related public goods in Australia	Imposition of a tax on the use of accommodation by international tourists (principal) and both by international and domestic tourists (alternative)	Two sets of simulations each under two different closures: short-run and long-run
3	Maximising government tax revenue via international tourism sector	Increase in taxes on planned tourism consumption expenditure	Three sets of simulations each under two different closures
4	Tourism refund scheme (TRS)	Provision of tax refunds to international visitors	Two simulations: short-run and long-run
5	Abolition of tourism taxes	Abolition of all tourism taxes and increase of GST to raise funds for the abolition	Three sets of simulations each under two different closures: short-run and long-run

The general equilibrium effects of tourism tax changes were analysed in terms of changes in prices, industry effects, household consumption effects and welfare changes, and macroeconomic effects. Overall, the results appear to be theoretically consistent and are in line with previous empirical findings. However, due to unknown errors in the data, our results may contain some bias. For instance, three major policy scenarios (the first three in Table 9.1) were designed based on estimations made using available information. The costs of negative externalities and public goods in relation to international tourism were estimated based on available data for the first two scenarios. Similarly, tax rates that maximise government revenue were estimated based on current tourism consumption data for the third scenario. Such estimations might contain various limitations. Subject to these potential limitations, some general policy inferences could be drawn in the light of our analysis and issues raised at the outset of this chapter.

In drawing policy inferences from our experiments, it is of great importance that a comparison across different alternatives and across different policy scenarios be done. However, such a comparison between alternatives (i.e. principal policy and alternative policy) may not be needed since a detailed comparison was given in the previous chapter. For instance, comparative results clearly suggested that the principal policy change is a better alternative than the alternative policy as it results in less adverse effects.

Such a comparison will help guide the future direction of Australian tourism tax policy. This comparison should be based on an overall measurement of our results that reflects the effectiveness of the policy changes considered. However, within our modelling structure, it appears that there is no single measurement suitable for both the short-run and long-run that reflects the overall effectiveness of tax policy changes.

In this context, a range of measures may be considered and they include changes in international tourism consumption, GDP, welfare changes and commodity tax revenue. From the tourism sector viewpoint, a change in tourism consumption is an important indicator of the effect of tourism taxes on the sector. As noted earlier, tourism taxes have an immediate impact on tourism prices and hence cause changes in tourism consumption. Given the multifaceted nature of tourism, such changes in tourism consumption become even more important since they affect tourism-related sectors. Therefore, despite the likely positive effects of tourism tax changes, changes in tourism consumption should be considered in conjunction with a few other general measures as noted above.

Among these general measures, GDP is an important one and its changes reflect the broader macroeconomic effects of policy changes. Note, however, that a change in GDP includes a change in tourism consumption as a part of aggregate exports. One notable limitation of GDP as a measure of tax changes in the short-run is that it does not reflect changes in household consumption arising from welfare changes. This is because, as noted earlier, household consumption is fixed in the short-run. Nevertheless, in the long-run, GDP reflects the overall effectiveness of policy changes. It accounts for changes in real consumption in the long-run. Furthermore, real consumption reflects welfare changes arising from tax changes after taking into account the redistribution of increased government tax income among households. This makes GDP the best indicator regarding the overall measurement in the long-run. In this context, tourism consumption and GDP are used in the comparison together with other measures such as welfare changes. Table 9.2 presents the dollar value of changes in selected measures in the base year value for Policies 1-3 and Table 9.3 presents the same for Policy 4 and 5.

Table 9.2: Summary Measures ($ mn): Tourism Tax Increases

Description	Policy 1		Policy 2		Policy 3	
	SR	LR	SR	LR	SR	LR
Tourism consumption	-78	-80	-202	-209	-1,898	-1,943
GDP	-29	6	-77	15	-803	19
Welfare changes	n.a.	27	n.a.	70	n.a.	513
Commodity tax revenue	41	45	107	117	940	1,012
Real household dis. Income*	0.005	0.012	0.129	0.030	0.107	0.254

SR = Short-run and LR = Long-run, *percentage change.

Table 9.3: Summary Measures ($ mn): Tax Refunds & Abolition

	Policy 4		Policy 5	
	SR	LR	SR	LR
Tourism consumption	77	80	1,249	1,380
GDP	23	-3	-283	-59
Welfare changes	n.a.	-30	n.a.	-368
Commodity tax revenue	-40	-45	142	11
Real household dis. Income*	-0.007	-0.012	-0.219	-0.185

SR = Short-run and LR = Long-run, *percentage change.

The first three policies (Policy 1-3) consider increases in tourism taxes (an increase in PMC, an imposition of an accommodation tax and an imposition of tax on planed tourism consumption, respectively). In the last two policies (Policy 4 and 5), tourism tax changes similar to tax reductions are considered (i.e. tourism tax refunds and abolition of all tourism taxes).

Changes in selected measures broadly reflect the directions of policy changes. For instance, tourism consumption contracts irrespective of the economic environment (short-run and long-run) in the first three policies, the most significant reduction being in relation to Policy 3 (maximisation of government revenue). It is almost 25 times higher than the first and nine times higher than the second. The least reduction in tourism consumption is reported in relation to Policy 1 and, understandably, this reflects the extent of the tax change considered (this policy considered a relatively small tax change). Clearly, the last two policy changes are beneficial to the tourism sector since they lead to an increase in tourism consumption.

In tandem with the contraction of tourism consumption, GDP contracts in the short-run and yet GDP reductions are lower than reductions in tourism consumption due to the expansions in other exports. The lowest contraction of GDP is due to the tourism tax increase in Policy 1 while Policy 2 and 3 experience almost a three times and 28 times higher contraction than that of Policy 1, respectively. In contrast, in the long-run, tourism tax increases cause some marginal GDP expansions. However, such expansions are not as significant as contractions. Of the three policies, Policy 3 enjoys the highest expansion. On the other hand, these tax increases also lead to welfare improvements in the long-run and they indicate that taxing tourism is advantageous in the long-run.

Policy 4 (tax refunds) realises opposite results to those of tax increases. For instance, in this policy, GDP expands in the short-run and contracts in the long-run. In terms of overall results, the most noticeable is Policy 5 (tax abolition) where GDP shows contractions both in the short-run (significant contraction) and long-run despite a considerable increase in tourism consumption. The short-run contraction of Policy 5 is the second highest contraction next to Policy 3. The welfare changes in the last two policies follow the GDP changes with the highest welfare reduction arising in Policy 5.

Changes in the commodity tax revenue of each policy are also presented in Table 9.2 and 9.3 and they show that tourism taxes can make a valuable contribution (in relation to Policy 1-3) to government tax revenue depending on the size of the initial change in the tax rate. Understandably, the highest tax revenue is realised in Policy 3, in which the tax increase is the highest. The increased tax revenue can initiate some positive changes within the economy. For instance, it can be redistributed among the Australian households either by way of reductions of income taxes or improved public goods.

As noted in the previous chapter, all simulations are budget neutral and thus, the redistribution of collected revenue is given as reductions in income taxes. In our results, household disposable income reflects the redistribution effect of income taxes. In order to support this view, we use percentage changes in real household disposable income as shown in Tables 9.2 and 9.3. It is evident that in the first three policies, real household disposable income improves while the last two policies experience the opposite result. These changes clearly guide the movements in real consumption in the long-run and thereby influence GDP. However, given the fixed real consumption in the short-run this aspect is not reflected in our results.

9.3. Implications for Policy

Our aim of making a comparison across five experimental tourism tax policies based on summary measures is to provide the background against which to recognise the most appropriate policy and subsequently draw policy inferences. From the policy makers' point of view, all available policy options, including ones we experimented with in the current study, may be broadly categorised as follows:

i. Abolish all tourism taxes and replace them with a broader commodity tax (Policy 5);
ii. Increase tourism taxes to address tourism-related externality issues and to maximise government revenue (Policy 1, 2, and 3);
iii. Provide some tax incentives to visitors (Policy 4); and
iv. Allow the current tourism tax structure operate unchanged.

In relation to the first option, our findings do not favour such a complete change in the current tourism tax structure. The results show that this policy change is contractionary in both the short-run and the long-run despite the considerable expansion in international tourism consumption. It, in fact, accounts for the second highest reduction in GDP in the short-run and the highest welfare reduction in the long-run. Therefore, the contractionary macroeconomic effect is too large to ignore despite the tourism expansion. From the tourism sector point of view, this policy may be theoretically appealing (due to tourism expansion) but our empirical findings are not supportive of this option.

Such an option may have serious implications against the background of deteriorating real household disposable income and it implies reduced standard of living among Australians. Therefore, this option stands as providing tax relief to international visitors at the cost of local residents. Furthermore, it is more likely that unemployment in other sectors and within the economy in general will arise (our results support this view) and thus the burden on the government budget arising from increasing unemployment benefit payments is likely to increase. In summary, given the contemporary macroeconomic environment in which maintenance of unemployment targets in line with other economic targets is a priority, it is highly unlikely that a policy that improves unemployment will be chosen.

The second option, which addresses three different policy issues, is about tourism tax increases of different magnitudes, the highest increase being for the last policy change (maximisation of government revenue). Such policy changes are of the highest importance as they have several policy implications. Tourism is largely a demand-driven activity and thus price competitiveness in the global market is the key to attracting international visitors. It is clear that tourism tax increases can result in the deterioration of tourism price competitiveness. The Available evidence suggests that Australia is considered to be a relatively less competitive destination in the region (Dwyer *et al.* 2000) and the WTTC Travel and Tourism Competitiveness Monitor (TCM) confirms this view (WTTC unspecified). In this context, tourism tax increases can be seen as further impediments.

The likely changes in price competitiveness result in a reduction in tourism consumption. This implies that international visitors could substitute away from Australia towards other competing destinations. The Available evidence also suggests that Australia experiences relatively higher cross-price elasticities from major markets, and destinations such as the UK, the US and New Zealand are more likely to receive those international visitors moving away from Australia (Divisekara 2003). Given this competitive market structure, it could be extremely difficult to avoid the adverse effects of increasing taxes on tourism. Therefore, what seems to be practical for Australia is to try to minimise such adverse effects, if possible, or to embark on tax changes that bring the lowest possible adverse effects, if it stands to gain via tourism taxes.

Our results that increased tourism taxes can adversely affect tourism-related sectors give rise to the question as to how these sectors could respond to restore the equilibrium as suggested in our results. From a practical viewpoint, these sectors may be facing relatively less elastic supply curves in the short-run. For instance, the number of rooms available in a hotel or the number of seats on a flight could not be adjusted immediately to restore the equilibrium. However, the results show that international tourism consumption declines and this could generate an excess supply in the market. In this context, there is a likelihood that the prices of these commodities in the local market could decline. Furthermore, given that the capital stock is fixed in the short-run, employment declines considerably in these sectors due to output reductions. Our results confirmed these two possibilities.

Against this background, tourism suppliers could be discouraged from such changes since reduced prices tend to affect profit margins. On the other hand, reduced capital returns can intensify already affected profit margins. Therefore, their reaction could be reflected by reduced labour demand. Accordingly, higher unemployment will appear in tourism-related sectors. The intuition is that the other (traded) sectors (those sectors that experience expansions) would absorb the surplus labour in line with their expansions.

Two basic problems may arise: First, can the other (traded) sectors absorb all unemployed labour? Second, are they readily employable in these sectors? These are complex policy issues. Whether or not these sectors can absorb the surplus labour depends on the size of the expansion among these sectors. It appears that in the short-run, tourism-related contraction exceeds the trade related expansion and thus this could stimulate overall unemployment in the economy.

Most tourism-related sectors are service-oriented and use largely semi-skilled labour. Therefore, the surplus labour in such sectors may not be readily employable without additional training and development. Such additional training could require additional funding, most probably by the government, and it could take a comparatively long time. This suggests that the government would need to intervene by providing essential supply side support to address the unemployment issue. Subsequently, one can question whether there is a net gain in raising tourism taxes from international visitors. The issue that there should be additional training for unemployed labour and that it requires additional funding has not been considered in the current study since this is beyond the scope of the current study. Overall, such issues need further investigation.

Are there any positive implications of increased tourism taxes from a much broader economic perspective? Increased government tax revenue arising from tourism taxes and their possible allocations are important in this context. Increased government revenue could be used in number of different ways. First, the government can earmark a significant portion of increased tax revenue towards some identified tourism projects. This strategy is widely used both to ease the negative burdens of tourism taxes within the sector and to strategically handle the objections from sector representatives. Effectively, such earmarked funds can be utilised for much needed tourism promotion. Large-scale tourism promotion is often the government's responsibility and the availability of funds from tourism taxes will ease the burden on the government budget.

Funds can also be earmarked for gathering tourism data and for conducting tourism research in vital areas. The lack of accurate and reliable tourism data and research is a barrier to informed policy debate. ATSA fills most existing gaps, especially in tourism data. However, the development of ATSA is based on existing official tourism databases such as International Visitor Surveys and National Visitor Surveys. The quality of such surveys needs to be improved. A recently released research report by the Productivity Commission (2005) argued that the tourism sector's contribution to the economy has been overestimated by ATSA. This could be due to the poor quality of data on which ATSA estimations are based.

Second, raised tax revenue can be redistributed among Australians by way of improved public goods. This can take the form of either improved infrastructure facilities such as transport and road networks or improved tourism facilities such as parks. Third, the government can reduce its reliance on income taxation. The budget neutral simulations showed that increased tourism tax revenue helps reduce the reliance on income taxes and thus positive changes in household disposable income are evident. Subsequently, tourism taxes appear to impact positively on aggregate real consumption. Table 9.2 confirms this pattern for all three policy changes. The increase in household real consumption is an indication of higher levels of living standards arising from tourism taxes.

On the other hand, a tax-induced lower demand for commodities from international visitors means more commodities are available for local consumption. Thus, it is clear that the macroeconomic environment is very conducive to an increase in household consumption. Such changes in consumption are likely to expand the overall macroeconomic condition in Australia. Increased household consumption is likely to have consumption-induced effects within the economy. Relatively smaller output contractions among the tourism-related sectors and larger expansions among the trade-oriented sectors in the long-run are partly due to this consumption-induced effect.

However, from the tourism sector's point of view, the short-run implications and the considerable immediate adverse effects within the tourism sector and related sectors arising from tourism taxes are very decisive, despite the long-run positive effects. Moreover, our results are based on simulation carried out using a comparative static model, thus some caution should be applied when policy inferences are made.

On the above grounds, in making crucial policy choices one has to make a subjective judgement in considering the long-run expansionary effects and welfare improvements of tourism tax increases within the context of the adverse effects on tourism. Accordingly, our results are not supportive of major increases in the current tourism taxes. Of the three policy changes in which tax increases are considered, Policy 3 (maximisation of government revenue) is not supported. This policy appears to be too robust. The results of this policy change are theoretically appealing, particularly in relation to government revenue, but practically it is too harmful. According to Table 9.2, this policy has the highest contraction in international tourism consumption. The expansionary effects (i.e. GDP increase in the long-run) of this policy are negligibly small when compared with the significant tourism contractions both in the short-run and long-run, and significant reduction in GDP in the short-run. Therefore, it appears that there is little room in the existing structure to increase taxes for the maximisation of government revenue. However, if such changes are to be implemented, they should be supported with further research to examine the broader implications.

The other two policy changes, Policy 1 and 2, in the second option were in relation to an increase in PMC and an imposition of accommodation tax (recovery of external costs and funding public goods). Table 9.2 shows that these changes have comparatively less contractionary effects on the tourism sector as well as on the economy in the short-run (partly due to the small size of the tax changes). Although the tourism sector is affected marginally, these tax changes can address and correct an existing market failure-tourism related externality issue. Therefore, on efficiency grounds, it appears that there is a case for further increases in tourism taxes or imposition of a new tax in relation to tourism externalities. According to simulations, this can be achieved through some moderate tax increases.

There are several other positive factors of these policy changes. First, they marginally stimulate overall economic activities with some welfare improvements in the long-run. Second, the proposed tax tools, in particular PMC in Policy 1, is an existing special tourism tax and thus it can be administered easily with comparatively lower compliance costs than a new tax. This tax change, in particular the tool, has been labelled as a perfect tax if the tourism sector is targeted (Clarke and Ng 1993, Gooroochurn and Sinclair 2005). Importantly, it can be imposed as a discriminatory tax on international visitors only (Tisdell 1983).

Considering the comparatively less contractionary effects on the sector and on the economy (short-run) and, more importantly, the ability of the proposed tax changes to improve efficiency by removing an existing market failure, the current study favours tax changes proposed in Policy 1 and 2. As noted earlier, it is not possible to achieve both expansionary effects (in tourism and in the economy) together with welfare improvements with increased tourism taxes. Therefore, we prefer a position where there is a reasonable balance.

The third option for policy consideration is whether tax incentives or reductions should be offered to visitors. If tourism tax reductions (concessions, refunds or subsidies) are offered, Australia as a destination may be able to maintain/improve its competitiveness over the other competitive destinations and, accordingly, may attract more international visitors. Such a policy move would help Australia maintain the growth momentum of its international tourism and maximise national gains via increasing tourism consumption, despite rising negative externalities and the cost of public goods.

The results in Table 9.3 show that overall the policy has been expansionary in the short-run (although it is contractionary in the long-run). However, these expansionary effects are not as high as one would expect from such a tax concession and they are rather benign. Moreover, in the long-run, this policy initiates a welfare reduction while real household disposable income shows a general decline. Therefore, our results do not support any extensions of such policies. However, since the TRS is currently operative, we are neutral about its continuation. Based largely on the short-run positive implications, it could be for the further benefit of the Australian tourism sector that this scheme continues in spite of the long-run negative aspects. However, one unknown yet important aspect in relation to the TRS is the administrative cost involved and this should be taken into account in any future policy formulation.

The final policy consideration is whether the current tourism tax structure should be allowed to operate unchanged. There are some merits of such an approach. A no change policy does not interrupt tourism price and thus international visitor flows and tourism consumption are unaffected, assuming that there are no other changes that affect price. Wide support from industry representatives can be expected. However, as shown in earlier chapters, the tourism sector's tax contribution is insufficient when it comes to the tourism-related cost of negative externalities and the cost of public goods. Accordingly, these existing issues need to be addressed adequately and corrective measures should be taken.

9.4. An Appropriate Tourism Tax Policy

Two important questions were raised at the outset of this chapter: (i) Is there a real need to change the current tourism tax structure? And, if so (ii) What is the appropriate policy that Australia can adopt in changing the tourism tax structure? Question one has already been answered. As noted above, it is our view that the current tourism tax structure may be changed, whenever necessary, to address the issues considered in our policy scenarios. Having realised that there is a need to change the current structure, we accordingly discussed available alternatives. This discussion offers policy makers a number of options (c.f. Section 9.3) including extreme policy changes such as a complete abolition of tourism taxes. Others include increases in tourism taxes of varying magnitudes and reductions of taxes or tax refunds.

These all had their relative merits and most results were theoretically appealing. However, on practical grounds, there were limitations. The case for a complete abolition of tourism taxes was not supported. It was found to be exceptionally disadvantageous from the macroeconomic perspective. Similarly, significant tourism tax increases or higher tax impositions to simply maximise government revenue were also not encouraged. It was found that the tourism sector might not be able to bear the heavy contraction generated by higher tax increases. Therefore, any major changes in the tax structure (i.e. a complete abolition of tourism taxes and significant tax increases for maximising government revenue) may not be appropriate since they are not viable either from the tourism sector's viewpoint or from the macro economic viewpoint. If such changes are deemed necessary they should be made based on further scrutiny of those policy changes.

If major tax changes are not to be contemplated, the line that the Australian tourism tax structure could take is to adopt some moderate tax measures that are capable of addressing some of the existing issues i.e. the cost of negative externalities or the cost of public goods. Most importantly, these tax measures should be designed in such a way that they generate the lowest possible contractionary effects on the sector together with reasonable improvements in the general welfare. Overall, it appears that whatever changes are to be implemented in relation to the current tourism tax structure, they should be considered and implemented as gradual changes rather than complete changes.

9.5. Concluding Remarks

In this chapter, we compared different policy scenarios that were tested in our simulations. A range of measures that represent the overall effect of policy changes was used in the comparison. Policy inferences were drawn in each case while relative merits were assessed. After a thorough comparison of both the contractionary effects (i.e. contraction in tourism consumption and GDP), the expansionary effects and the welfare improvements of tourism taxes, we conclude that only moderate tax changes appear to be economically viable. They are found to generate relatively small contractionary effects on the tourism sector and on the economy in general. Similarly, such tax changes tend to improve the general welfare, particularly in the long-run. Looking from a holistic perspective, this study favours the position that the current Australian tourism tax structure could be used to address existing externality issues highlighted in this study and thus moderate tax increases are encouraged.

To summarise, the findings of this thesis could guide the formulation of policies in the area of tourism taxation in Australia. However, such policies should not be based on our findings alone rather they should be carefully examined through further research.

CHAPTER TEN
SUMMARY AND CONCLUSIONS

In this chapter, the contribution of this thesis to the literature is highlighted, the major findings are summarised, general implications for policy are drawn, limitations of the study are outlined and an agenda for future research is identified.

10.1. An Overview

The main objective of this thesis was to examine the current tourism tax structure and analyse the economic effects of tourism taxes in Australia. Accordingly, in Chapter Four, the current tourism tax structure was outlined and total taxes attributable to the wider tourism sector were estimated. The impact of these taxes on total Australian taxation revenue was also estimated. This was followed by an assessment of the current state of tourism tax structure in Chapter Five. Based on this assessment, several policy scenarios were developed, proposing some changes to tourism taxes. Following a literature review in relation to alternative modelling tools for tourism policy studies in Chapter Six, a Tourism Tax Model (TTM), a modified version of ORANI-G, was developed in Chapter Seven. This was developed by incorporating two tourism sectors and a finance module. In Chapter Eight, using the TTM, several simulations were carried out based on tourism tax changes, including those proposed in the policy scenarios developed, and the results were analysed. The simulation results provide useful empirical insights into tourism tax issues in general. In Chapter Nine, the alternative tourism tax policy changes considered in the simulations were compared and evaluated. Subsequently, implications for policy were drawn. Overall, this thesis makes a direct contribution to the understanding of the nature of the current tourism tax structure and of the general equilibrium effects of tourism taxation in Australia. It also makes an indirect contribution to the empirical and methodological areas of tourism research in general, and tourism taxation in particular.

