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An Empirical Investigation of Trade Flows Between Australia and its Major Trading Partners

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Abstract

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Keywords

Australia; Trade deficit; Trading partners; Net export models; Estimation



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Samuel Belicka¹ and Ali Salman Saleh²

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This study introduces Net Export (NX) models to examine the determinants of the trade flows between Australia and eight selected trading partner (TP) countries (China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom, United States of America) in four selected Trade Deficit (TD) categories (Pharmaceutical Products; Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Electrical Machinery and Equipment; Sound Recorders and Producers, and Vehicles Other Than Railway or Tramway Rolling-Stock). A total of 29 NX models are estimated, which are based on both the monetary and Quantity (QTY) values. Findings in this study suggest that macroeconomic variables such as money supply, interest rates and savings rates have no-significant effect in the determination of the NX levels in the selected categories. This highlights that monetary policy cannot influence the NX levels in the selected TD categories in Australia. This study also identifies some policy implications which arise from this paper.

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I. Introduction

Research in the area of trade flows between Australia and China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom and United States of America is scant. To our knowledge, there is only one study (see, for instance, Kyereme, 2002) that examined the key determinants of Net Export (NX) between the United States of America and Australia. Despite the growing Trade Deficit (TD) between Australia and these selected TD and relevant industries (such as Pharmaceutical Products, Nuclear Reactors, Boilers, Machinery and Mechanical Appliances etc.) involved in international trade, there is only very limited research in this area. The existing literature is sporadic and selective in their focus on industries, countries and the export (X) and import (M) determinants/ variables. According to the extensive list of empirical studies such as McColl & Nicol (1980), Labys & Cohen (2006), Swift (2005), Bahmani-Oskooee & Wang (2007), Mulgan (2008), there is strong evidence to show that systematic, intensive and in-depth research has not been undertaken in respect to Australia's trading partners in selected TD categories within the current literature. In this study, our objective is to introduce Net Export (NX) models to analyse the determinants of the trade flows from the theoretical and empirical perspectives between Australia and eight selected Trading partner countries (China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom, United States of America) during the period of 1990-2006. This study has focused on this particular period because during this period, the Australian economy has experienced the longest period of economic growth and the Australian dollar has significantly appreciated, especially during the start of the year 2006 (one of the year of commodity export boom). The NX model estimated will clearly identify which macroeconomic variables are significant in explaining the NX level in the four selected TD categories (*Category 30* - Pharmaceutical Products; *Category 84* - Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof; *Category 85* - Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Producers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles and *Category 87* - Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories). Additionally, the existing studies (see, for example, Kyereme, 2002 and Duasa, 2007) which estimated the NX models did not incorporate the key variables such as interest rates and savings rates which based on the economic theory playing a significant influence in determination of the NX levels. To our knowledge there are no existing studies which specifically investigate the NX between Australia and its trading partner countries in any of the above specific categories, which generate the need to introduce the NX models in these categories to identify and to better understand the variables responsible for the trade balance in these categories. We believe conducting such analysis is important for policy implications and to ascertain what macroeconomic variables are influencing the NX levels in the selected categories. For example, the existing studies lack the emphasis on the interest rates and saving rates and their effects on the NX levels. As a result, this study will establish the significance of these two variables with respect to the NX levels in these categories and in turn it will clarify its significance for policy makers.

The NX models estimated in this study are concerned with bilateral trade analysis between Australia and the selected trade partner countries in the four selected TD categories. Bilateral trade analysis in comparison to multilateral trade analysis are likely to divulge additional information that are distinctive for each trading partner country analysed and as a result, it is likely to provide supplementary information to the relevant industries and trade policy makers.

The NX in this study refers to the trade balance between Australia and the selected trading partner countries in the selected TD categories. The selected categories in this study are growing industries in Australia in respect to their contribution to Gross domestic Product (GDP) and at the same time Australia is experiencing a significant and growing TD in these categories. All NX models estimated are examined on a bilateral basis in order to establish the patterns and determinants of a two-way trade between Australia and the selected trade partner countries. According to Kyereme (2002), the bilateral trade analyses when compared to the multilateral trade analysis are likely to provide policy makers with more comprehensive trade balance information. This includes ‘country specific’ variables that are significant in trade flows determination, which in turn can assist policy makers to tailor more effective trade policies.