10.2. Contribution of the Thesis

This thesis makes its main contribution to the empirical literature by exploring several important aspects of tourism taxation in Australia. It appears to be the first study to address tourism taxation by highlighting its totality, including the levels, magnitude and effects of tourism taxes. Accordingly, the contribution to the empirical literature is two-fold. First, it contributes by examining the current tourism tax structure and by estimating the total tax revenue attributable to the Australian tourism sector. Second, unlike previous studies where mostly partial equilibrium effects were analysed, the current thesis makes a contribution by analysing the effects of tourism tax changes in Australia in a general equilibrium setting. This analysis enables us to understand price effects, industry effects, welfare effects and macroeconomic effects of tourism tax changes where a wider economic representation is required.

Two methodological contributions are made in the current study. The first is the application of Tourism Satellite Accounts (TSA) in the estimation of tourism taxes. As noted in Chapter Four, these taxes are not identified in official sources and thus estimation is cumbersome. We overcame this difficulty by applying a novel technique, the TSA framework, to extract tourism taxes from existing general sources. The Australian Tourism Satellite Account database was used to derive the industry-value added shares for each tourism-related industry and these were applied to extract the tax contribution attributable to the wider tourism sector for each type of tax. We applied this following the conceptual idea that the TSA represent the actual contribution of the tourism sector of the country in question. While a similar approach has been applied elsewhere (for example in Canada), this appears to be the first such attempt in Australia.

The second contribution to the methodology follows from Chapter Seven where we developed the Tourism Tax Model of the Australian Economy as a modified version of the ORANI-G model. The ORANI-G model was augmented to incorporate two tourism sectors and a finance module. The two tourism sectors, domestic and international, were incorporated using the "dummy sector approach". The TTM was then applied to analyse several tourism tax policy issues in Australia. GGE models are widely applied in general tax policy studies around the world but only on a few previous occasions have they been used in tourism tax studies. In this respect, our study seems to be the first such study to apply a CGE model to analyse tourism tax issues in this way in Australia. Moreover, our modelling approach departs from the previous studies in which CGE models were used by applying a model with explicit tourism sectors. Such an approach provides an important modelling tool that can be applied not only to tourism tax studies but also to various other tourism policy issues.

Finally, while this thesis has a strong policy focus, it provides some important theoretical insights. Our analysis shows that general equilibrium tax theory can be applied effectively in tourism research to explain effects of tax changes, which enhances our understanding of the general equilibrium effects of tourism tax changes. Furthermore, it highlights the increasing importance of handling tourism policy issues within a general equilibrium framework, recognising the multifaceted nature of tourism. In relation to the modelling technique applied to define tourism in our model, our approach signifies the importance of duly recognising the tourism sector/sectors as a separate economic activity.

In summary, the thesis has made several contributions to the empirical literature, methodology and data. Of the contributions, tourism tax database that contains the tourism sector's yield in different taxes, developed in the study could be a useful basis for future research. They provide essential background information for any research into tourism taxation in Australia. Overall, the findings of this study form background information to help further the policy debate on tourism taxation.

10.3. Summary of the Major Findings

The major findings of this thesis stem from two chapters, Chapter Four and Chapter Eight. In Chapter Four, we examined the current tourism tax structure and estimated the total tax contribution of the Australian tourism sector. In Chapter Eight, we carried out all simulations in relation to tourism tax changes and analysed the general equilibrium effects of such tax changes. Accordingly, in this section, our intention is to summarise these key findings.

Major Findings of the Examination of Tourism Tax Structure

In Chapter Four it can be seen that the tourism sector's contribution to total taxation in Australia has been increasing during the period 1993 to 2003. The current tourism tax structure contains two types of taxes, general tourism taxes and special tourism taxes. The Goods and Services Tax (GST), company tax, payroll tax, personal income tax, fringe benefit tax, excise duties and gambling taxes constitute general taxes, while the Passenger Movement Charge (PMC), visa charges, the Aircraft Noise Levy (ANL), Environmental Management Charge (EMC), accommodation levy and air passenger ticket levy constitute special taxes.

Of the two types, general tourism taxes accounted for the largest portion of total tourism tax revenue during the period 1993 to 2003. Among the general tourism taxes, excise duties accounted for the most significant portion of tax revenue in the 1990s, representing more than half of the total tax revenue from the sector. Following tax reforms introduced in 2000, the GST became the single largest contributor to tourism tax revenue. Of the special tourism taxes, the PMC made the largest contribution followed by visa charges.

Estimates of total tourism taxes revealed that the Australian tourism sector makes a significant contribution to national tax revenue and its contribution has increased over time. Besides the continued growth of the tourism sector generating increased tax revenue, an important contributor to the sharp increase in the tax yield evident in recent years was the introduction of the GST in 2000. Since its introduction, total tourism tax revenue grew more than double and the tourism sector became the third largest contributor to total national GST revenue. A comparison of the total tax yield of the tourism sector with those of two similar sectors, mining and retail, indicated that the tourism sector tends to bear a disproportionate tax burden and that the burden has been increasing.

Major Findings of General Equilibrium Analysis of Tourism Taxes

A further assessment of the current state of the tourism tax structure was undertaken in Chapter Five based on three major tourism tax policy issues. They include appropriation of the external costs of tourism, funding tourism-related public goods and maximising government revenue. In relation to the first two, tourism- related external costs (international tourism) and the cost of public goods consumed by international visitors in Australia were estimated and assessed against the tourism tax contribution by international visitors. The assessments showed that current tourism tax revenue is not sufficient to cover the external costs of tourism, nor it is sufficient to fund tourism-related public goods. In the last assessment, the tourism tax structure was explored for opportunities to maximise government revenue. This showed that the current tourism pricing structure might be used to maximise government tax revenue. In each of these three cases, a tourism tax policy scenario was developed proposing changes in the current tourism tax structure i.e. increases in international tourism taxes and the imposition of new taxes.

In Chapter Eight, the TTM which was developed in Chapter Seven was used to carry out simulations based on tourism tax changes including those proposed in the policy scenarios. In relation to the first two scenarios, two sets of experimental simulations, with increases in tourism taxes, were carried out. In the first simulation, an increase in the PMC was tested and in the second, the imposition of an accommodation tax was tested. In relation to the last policy scenario, a set of simulations was carried out by imposing taxes on international tourism consumption. In each simulation, both short-run and long-run economic environments were considered to measure the short-run and long-run effects of tax changes. All simulations were carried out as budget neutral and as stand-alone experiments.

Simulation results were analysed in terms of price effects, industry effects, household consumption and welfare effects and macroeconomic effects. The results were consistent with both previous studies as well as with general equilibrium tax theory. The results were broadly similar in all three experiments in terms of the directions of change in key variables though the extent of changes in key variables varies across the simulations. Thus, we concluded that tourism tax increases may have the following common effects in general.

The results of the short-run simulations indicated that tourism taxes caused increases in the price of international tourism and reduced tourism consumption. Reduction in consumption affected adversely a large number of tourism-related sectors causing considerable output contractions in relevant sectors. The most affected are hotels and cafes, transport and travel, travel-related services, recreation and leisure and eduction services. These sectors are mostly labour intensive sectors and thus the impact on employment was substantial.

In contrast to the contractionary effects among tourism-related sectors, the simulation results suggested that other sectors (traded sectors) experience some output expansions. Among these, mining, textiles, agriculture, other manufacturing, chemicals, metallic products and motor vehicles and parts sectors have realised more pronounced expansions. General equilibrium tax theory states that unemployed labour in affected sectors is absorbed by other expanded sectors. Furthermore, it is suggested that the price of labour may decline to facilitate this mechanism. The results confirmed that there is an economy-wide reduction in nominal wages. Additionally, capital rental in affected sectors declines, resulting in reductions in the gross rate of return of these sectors.

In contrast to the above-mentioned adverse effects of increased tourism taxes, one positive change was the reduced prices of commodities. The results suggested an economy-wide reduction in commodity prices as represented by the fall in the CPI.

In addition, simulations revealed that increased tourism taxes cause some macroeconomic changes. Tourism taxes result in a general economic contraction in the short-run as shown in the reduction in real GDP. This contraction was reflected both on the income side as a reduction in aggregate employment, and on the expenditure side as a reduction in aggregate exports. Reduction in aggregate exports was primarily a reflection of reduced international tourism consumption.

In the long-run, price changes of increased tourism taxes were in the same direction. An increased tourism price had the same adverse effect upon international tourism consumption. However, the results suggested that contractionary effects among tourism-related sectors were less significant in the long-run than in the short-run. On the other hand, expansionary effects among other (traded) sectors were more pronounced.

Changes in factor employment among sectors were in line with the aforementioned output changes. However, since all factors are mobile in the long-run, adverse effects on labour were less pronounced among the tourism-related sectors while contractions in the use of capital in affected sectors are evident. Along with these changes in labour and capital, both nominal wages and rental capital declined. Unlike the short-run, with declining nominal wages, the before-tax real wage declines. However, following the effects of the redistribution of increased tax revenue by way of reduced income taxes, the after-tax real wage shows a marginal increase.

The results showed that household consumption of commodities increases, given that real consumption in the long-run is endogenous. The long-run results indicated that, unlike the short run, tourism taxes are welfare-improving. Following the less pronounced adverse effects on industry outputs and welfare improvements in the household sector, the results suggested that in the long-run tourism taxes are marginally expansionary, as shown in a marginal increase in real GDP. This increase in real GDP is explained by an increase in aggregate capital stock on the income side and an increase in real consumption on the expenditure side. Both capital stock and real consumption are moved by improvements in the terms of trade and increased indirect taxes. Moreover, the results suggested that real household disposable income has improved against the background of reduced income taxes. The improvement in real household disposable income is an indication of the expansionary effects of tourism taxes on the household sector. A comparison of the results revealed that although tourism taxes are contractionary in the short-run, they might be marginally expansionary in the long-run.

Additionally, in our simulations we also attempted to ascertain whether there is any difference in results if discriminatory taxes are administered. This means that in the simulations, where possible, tax changes were separately tested for international visitors (the principal policy) and alternatively for both international and domestic visitors (the alternative policy). The results of these experiments were mostly supportive for a discriminatory tax policy where only international visitors can be targeted. The results suggested that with a discriminatory tax, adverse effects of taxation on the tourism sector, related sectors and on the economy in general are less pronounced. Furthermore, they indicated that positive effects are more pronounced in discriminatory taxation.

Having identified the general equilibrium effects of increased tourism taxes, we then experimented with some counter changes in tourism taxation. Two sets of experimental simulations were carried out. The first was in relation to the existence of a tourist refund scheme (In the refund scheme, international visitors are given a GST refund on selected purchases and we considered this as a tax reduction or a subsidy to international tourism). In the second, a set of simulations was carried out where all available international tourism taxes are abolished and the tax abolition is financed via an increase in the GST.

The results of these simulations were consistent with both prior expectations as well as with general equilibrium tax theory. The results indicated that such changes (tourism tax reductions) result in reductions in international tourism prices and thus international visitors are encouraged, thereby increasing tourism consumption. With increased tourism consumption, the tourism-related sectors experienced output expansions and hence factor utilisations. Such changes in factor utilisation resulted in increases in nominal wages and capital rental. In contrast to output expansions experienced by the tourism-related sectors, other (traded) sectors experienced contractionary effects in output. These contractions resulted primarily from reduced exports due to higher local commodity prices.

As far as the macroeconomic effects are concerned, our results showed that tourism tax reductions (concessions or subsidies) are expansionary in the short-run, as reflected in an increase in real GDP. This is explained both by increased aggregate employment and increased exports volume. Increased exports volume reflected improvements in international tourism consumption. In the long-run, however, the results did not follow the same expansionary path as in the short-run. Our results indicated that tourism tax reductions (concessions or subsidies) are contractionary, as shown in the reduction in real GDP. Moreover, the results showed that real household consumption declines, suggesting a welfare loss involved with tourism tax reductions. This is also confirmed by the reduced real household disposable income.

There was a notable difference in the macroeconomic results of the tax abolition simulation. As noted above, while tax refunds are indicative of short-run expansions of the macroeconomic condition, the abolition of tourism taxes is contractionary. For instance, the results indicated that such changes are contractionary irrespective of the economic environment (short-run or long-run), as shown in real GDP, and are welfare-decreasing as shown in reduction in household consumption.

Having analysed the simulation results we then compared and evaluated the alternative tax changes considered in the simulations. The comparison and evaluation were based on several measures such as changes in tourism consumption, GDP, welfare changes and commodity tax revenue in each of the alternatives. This comparison across alternatives was aimed at deriving conclusive evidence for the most appropriate alternative tourism tax change, and at drawing policy implications.

In summary, the evidence gathered and assembled supported the view that the current Australian tourism tax structure, in particular international tourism, could be used to address existing externality issues highlighted in this study. The most appropriate strategy appears to be moderate tax changes (i.e. tax increases or impositions) to achieve identified targets (i.e. recovery of the external cost of tourism and funding tourism related public goods). The evidence suggests that significant tax increases (or decreases) are not appropriate. However, our findings are indicative only, and they are subject to the potential limitations of our approach, database and the theory applied, as outlined in Section 10.6 below. Therefore, they need to be carefully scrutinised through further research. Subject to such limitations, we derive policy implications as outlined in the following section.

10.4. Implications for Policy

The case for further taxation of international tourism was supported against a background where the Australian international tourism sector generates negative externalities and the sector can be used to maximise government tax revenue. While tax increases in international tourism are desired, an equally important aspect is to maintain the current growth momentum of the sector. It is a vital issue mainly due to two reasons: (i) the multifaceted nature of the sector, i.e. any change in the sector could affect a large number of tourism-related sectors; and (ii) any increased taxes could adversely affect tourism price competitiveness. Tourism being mainly a demand-oriented sector, any increases in international tourism prices arising from tourism tax increases can cause considerable reductions in tourism consumption, thereby generating contractions in output among a large number of tourism-related sectors. Moreover, such tax increases can also be contractionary in terms of overall economic activity.

Against this background, the findings of this study did not support significant tax increases which target maximisation of government revenue. The adverse effects of such tax changes on the sector and related sectors were found to be extremely large. They also generated severe contractionary effects within the economy in terms of

GDP and employment, particularly in the short-run. Such short-run adverse effects appear to be too large to be ignored in spite of likely marginal expansionary effects in the long-run. Similarly, the findings were not supportive of major tax reductions such as the total abolition of current tourism taxes. Empirically, they were found to be generating significant adverse effects in the economy in terms of GDP. Unlike any other alternative tax changes considered, one noticeable aspect of tax abolition was that its contractionary effects on the economy were evident both in the short-run as well as in the long-run. Overall, therefore, the findings of this thesis are not in favour of major changes in the current tourism tax structure such as a complete abolition of existing tourism taxes and significant tax increases for the purpose of government revenue maximisation.

If major changes are to be avoided, the appropriate strategy available to Australia is to consider some moderate tax changes/increases, which are capable of addressing the issue of negative externalities in tourism. Such a policy stand can be justified on several grounds. First, the most important aspect of these policy changes is that they are capable of addressing and correcting existing market failures. Therefore, on efficiency grounds, tourism tax increases and/or imposition of new taxes which are designed to address existing tourism-related negative externalities appear to be appropriate policy options. Second, our findings suggest that the adverse effects of such tax changes on the sector and related sectors are at a minimum. This is an important aspect given the multifaceted nature of the sector and the adverse effects on the sector should be minimised considering the sector's important contribution to the economy. Third, the contractionary effects of these tax changes on the economy in the short-run are also at a minimum and this implies that the unemployment arising from the contraction is low. Fourth, in the long-run, such tax changes tend to improve general welfare. Finally, our results suggest that it is highly unlikely that an increase in tourism tax results in both general welfare improvement and tourism growth. For example, our results show that when the tax change is beneficial to the tourism sector it is harmful to general welfare, and vice versa. Therefore, our view is that the economy in general, and the tourism sector in particular, are better-off with a policy that brings a balance between positive and negative effects. Against this background, moderate tourism tax increases appear to be the most appropriate alternative.

In relation to the appropriate tax tool, it is our view that a discriminatory tax be administered. As noted above, our results were supportive of such a tax change. Among the general and special tourism taxes, a carefully chosen special tourism tax may be appropriate for this purpose. For instance, an increase in the PMC could be considered (this is the tax tool we experimented with in simulation 1). There are a number of advantages over the selection of the PMC as an appropriate tax tool. This is an existing tax and is collected through airlines and ticketing agencies. Thus, administrative efficiency tends to be high. Often the tax is included in the airfare and visitors may be less informed about the tax increase. Furthermore, a special tourism tax is relatively easier to implement as a discriminatory tax than is a general tourism tax.

10.5. Recommendations

Several important problems were recognised during the course of the current study. First, it appears that the current tourism tax structure is complex with a large number of taxes. It consists of about eight general taxes and more than ten special taxes. Unlike other sectors, there are many special taxes in this sector. They are imposed by different levels of government such as the Commonwealth, State and local. Additionally, there are some charges imposed by private sector organisations such as airport authorities that arise because of government regulations, and these are thus considered to be taxes. This complexity leads to high compliance costs and, hence, to increased inefficiency. Therefore, it is recommended that some corrective measures should be taken to establish an efficient tourism tax structure by minimising these complexities.

The second important problem is the lack of reliable data sources. The available major official sources such as the Australian Taxation Office do not recognise tourism taxes separately. The only official source that has some recognition of tourism taxes is the ATSA. Even in the ATSA database however, tourism taxes include only the GST, excise duties and gambling taxes paid on goods and services purchased by tourists. Statistics on most of the other special tourism taxes such as the passenger movement charge, the aircraft noise levy, visa charges and the environmental management charge are not included in ATSA. Therefore, an official, national database should be developed in ATSA extending the current database to include those special tourism taxes noted above.

A third problem is that it is evident that tourism sector representatives are not well informed about the structure, level and the extent of tourism taxes in Australia. Therefore, often unfair comments and statements about tourism taxation are aired without justifiable grounds. This is primarily due to the lack of communication between the government, tourism bodies and sector representatives. In order to avoid such misunderstandings, it is recommended that a proper channel of consultation be established between policy makers and tourism sector representatives. This is even more important during times when a policy change is to be considered.

10.6. Limitations of the Study and Agenda for Future Research

Two major types of limitations in this study: database and general theoretical, are identified. While these limitations do not undermine the overall validity and applicability of the results of this study, caution should be exercised when policy conclusions are drawn. Several limitations concerning the database were evident in the current study. First, in the construction of the database of the TTM, the standard ORANI-G core database was updated to include important features such as the GST, tourism sectors and a government finance module. Together with these modifications, as noted in Section 7.5, an update of the core database to represent the scale of a more recent year would certainly have improved the quality of the database. We did not undertake this task as it is well beyond the scope and time frame of the current study.

Second, in our model, tourism is represented by two sectors, international and domestic tourism. One important aspect that might need more emphasis in such a model is Australian outbound tourism. Outbound tourism expenditure may be embedded in domestic tourism expenditure. However this is not sufficient since outbound tourism behaviour is different from that of domestic tourism. Thus, a separate dummy sector should be incorporated to analyse the behaviour of Australian outbound tourism. Moreover, the domestic tourism sector in the model represents only tourism demand from the household sector. Additionally, domestic tourism demand arising from the business sector and the government sector should be disaggregated and incorporated.

In the policy context, policy scenarios for the simulations were designed based on available information. We have made some approximations in relation to the cost of the negative externalities of tourism and the cost of public goods in international tourism. These were made based on publicly available information from reliable sources. However, the accuracy and suitability of sources for the time period that we applied are limitations. Due to the little attention given to this area in the literature and the complexity of the issues, we had no alternative other than using what is available. Therefore, some empirical work to estimate the current cost of negative externalities and public goods in Australia is desirable.

Finally, in terms of the theoretical limitations of the study, the lack of enough emphasis to recognise the distributional aspect of tourism tax incidence should be noted. Our model consists of a single representative household and thus welfare changes were measured based on changes in the consumption of this single household. However, a detailed distributional analysis of the tourism tax incidence of Australian households based on income distribution data would have improved the quality of our findings. This issue was regarded as beyond the scope of this study. According to our knowledge, this aspect in relation to tourism taxes has not been addressed so far in the Australian context and thus some empirical work is needed.

10.7. Conclusions

There is a considerable increase in the tourism sector's contribution to Australian total tax revenue during the period 1993 to 2003. However, in the context of tourism-related negative externalities, the current tourism tax structure appears to be less efficient. Moreover, the current tourism pricing structure shows that the international tourism sector may be a potential source for maximising government revenue. With either situation, there appears to be a case for further taxation in international tourism. Nevertheless, such taxes tend to bring about mixed results within the Australian economy. Tourism taxes can adversely affect tourism price competitiveness. Given the price-elastic nature of international tourism, such changes result in a significant reduction in international tourism consumption. Therefore, tourism-related sectors contract while other (traded) sectors experience some expansions. Overall, tourism taxes are contractionary in terms of lowering real GDP during the short-run. However, they tend to generate marginal macroeconomic expansions in the long-run. Additionally, household consumption improves signalling that tourism taxes are welfare-improving.

In summary, although increased tourism taxes are appealing in terms of their long-run expansionary effects and revenue-generating abilities, they could also be contractionary in terms of reduced international tourism consumption and subsequent adverse effects on related sectors. Given this mixed nature of the effects of tourism taxes, from a policy perspective, tax-induced adverse effects on the sector and related sectors become crucial. Therefore, it appears that there is little room for using the international tourism sector as a potential source of raising government tax revenue. However, in relation to tourism-related externalities there appears to be a case for consideration of either increasing existing taxes or imposing a new tax, since the existing taxes do not yield sufficient revenue to recover the externality cost. Although, such tax changes could have negative effects on the tourism sector, on efficiency grounds they may be justified.

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APPENDIX A: TOURISM PRODUCT AND INDUSTRY CONCORDANCE

Table A1: Tourism Product Concordance

Tourism Related Products	ANZSPC code	Related Product from ANZSPC
Travel agency & tour operator services	6781	Travel agency & tour operator services
Taxi fares	6422	Non-scheduled road transport services of passengers
Long distance passenger transportation	661	Air transport services of passengers
	6411	Railway transport services of passengers
	6421	Scheduled road transport services of passengers
	65110	Coastal & transoceanic water transport services of passengers
Local area passenger transportation	6411	Railway transport services of passengers
	6421	Scheduled road transport services of passengers
	6521	Inland water (excluding inner harbour) transport services of passengers
Motor vehicle hire and lease	73111	Leasing or rental services concerning cars or light vans without operator
Fuel (petrol, diesel)	33301.1	Automotive petrol; refined or blended gasoline; motor spirit including aviation spirit & synthetic petrol
	33300.3	Gas or fuel oil excluding motor spirit & kerosene
Repair & maintenance of motor vehicle	87141	Maintenance & repair services of motor vehicle
	61	Wholesale trade services (part)
	62	Retail trade services (part)
Accommodation services	631	Lodging services
Actual & imputed rent on dwellings	-	-
Takeaway & restaurant meals	632	Food serving services
	633	Beverage serving services for consumption on the premises
Food products	21	Meat, fish, fruit, vegetables, oils & fats
	22	Dairy products (part)
	23	Other food products
Alcohol & other beverages	24	Beverages
	22	Dairy products (part)
Shopping (including gifts & souvenirs)	28	Knitted or crocheted fabrics; wearing apparel
	29	Leather & leather products; footwear
	381	Furniture
	448	Domestic appliances & parts thereof
	36900.2	Plastic tableware, kitchenware, other household & toilet articles
	47	Radio, television & communication equipment & apparatus
	385	Games & toys
	384	Sporting goods & accessories
	322	Books, maps, chart, plans, sheet music printed & or published by the same unit
	328	Newspapers, journals & periodicals
	353	Soap, cleaning preparations, perfumes & toilet preparations
	382	Jewellery & related articles
	48400.1	Stop watches
	48400.9	Other watches (including metal watch straps), watch cases, clocks & parts
	29220.1	Luggage, handbags & the like

Motor vehicles, caravans, boats, etc	61	Wholesale trade services (part)
	62	Retail trade services (part)
	492.17	Trailers & semi-trailers of caravan type, for housing or camping
	49220.3	Trailers & semi-trailers for the transport of goods & materials (including box trailers, horse floats, tankers, stock crates, timber jinkers & boat trailers)
	49220.9	Other trailers not elsewhere classified, containers not elsewhere classified
Recreational, cultural & sporting services	494	Pleasure & sporting boats
	732	Leasing or rental services concerning other goods
	845	Library & archives services
	9642	Botanical, zoological & nature reserve services
	9641	Museums & preservation services of historical sites & buildings
	965	Sports & recreational sports services
	966	Services of athletes & related support services
	9693	Coin operated amusement machine services
	9699	Other recreational & amusement services
	96100.5	Film & video exhibition services
Gambling & betting services	9692	Gambling & betting services
Education services	92	Education services
Other tourism goods & services	25	Tobacco products
	352	Pharmaceutical products
	9312	Medical & dental services
	9311	Hospital services
	9319	Other human health services
	6753	Parking lot services
	841	Telecommunication services
	842	On-line services
	971	Washing, cleaning & dyeing services
	972	Beauty & physical well being services
	7132	Accident & health insurance services (excluding reinsurance services)
	7133	Other non-life insurance services
	7142	Accident & health reinsurance services
	7143	Other non-life reinsurance services
	838	Photographic services & photographic processing services

Source: ABS (2004a)

Table A2: Tourism Industry Concordance

Tourism Related Industry	ANZSIC code	Related Industry from ANZSPC
Travel agency & tour operator services	6641	Travel agency services
Taxi transport	6123	Taxi & other road passenger transport
Other road transport	611	Road freight transport
	6121	Long distance bus transport
	6122	Short distance bus transport
Rail transport	62	Rail transport
Air & water transport	63	Water transport
	64	Air & space transport
Motor vehicle hiring	7741	Motor vehicle hiring
Automotive fuel retailing	5321	Automotive fuel retailing
Accommodation	5710	Accommodation
Ownership of dwellings	7711	Residential property operators
Cafes, restaurant & takeaway food outlets	5125	Takeaway food retailing
	5730	Cafes & restaurants
Food manufacturing	211	Meat & meat product manufacturing
	212	Dairy product manufacturing
	213	Fruit & vegetable processing
	214	Oil & fat manufacturing
	215	Flour mill & cereal food manufacturing
	216	Bakery product manufacturing
	217	Other food manufacturing
Beverage manufacturing	218	Beverage & malt manufacture
Transport equipment manufacturing	281	Motor vehicle & part manufacturing
	282	Other transport equipment manufacturing
Other manufacturing	219	Tobacco product manufacturing
	22	Textile, clothing, footwear & leather manufacturing
	23	Wood & paper product manufacturing
	24	Printing, publishing & recoded media
	25	Petroleum, coal, chemical & associated product manufacturing
	26	Non-metalic mineral product manufacturing
	27	Metal product manufacturing
	283	Machinery & equipment manufacturing
	284	Electronic manufacturing
	285	Electrical equipment & appliance manufacturing
	286	Industry machinery & equipment manufacturing
	29	Other manufacturing
Other retail trade	51	Food retailing (except takeaway food retailing
	52	Personal & household good retailing
	531	Motor vehicle retailing
	5322	Automotive electrical services
	5323	Smash repairing
	5324	Tyre retailing
Clubs, pubs, tavern & bars	5720	Pubs, tavern & bars
	5740	Clubs (hospitality)
Casinos & other gambling services	932	Gambling services
Libraries, museums & arts	92	Libraries, museums & arts
Other entertainment services	91	Motion picture, radio & television services
	931	Sport
	933	Other recreation services
Education	84	Education
All other industries		All other industries

Source: ABS (2004a)

APPENDIX B: ORANI GENERAL THEORY

Section One

ORANI General Theory

Section 7.2.1 briefly outlined the ORANI theoretical structure. In this appendix, we expand the discussion to include the entire theoretical structure and provide all relevant equations for the core CGE module. The theoretical structure was directly adopted from Dixon *et al.* (1982). The equations are given in percentage change form and, the following key is used in writing the equations:

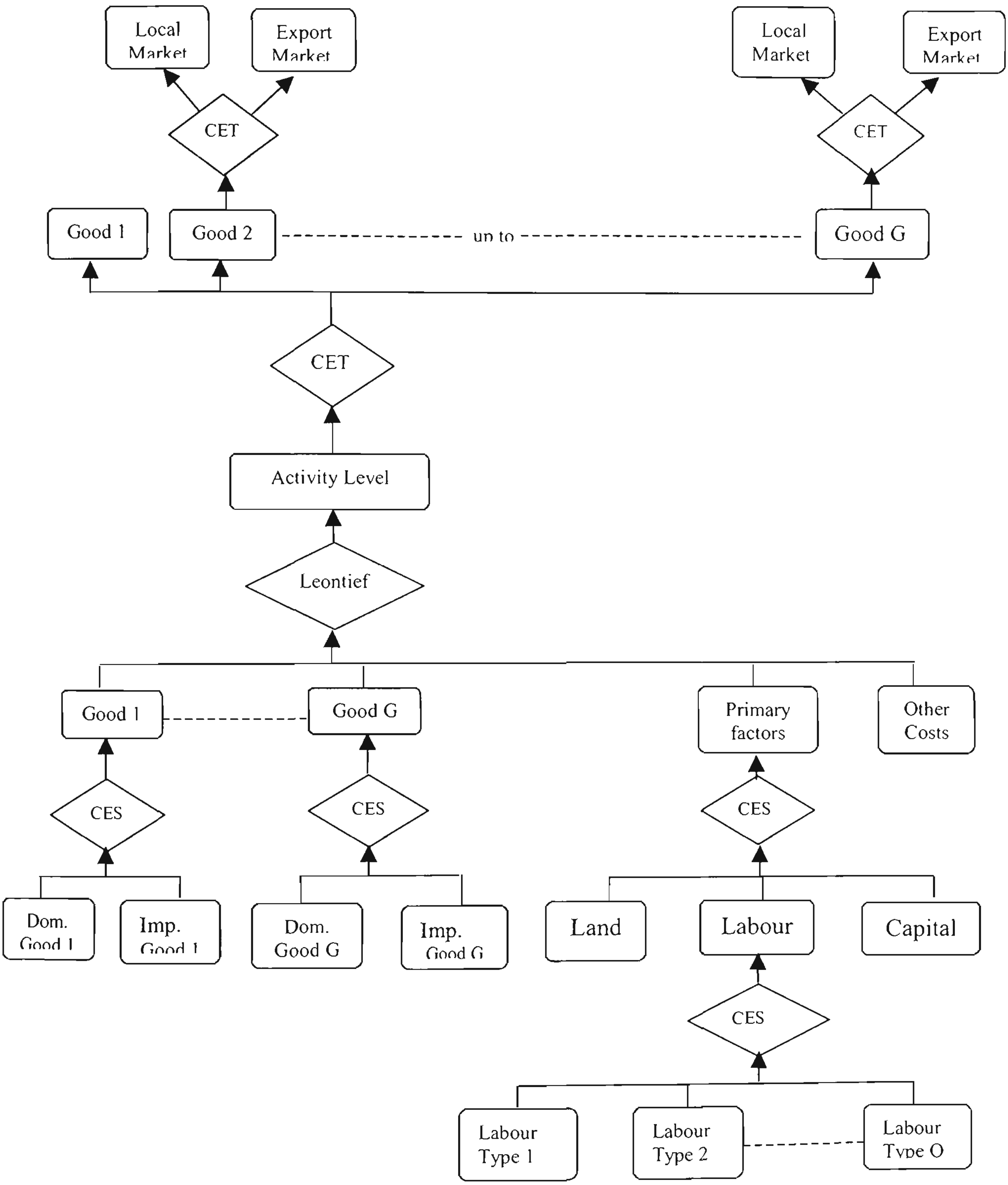
0	All users
1	Current production/intermediate
2	Investment
3	Consumption/household
4	Export
5	Government
6	Inventories
i	Commodities $i = 1, \ldots\ldots, 37$,
j	Industries $j = 1, \ldots\ldots., 37$,
s	Sources $s = 1$, & 2, (1 = Domestic, 2 = imported),
q	Occupations/skills, $o = 1, \ldots\ldots, 9$,
m	Margins $m = 1, \ldots.., 5$,
v	Primary factors $v = 1, 2$, & 3, (1 = labour, 2 = capital, & 3 = land)
X	Demand
P	Price of commodities/factors
Z	Activity level

The lower case letters represent the percentage change of variables. Demand for commodities/factors is denoted by X and a number of subscripts are used to show the user, source and commodity etc. For example, $X_{1(is)j}$ denotes the intermediate demand for commodity i, source s (domestic or imported), by industry j.

Structure of the Production

The production technology is explained by a system of nested combinations and this is represented in Figure B1. It shows that the technology comprises two main parts. The top part describes the technology used in producing various commodity outputs and the bottom part explains the input technology in producing the activity level. The commodity output function is derived from two-nested CET (constant elasticity of transformation) aggregation functions.

Figure B1: Structure of Production



Source: Adapted from Horridge (2003)

Equation (B1) explains the percentage change in demand for intermediate commodities from producers ($x_{1(is)j}$). This variable has four subscripts indicating from where the demand arises. It indicates that it is the intermediate demand (subscript 1) for commodity i (i =1 to 37) from source s (s =1 domestic, s = 2 imported) by the industry j (j = 1 to 37). Variable z_j is the activity level of industry j and p's are price variables. σ_{lij} and S_{lisj} are substitution elasticities and cost shares respectively, and a's are technical change variables.

Equation (B1): Industry Demand for Commodities

$$x_{1(is)j} = z_j - \sigma_{1ij}\left(p_{1(is)j} - \sum_{s=1}^{2} S_{1(is)j}\, p_{1(is)j} \right) + a_{1j} + a_{1ij} + a_{1(is)j} - \sigma_{1ij}\left(a_{1(is)j} - \sum_{s=1}^{2} S_{1(is)j}\, a_{1(is)j} \right)$$

$$i = 1,\ldots,g, \qquad s = 1, 2, j = 1\ldots..,h,$$

Equation (B1) indicates that in the absence of changes in the relative prices of commodities and technical changes, the intermediate demand for commodity i is a function of the activity level of industry j. This means that a one per cent increase in the activity level will increase the producer demand for the commodity by one per cent (the constant returns to scale assumption in production). In the case of a relative price change, the producers demand for commodities would change by an amount less than the activity level. For example, if the price of domestically produced commodities increases relative to their counterparts, producers will substitute away from locally produced commodities towards imported commodities, and hence the producers' demand ($x_{1(is)j}$) will rise by an amount less than z_j. The effect of technical changes can be explained in the same way. In the absence of relative price changes, if, for example, a_{lij} (technical change for good i in industry j) declines by one per cent, Equation (B1) implies that industry j's requirement for input i from both sources would fall by one per cent.

There are two sets of inputs that require specifications of demand equations: land, labour and capital ($g+1$) and other costs ($g+2$). Equation (B2) specifies industry j's demand for other costs and it explains that in the absence of technical changes, the industry's demand for other costs is fully determined by the industry's activity level.

Equation (B2): Demand for Other Costs

$$x_{1(g+2)j} = z_j + a_{1j} + a_{1(g+2)j}$$

$$j = 1\ldots..,h,$$

Equation (B3): Demand for Primary Factors

$$x_{1(g+1,v)j} = z_j - \sigma_{1(g+1,v)j}\left(p_{1(g+1,v)j} - \sum_{v=1}^{3} S_{1(g+1,v)j}\, p_{1(g+1,v)j} \right) + a_{1j} + a_{1(g+1)j} + a_{1(g+1,v)j}$$

$$- \sigma_{1(g+1,v)j}\left(a_{1(g+1,v)j} - \sum_{v=1}^{3} S_{1(g+1,v)j}\, a_{1(g+1,v)j} \right)$$

$$v = 1, 2, 3, \qquad j = 1\ldots..,h,$$

Equation (B3) describes the industry demand for primary factors that includes land, composite labour and capital and this is analogous to Equation (B1) in interpretation. This equation has two different subscripts that need explanation. Subscript v denotes (v = 1, 2, 3; 1 = labour, 2 = capital, 3 = land) three primary factors and subscript $g+1$ distinguishes the primary factor demand equation from the intermediate demand equation. The equation signifies that, in the absence of changes in relative factor price and technical changes, the percentage change in the demand for primary factors is determined by changes in the activity level. Changes in relative factor prices have the same effect as in the demand for intermediate goods. If the cost of a particular factor (e.g. capital) to industry j increases relative to the weighted average of the costs of all factors, then industry j substitutes away from that factor (capital) in favour of the other two (land and labour). The degree of substitution is determined by the parameter $\sigma_{1(g+1,v)j}$.

Equation (B4) determines the demand for labour by occupational type and a new subscript, q has been added to represent nine occupational/skill categories in the labour force. It signifies that in the absence of changes in the relative prices of different occupational types and technical changes, the demand for each occupational type is a function of the industry's total demand for labour. However, if in industry j wages for a particular occupational type (e.g. managers) increase (decrease) relative to the average wage cost for all occupational types, the industry's demand for this occupational type would decrease (increase) by an amount less than the change in total demand for labour. The degree of the demand change is determined by the size of the substitution parameter ($\sigma_{1(g+1,1,q)j}$) and the changes in relative wages.

Equation (B4): Demand for Labour by Occupational/Skill Type

$$x_{1(g+1,1,q)j} = x_{1(g+1,1)j} - \sigma_{1(g+1,1,q)j}\left(p_{1(g+1,1,q)j} - \sum_{q=1}^{9} S_{1(g+1,1,q)j}\, p_{1(g+1,1,q)j} \right) + a_{1(g+1,1,q)j}$$

$$- \sigma_{1(g+1,1,q)j}\left(a_{1(g+1,1,q)j} - \sum_{q=1}^{9} S_{1(g+1,1,q)j}\, a_{1(g+1,1,q)j} \right)$$

$$q = 1,\ldots M, \qquad j = 1\ldots,h,$$

Equation (B5) concerns the general price of labour to industry j. The equation indicates that the percentage change in the general price of labour in industry j is determined by the weighted average of the percentage change in the costs to the industry of units of labour from all types of skill groups, in the absence of technical changes. The weighted average of costs of labour to the industry is estimated by the wage of each type of labour to the industry ($p_{1(g+1,1,q)j}$) and the cost shares of each skill group in j's total labour cost that is denoted by $S_{1(g+1,1,q)j}$ in the equation.

Equation (B5): Industry Wage Rate for an Effective Unit of Labour

$$p_{1(g+1.1)j} = \sum_{q=1}^{9} p_{1(g+1,1,q)j} S_{1(g+1,1,q)j} + \sum_{q=1}^{9} a_{1(g+1,1,q)j} S_{1(g+1,1,q)j}$$

$j = 1.....,h,$

Equation (B6) defines industry j's output of composite commodities and here we denote the composite commodity using subscript r^*. The equation signifies that in the absence of technical and relative price changes, a one per cent change (increase or decrease) in the activity level of industry will bring about a similar change in the supplies of each of industry j's composite commodities. In the case where, for example, the price of composite commodity r rises relative to the weighted average of the prices of all industry j's composite commodities, industry j would transform its output combination of commodities in favour of commodity r and away from other composite commodities.[1] However, the transformation of commodity combination in supplies (x_{0r^*}) is determined mainly by two factors that are shown in Equation (B6). They include a CET (constant elasticity of transformation) parameter denoted as σ and the revenue shares of each of the composite commodities (denoted as H) in total industry revenue.

Equation (B6): Industry Supply/Output of Composite Commodities

$$x_{0(r^*)j} = z_j + \sigma_{0(r^*)j}\left(p_{0(r^*)j} - \sum_{r=1}^{N} H_{0(r^*)j} p_{0(r^*)j} \right) - a_{0j} - a_{0(r^*)j} -$$

$$\sigma_{0(r^*)j}\left(a_{0(r^*)j} - \sum_{r=1}^{N} H_{0(r^*)j} a_{0(r^*)j} \right)$$

$r = 1,....,N(j),$ $\quad$ $j = 1.....,h,$

Equation (B7) describes industry j's supply of commodity i and it shows that the supply of this commodity depends on the changes of the supply of composite commodity r^*, as we have explained in Equation (B6).

Equation (B7): Supply of a Commodity

$$x_{0(i1)j} = x_{0(r^*)j} - a_{0(i1)j} \quad \text{for all } i \in G(r, j)$$

$r = 1,....,N(j),$ $\quad$ $j = 1.....,h,$

Equation (B8) defines the average price of composite commodity ($p_{0(r^*)j}$) as the weighted share of the percentage change in the basic prices of the commodities ($p_{0(i1)}$) that make up the

[1] However, in the TTM database, each industry produces only one commodity and thus the output of industry j is determined by the activity level. In this case, all components of Equation (B6) except z_j, become zero in value.

composite commodity. The weight $S_{0(i1)j}$ is the share of commodity i in the composite commodity r^* produced by industry j.

Equation (B8): Average Price of Composite Commodity

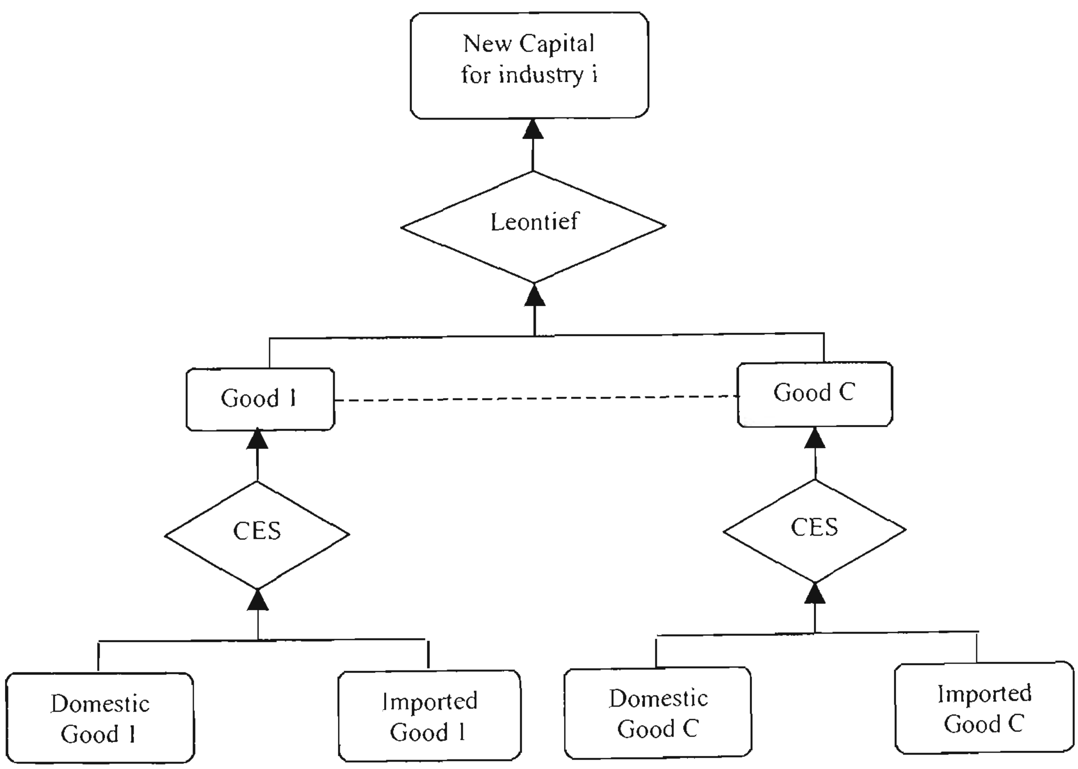
$$p_{0(r^*)j} = \sum_{i \in G(r.j)} p_{0(i1)} S_{0(i1)} - \sum_{i \in G(r.j)} a_{0(i1)j} S_{0(i1)j}$$

$$r = 1,\ldots,N(j), \qquad j = 1\ldots..,h,$$

Demand for Investment Goods

The demand for inputs for capital formation by industries is explained in this section and the two-level nesting structure of investment demand is given in Figure B2. At the lower level of nesting, it is assumed that investors choose from domestically produced and imported goods in order to minimise total costs subject to the CES production function. At the top level of the production structure, investors are assumed to be minimising the total cost of commodity composite subject to the Leontief production function.

Figure B2: Structure of Investment Demand



Source: Adapted from Horridge (2003)

Equation (B9): Demand for Investment

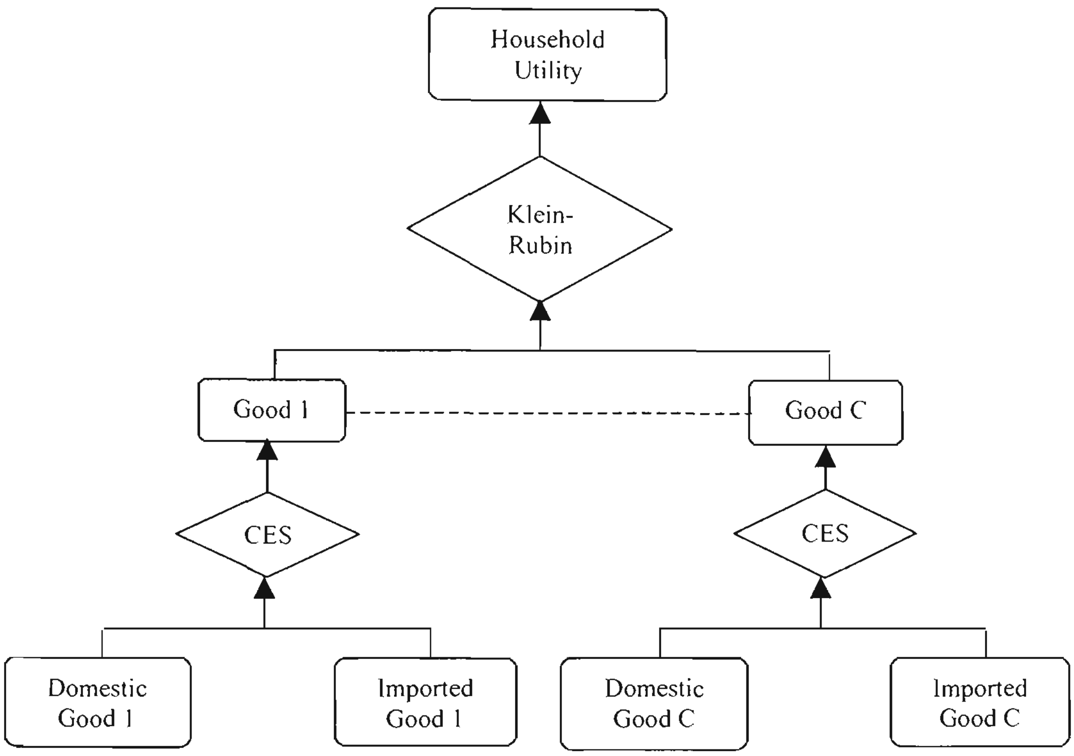
$$x_{2(is)j} = y_j - \sigma_{2ij}\left(p_{2(is)j} - \sum_{s=1}^{2} S_{2(is)j} p_{2(is)j} \right) + a_j + a_{2ij} + a_{2(is)j} - \sigma_{2ij}\left(a_{2(is)j} - \sum_{s=1}^{2} S_{2(is)j} a_{2(is)j} \right)$$

$$i = 1,\ldots,g, \qquad s = 1, 2, j = 1\ldots..,h,$$

Where $x_{2(is)j}$ is the percentage change in investment demand for commodity i (i = 37) from source s (s = 2) by industry j, y_j is the total amount of investment in industry j, $p_{2(is)j}$ is the price variable, σ_{2ij} is the elasticity of substitution between domestic and imported good i as inputs for capital formation, $S_{2(is)j}$ is the share of commodity i from source s in the total cost of commodity i used for capital creation in industry j, and a_j s are technical change variables.

Equation (B9) defines that in the absence of relative price changes, the percentage change in demand for commodities for capital formation in industry j is dependent upon the total amount of industry j's investment. However, if relative prices between domestic and imported sources change, industries are supposed to substitute away from the expensive source.

Figure B3: Structure of Consumer Demand



Source: Adapted from Horridge (2003)

Household Demands

The single representative household in the model is assumed to be maximising utility subject to the household budget constraint. Therefore, the household demand equations are derived from a two-level nesting structure, depicted in Figure B3, similar to investment demand. At the lower level, consumers are assumed to be choosing source-specific commodities subject to the household budget using a CES aggregation. At the top level, consumers choose the right combination of composite commodities (selected from domestic and imported sources) subject to a Klien-Rubin utility function[2].

Equation (B10): Source-Specific Household Demand for Commodities

$$x_{3(is)} = x_{3(i)} - \sigma_{3(i)}\left(p_{3(is)} - \sum_{s=1}^{2} S_{3(is)} p_{3(is)} \right) + a_{3(is)} - \sigma_{3(i)}\left(a_{3(is)} - \sum_{s=1}^{2} S_{3(is)} a_{3(is)} \right)$$

$i = 1,\ldots,g, \qquad s = 1, 2,$

Where $x_{3(is)}$ and $p_{3(is)}$ are the percentage changes in quantities consumed and the prices paid by households for commodity i from source s, $x_{3(i)}$ is the households use of the domestic and imported commodity composite, $\sigma_{3(i)}$ is the elasticity of substitution in consumption between domestic and imported commodity i, $S_{3(is)}$ is the share of total consumer spending on commodity i from source s and $a_{3(is)}$ is a taste change variable.

Equation (B10) describes the source-specific household demand for commodities and it defines that, in the absence of relative price changes between domestic and imported commodities, household demand for commodity i from source s moves in proportion to household demand for the effective units of commodity i ($x_{3(i)}$). If for example, the price of imported commodity i increases, consumers will substitute away from imported commodity i in favour of domestic commodity i. Household demand for the effective unit of commodity i ($x_{3(i)}$) is given in Equation (B12).

Equation (B11): General Price of each Commodity to Households

$$p_{3(i)} = \sum S_{3(is)} p_{3(is)}$$

$i = 1,\ldots,g,$

Equation (B11) defines that the percentage change in the price of an effective unit of commodity i to households is a weighted average of the percentage changes in the prices of commodity i from both domestic and imported sources.

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[2] A Klein-Rubin utility function is a non-homothetic function, which means that budget shares changeswith changing income even with price ratios fixed. After solving the utility function, a linear expenditure system: system of demand equations can be obtained. In a linear demand system, the expenditure on each good is a linear function of prices and expenditure. The demand for the composite commodity is divided into two main parts: subsistence demand and luxury or supernumerary demand. Consumers are expected to allocate total income between these two categories. The subsistence requirement of each good is not determined by the price and the consumer purchases goods for subsistence requirement first. After enough purchase are made, the balance of income is spent on luxury demand. Luxury demand depends on the marginal budget shares (i.e. the shares of the luxury income allocated to each commodity).

Equation (B12): Household Demands for Commodities, Undifferentiated by Source

$$x_{3(i)} - q = \varepsilon_i (c - q) + \sum_{k=1}^{g} \eta_{ik} p_{3(k)} + a_{3(i)} + \sum_{k=1}^{g} \eta_{ik} \left(a_{3(k)} + \sum_{s=1}^{2} S_{3(ks)} a_{3(ks)} \right)$$

$i = 1,\ldots,g,$

Where q and c are the percentage changes in the number of households and aggregate nominal consumption, ε_i's and η_{ik}'s are expenditure and own and cross-price elasticities.

Equation (B12) states that the percentage change in demand for an effective unit of commodity i is determined by the percentage change in nominal consumption expenditure of the average household and relative price changes between commodities (undifferentiated by source). Variable ε_i measures how responsive is the household demand for an effective unit of commodity i to the changes in average household expenditure. The change in household demand for an effective unit of commodity i to the changes in the general price of good k is given in η_{ik} (where for $i = k$, η_{ik} is the own price elasticity and for $i \neq k$ η_{ik} is the cross price elasticity). In conclusion, in deriving the household demand equations, the following assumptions have been made (DSPV, 1982):

i. Consumers behave as if they maximise a single utility function subject to a budget constraint.
ii. The utility function is assumed to be Klein-Rubin and this assumption simplifies the estimation of the outside demand elasticities.
iii. The consumption of commodity i, in general, is defined by a CES aggregate of the consumption of commodity i from domestic and foreign sources. In response to the relative price changes of commodity i from the two sources, consumers are assumed to substitute between the two sources of supply of commodity i.

Exports Demand

Export demand for Australian-made commodities is assumed to be inversely related to the foreign currency prices of exports and this is given in Equation (B13).

Equation (B13): Export Demand

$$p_{4(i1)} = -\gamma_i x_{4(i1)} + f_{4(i1)}$$

$i = 1,\ldots,g,$

Where $p_{4(i1)}$ is the foreign currency receipt per unit of export of good i, γ_i is the non-negative reciprocal of the foreign elasticity of demand for Australian exports of commodity i, $x_{4(i1)}$ is the percentage change in foreign demand for commodity i and $f_{4(i1)}$ is a shift variable. Equation (B13) can also be expressed as:

$$x_{4(i1)} = -\frac{1}{\gamma} p_{4(i1)} - f_{4(i1)}$$

This equation describes the percentage change in export demand for commodity i as a decreasing function of the percentage change in the export price of commodity i.

Government Demand

Government demand describes the demand for locally produced and imported commodities by government institutions and this is the last major final demand category.

Equation (B14): Government Demand

$$x_{5(is)} = c_R h_{5(is)} + f_{5(is)}$$

$$i = 1, \ldots, g, \qquad s = 1, 2,$$

Where $x_{5(is)}$ is the percentage change in government demand for commodity i, c_R is the percentage change in real aggregate household expenditure, and $h_{5(is)}$, and $f_{5(is)}$ are shift variables.

Equation (B14) defines that the government demand for commodity i from source s is determined by the percentage change in real aggregate household consumption. The percentage change in real aggregate consumption is equal to nominal aggregate consumption minus the consumer price index as defined below:

$$c_R = c - \xi_3$$

Where c and ξ_3 are the nominal aggregate consumption and the CPI, respectively.

Demands for Margins

Margin services such as road, rail, and water transport services and wholesale and retail trade, are essential to deliver other commodities from producers to consumers. The demand for the output of these service industries for margin purposes should be modelled separately since it cannot be modelled the same way as the direct demand for commodities. The demand for margin services is dependent upon the demand for related commodities for which marginal services play the vital role of transferring commodities between producers and consumers. Equation (B15a) presents the demand for margin services for the distribution of inputs for current production and capital formation.

Equation (B15a): Demand for Margins used in Current Production and Capital Formation

$$x_{(r1)(is)jk} = x_{k(is)j} + a_{(r1)(is)jk}$$

$i, r = 1......,g, \qquad j = 1.....,h, \qquad k, s = 1, 2.$

Where $x_{(r1)(is)jk}$ is the percentage change in demand for commodity $(r1)$ as a margin service to facilitate the delivery of good i from source s to industry j for purpose k (k = 1: intermediate, k = 2: capital formation), $a_{(r1)(is)jk}$ is a technical change variable and $x_{k(is)j}$ is the usage of commodity i from source s used in industry j for purpose k and this is defined in Equations (B1) and (B8) above.

Equation (B15a) describes that the percentage change in demand for commodity r as a margin service by industry j depends on the commodity usage in industry j, in the absence of technical changes. For example a one per cent increase in intermediate usage of iron ore by the steel industry implies a one per cent increase in demand for transport services to facilitate the transportation of iron ore from iron ore producers to steel manufacturers.

Equations (B15b), (B15c) and (B15d) are concerned with the demand for margin services by households, the government and foreigners and they are modelled in the same manner as Equation (B15a).

Equation (B15b): Demand for Margins by Households

$$x_{(r1)(is)3} = x_{3(is)} + a_{(r1)(is)3}$$

$r, i = 1,....,g, \quad s = 1, 2,$

Equation (B15c): Demand for Margins by the Government

$$x_{(r1)(is)5} = x_{5(is)} + a_{(r1)(is)5}$$

$r, i = 1,....,g, \quad s = 1, 2,$

Where $x_{(r1)(is)3}$ and $x_{(r1)(is)5}$ are the percentage changes in demand for commodity $(r1)$ to be used as a margin service to enable the flow of good i from source s to households and the government respectively, $x_{3(is)}$ and $x_{5(is)}$ are the percentage changes in usage of commodity i by households and the government respectively and a's are technical change variables.

Equation (B15d): Demand for Margins used to Facilitate Exports

$$x_{(r1)(i1)4} = x_{4(i1)} + a_{(r1)(i1)4}$$

$i, r = 1,....,g,$

Where $x_{(r1)(i1)4}$ is the percentage change in demand for margin service $(r1)$ to facilitate the flow of the Australian-made good i from its manufacturers to Australian ports prior to export, $x_{4(i1)}$ is the percentage change in the usage of the Australian-made good i by foreigners.

Equations (B15b), (B15c), and (B15d) define that, in the absence of technical changes, the percentage change in demand for margin flows associated with the delivery of commodities to households, the government and to Australian ports prior to export is moving with the percentage change in the consumption of commodities by households, the government and foreigners.

Price Equations

In ORANI theory there are two types of prices: basic prices and purchaser's prices. Basic prices for domestically produced commodities are the prices received by producers which exclude taxes and margin costs, and, for imported commodities, they are the prices received by the importers which exclude sales taxes and margin costs but include import duties. In deriving the price equations, it is assumed that pure competition exists which implies that there are no pure profits in any economic activity. Furthermore, uniform basic prices across users are assumed. The zero pure profit assumption states that industry j's total cost is equal to its total revenue. Based on these assumptions Equations (B16a) and (B16b) are derived.

Equation (B16a): Basic Price of Commodities

$$\sum_{i=1}^{g} p_{0(i1)} H_{0(i1)j} = \sum_{i=1}^{g}\sum_{s=1}^{2} p_{1(is)j} H_{1(is)j} + \sum_{m=1}^{M} p_{1(g=1,1,m)j} H_{1(g=1,1,m)j} + \sum_{s=2}^{3} p_{1(g+1,1,m)j} H_{1(g+1,s)j} +$$

$$p_{1(g+2)j} H_{1(g+2)j} + a_j$$

$$j = 1,\ldots.h,$$

where

Equation (B16b): Weighted Sum of Technical Change

$$a_j = a_{0j} + \sum_{r=1}^{N(j)} a_{0(r^*)j} H_{0(r^*)j} + \sum_{i=1}^{g} a_{0(i1)j} H_{0(i1)j} + a_{1j} + \sum_{i=1}^{g+2} a_{1(i)j} H_{1(i)j} + \sum_{i=1}^{g}\sum_{s=1}^{2} a_{1(is)j} H_{1(is)j} +$$

$$\sum_{s=1}^{3} a_{1(g+1,s)j} H_{1(g+1,s)j} + \sum_{m=1}^{M} a_{1(g+1,1,m)j} H_{1(g+1,1,m)j}$$

$$j = 1,\ldots.h,$$

Equation (B16a) together with (A16b) define the percentage change in the basic price of the output of commodity i ($p_{0(i1)}$). In the absence of technical change ($a_j = 0$), the weighted average of the percentage change in the basic prices of outputs of industry j is equal to a weighted average of the percentage change in various inputs used by industry j. The H_0 and H_1 terms appearing in the above two equations are industry j's revenue shares and cost shares, respectively, and they both add to unity. The output terms do not appear in the above equations since the assumption of constant returns to scale in production is valid. Equation (B16b) explains the technical change term aj and it is a weighted sum of the percentage change in all technical change coefficients for industry j's production function.

Equation (B16c): Zero Pure Profits in Capital Formation

$$\pi_j = \sum_{i=1}^{g}\sum_{s=1}^{2} p_{2(is)j} H_{2(is)j} + a_{2j} + \sum_{i=1}^{g} a_{2(i)j} H_{2(i)j} + \sum_{i=1}^{g}\sum_{s=1}^{2} a_{2(is)j} H_{2(is)j}$$

$j = 1,\ldots.h,$

Where π_j is the percentage change in the price of a unit of capital for industry j and the H_2 terms are industry cost shares.

The second price equation in ORANI is the price of a capital unit for industry j and is shown in Equation (B16c). This implies that, in the absence of technical change, the percentage change in the cost of a capital unit for industry j is equal to a weighted average of the percentage changes in the prices of the inputs.

Equation (B16d): Zero Pure Profits in Importing

$$p_{0(i2)} = \left(p_{m(i2)} + \phi\right)\zeta_{1(i2,0)} + g_{(i2,0)}\zeta_{2(i2,0)}$$, and

$i = 1,\ldots.g,$

Equation (B16e): Tariff Rates

$$g_{(i2,0)} = h_{1(i2,0)}\xi_3 + h_{2(i2,0)}\left(t_{(i2,0} + p_{m(i2)} + \phi\right) + h_{3(i2,0)} v_{(i2,0)}$$

$i = 1,\ldots.g,$

Where $p_{0(i2)}$ is the basic price of the imported good i, $p_{m(i2)}$ is the foreign currency c.i.f. price of imported units of good i, ϕ is the exchange rate, $g_{(i2,0)}$ is the tariff in \$A per unit of imported good i, $\zeta_{1(i2,0)}$ and $\zeta_{2(i2,0)}$ are the shares in the basic price of the c.i.f. price and the tariff respectively, ξ_3 is the CPI and $t_{(i2,0)}$ and $v_{(i2,0)}$ are variables used to reflect ad valorem and specific rates of protection.

The percentage change in the basic price of imports of good i which is defined in Equation (B16d) is a weighted sum of the percentage change in the foreign currency c.i.f. price of good i converted (by the exchange rate) to \$A and the percentage change in the amount of duty payable in \$A on each imported unit of i. The percentage change in tariff $g_{(i2,0)}$ is explained in Equation (B16e) and the tariff on good i can be set as moving with one of the three variables that appear in the equation: CPI, ad valorem rate of tariff and specific rate of tariff. In order to set the tariff rate in this way, one of the h parameters should be set at unity while the other two h variables should be set at zero. For example, if $h_{(i2,0)}$ is one while the other two h's are set at zero, then the tariff rate on imported good i is ad valorem on the c.i.f $A import price. Accordingly, the percentage change in the amount of tariff payable on a unit of imported good i is dependent upon percentage changes in the ad valorem tariff rate, the foreign currency import price and the exchange rate.

Equation (B16f): Zero Pure Profits in Exporting

$$p_{4(i1)} + \phi = p_{0(i1)}\zeta_{1((i1,4)} + g_{(i1,4)}\zeta_{2(i1,4)} + \left(\sum_{r=1}^{g} M_{(r1)(i1)4}\, p_{0(r1)}\right)\zeta_{3(i1,4)} +$$

$$\left(\sum_{r=1}^{g} M_{(r1)(i1)4}\, a_{(r1)(i1)4}\right)\zeta_{3(i1,4)}$$

$$i = 1,\ldots g,$$

and

Equation (B16g): Export Taxes

$$g_{(i1,4)} = h_{1(i1,4)}\xi_3 + h_{2(i1,4)}\left(t_{(i1,4} + p_{4(i1)} + \phi\right) + h_{3(i1,4)}v_{(i1,4)}$$

$$i = 1,\ldots g,$$

The percentage change in the foreign currency f.o.b. price of ($p_{4(i1)}$) exports of units of commodity i is explained in Equation (B16f) and it is equal to a weighted sum of the percentages in the basic price of commodity i, export taxes, and the costs of margin services that facilitate the delivery of commodity i from producers to the Australian ports for exporting. The percentage change in the foreign currency f.o.b. price of exports of units of commodity i is converted to local currency using the percentage change in the exchange rate in the equation. In RHS, ζ 's are the shares of the basic price, export taxes and the margins in the Australian currency price paid by foreigners for units of commodity i while M's are the shares in the total cost of margin services involved with exporting commodity i.

According to Equation (B16g), the percentage change in export taxes ($g_{(i1,4)}$) is treated in the same way as tariffs in Equation (B16e) and it allows export taxes to be determined in line with real, ad valorem or specific terms.

Next two equations handle final price relationships in the model that relate to the determination of prices payable by domestic purchasers: industries for current production and capital formation, and households for consumption.

Equation (B16h): Purchaser's Prices for Producers and Capital Creators

$$p_{k(is)j} = p_{0(is)}\zeta_{1(is.jk)} + g_{(is.jk)}\zeta_{2(is.jk)} + \left(\sum_{r=1}^{g} M_{(r1)(is)jk}\, p_{0(r1)}\right)\zeta_{3(is.jk)} + \left(\sum_{r=1}^{g} M_{(r1)(is)jk}\, a_{(r1)(is)jk}\right)\zeta_{3(is.jk)}$$

$$i = 1,\ldots g, \qquad j = 1,\ldots h, \qquad s,\, k = 1,\, 2,$$

Equation (B16i): Purchaser's Prices for Households

$$p_{3(is)} = p_{0(is)}\zeta_{1(is.3)} + g_{(is.3)}\zeta_{2(is.3)} + \left(\sum_{r=1}^{g} M_{(r1)(is)3}\, p_{0(r1)}\right)\zeta_{3(is.3)} + \left(\sum_{r=1}^{g} M_{(r1)(is)3}\, a_{(r1)(is)3}\right)\zeta_{3(is.3)}$$

$$i = 1,\ldots g, \qquad s, = 1,\, 2,$$

Equation (B16h) describes the percentage change in the prices paid for commodity i by industry j ($p_{k(is)j}$) to be used for current production ($k = 1$) and capital formation ($k = 2$) and it is equal to the weighted sum of percentage changes in the basic price of commodity i from source s and the costs of the relevant taxes and margins. Equation (B16i) defines the percentage change in prices paid by households ($p_{3(is)}$) for the consumption of commodity i from source s and it shows the same relationship as in Equation (B16h). The tax terms appear in the equations as g's and will be explained further in the next two equations. The share coefficients that appear (ζ's and M's) operate in the same manner as in Equation (B16f). There is no price equation to explain the purchaser's price paid by the government since government demand for commodities is not price-sensitive as shown in Equation (B14).

Equation (B16j): Sales Taxes on Producers

$$g_{(is.jk)} = h_{1(is.jk)}\xi_3 + h_{2(is.jk)}t_{(is.jk)} + p_{0(is)} + h_{3(is.jk)}v_{(is.jk)}$$

$$i = 1,\ldots,g, \qquad j = 1,\ldots,h, \qquad s,\, k = 1,2,$$

Equation (B16k): Sales Taxes on Consumers

$$g_{(is.3)} = h_{1(is.3)}\xi_3 + h_{2(is.3)}t_{(is.3)} + p_{0(is)} + h_{3(is.3)}v_{(is.3)}$$

$$i = 1,\ldots,g, \qquad s = 1,2,$$

Equations (B16j) and (B16k) are modelled to handle sales taxes on producers and consumers and the operation of these two equations is identical to that of Equation (B16g). For example, the percentage change in sales taxes on commodity (is) by households can be set as moving with the CPI, ad valorem tax rate or specific tax rate.[3] However, the ad valorem tax rate that appears in Equation (B16g) is based on purchaser's price while the rate that appears in Equations (B16j) and (B16k) is based on basic price.

Rates of Return and Investment

The allocation of investment across industries in ORANI is obtained through a six-steps process by which allocations of investment by two main classes of investors is explained (for more information about the theory see Dixon *et al.* 1982). The two classes of investors are private investors whose investment is determined by the relative rate of return and investors whose investment is not determined by the relative rate of return. The investment decisions of the latter may be made based on other factors such as government policies. For example, sectors such as government administration, health, defence and education can be included in this category and their investment decisions are mainly driven by government policies.

Equation (B17a): Rates of Return on Capital of each Industry

$$r_j(0) = Q_j\left(p_{1(g+1,2)j} - \pi_j\right)$$

$$j = 1,\ldots,h,$$

Equation (B17a) describes the allocation of private investment and it defines that the percentage change in the current net rate of return on fixed capital in industry j ($r_j(0)$) is determined by relative changes in the rental price of a unit of capital and the cost of a unit of capital for industry j (these two variables are introduced in Equations (B16a) and (B16c)). The coefficient Q_j is the ratio of the gross rate of return in industry j to the net rate of return.

Equation (B17b): Equality of Rate of Return across Industries

$$-\beta_j\left(k_j(1) - k_j(0)\right) + r_j(0) = \omega$$

$$j \in J,$$

Equality of rate of return across industries is defined in Equation (B17b) and according to this equation, the percentage change in the expected rate of return in industry j (shown on the LHS) is equal to the percentage change in the economy-wide expected rate of return on capital (variable ω on the RHS).

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[3] The sales tax equations (Equations (B16j) and B16k)) provides the modeller with a greater flexibility in the different tax options. For example, if only specific taxes are available (the last term in equations) the other tax terms are redundant. However, in the TTM that is applied in simulations, taxes are ad valorem taxes.

Equation (B17c): Capital Accumulation

$$k_j(1) = k_j(0)(1 - G_j) + y_j G_j$$

$$j = 1, \ldots, h,$$

Equation (B17c) introduces the percentage change in the capital stock at the end of period one ($k_j(1)$). The percentage change in the future capital stock of industry j is determined by the percentage change in the current capital stock ($k_j(0)$) and the current level of investment of industry j. G_j is the ratio of gross investment in industry j to its capital stock at the end of period one ($Y_j/K_j(1)$).

Equation (B17d): Investment Budget

$$\sum_{j \in J} (\pi_j + y_j) \Upsilon_j = \left(\sum_{j \in J} \Upsilon_j \right) i$$

Equation B17d defines the private investment budget. A weighted sum of percentage changes in private investment expenditures across all j industries (LHS) is equal to the percentage change in the total nominal economy-wide investment budget (i). The coefficient Υ is industry j's private investment share in total private sector economy-wide investment.

Equation (B17f): Exogenous Private Investment

$$y_j = h_{2j} i_R + f_{2j}$$

$$j \notin J,$$

Equation (B17f) describes investment in those industries ($j \notin J$) for which the rate of return theory is considered inappropriate. As noted earlier, investment in these industries may be determined by government policies. Based on this, the percentage change in investment by the exogenous-investment industry j ($j \notin J$) moves with the percentage change in the economy-wide real private investment (i_R). The parameter h_{2j} can be set at zero or unity and f_{2j} is a shift variable.

Market Clearing Equations

This section deals with equations that make up the equality of demand and supply for domestically-produced commodities and for the primary factors of production: land, labour and capital.

Equation (B18a): Equality of Demand and Supply for Domestically-Produced Commodities

$$x_{0(r1)} = \sum_{j=1}^{h} x_{1(r1)j} B_{1(r1)j} + \sum_{j=1}^{h} x_{2(r1)j} B_{2(r1)j} + x_{3(r1)} B_{3(r1)} + x_{4(r1)} B_{4(r1)} + x_{5(r1)} B_{5(r1)} +$$

$$\sum_{i=1}^{g}\sum_{s=1}^{2}\sum_{j=1}^{h}\sum_{k=1}^{2} x_{(r1)(is)jk} B_{(r1)(is)jk} + \sum_{i=1}^{g}\sum_{s=1}^{2}\sum_{k=3.5} x_{(r1)(is)k} B_{(r1)(is)k} + \sum_{i=1}^{g} x_{(r1)(i1)4} B_{(r1)(i1)4}$$

r = 1,……, g.

Equation (B18a) defines that the percentage change in the total supply of domestically-produced commodity ($x_{0(r1)}$) equals the weighted sum of the percentage change in total demand for the domestically-produced commodity. Total demand includes demand from producers for current production, private investors, households, foreigners, the government and from those who need commodities for margin services. *B*'s that appear in the equation are the shares of the sales of domestically-produced commodities that are absorbed by the various types of demand shown on the RHS of the equation. For example, B_{3r1} is the share of the total sales of domestically-produced commodity *r*, accounted for by direct sales to households.

Equation (B18b): Total Output of Commodity

$$x_{0(r1)} = \sum_{j=1}^{h} x_{0(r1)j} B_{0(r1)j}$$

r = 1,……, g

Equation (B18b) simply describes the percentage change in the total supply of commodity (r_l) and it is the weighted sum of the percentage changes in the supply of the commodity by each industry *j*. The *B*'s are the production shares in this equation.

Equation (B18c): Demand and Supply Equality for Labour of each Skill

$$\ell_m = \sum_{j=1}^{h} x_{1(g+1,1,m)j} B_{1(g+1,1,m)j}.$$

m = 1,….M,

Equation (B18c) equates the percentage change in the supply of labour skill *m* (l_m) to the weighted sum of percentage changes in demand for labour of skill class *m* by each of the *j* industries. The *B*'s that appear in Equation B18c are employment shares.

Equation (B18d): Demand and Supply Equality of Capital

$$k_j(0) = x_{1(g+1,2)j},$$

$j = 1,\ldots,h,$

The percentage change in the supply of the current capital stock of industry j is shown in Equation (B18d) as equal to the percentage change in demand for capital by industry j and this implies that, unlike labour, capital is assumed to be industry-specific. Therefore, capital cannot be shifted between industries.

Equation (B18e): Demand and Supply Equality for Land

$$n_j = x_{1(g+1,3)j},$$

$$j = 1,\ldots,h,$$

The last equation in this section, (B18e), defines the equality between the percentage changes in demand for, and supply of, (n_j) agricultural land in each j industry. Like the above case (capital), it is assumed that agricultural land cannot be shifted between industries.

Aggregate Import, Exports and the Balance of Trade

The following equation, (B19a), describes the percentage change in the aggregate demand for imported good r ($x_{0(r2)}$) and it shows that the demand is equal to the weighted sum of percentage changes in the demand for the same by current producers for intermediate use, private investors, households and the government for current consumption and capital purposes. The B's are shares of total import flows.

Equation (B19a): Import Volumes

$$x_{0(r2)} = \sum_{k=1}^{2}\sum_{j=1}^{h} x_{k(r2)j} B_{k(r2)j} + \sum_{k=3,5} x_{k(r2)} B_{k(r2)},$$

$$r = 1,\ldots\ldots, g$$

Equation (B19b) defines the percentage change in the foreign currency value of imports, variable m, as a weighted sum of the percentage changes in foreign currency expenditure on each commodity r imported. M is a share of the aggregate foreign currency cost of commodity imports accounted for by imported good r.

Equation (B19b): Foreign Currency Value of Imports

$$m = \sum_{r=1}^{g}\left(p_{m(r2)} + x_{0(r2)}\right)M_{(r2)},$$

The percentage change in the foreign currency value of aggregate exports (e) is presented in Equation (B19c) as a weighted sum of the percentage change in export revenue in exporting commodity r and E is the share of good r in aggregate export revenue.

Equation (B19c): Foreign Currency Value of Exports

$$e = \sum_{r=1}^{g} \left(p_{e(r1)} + x_{4(r1)} \right) E_{(r1)} ,$$

The last equation, Equation (B19d), deals with the balance of trade. The balance of trade, ΔB in the equation, is different from the other equations in that it is presented as the change, not as the percentage change.

Equation (B19d): The Balance of Trade

$$100\Delta B = Ee - Mm ,$$

Other Macro Indices

This section defines some of the previously introduced variables such as the consumer price index, aggregate employment and aggregate capital stock.

Equation (B20a): Consumer Price Index

$$\xi_3 = \sum_{s=1}^{2} \sum_{i=1}^{g} w_{3(is)} p_{3(is)}$$

The percentage change in the consumer price index ξ_3 is a weighted average of the percentage changes in the purchaser's prices of consumer goods and $w_{3(is)}$ is the share of aggregate consumer spending devoted to commodity i from source s.

Equation (B20b): The Capital Goods-Price Index

$$\xi_2 = \sum_{j \in J} \Upsilon_j^* \pi_j$$

Equation (B20b) defines the percentage change in the capital goods price index ξ_2 and it is the weighted sum of the percentage changes in industry private costs of capital where Υ_j^* is the share of total private investment expenditure accounted for by industry j.

Equation (B20c): Aggregate Employment

$$\ell = \sum_{m=1}^{M} \ell_m \psi_{1m}$$

Equation (B20d): Aggregate Capital Stock

$$k(0) = \sum_{j=1}^{h} k_j(0)\psi_{2j}$$

Equation (B20e): Ratio of Real Investment to Real Consumption

$$f_R = i_R - c_R$$

Equations (B20c), (B20d), and (B20e) estimate the percentage change in aggregate employment, aggregate capital stock and the ratio between real private investment expenditure and real consumption expenditure. ψ_{1m} and ψ_{2j} are the share of skill m in total employment and the share of capital of type j in the total value of fixed capital for the economy, respectively.

Wage Indexation

This is the last section of the theoretical structure and it presents wage indexation. Equation (B21a) and (B21b) describe how wages and other costs are indexed to the consumer price index. The f's and h's are variables and parameters, respectively. If, in Equation (B21a), all f's are set at zero and h is set at unity for all m skills and j industries, then wages are fully indexed to the consumer price index. Alternatively, the f's can be left to decide endogenously.

Equation (B21a): Flexible Handling of Wages by Occupations and Industry

$$p_{1(g+1,1,m)j} = h_{1(g+1,1,m)j}\xi_3 + f_{1(g+1,1)} + f_{1(g+1,1)j} + f_{1(g+1,1,m)} + f_{1(g+1,1,m)j}$$

$$m = 1,\ldots\ldots, M, j = 1,\ldots\ldots, h,$$

Equation (B21b) can be used in the same way by setting h at unity and the f's as exogenous, although alternative treatments are possible.

Equation (B21b): Indexing of the Prices of Other Costs

$$p_{1(g+2)j} = h_{1(g+2)j}\xi_3 + f_{1(g+2)j}$$

$$j = 1,\ldots\ldots, h,$$

The above section concludes the theoretical structure of the ORANI model. The percentage form of all the variables of the basic model are presented in Table B1 below.

Table B1: The Percentage Change Variables of ORANI

Variable	Subscript Range	Description
z_j	$j = 1,\ldots,h.$	Industry activity level
$x_{k(is)j}$	$i = 1,\ldots,g,$ $j = 1,\ldots,h,$ $s, k, = 1, 2.$	Demand for inputs (domestic and imported) for current production and capital creation
$x_{1(g+2)j}$	$j = 1,\ldots,h.$	Demand for other costs
$x_{1(g+1.1.q)j}$	$q = 1\ldots,M,$ $j = 1,\ldots,h.$	Demand for labour inputs by skill group and industry
$x_{1(g+1.v)j}$	$v = 1, 2, 3,$ $j = 1,\ldots,h.$	Industry demand for labour in general, capital and agricultural land
$x_{0(r^*)j}$	$j = 1,\ldots,h,$ $r = 1,\ldots,N(j).$	Supplies of composite commodities by industry
$x_{0(i1)j}$	$j = 1,\ldots,h,$ $i = 1,\ldots,g.$	Supplies of commodities by industry
$x_{k(is)}$	$k = 3, 5,$ $s = 1, 2,$ $i = 1,\ldots,g.$	Household demand ($k = 3$) and government demands ($k = 5$) for goods by type and source
$x_{3(i)}$	$i = 1,\ldots,g.$	Household demands for goods by type, undifferentiated by source
$x_{4(i1)}$	$i = 1,\ldots,g.$	Export volumes
$x_{(r1)(is)jk}$	$j = 1,\ldots,h,$ $i, r = 1,\ldots,g,$ $k, s = 1, 2.$	Demand for margin services to facilitate commodity flows to production and capital creation
$x_{(r1)(is)k}$	$i, r = 1,\ldots,g,$ $k = 3, 5,$ $s = 1, 2.$	Demand for margin services to facilitate flows of goods to households and other users
$x_{(r1)(i1)4}$	$r, i = 1,\ldots,g.$	Demand for margin services to facilitate flows of goods to ports for exports
$x_{0(i1)}$	$r = 1,\ldots,g.$	Total supplies of domestic commodities
y_j	$j = 1,\ldots,h.$	Capital creation by using industry
$p_{k(is)j}$	$i = 1,\ldots,g,$ $j = 1,\ldots,h,$ $k, s = 1, 2.$	Purchaser's prices for produced inputs for current production and capital creation
$p_{1(g+1.v)j}$	$v = 1, 2, 3,$ $j = 1,\ldots,h.$	Prices paid by each industry for their labour in general, rental of capital and rental of agricultural land
$p_{1(g+1.1.m)j}$	$m = 1,\ldots,M,$ $j = 1,\ldots,h.$	Prices paid by industries for units of labour of different skill categories
$p_{3(i)}$	$i = 1,\ldots,g.$	Purchaser's prices for consumer goods by type but not by source

$p_{3(is)}$	$i = 1,....,g,$ $s = 1, 2.$	Purchaser's prices paid for commodities by households
$p_{4(i1)}$	$i = 1,....,g.$	F.O.B. foreign currency export prices
$p_{0(is)}$	$i = 1,....,g,$ $s = 1, 2.$	Basic prices of both domestic goods and imports
$p_{0(t^*)j}$	$t = 1,...,N(j),$ $j = 1,....,h.$	Prices of composite commodities
$p_{1(g+2)j}$	$j = 1,....,h.$	Prices of other cost cost tickets to each industry
π_j	$j = 1,....,h.$	Costs of units of capital
$p_{m(i2)}$	$i = 1,....,g.$	C.I.F. foreign currency import prices
ϕ		The exchange rate, \$A per \$US, say
q		Number of households
$k_{j(1)}$	$j = 1,....,h.$	Future capital stock
$k_{j(0)}$	$j = 1,....,h.$	Current capital stock
$r_{j(0)}$	$j = 1,....,h.$	Current rates of return on fixed capital
ω		Economy-wide expected rate of return on capital
ℓ_m	$m = 1,....,M.$	Employment of labour by skill group
n_j	$j = 1,....,h.$	Use of agricultural land in each industry
$x_{0(r2)}$	$r = 1,....,g.$	Aggregate imports by commodity
m		Foreign currency value of imports
e		Foreign currency value of exports
ΔB		The balance of trade
ξ_3		ORANI consumer price index
ξ_2		ORANI capital-goods price index
c		Aggregate household expenditure
c_R		Real aggregate household expenditure
i_R		Real aggregate private investment expenditure
i		Aggregate private investment expenditure
l		Aggregate employment
$k_{(0)}$		Aggregate capital stock
f_R		The ratio of real private investment expenditure to real household consumption expenditure

$f_{e(i1)}$	$i = 1,....,g.$	Shifts in foreign export demand
$f_{5(is)}$	$i = 1,....,g,$ $s = 1, 2.$	Shifts terms for other demands
f_{2j}	$j \notin J.$	Exogenous investment terms. Can sometimes be interpreted as the ratios of real investment in particular industries to total real private investment
$f_{1(g+1.1)}$		General wage shift variable. Can sometimes be interpreted as the change in the overall level of real wages
$f_{1(g+1.1)j}$	$j = 1,....,h.$	Variable used for simulating the effects of changes in wages payable by particular industries relative to other industries
$f_{1(g+1.1.m)}$	$m = 1,....,M.$	Variable used in simulations involving changes in occupational wage relativities
$f_{1(g+1.1.m)j}$	$m = 1,....,M,$ $j = 1,......,h.$	Variable allowing changes in both occupational and industrial wage relativities
$f_{1(g+2)j}$	$j = 1,......,h.$	Shift terms for allowing for changes in the price of other cost tickets
a_j	$j = 1,......,h.$	Weighted sums of the technical-change terms affecting the production functions for each industry
a_{1j}	$j = 1,......,h.$	Neutral-input-augmenting technical change
$a_{1(i)j}$	$i = 1,....,g+2,$ $j = 1,......,h.$	Input-i-augmenting technical chnage
$a_{1(is)j}$	$i = 1,....,g,$ $s = 1,2,$ $j = 1,....,h.$	Input-(is)-augmental technical change
$a_{1(g+1.s)j}$	$s = 1, 2,3,$ $j = 1,....,h.$	Labour, capital and agricultural land-augmenting technical change
$a_{1(g+1.1.q)j}$	$q = 1,....,M,$ $j = 1,.....,h.$	Specific-skill- augmenting technical change
$a_{(0)j}$	$j = 1,....,h.$	Neutral output-augmenting technical change
$a_{0(r^*)j}$	$r = 1,....,N(j),$ $j = 1,....,h.$	Composite-good-augmenting technical change
$a_{0(i1)j}$	$i = 1,....,g,$ $j = 1,....,h.$	Augmenting technical change with respect to commodity outputs
$a_{2(j)}$	$j = 1,....,h.$	Neutral input-augmenting technical change with respect to capital creation
$a_{2(i)j}$	$i = 1,....,g,$ $j = 1,....,h.$	Input-i-augmenting technical change with respect to capital creation
$a_{2(is)j}$	$i = 1,....,g,$ $s = 1,2,$ $j = 1,....,h.$	Input-(is)-augmenting technical change with respect to capital creation
$a_{3(i)}$	$i = 1,....,g.$	Commodity-i-augmenting change in household preferences

$a_{3(is)}$	$i = 1,....,g,$ $s = 1, 2.$	Commodity-(is)-augmenting change in household preferences
$a_{(r1)(is)jk}$	$r, i = 1,....,g,$ $s, k = 1, 2,$ $j = 1,....,h.$	Technical change associated with the use of services in facilitating input flows to industries for current production and capital creation
$a_{(r1)(is)k}$	$r, i = 1,....,g,$ $s = 1,2,$ $k = 3, 5.$	Technical change associated with the use of services in facilitating commodity flows to households and other users
$a_{(r1)(i1)4}$	$r, i = 1,....,g.$	Technical change associated with the use of services in facilitating flows of exports from producers to the ports of exit
$g_{(i2.0)}$ $t_{(i2.0)}$ $v_{(i2.0)}$	$i = 1,....,g.$	The g's are the tariffs per unit of imports. The t's and v's are variables allowing tariffs to be modelled as ad valorem or specific
$g_{(i1.4)}$ $t_{(i1.4)}$ $v_{(i1.4)}$	$i = 1,....,g.$	The g's are taxes per unit of exports. The t's and v's allow these taxes to be modelled as ad valorem or specific
$g_{(is.jk)}$ $t_{(is.jk)}$ $v_{(is.jk)}$	$i = 1,....,g,$ $s, k = 1,2,$ $j = 1,....,h.$	The g's are the taxes on the sales of inputs to industries for current production and capital creation. The t's and v's allow these taxes to be modelled as ad valorem or specific
$g_{(is.3)}$ $t_{(is.3)}$ $v_{(is.3)}$	$i = 1,....,g,$ $s = 1,2.$	The g's are the taxes on the sales of commodities to households. The t's and v's allow these taxes to be modelled as ad valorem or specific

Source: Dixon *et al.* (1982)

Table B2: A List of Standard Exogenous Variable

Variable	Subscript Range	Description
$x_{4(i1)}$	$i = 1,....,g.$	Export volumes
$p_{m(i2)}$	$i = 1,....,g.$	C.I.F. foreign currency import prices
ϕ		The exchange rate, \$A per \$US
q		Number of households
$k_{j(0)}$	$j = 1,....,h.$	Current capital stock
n_j	$j = 1,....,h.$	Use of agricultural land in each industry
c_R		Real aggregate household expenditure
i_R		Real aggregate private investment expenditure
$f_{e(i1)}$	$i = 1,....,g.$	Shifts in foreign export demand
$f_{5(is)}$	$i = 1,....,g,$ $s = 1, 2.$	Shifts terms for other demands
f_{2j}	$j \notin J.$	Exogenous investment terms. Can sometimes be interpreted as the ratios of real investment in particular industries to total real private investment
$f_{1(g+1,1)}$		General wage shift variable. Can sometimes be interpreted as the change in the overall level of real wages
$f_{1(g+1,1)j}$	$j = 1,....,h.$	Variable used for simulating the effects of changes in wages payable by particular industries relative to other industries
$f_{1(g+1,1,m)}$	$m = 1,....,M.$	Variable used in simulations involving changes in occupational wage relativities
$f_{1(g+1,1,m)j}$	$m = 1,....,M,$ $j = 1,.......,h.$	Variable allowing changes in both occupational and industrial wage relativities
$f_{1(g+2)j}$	$j = 1,.......,h.$	Shift terms for allowing for changes in the price of other cost tickets
$t_{(i2,0)}$ $v_{(i2,0)}$	$i = 1,....,g,$	Tariff terms
$t_{(is,jk)}$ $v_{(is,jk)}$	$i = 1,....,g,$ $s, k = 1,2,$ $j = 1,....,h.$	Ad valorem and specific sales tax terms
$t_{(is,3)}$ $v_{(is,3)}$	$i = 1,....,g,$ $s, k = 1,2,$	Ad valorem and specific sales tax terms
$v_{(i1,4)}$ $t_{(i1,4)}$	$i = 1,....,g,$	Ad valorem export tax terms
a's (excl. $a_{(i)}$)		Technological change and changes in household preferences

Source: Dixon *et al.* (1982)

Section Two

Derivation of Percentage Form of Levels Equations

The percentage change form of the levels equation is derived by totally differentiating each equation and then transforming to percentage form. Three main rules, the product rule, the power rule and the sum rule, are applied to derive percentage change forms. Using the product rule, a levels equation, for instance

(1) $A = BC$ is transformed into the percentage change form by first totally differentiating:

(2) $dA = dB + dC$, and then percentage changes of a, b, and c are defined as:

$a = (dA/A)*100$, $b = (dB/B)*100$ and $c = (dC/C)*100$, thus (1) can be written as

$Aa = BCb + BCc$, and finally the percentage form of equation (1) is

$a = b + c$

The sum rule of a levels equation, for instance $A = B + C$, after total differentiation and using percentage change of each variable provides:

$Aa = Bb + Cc$, thus the percentage form of the equation is

$A = S_b b + S_c c$ where $S_b = B/A$ and $S_c = C/A$ (shares of B and C in terms of A).

APPENDIX C: SELECTED DATA MATRICES OF TTM AFTER INCORPORATING TOURISM SECTORS

Table C1: Intermediate Basic: Domestic (V1BAS)

No.	Commodity/Industry	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Agriculture	3874.37	10.58	0.62	10699.36	1139.82	1121.54	0.70	94.42	1.87	0.00	90.89	31.52	0.79
2	ForestFish	50.09	103.31	15.46	9.25	0.03	0.02	0.01	8.15	435.08	0.00	6.81	0.04	3.94
3	Mining	33.96	3.85	3801.61	238.77	18.05	28.21	4.45	119.28	58.84	3489.78	365.13	953.26	4369.65
4	FoodProds	1218.03	133.76	15.68	4127.92	81.97	2.34	11.49	156.95	1.26	0.61	162.38	0.67	2.22
5	BevCigs	21.03	4.18	6.17	58.52	346.47	1.24	1.26	3.41	4.76	0.74	4.95	1.14	1.91
6	Textiles	17.00	10.41	5.25	53.54	10.34	714.36	731.87	118.40	36.71	2.00	56.17	37.48	48.73
7	ClothingFtw	13.24	7.11	13.89	14.17	1.14	21.30	139.33	48.58	15.28	1.21	5.91	2.77	53.63
8	OtherManufac	108.55	204.82	1396.48	133.88	28.57	26.87	83.49	2493.38	152.73	7.48	48.03	76.37	452.51
9	WoodPapretc	139.11	31.77	142.20	765.68	236.16	28.43	94.20	1086.60	3707.25	19.50	301.16	199.60	264.92
10	Petrolref	482.20	142.12	986.52	56.75	11.56	3.85	1.31	24.91	66.84	102.90	123.71	47.13	204.23
11	Chemicals	1437.52	33.50	540.52	63.88	5.80	52.47	16.59	534.35	571.98	138.72	2804.65	984.15	426.01
12	NonMetMinrl	37.09	56.67	85.41	1201.87	338.37	37.45	18.13	567.70	430.14	15.01	446.28	1493.20	414.79
13	MetalPrd	61.60	94.59	733.88	436.42	548.90	44.66	15.47	3982.38	334.58	8.05	152.78	319.68	9628.50
14	MVPOthTrnEq	29.38	32.05	66.68	10.01	1.69	0.66	0.31	103.96	6.57	0.40	8.05	18.10	17.72
15	Aircraft	5.48	0.50	3.52	0.19	0.02	0.01	0.01	2.47	0.17	0.02	0.16	0.16	0.56
16	ElecGasWater	304.62	13.76	800.99	737.64	90.91	114.07	27.31	441.75	359.78	104.09	309.32	470.13	1380.20
17	Construction	178.50	1.20	206.99	6.21	1.50	0.81	0.90	14.37	14.68	0.71	5.54	5.82	10.35
18	WhlsleTrade	394.31	10.31	48.26	307.82	38.87	85.37	44.61	169.92	21.73	8.42	116.57	18.94	71.39
19	RetailTrade	0.41	0.01	9.52	8.96	0.20	1.42	1.33	31.09	35.59	12.52	12.58	3.96	13.43
20	Repairs	449.63	86.41	370.09	262.31	20.94	9.26	0.02	82.35	373.80	2.28	77.81	74.53	74.08
21	HotelsCafes	289.84	20.07	383.68	314.85	744.15	41.07	63.51	233.67	347.24	54.30	277.10	109.97	303.03
22	RoadTransprt	279.11	15.02	509.69	706.88	176.18	27.09	21.27	236.36	409.45	57.98	149.99	420.77	412.11
23	RailTransprt	10.11	0.22	490.20	22.01	4.53	40.83	1.16	56.78	14.29	2.57	7.86	198.34	316.97
24	WaterTranspt	0.11	3.96	97.03	17.16	1.08	3.05	4.05	11.24	14.13	0.00	7.57	6.12	19.99
25	AirTransport	115.62	21.72	171.53	107.72	13.92	29.71	87.45	235.62	220.31	23.13	83.25	31.90	88.49
26	TransprtSrvc	244.68	11.34	210.59	448.18	153.78	15.39	58.94	119.40	534.07	74.38	335.12	86.84	332.28
27	CommunicSrvc	286.83	19.06	375.69	254.98	43.92	41.63	44.77	401.01	315.60	13.10	120.89	128.30	211.29
28	FinanceSrvce	1512.94	134.10	2679.81	1896.02	428.42	237.80	265.62	1638.31	1672.11	94.43	1568.07	678.97	2245.43
29	OwnerDwellng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	PublicServ	99.94	16.91	321.30	153.78	32.59	7.72	31.83	62.03	251.07	28.63	94.25	32.18	89.89
31	Education	6.39	1.77	36.48	40.95	8.69	3.32	29.70	37.01	23.70	6.00	20.46	14.13	30.04
32	OthEntertain	6.24	0.95	13.38	53.26	11.06	2.93	2.41	17.70	35.32	2.48	22.40	6.06	7.87
33	LbryMseumArt	0.98	0.02	2.94	2.89	0.27	0.03	2.12	0.65	31.20	0.17	0.37	0.89	0.47
34	GambRec	0.70	0.12	1.67	1.66	13.14	0.05	0.18	1.89	4.57	0.01	1.40	0.59	0.84
35	OtherServ	12.18	8.91	292.82	54.81	13.88	4.26	27.55	75.50	90.51	3.42	48.62	38.08	47.09
36	DomToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	IntToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	11721.79	1235.06	14836.54	23268.30	4566.89	2749.22	1833.34	13211.55	10593.20	4275.00	7836.21	6491.76	21545.36

Table C1: Intermediate Basic: Domestic (V1BAS) Cont.

14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
0.00	0.02	1.93	115.77	6.76	119.38	1.69	280.55	0.45	1.08	0.06	0.16	6.82	0.31	142.94	0.07
0.06	0.00	0.66	9.28	0.53	134.30	0.09	459.58	1.26	15.75	0.03	0.05	0.45	1.24	8.79	0.01
16.20	0.80	2284.84	700.62	119.37	60.33	3.79	122.04	22.83	11.10	3.58	3.14	9.10	46.41	137.49	31.36
2.23	1.36	5.02	12.72	41.47	1368.45	4.92	1836.68	3.58	5.56	1.18	4.65	2.83	21.68	140.72	5.53
1.65	0.77	3.15	6.26	19.02	19.37	3.13	931.73	2.80	2.48	0.33	2.65	2.18	11.38	62.71	1.09
21.19	1.72	2.10	103.87	80.58	77.48	4.31	170.18	18.54	11.12	4.25	3.05	2.19	19.18	93.78	9.13
4.32	0.99	4.36	8.51	42.71	40.40	20.22	60.31	6.82	14.72	0.19	2.99	11.96	15.03	63.50	1.40
386.87	19.58	305.99	3306.33	293.34	305.69	443.00	478.95	389.12	603.35	110.30	13.40	112.50	630.00	657.69	147.64
76.36	7.43	64.99	2663.99	2144.80	2619.43	34.24	697.73	98.00	104.49	22.35	66.28	104.47	701.20	2856.65	268.55
5.74	0.35	158.86	180.19	326.12	189.90	50.62	171.07	638.43	60.62	59.80	1619.34	106.99	139.55	413.64	10.29
268.98	33.82	195.85	473.84	40.20	15.01	52.16	148.61	14.08	24.39	8.23	4.37	10.16	11.86	482.16	104.76
149.10	5.47	217.65	5475.35	511.29	80.78	34.31	158.35	50.05	11.59	4.22	62.75	17.10	182.02	85.36	257.15
1646.24	119.56	209.79	4575.04	370.09	255.85	55.65	84.05	197.99	514.25	110.70	50.14	91.83	308.76	148.03	634.37
2140.19	0.20	13.79	46.40	389.61	280.06	889.61	96.81	364.75	3.73	0.34	4.19	55.18	95.69	79.52	2.68
0.40	7.99	0.34	3.96	30.12	0.33	1.09	0.77	0.75	0.75	0.01	860.61	73.87	0.40	4.75	0.19
158.18	33.04	8571.65	151.25	370.89	449.80	190.04	839.83	66.61	227.64	11.25	26.49	281.21	176.59	2413.20	64.15
4.71	0.20	27.99	57.35	181.78	31.50	2.06	322.85	22.70	145.01	4.44	11.86	61.56	8.69	303.87	1260.66
74.07	0.07	0.66	12.25	467.75	14.11	0.04	2.78	16.29	122.07	0.41	1.34	13.22	500.84	129.00	5.19
4.17	0.04	0.26	3.47	378.07	102.65	0.00	3.55	9.84	0.17	0.24	0.53	4.23	13.71	61.41	0.06
29.13	0.27	168.26	714.34	802.10	1552.44	10.38	1166.42	950.93	52.69	17.49	22.44	349.17	664.98	1258.99	366.58
104.73	2.05	119.70	315.26	914.34	474.96	32.66	107.86	227.67	25.68	17.89	111.79	180.82	402.95	3150.16	0.21
78.61	2.28	12.53	94.82	1904.91	127.22	17.13	9.50	2381.92	24.91	4.38	20.86	260.23	306.49	330.01	0.00
3.22	0.01	31.90	53.89	80.48	35.29	0.73	3.59	1.31	5.06	1.36	3.26	34.25	51.99	271.71	1.91
1.43	0.10	8.10	0.00	13.79	10.00	0.59	0.86	0.15	0.26	556.61	0.00	0.45	18.00	37.02	0.00
53.93	7.95	71.69	32.61	1084.01	242.93	8.53	47.45	29.94	2.07	8.89	805.66	54.80	373.21	1250.72	0.22
108.75	4.64	15.27	281.37	3300.23	414.87	29.49	182.39	349.33	18.39	483.67	1159.69	678.20	245.05	2133.17	3.08
78.05	23.00	213.84	204.89	2280.83	2256.58	141.86	717.72	779.04	57.56	22.65	127.93	385.83	452.39	3696.83	11.31
1154.09	61.58	1952.85	6641.60	15401.32	9439.21	638.32	4207.95	2386.68	1028.73	269.43	1417.94	1885.44	1656.95	43412.61	4144.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.87	3.37	46.19	166.01	156.43	215.39	39.97	30.79	623.42	31.37	4.49	6.14	311.79	203.72	747.78	8.07
16.53	0.79	35.40	33.81	18.63	53.92	2.25	28.95	18.06	9.54	3.75	14.53	32.81	9.28	560.65	0.32
49.38	0.35	5.83	5.59	221.00	473.45	3.65	72.13	22.78	1.38	2.61	13.05	7.62	20.78	1277.03	0.17
0.75	0.05	0.70	0.36	14.65	31.60	0.00	164.07	1.92	0.61	0.09	1.12	3.50	0.25	180.91	0.00
0.46	0.01	0.06	0.82	6.77	6.90	0.00	5.72	0.90	0.58	0.06	0.82	1.16	0.25	26.59	0.01
38.39	2.88	28.75	29.47	53.59	125.57	7.05	86.82	35.94	6.70	0.65	4.91	24.17	33.80	501.89	0.85
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6759.01	342.74	14780.92	26481.29	32067.58	21625.16	2723.57	13698.65	9734.84	3145.40	1735.91	6448.14	5178.08	7324.61	67121.28	7341.03

Table C1: Intermediate Basic: Domestic (V1BAS) Cont.

30	31	32	33	34	35	36	37	Total
69.01	1.10	69.14	7.39	294.44	38.52	0.00	0.00	18224.04
3.67	0.06	1.39	0.41	2.92	3.06	0.00	0.00	1275.79
172.90	8.29	34.14	6.60	66.22	32.56	0.00	0.00	17378.56
91.42	16.71	12.34	5.97	142.24	47.62	2110.83	508.95	12309.95
38.15	5.71	1.07	0.74	3.46	2.83	1248.53	247.64	3074.58
151.38	17.19	4.08	1.50	7.81	45.38	65.17	15.86	2773.29
198.15	11.29	2.35	0.84	13.56	114.56	391.02	95.19	1462.96
1669.71	145.31	86.98	22.43	230.72	137.10	560.47	136.43	16406.04
1463.18	383.25	91.69	81.59	174.94	302.78	130.34	31.73	22207.04
178.35	0.43	5.65	1.63	16.68	83.76	1096.16	74.25	7842.46
601.27	12.18	36.12	3.60	83.87	280.08	223.08	64.51	10803.32
199.16	10.27	2.07	0.88	3.68	51.75	0.00	0.00	12712.44
263.99	102.13	42.32	12.42	71.83	63.48	0.00	0.00	26289.97
71.19	6.46	3.88	0.99	8.21	12.93	456.43	48.78	5367.19
62.17	0.12	0.10	0.02	0.23	0.23	0.00	0.00	1062.48
789.48	268.01	47.11	13.98	131.74	152.36	0.00	0.00	20589.06
724.20	3.07	1.82	0.73	5.55	6.43	0.00	0.00	3636.57
32.26	2.89	0.16	0.28	0.45	1.48	0.00	0.00	2734.15
7.15	0.13	2.88	0.86	5.44	16.03	365.39	0.00	1111.28
186.82	24.19	40.56	16.97	116.15	139.02	296.01	9.84	10839.67
832.04	86.28	84.95	23.92	177.65	149.39	7920.58	2272.16	20918.23
279.58	54.56	17.10	10.51	21.78	76.59	425.82	623.64	10507.32
23.77	6.15	4.55	3.40	7.67	6.26	409.93	346.35	2553.87
41.35	0.74	0.20	0.08	0.32	10.85	132.55	542.84	1561.75
637.33	83.53	33.34	9.08	97.49	41.80	2415.25	2019.18	10641.97
551.19	32.95	11.91	4.16	22.69	41.46	985.79	216.70	13899.42
2068.58	248.36	108.20	34.15	330.08	422.20	315.57	126.91	17361.43
7573.85	596.90	497.15	179.63	1624.04	1505.01	615.44	285.63	123628.40
0.00	0.00	0.00	0.00	0.00	0.00	1185.91	219.93	1405.84
3314.09	105.20	16.85	7.06	41.91	50.95	394.46	132.20	7960.60
132.19	64.75	3.69	8.26	4.92	53.57	67.22	1076.34	2508.80
95.66	3.52	423.05	23.92	140.46	33.47	403.87	64.97	3547.74
31.53	62.61	50.63	17.86	64.19	6.83	403.87	64.97	1146.05
17.88	5.95	167.54	9.98	358.90	8.19	869.56	163.81	1679.72
472.38	37.64	29.01	4.38	24.98	63.44	315.57	84.61	2731.07
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23045.03	2407.91	1934.01	516.22	4297.22	4001.98	23804.82	9473.42	420153.06

Table C2: Intermediate Basic: Imported (V1BAS)

No.	Commodity/Indsutry	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Agriculture	33.84	0.20	0.06	198.33	88.96	1.52	0.41	4.22	0.16	0.00	2.63	22.61	0.06	0.00
2	ForestFish	6.54	13.47	0.99	0.22	0.00	0.00	0.00	2.34	1.40	0.00	1.16	0.00	0.04	0.00
3	Mining	6.59	0.26	37.52	3.84	0.44	0.23	0.27	98.79	4.60	4058.09	26.30	52.02	566.30	0.80
4	FoodProds	38.37	1.72	2.32	525.34	20.22	0.35	0.16	1.49	0.57	0.08	36.70	0.17	0.12	0.30
5	BevCigs	2.98	0.73	1.08	5.82	25.02	0.60	1.39	1.02	1.18	0.14	1.07	0.44	0.29	0.33
6	Textiles	13.26	5.91	4.59	45.83	11.05	355.68	935.90	106.78	26.17	1.66	17.82	42.90	26.80	11.81
7	ClothingFtw	6.99	6.04	19.07	8.72	0.65	3.62	56.90	25.89	12.54	0.36	3.45	1.91	30.11	4.17
8	OtherManufac	80.38	325.60	1090.60	65.27	12.01	18.68	117.09	3700.66	236.21	4.69	98.12	59.39	270.01	522.74
9	WoodPapretc	16.40	5.25	24.85	85.74	32.59	8.45	9.76	189.47	1807.31	3.75	27.13	59.43	43.06	7.74
10	Petrolref	42.94	9.52	73.76	12.39	1.85	0.78	0.09	14.03	12.45	333.07	66.78	11.39	113.18	1.96
11	Chemicals	692.08	5.51	219.95	48.33	6.91	60.58	21.82	286.42	477.86	191.25	2243.30	832.65	296.84	76.21
12	NonMetMinrl	10.96	7.75	9.72	241.75	53.37	14.61	10.17	257.97	209.63	9.02	110.69	310.06	135.14	49.87
13	MetalPrd	15.18	32.02	182.40	23.23	45.53	13.50	9.57	787.30	49.61	0.82	43.29	79.12	1212.54	254.74
14	MVPOthTrnEq	11.45	15.28	30.80	1.74	0.20	0.11	0.09	87.31	1.89	0.08	1.55	1.33	13.45	2559.23
15	Aircraft	1.95	1.28	49.45	0.18	0.01	0.01	0.02	6.17	0.23	0.01	0.32	0.13	0.47	1.23
16	ElecGasWater	0.51	0.03	0.87	0.83	0.12	0.13	0.03	0.51	0.94	0.11	0.39	0.60	1.29	0.18
17	Construction	2.14	0.91	3.71	0.33	0.08	0.04	0.04	6.94	2.67	0.04	0.56	0.45	0.87	1.17
18	WhlsleTrade	0.22	0.02	0.32	0.88	0.06	0.03	0.01	0.19	0.47	0.02	0.17	0.06	0.10	0.05
19	RetailTrade	0.05	0.00	0.17	0.03	0.00	0.01	0.00	0.09	0.09	0.00	0.09	0.03	0.05	0.03
20	Repairs	2.48	0.42	3.45	1.00	0.11	0.03	0.00	0.32	2.54	0.01	0.33	0.60	0.66	0.36
21	HotelsCafes	32.40	1.00	18.67	13.26	15.28	1.37	1.32	12.93	36.67	1.83	19.05	4.86	18.71	5.45
22	RoadTransprt	0.30	0.04	1.26	0.76	0.16	0.22	0.18	0.83	1.17	0.12	0.42	0.32	0.69	0.44
23	RailTransprt	0.37	0.00	1.64	0.03	0.01	0.00	0.00	1.89	0.00	0.02	0.36	3.32	3.23	0.01
24	WaterTranspt	1.35	2.00	46.54	9.90	0.76	1.64	2.04	5.65	6.82	56.30	3.93	4.27	38.19	0.70
25	AirTransport	13.08	0.95	36.56	23.22	3.28	5.88	15.53	38.38	45.41	4.82	17.05	6.69	18.48	9.63
26	TransprtSrvc	2.94	1.07	8.83	9.58	0.40	0.40	0.74	2.13	1.14	0.05	1.73	0.68	2.78	0.76
27	CommunicSrvc	7.67	1.35	7.84	13.92	1.98	2.05	4.94	47.00	37.09	1.15	8.37	6.33	14.30	5.44
28	FinanceSrvce	114.82	8.39	145.39	114.66	26.38	9.19	10.63	130.70	490.30	2.85	80.68	38.48	57.51	45.11
29	OwnerDwellng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	PublicServ	8.73	0.06	1.67	1.68	0.38	0.09	1.14	0.97	2.18	0.03	3.23	0.35	0.50	0.83
31	Education	0.51	0.12	2.49	2.64	0.56	0.21	1.97	2.50	1.69	0.40	1.46	0.96	1.93	1.05
32	OthEntertain	0.45	0.12	1.37	8.86	1.85	0.43	0.35	2.40	5.65	0.42	3.73	0.82	1.00	8.53
33	LbryMseumArt	0.01	0.00	0.04	0.03	0.00	0.00	0.03	0.01	0.72	0.00	0.01	0.01	0.01	0.01
34	GambRec	0.02	0.00	0.04	0.01	0.04	0.00	0.01	0.03	0.04	0.00	0.03	0.01	0.01	0.01
35	OtherServ	0.11	0.10	0.40	0.52	0.13	0.04	0.14	67.80	0.60	0.05	12.34	0.24	0.41	0.64
36	DomToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	IntToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	1168.09	447.14	2028.39	1468.85	350.39	500.48	1202.75	5891.14	3477.98	4671.24	2834.21	1542.62	2869.15	3571.54

Table C2: Intermediate Basic: Imported (V1BAS) Cont.

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0.00	0.13	5.88	0.53	6.11	0.14	14.92	0.04	0.08	0.00	0.07	0.38	0.05	20.59	0.00	1.90
0.00	0.05	0.11	0.04	3.28	0.00	7.47	0.15	0.13	0.00	0.00	0.04	0.05	0.24	0.00	0.09
0.04	13.26	9.48	0.20	2.86	0.31	2.27	1.94	0.62	0.05	0.02	0.51	4.42	8.07	0.06	9.53
0.16	0.70	0.81	2.86	118.80	0.89	129.61	0.37	0.45	0.07	0.35	0.24	2.54	18.18	0.10	12.21
0.12	0.35	0.53	2.04	1.44	0.45	225.28	0.24	0.15	0.03	0.33	0.19	0.91	7.78	0.02	6.33
1.25	0.29	42.08	24.59	23.50	1.36	117.27	6.63	8.07	2.47	2.20	0.80	5.92	29.29	3.10	80.45
0.49	5.84	6.50	41.22	21.78	29.96	34.73	1.73	10.33	0.16	2.33	5.96	12.57	42.83	0.47	81.10
43.71	324.01	1329.13	158.17	95.39	742.16	379.72	265.34	90.97	3.35	7.70	242.70	721.12	1172.71	47.17	1395.63
0.81	7.02	315.28	176.71	276.87	2.98	41.63	19.92	6.87	2.06	7.34	18.99	53.98	138.18	11.02	190.21
0.50	11.88	127.53	39.56	24.20	18.31	20.65	51.86	4.84	3.25	180.47	11.00	18.65	38.10	1.52	20.63
2.85	248.82	97.04	16.53	6.31	11.44	45.32	4.85	14.65	2.90	1.17	2.49	9.88	352.47	62.95	241.87
1.91	9.34	486.40	153.09	34.14	8.14	45.56	13.52	2.52	1.07	15.72	4.52	99.16	24.02	148.10	53.46
18.96	75.85	712.86	78.21	60.64	35.36	59.80	7.80	9.91	3.23	1.51	4.42	40.69	52.37	112.57	129.26
1.10	2.75	6.81	71.95	100.80	358.84	5.36	211.76	0.82	0.02	0.19	20.88	49.44	23.98	0.42	46.29
270.87	0.66	1.12	0.82	0.06	2.90	1.98	0.10	0.05	0.00	40.28	4.62	0.27	4.80	0.01	22.48
0.03	7.10	0.39	0.71	1.03	0.15	0.86	0.13	0.19	0.03	0.05	0.26	0.33	5.57	0.04	1.02
0.06	0.87	2.85	3.30	1.50	2.44	4.99	0.55	0.12	0.08	0.17	1.06	0.45	9.14	0.13	3.66
0.00	0.02	0.54	1.16	0.05	0.00	0.03	0.13	0.74	0.01	0.02	0.09	0.19	2.87	0.03	0.38
0.00	0.01	0.30	0.09	0.01	0.00	0.02	0.03	0.00	0.01	0.01	0.05	0.01	1.10	0.00	0.14
0.00	0.78	2.26	5.55	14.40	0.02	0.63	3.50	0.58	0.22	0.49	1.13	4.10	19.30	0.01	0.97
0.25	7.42	25.14	161.64	39.94	2.02	3.34	23.65	0.60	1.88	36.06	18.74	19.77	135.23	0.03	81.97
0.14	0.57	1.23	7.45	1.30	0.08	1.07	2.01	3.32	0.44	3.39	1.16	2.08	7.63	0.00	16.11
0.00	0.12	0.60	0.08	0.08	0.00	0.03	0.00	0.00	0.11	0.42	0.04	0.00	0.26	0.00	0.62
0.05	4.09	1.03	6.74	4.88	0.35	0.73	0.68	0.21	257.39	1.27	0.33	8.50	17.62	0.03	19.41
1.66	15.02	8.46	225.88	50.98	2.03	11.05	6.26	0.55	1.86	167.80	11.48	77.77	261.34	0.08	133.30
0.13	0.09	0.00	22.57	9.52	0.00	4.22	0.03	0.50	39.93	151.20	13.73	0.00	8.73	0.00	2.78
3.51	6.38	7.57	120.76	64.44	7.53	45.78	26.40	2.97	3.67	30.71	69.28	44.75	175.36	0.14	170.69
2.33	39.51	229.32	442.84	256.12	41.30	119.85	44.46	17.83	6.80	25.63	65.38	52.35	1883.06	69.19	188.75
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.08	0.19	3.13	1.57	1.05	0.14	0.30	0.26	0.14	0.09	0.13	1.30	0.97	12.34	0.01	11.55
0.05	2.34	2.48	0.83	3.41	0.15	1.79	0.98	0.61	0.22	0.89	2.02	0.52	38.68	0.02	8.23
0.02	0.54	0.52	34.49	78.01	0.32	11.45	2.26	0.07	0.44	2.42	1.33	3.09	208.63	0.00	12.04
0.00	0.01	0.03	0.15	0.28	0.00	2.25	0.01	0.00	0.00	0.01	0.02	0.00	2.81	0.00	0.65
0.00	0.00	0.07	0.03	0.04	0.00	0.20	0.04	0.00	0.00	0.05	0.07	0.01	0.34	0.00	0.27
0.06	0.24	0.67	1.05	1.52	0.24	1.19	0.19	0.14	0.01	0.13	0.35	0.52	4.59	0.00	6.65
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
351.13	786.28	3428.13	1803.43	1304.77	1270.00	1341.37	697.80	179.05	331.85	680.55	505.55	1235.05	4728.25	457.22	2950.62

Table C2: Intermediate Basic: Imported (V1BAS) Cont.

31	32	33	34	35	36	37	Total
0.06	10.39	1.17	44.78	1.48	0.00	0.00	461.71
0.00	0.01	0.00	0.02	0.05	0.00	0.00	37.93
0.48	0.31	0.08	0.65	1.40	0.00	0.00	4912.60
1.57	1.17	0.62	10.85	8.58	206.19	49.72	1194.96
0.45	0.14	0.05	0.38	0.31	144.45	24.86	458.93
5.05	2.03	0.52	3.85	13.90	80.50	19.60	2080.86
8.62	2.23	0.82	5.59	35.77	482.98	117.57	1132.03
207.36	169.97	31.32	342.79	174.42	692.27	168.52	15407.05
69.94	4.86	8.64	7.11	16.76	160.99	39.19	3898.30
0.04	0.75	0.22	2.23	17.12	64.03	0.00	1351.55
14.44	18.58	1.98	51.90	156.24	218.78	49.64	7092.83
5.41	1.15	0.42	2.11	30.08	0.00	0.00	2570.56
16.09	17.79	3.80	27.09	37.83	0.00	0.00	4254.85
14.18	1.80	0.37	3.57	5.53	147.57	15.77	3814.70
0.20	0.42	0.03	0.65	2.03	0.00	0.00	415.81
0.25	0.06	0.03	0.18	0.18	0.00	0.00	25.12
0.24	0.06	0.02	0.23	0.43	0.00	0.00	52.34
0.03	0.00	0.00	0.01	0.04	0.00	0.00	8.94
0.01	0.00	0.00	0.00	0.02	21.34	0.00	23.79
0.22	0.30	0.19	0.84	0.65	0.00	0.00	68.43
8.38	4.68	1.43	9.53	18.36	0.00	0.00	782.86
1.68	0.35	0.10	0.87	0.38	7.31	0.00	65.56
0.00	0.01	0.00	0.01	0.01	0.00	0.00	13.27
0.35	0.13	0.05	0.24	5.13	0.00	0.00	509.28
17.45	7.37	1.93	21.93	8.84	0.00	0.00	1272.01
0.13	0.05	0.02	0.10	0.22	0.00	0.00	287.19
22.40	9.10	2.56	12.49	22.44	29.24	12.55	1050.15
16.17	15.78	12.27	56.73	65.25	29.24	13.07	4968.33
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.42	1.03	0.03	3.39	2.07	0.00	13.07	75.09
4.29	0.24	0.54	0.32	3.50	1.06	16.99	108.63
0.15	43.28	2.38	9.91	4.86	0.00	1.09	453.32
1.42	1.01	199.65	1.89	0.23	0.00	1.09	212.39
0.01	0.52	0.08	1.17	0.04	1.14	1.71	6.04
0.93	0.26	0.08	0.31	1.56	29.24	8.37	141.81
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
418.43	315.83	271.41	623.71	635.69	2316.33	552.79	59209.22

Table C3: Intermediate Margin: Total (V1MAR)

No.	Commodity/Indsutry	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Agriculture	0.22	2728.91	309.76	395.47	0.29	26.98	0.53	0.00	108.14	12.98	0.23	0.00	0.01
2	ForestFish	4.60	1.61	0.00	0.00	0.00	11.83	104.18	0.00	7.26	0.00	2.09	0.00	0.00
3	Mining	104.82	93.00	11.51	6.10	2.00	54.12	29.24	187.51	64.18	778.91	491.02	8.26	0.43
4	FoodProds	1.53	441.78	24.95	1.10	5.01	71.16	0.28	0.13	94.01	0.11	0.21	0.32	0.08
5	BevCigs	0.73	110.15	38.77	0.24	0.27	0.38	0.91	0.06	0.79	0.22	0.20	0.13	0.10
6	Textiles	0.93	7.13	2.28	135.25	205.38	32.21	7.47	0.47	8.93	9.63	8.42	3.42	0.38
7	ClothingFtw	2.76	2.68	0.19	2.75	7.56	5.44	3.17	0.36	0.82	0.75	6.05	0.73	0.21
8	OtherManufac	655.26	34.06	7.06	3.17	36.01	1010.25	130.87	2.47	75.66	20.28	143.27	255.40	29.62
9	WoodPapretc	27.59	78.20	25.90	3.93	11.85	431.93	749.47	5.81	42.23	29.59	56.13	7.34	0.80
10	Petrolref	346.16	25.52	4.35	1.69	0.45	13.28	25.96	0.35	71.74	20.60	52.41	3.29	0.58
11	Chemicals	168.18	22.97	3.38	15.31	4.27	117.45	272.77	33.60	610.78	270.72	164.00	29.39	0.23
12	NonMetMinrl	11.29	145.28	31.50	5.32	12.80	157.66	77.63	5.89	68.92	69.77	99.37	58.53	1.83
13	MetalPrd	98.30	70.13	55.16	3.25	1.62	285.64	26.22	0.62	37.70	36.03	322.93	68.78	18.83
14	MVPOthTrnEq	74.47	6.42	0.31	0.51	0.05	114.92	0.42	0.02	2.25	29.92	17.30	2.32	0.08
15	Aircraft	6.54	0.07	0.00	0.00	0.01	0.96	0.10	0.00	0.09	0.04	0.21	0.16	0.03
16	ElecGasWater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Construction	1.36	0.22	0.01	0.00	0.01	3.40	0.14	0.10	0.13	2.56	0.73	0.18	0.03
18	WhlsleTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	RetailTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	HotelsCafes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	RoadTransprt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	RailTransprt	5.54	3.31	0.00	0.00	0.00	2.86	0.07	1.13	1.10	49.86	8.36	0.07	0.00
24	WaterTranspt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	AirTransport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	TransprtSrvc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	CommunicSrvc	1.80	0.47	0.04	0.03	3.06	10.36	9.03	0.16	0.90	0.65	2.34	0.72	1.67
28	FinanceSrvce	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	OwnerDwellng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	PublicServ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	OthEntertain	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	LbryMseumArt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	GambRec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	OtherServ	0.00	0.00	0.00	0.00	0.00	7.26	0.00	0.00	1.16	0.00	0.00	0.00	0.00
36	DomToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	IntToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	1512.07	3771.90	515.17	574.13	290.65	2358.08	1438.47	238.68	1196.79	1332.63	1375.27	439.04	54.92

Table C3: Intermediate Margin: Total (V1MAR) Cont.

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0.51	27.46	1.87	32.87	0.48	80.03	0.12	0.29	0.02	0.06	1.68	0.08	34.08	0.02	12.44	0.31
0.14	4.85	0.13	23.48	0.01	82.76	0.00	8.60	0.00	0.00	0.00	0.46	1.61	0.00	0.74	0.01
233.42	508.60	68.11	26.18	2.30	72.74	2.38	2.43	0.08	0.66	2.77	16.36	46.78	16.59	73.96	3.97
0.61	0.72	1.79	102.13	0.58	143.36	0.19	0.31	0.07	0.33	0.32	2.00	11.37	0.05	8.78	1.69
0.19	0.31	1.31	0.77	0.26	187.04	0.19	0.06	0.02	0.35	0.20	0.47	7.11	0.01	6.41	0.22
0.28	22.75	5.79	27.44	0.38	38.51	1.19	1.07	0.26	0.25	0.13	2.20	12.48	1.82	21.67	2.95
0.87	2.37	22.78	4.31	21.97	4.82	1.71	0.89	0.05	0.16	2.37	2.86	5.90	0.13	18.67	1.61
194.53	1003.29	77.93	65.79	579.18	182.53	154.18	51.11	4.08	6.16	168.57	461.85	810.13	52.29	864.19	235.22
6.20	763.93	201.37	157.62	3.37	67.89	11.96	8.32	1.33	6.20	6.67	51.75	122.96	24.91	182.99	55.31
55.50	46.72	113.57	67.29	32.15	60.15	226.43	22.31	21.17	567.91	39.60	51.69	146.55	3.60	64.76	0.16
177.90	44.36	8.78	3.56	5.35	41.20	3.39	10.48	1.11	0.66	1.78	6.41	138.37	41.36	368.62	9.79
24.10	646.73	98.66	14.52	12.99	66.55	25.41	3.42	0.74	18.01	5.77	159.26	21.74	82.66	34.98	8.93
49.21	524.16	37.23	35.14	23.75	37.97	9.06	41.57	2.74	1.10	4.53	19.34	37.45	60.24	69.74	24.79
13.44	6.26	212.10	234.42	1204.47	40.21	549.61	2.71	0.02	0.08	46.84	125.60	55.94	0.28	42.81	5.42
0.24	1.38	0.26	0.02	1.49	0.48	0.02	0.01	0.00	9.38	0.91	0.14	1.01	0.01	3.18	0.11
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.29	6.75	0.22	0.22	1.24	0.37	0.06	0.01	0.00	0.00	0.06	0.13	0.59	0.43	0.51	0.14
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.56	39.14	0.01	0.05	0.00	1.18	0.00	0.00	0.00	0.00	0.00	0.00	1.51	1.16	2.46	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.49	0.91	0.31	0.71	1.64	0.63	0.04	0.28	0.02	0.03	0.14	5.70	12.21	0.00	75.77	9.62
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
759.48	3650.70	852.22	796.53	1891.62	1108.43	985.96	153.88	31.70	611.34	282.33	906.28	1467.79	285.56	1852.68	360.25

Table C3: Intermediate Margin: Total (V1MAR) Cont.

32	33	34	35	36	37	Total
19.87	2.08	85.05	9.48	0.00	0.00	4271.42
0.27	0.08	0.58	0.62	0.00	0.00	255.93
19.74	3.70	38.07	15.45	0.00	0.00	2998.92
0.55	0.43	3.65	2.90	910.78	219.60	2116.13
0.09	0.03	0.18	0.20	240.71	60.51	664.16
0.70	0.23	1.34	4.25	148.33	36.11	755.88
0.81	0.22	2.40	6.62	889.98	216.65	1243.72
89.38	14.79	191.83	104.15	1275.65	310.53	9657.67
6.72	8.13	8.85	23.01	296.66	72.22	3576.43
1.96	0.57	5.77	37.98	228.16	10.95	2600.22
13.51	1.25	29.60	130.94	368.21	104.40	3820.09
1.19	0.41	2.28	23.42	0.00	0.00	2025.38
10.78	2.68	22.60	19.81	0.00	0.00	2110.82
4.70	1.14	8.85	16.30	135.90	14.52	3052.13
0.06	0.01	0.11	0.31	0.00	0.00	28.08
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.10	0.02	0.20	0.14	0.00	0.00	20.76
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.48	0.27	2.83	0.87	0.00	0.00	125.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.57	0.76	1.92	5.13	0.00	0.00	151.12
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	8.41
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
174.48	36.80	406.12	401.59	4494.39	1045.49	39482.55

Table C4: Intermediate Tax: Domestic (V1TAX)

No.	Commodity/Industry	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Agriculture	-9.35	-0.06	0.00	24.06	-0.65	82.98	0.01	4.48	-0.01	0.00	-0.45	-0.19	0.00	0.00
2	ForestFish	-0.14	-0.28	0.00	0.11	0.00	0.00	0.00	-0.01	-0.13	0.00	0.00	0.00	0.01	0.00
3	Mining	0.01	0.00	-0.70	0.07	0.02	0.01	0.00	0.01	0.05	1.68	0.02	0.08	-0.53	0.01
4	FoodProds	-2.92	-0.34	0.51	-3.78	-0.06	0.01	-0.02	-0.38	0.07	0.01	-0.36	0.00	0.00	0.04
5	BevCigs	13.57	3.24	2.26	15.85	34.41	0.15	0.00	0.73	3.47	0.15	2.73	0.55	0.64	0.32
6	Textiles	-0.25	-0.16	-0.08	-0.76	-0.18	-12.02	-13.24	-1.81	-0.53	-0.03	-0.81	-0.57	-0.71	-0.30
7	ClothingFtw	-0.38	-0.21	-0.41	-0.40	-0.03	-0.63	-4.04	-1.32	-0.40	-0.03	-0.17	-0.08	-1.56	-0.12
8	OtherManufac	-2.61	-4.55	-32.17	-3.13	0.71	-0.49	0.88	-21.48	27.68	-0.13	-0.67	-1.37	-6.45	11.44
9	WoodPapretc	-1.35	-0.36	2.75	-6.10	-1.93	0.20	-0.63	-10.44	-44.69	0.02	-0.72	-1.09	-1.72	-0.57
10	Petrolref	223.47	60.44	65.95	54.79	18.10	4.33	1.38	20.47	88.80	1.08	14.93	24.45	53.78	5.35
11	Chemicals	-15.71	-0.34	-5.72	-0.51	-0.05	2.27	0.67	-1.70	59.71	-0.14	-18.99	-5.98	-1.99	-2.89
12	NonMetMinrl	-0.25	-0.54	-0.82	-7.22	-2.23	-0.34	-0.15	-5.11	-4.00	-0.14	-1.83	-14.52	-4.00	-1.38
13	MetalPrd	-0.31	-0.45	-3.98	-2.23	-2.53	-0.24	-0.09	-17.83	-1.35	-0.04	-0.72	-0.29	-51.56	-8.67
14	MVPOthTrnEq	-1.65	-1.80	-3.73	-0.55	-0.09	-0.04	-0.02	-5.84	-0.37	-0.02	-0.45	-1.01	-1.02	-115.85
15	Aircraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	ElecGasWater	2.70	-0.01	-3.22	13.56	2.41	1.21	0.27	0.49	3.93	2.09	5.79	26.41	16.42	0.90
17	Construction	-0.05	0.00	-0.05	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
18	WhlsleTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	RetailTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	HotelsCafes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	RoadTransprt	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	RailTransprt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	WaterTranspt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	AirTransport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	TransprtSrvc	-0.40	0.02	1.10	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00
27	CommunicSrvc	-0.09	-0.01	-0.11	-0.08	-0.01	-0.01	-0.02	-0.12	-0.10	0.00	-0.04	-0.04	-0.07	-0.02
28	FinanceSrvce	54.47	9.31	42.04	13.52	5.86	2.06	0.26	6.39	7.44	5.88	-6.25	2.30	-0.89	2.45
29	OwnerDwellng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	PublicServ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	OthEntertain	-0.06	0.03	0.24	2.83	0.61	0.12	0.09	0.51	1.71	0.14	1.16	0.19	0.17	2.93
33	LbryMseumArt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	GambRec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	OtherServ	0.00	0.02	-0.04	-0.01	0.00	0.00	0.00	0.02	-0.01	0.00	-0.01	-0.01	-0.01	-0.01
36	DomToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	IntToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	258.71	63.95	63.84	100.00	54.35	79.55	-14.66	-32.95	141.28	10.52	-6.83	28.84	0.54	-106.37

Table C4: Intermediate Tax: Domesticl (V1TAX) Cont.

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0.00	-0.01	-0.70	-0.04	-0.60	-0.01	-1.50	0.00	-0.01	0.00	0.00	-0.04	0.00	-0.09	0.00	0.14
0.00	0.00	0.01	0.00	1.36	0.00	2.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.00	0.03	0.00	0.11	0.05	0.02	0.11	0.01	0.00	0.00	0.00	0.05	0.11	0.15	0.00	0.08
0.02	0.12	0.08	0.36	5.01	0.16	8.40	0.05	0.08	0.00	0.01	0.01	0.50	1.59	0.00	0.23
0.37	0.47	0.67	4.88	1.60	0.43	645.68	0.69	0.14	0.07	1.32	0.78	1.24	26.47	0.01	13.18
-0.03	-0.02	-0.99	-1.12	-0.47	-0.04	0.15	-0.15	-0.12	-0.02	0.05	-0.01	-0.03	-0.90	-0.11	-1.85
-0.03	-0.10	-0.15	-1.23	-0.32	-0.56	-1.53	-0.17	-0.39	0.02	-0.04	0.16	-0.04	-1.57	-0.02	-3.76
-0.49	29.44	99.69	-7.20	21.29	25.00	13.58	44.60	-13.56	-2.65	0.07	9.21	28.48	26.83	3.99	-44.70
-0.01	1.93	-25.84	9.50	150.25	0.60	18.54	6.53	0.99	0.76	3.56	4.56	5.77	59.83	-2.63	-10.68
0.07	164.35	81.54	531.53	308.46	55.23	278.31	840.26	71.33	63.84	501.93	137.42	218.31	537.22	17.64	224.27
0.07	-1.69	-3.51	-0.02	0.12	-0.54	-1.26	0.38	0.19	-0.06	0.34	3.17	-0.01	21.76	-1.06	-0.83
-0.05	-1.54	-28.70	-5.41	47.58	0.16	8.71	1.35	0.95	0.43	8.79	0.65	5.00	10.55	1.94	2.55
-0.67	2.52	32.29	-1.98	18.14	0.46	2.59	-0.27	-0.42	-0.44	-0.08	-0.02	47.73	3.03	6.30	5.85
-0.01	3.59	1.48	-21.69	42.61	245.14	6.58	110.25	0.28	-0.02	-0.21	10.20	23.55	9.50	-0.08	-1.21
0.00	0.01	0.02	-0.02	0.01	0.11	0.02	0.04	0.00	0.00	-0.43	-0.03	0.03	0.04	0.00	-0.03
-0.07	-8.80	-0.04	13.42	1.89	-0.87	9.04	-0.52	-1.68	0.17	-0.09	-2.01	1.19	30.02	-0.21	8.56
0.00	0.03	0.05	-0.05	0.01	0.13	-0.03	0.11	-0.03	0.00	0.00	0.09	0.06	0.10	-0.32	-0.16
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.02	-0.11	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.05	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.19	-1.27	0.00	-0.54	0.00	-0.06	2.59	-19.04	0.48	0.00	-0.71	0.00	-0.14
-0.01	0.02	0.00	-0.64	-0.62	0.21	-0.15	-0.22	-0.01	0.00	-0.04	-0.11	0.46	0.86	0.00	0.51
0.66	50.98	57.46	110.01	100.90	28.11	25.46	30.87	3.46	3.65	0.11	9.76	14.22	-79.62	180.86	80.28
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.01	0.04	0.01	10.18	25.74	0.02	3.37	0.23	-0.03	0.12	0.63	-0.14	0.64	67.47	-0.01	2.44
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	-0.01	0.16	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.15	0.00	0.04
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.19	241.34	213.39	641.80	721.89	353.77	1017.51	1034.03	61.15	68.49	496.72	174.20	347.19	712.68	206.29	274.78

Table C4: Intermediate Tax: Domesticl (V1TAX) Cont.

31	32	33	34	35	36	37	Total
-0.01	-0.35	-0.04	-1.58	0.28	0.00	0.00	96.26
0.00	0.00	0.00	-0.01	0.01	0.00	0.00	2.96
0.03	0.00	0.00	0.03	0.01	0.00	0.00	1.55
0.18	0.00	0.00	-0.28	0.22	46.16	11.13	66.80
0.53	0.28	0.07	0.47	0.61	464.87	90.23	1333.13
-0.21	-0.01	-0.01	-0.02	-0.36	10.78	2.62	-24.31
-0.28	0.01	-0.01	-0.18	-3.24	64.67	15.74	57.21
4.63	0.44	0.14	1.38	5.84	92.69	22.56	328.94
-1.48	0.40	1.99	2.59	6.99	21.56	5.25	194.32
0.44	9.97	2.83	29.66	109.39	867.72	44.08	5733.15
-0.05	11.86	0.00	23.86	-2.48	35.77	10.59	105.22
0.85	0.11	0.15	0.14	8.24	0.00	0.00	19.91
0.15	0.58	0.10	0.53	1.92	0.00	0.00	28.02
0.01	0.31	0.06	1.62	3.10	42.01	4.49	349.13
0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.22
-0.50	0.09	0.07	0.32	0.01	0.00	0.00	122.94
0.05	0.00	0.00	0.01	0.03	0.00	0.00	-0.06
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	25.47	0.00	25.47
0.00	0.00	0.00	0.00	0.00	616.15	142.17	758.31
0.00	0.00	0.00	0.00	0.00	-1.77	-17.45	-19.31
0.00	0.00	0.00	0.00	0.00	-21.88	-11.79	-33.72
0.00	0.00	0.00	0.00	0.00	-11.74	-19.48	-31.21
0.00	0.00	0.00	0.00	0.00	97.76	110.07	207.84
-0.01	0.00	0.00	-0.01	-0.02	8.31	1.83	-6.63
0.96	-0.02	0.25	0.51	0.45	47.66	20.34	69.71
18.52	8.64	3.11	11.79	7.10	63.67	29.42	904.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	65.10	21.19	86.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.13	-13.65	-0.24	0.53	1.37	44.65	7.27	161.17
0.00	0.00	0.00	0.00	0.00	44.65	7.30	51.96
0.00	0.00	0.00	0.00	0.00	206.22	44.00	250.22
-0.01	0.06	0.01	0.06	0.00	47.66	13.55	61.58
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23.69	18.70	8.49	71.42	139.48	2878.16	555.12	10900.85

Table C5: Intermediate Tax: Imported (V1TAX)

No.	Commodity/Indsutry	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Agriculture	-0.07	0.00	0.00	0.41	-0.15	-0.01	0.00	-0.02	0.00	0.00	0.00	-0.14	0.00	0.00
2	ForestFish	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	1.97	0.00	-0.01	-0.10	0.00
4	FoodProds	0.22	0.00	0.10	6.32	0.47	0.00	0.00	0.03	0.03	0.00	0.12	0.00	0.00	0.01
5	BevCigs	2.30	0.60	0.73	3.97	4.65	0.13	0.08	0.38	0.68	0.05	0.59	0.19	0.20	0.14
6	Textiles	0.44	0.10	0.19	1.44	0.09	9.77	49.11	6.01	0.86	0.07	0.28	1.98	1.17	0.62
7	ClothingFtw	0.99	0.88	3.05	0.61	0.07	0.29	4.69	2.74	1.56	0.04	0.34	0.14	3.69	0.64
8	OtherManufac	-0.27	0.74	2.09	-0.15	0.12	-0.17	0.24	-7.53	5.81	0.03	-0.17	0.02	-0.80	16.29
9	WoodPapretc	0.26	0.08	2.90	1.45	0.06	0.19	0.00	3.39	5.10	0.09	1.82	1.14	1.63	0.12
10	Petrolref	20.20	4.15	4.94	10.64	2.89	0.73	0.09	7.43	14.90	3.51	7.42	5.36	21.29	1.83
11	Chemicals	-4.56	0.06	-0.28	0.17	-0.02	8.87	3.06	5.90	31.70	0.90	11.34	13.10	2.38	0.85
12	NonMetMinrl	0.18	0.16	0.19	5.29	0.78	0.28	0.19	4.56	3.75	0.18	2.59	4.64	2.37	1.15
13	MetalPrd	0.34	0.58	3.98	0.57	0.69	0.24	0.17	16.03	1.28	0.02	0.49	1.77	16.36	4.54
14	MVPOthTrnEq	-0.39	-0.49	-1.01	-0.05	-0.01	0.00	0.00	-2.93	-0.07	0.00	-0.04	-0.03	-0.51	-79.56
15	Aircraft	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.01	0.00	0.01	0.01
16	ElecGasWater	0.01	0.00	0.00	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.02	0.06	0.05	0.00
17	Construction	0.00	0.02	0.08	0.00	0.00	0.00	0.00	0.12	0.03	0.00	0.01	0.00	0.01	0.01
18	WhlsleTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	RetailTrade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	HotelsCafes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	RoadTransprt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	RailTransprt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	WaterTranspt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	AirTransport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	TransprtSrvc	-0.01	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	CommunicSrvc	0.00	0.01	0.02	0.00	0.00	0.00	0.03	0.17	0.44	0.00	0.00	0.00	0.01	0.00
28	FinanceSrvce	10.99	1.27	14.73	2.94	1.61	0.09	0.00	0.28	1.22	0.60	-0.18	0.43	1.14	2.17
29	OwnerDwellng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	PublicServ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	OthEntertain	0.01	0.01	0.03	0.47	0.10	0.02	0.01	0.08	0.28	0.02	0.20	0.03	0.02	0.50
33	LbryMseumArt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	GambRec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	OtherServ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
36	DomToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	IntToursm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	30.66	8.22	31.98	34.12	11.35	20.43	57.69	36.74	67.59	7.48	24.82	28.69	48.92	-50.68

Table C5: Intermediate Tax: Imported (V1TAX) Cont.

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0.00	0.00	-0.04	0.00	-0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	-0.12	0.00	-0.01	0.00
0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.00	0.01	0.00
0.00	0.03	0.02	0.07	3.98	0.05	3.34	0.01	0.01	0.00	0.01	0.00	0.09	0.55	0.00	0.30	0.04
0.07	0.14	0.16	0.86	0.54	0.19	227.21	0.11	0.02	0.01	0.27	0.11	0.24	5.30	0.00	8.00	0.10
0.01	0.02	2.13	0.77	1.39	0.05	9.16	0.21	0.26	0.09	0.15	0.03	0.27	1.22	0.16	6.27	0.28
0.05	0.86	0.88	2.17	3.07	0.48	4.58	0.23	1.44	0.03	0.35	0.72	1.98	6.28	0.05	11.85	1.25
-0.49	37.14	72.30	0.64	11.70	57.72	20.38	47.50	1.69	0.21	0.43	26.39	47.70	86.39	2.61	-2.87	19.93
0.02	0.46	7.75	3.56	28.54	0.16	3.86	3.22	0.59	0.53	2.94	2.43	2.13	14.06	0.48	3.20	-0.07
0.10	12.23	57.60	64.53	39.35	10.36	33.63	68.32	5.71	3.47	55.99	14.14	29.20	49.86	2.61	26.39	0.04
0.20	-0.83	1.96	0.30	0.19	0.08	0.53	0.29	0.30	0.08	0.05	0.35	0.11	14.06	0.20	0.36	0.04
0.03	0.41	18.56	2.45	25.81	0.50	4.77	0.89	0.30	0.15	2.68	0.31	5.55	4.96	11.47	2.80	0.45
0.42	2.97	30.21	1.79	4.99	1.33	4.27	0.35	0.43	0.02	0.05	0.12	6.72	2.39	4.15	3.29	1.03
-0.06	0.81	0.42	-2.65	17.20	106.68	0.50	68.80	0.09	0.00	-0.01	4.35	13.24	3.76	0.00	-0.63	0.18
-0.14	0.04	0.04	0.00	0.00	0.36	0.06	0.01	0.00	0.00	-0.02	0.00	0.03	0.17	0.00	0.03	0.02
0.00	0.06	0.00	0.03	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.02	0.00
0.00	0.01	0.13	0.01	0.02	0.26	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.05	0.01	0.02	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.01	-0.03	0.00	-0.01	0.00	0.00	0.21	-2.48	0.01	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	-0.03	-0.01	0.03	-0.01	-0.01	0.00	0.00	-0.01	-0.02	0.08	0.32	0.00	0.97	0.17
0.00	0.66	3.48	10.51	9.25	5.89	3.73	3.10	1.16	0.03	-0.01	0.08	1.32	-0.03	6.19	1.84	0.42
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.01	0.00	1.57	4.19	0.00	0.53	0.02	0.00	0.02	0.12	-0.02	0.09	10.91	0.00	0.33	-0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25	55.05	195.64	86.58	150.20	184.15	316.64	193.05	12.01	4.86	60.49	49.01	108.79	200.23	27.93	62.17	23.90

Table C5: Intermediate Tax: Imported (V1TAX) Cont.

32	33	34	35	36	37	Total
-0.05	-0.01	-0.24	-0.01	0.00	0.00	-0.47
0.00	0.00	0.00	0.00	0.00	0.00	0.11
0.00	0.00	0.00	0.00	0.00	0.00	2.02
0.00	0.00	0.00	0.22	4.51	1.09	21.65
0.13	0.02	0.26	0.13	53.78	9.06	321.39
0.27	0.06	0.52	0.50	13.31	3.24	112.52
0.31	0.13	0.80	5.24	79.88	19.44	161.78
3.04	2.19	20.94	11.74	114.49	27.87	625.94
0.19	0.42	0.31	1.72	26.63	6.48	127.82
1.32	0.38	3.97	22.37	50.69	0.00	657.62
4.54	0.02	9.98	0.91	35.07	8.15	150.42
0.10	0.08	0.14	3.89	0.00	0.00	112.64
0.70	0.20	0.93	2.11	0.00	0.00	115.53
0.18	0.03	0.78	1.46	13.58	1.45	145.07
0.00	0.00	0.01	0.04	0.00	0.00	0.85
0.00	0.00	0.00	0.00	0.00	0.00	0.46
0.00	0.00	0.00	0.01	0.00	0.00	0.88
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	-0.02
0.00	0.00	0.00	0.00	0.00	0.00	-0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	-2.12
0.09	0.04	0.05	0.19	4.42	2.01	8.96
0.55	0.88	0.69	0.40	3.03	1.35	91.80
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	2.09	2.09
0.00	0.00	0.00	0.00	0.00	0.00	0.00
-1.42	-0.03	0.03	0.20	0.00	0.04	18.36
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.27	0.00	0.27
0.00	0.00	0.00	0.00	4.42	1.35	5.76
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.95	4.40	39.20	51.13	404.08	83.62	2681.32

Table C6: Household Consumption: Basic (V3BAS)

	Commodity/Indsutry	Domestic	Imported	Total
1	Agriculture	3404.25	240.25	3644.50
2	ForestFish	1022.82	24.59	1047.41
3	Mining	440.73	7.26	447.99
4	FoodProds	17001.71	2624.15	19625.86
5	BevCigs	4198.94	1273.98	5472.92
6	Textiles	1512.03	618.75	2130.78
7	ClothingFtw	2661.38	1365.71	4027.09
8	OtherManufac	3184.70	3763.27	6947.97
9	WoodPapretc	3304.17	723.83	4028.00
10	Petrolref	1019.99	229.52	1249.50
11	Chemicals	1661.47	406.32	2067.79
12	NonMetMinrl	1278.02	477.18	1755.20
13	MetalPrd	690.45	726.52	1416.96
14	MVPOthTrnEq	3451.17	2506.42	5957.58
15	Aircraft	5.33	51.10	56.43
16	ElecGasWater	7881.20	9.70	7890.91
17	Construction	11.67	1.59	13.27
18	WhlsleTrade	0.38	0.06	0.44
19	RetailTrade	7603.16	177.23	7780.39
20	Repairs	7697.12	18.28	7715.40
21	HotelsCafes	8698.20	997.51	9695.71
22	RoadTransprt	1196.83	363.62	1560.46
23	RailTransprt	1633.95	213.79	1847.74
24	WaterTranspt	732.40	428.23	1160.62
25	AirTransport	1056.41	736.07	1792.47
26	TransprtSrvc	190.99	120.95	311.95
27	CommunicSrvc	6272.77	375.51	6648.28
28	FinanceSrvce	20567.48	247.46	20814.94
29	OwnerDwellng	56534.01	0.00	56534.01
30	PublicServ	12890.36	270.50	13160.86
31	Education	6186.97	397.64	6584.60
32	OthEntertain	179.27	36.77	216.04
33	LbryMseumArt	742.91	19.75	762.66
34	GambRec	7662.59	309.11	7971.70
35	OtherServ	9455.55	120.05	9575.60
36	DomToursm	33897.77	0.00	33897.77
37	IntToursm	0.00	0.00	0.00
	Total	235929.14	19882.67	255811.81

Table B 7: Exports Basic (V4BAS)

	Commodity	Exports
1	Agriculture	7618.34
2	ForestFish	593.86
3	Mining	25097.42
4	FoodProds	8666.22
5	BevCigs	1047.58
6	Textiles	1511.09
7	ClothingFtw	427.94
8	OtherManufac	6345.80
9	WoodPapretc	1218.74
10	Petrolref	1395.27
11	Chemicals	2382.05
12	NonMetMinrl	654.21
13	MetalPrd	9829.41
14	MVPOthTrnEq	1871.62
15	Aircraft	490.49
16	ElecGasWater	39.71
17	Construction	90.31
18	WhlsleTrade	152.08
19	RetailTrade	350.38
20	Repairs	22.96
21	HotelsCafes	0.00
22	RoadTransprt	0.00
23	RailTransprt	0.00
24	WaterTranspt	0.00
25	AirTransport	121.40
26	TransprtSrvc	495.93
27	CommunicSrvc	917.33
28	FinanceSrvce	3668.97
29	OwnerDwellng	0.00
30	PublicServ	471.89
31	Education	1477.53
32	OthEntertain	257.19
33	LbryMseumArt	2.96
34	GambRec	165.71
35	OtherServ	0.00
36	DomToursm	0.00
37	IntToursm	11710.45
	Total	89094.85

APPENDIX D: MISCELLANEOUS FIGURES

Figure D1: A Conceptual Model Showing the Various Components of the Thesis

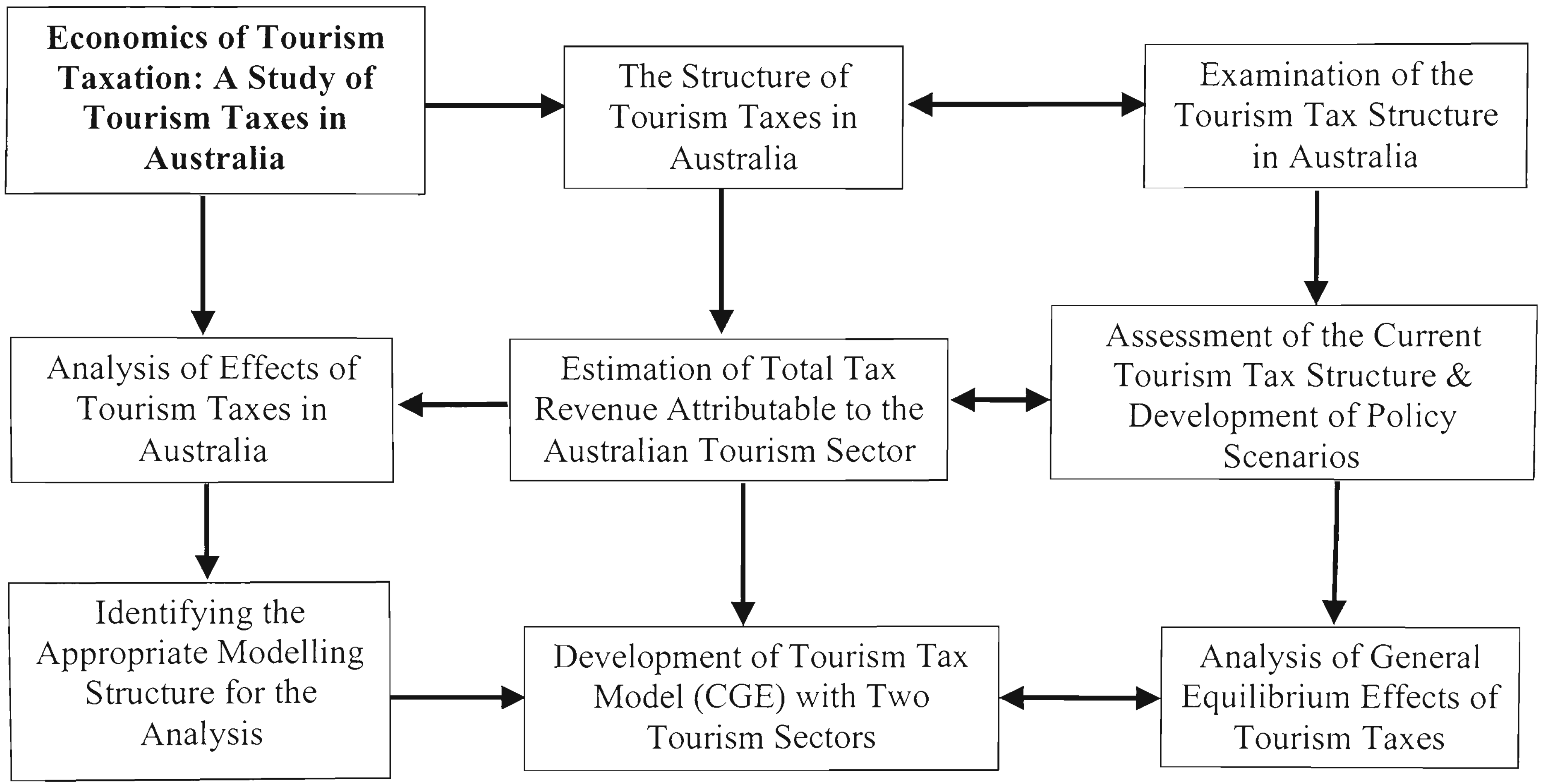

Figure D2: Alternative Models – Theory and Data Dependence