II. A Review of the Literature

According to the Keynesian open macroeconomic model, a country’s GDP is one of the major determinants of the NX levels, which argues that contractionary fiscal policy reduces the TD, while expansionary fiscal policy increases the TD levels. This method in the current literature is known as the ‘absorption approach’. The ‘absorption approach’ has been pioneered by Harberger (1950), Meade (1951) and Alexander (1959), which specifies that any trade balance improvements can be achieved only by increasing the domestic aggregate income over aggregate expenditure.

Econometric analysis of the NX in the current literature is limited. Investigating the relationship between the trade balance and the net trade flows has been a main focus in the literature (Bahmani-Oskooee (1992), Martín & Velázquez (2002), Kyereme (2002) and Duasa (2007)). Two most relevant empirical studies that have estimated the NX are the studies by Kyereme (2002) and Duasa (2007), while Tang (2008) has reviewed the study by Duasa (2007). The study by Kyereme (2002) estimated the NX between the United States of America and Australia, while the study by Duasa (2007) estimated the NX between Malaysia and the Association of Southeast Asian Nations (ASEAN) countries. The dependent variables used in these two studies by Kyereme (2002) and Duasa (2007) are the United States of America’s NX over the Australian NX and the ratio of the X over M between Malaysia and ASEAN countries respectively.

Kyereme (2002) used four independent variables which include the Gross Domestic Product (GDP), exchange rates (EXR), money supply (MS) and interest rates (IR), while the GDP, MS and IR are all expressed as a ratio of the United States of America’s values relative to the Australian values and the EXR is expressed as value of one unit of the AUD in terms of the USD. The major findings in this study suggest that the IR is the most significant variable, followed by the GDP, MS and EXR. Furthermore, all variables except the MS and the EXR are statistically significant at 1 per cent level, while the MS is significant at a 5 per cent level and the EXR is not statistically significant. Finally, the 3 independent variables (GDP, MS and EXR) have a negative relationship with the NX and the IR is having a positive relationship with the NX.

Duasa (2007) used three independent variables which includes the Malaysian EXR, GDP and MS. The overall finding in this study shows a weak statistical link between the NX and the EXR, while the links between the NX - GDP and the NX - MS are statistically significant at a 1 per cent level of significance. In overall, in the long-run, the independent variables GDP and EXR shows a negative relationship with the NX and the MS shows a positive

relationship with the NX. However, the coefficients estimated using the ECM shows a negative relationship between the NX and all these 3 independent variables.

The major difference between these two studies is that Kyereme (2002) compared to Duasa (2007) has used in the model the IR variable as an additional independent variable. Furthermore, Kyereme has taken into account the values of both the domestic and foreign macroeconomic variables, while Duasa has included only the Malaysian domestic macroeconomic variables in the model. Tang (2008) has criticized the approach adopted by Duasa (2007), on the basis that the independent variables the GDP and MS are only observed for the Malaysian economy, while the foreign GDP and MS are not taken into account. In addition, according to Tang (2008), the IR is an important dependent variable and should be included in the NX model; however, Duasa (2007) has omitted this variable.

Both NX models estimated by Kyereme (2002) and Duasa (2007), have used an aggregated X and M volumes as a dependent variable, without reference to any specific category. This approach is likely to have some shortcomings, for instance, different trade categories is likely to respond differently to changes in the macroeconomic variables. Hence, the estimation of the NX models with reference to specific trade categories is likely to reveal more specific information on a category-by-category basis. Kyereme (2002) recognized the potential downsides of his model and clearly suggests that further research in this area is required, which includes and is not limited, to model modification and inclusion of an additional variable(s) in order to develop a more robust NX model. Hence, these above studies suffer from many limitations such as lack of emphasis on variables such as interest rates and savings rates which based on the economic theory playing a significant influence in determination of the NX levels. Furthermore, the existing studies mainly focus on the United States of America and Malaysia, and none of them focus on Australia.

III. Theoretical Framework and Methodology

In this study we follow Duasa's (2007) approach in determining the dependent variable, where the NX will be expressed as a ratio of the X to M between Australia and the selected TD country, in the selected TD category. This approach as Bahmani-Oskooee (1991) suggested is preferable, since it is not sensitive to the units of measurement and interpretation of such ratio refers to real trade balance. In addition, the usage of the ratio maintains a positive value of the NX, irrespective of whether the trade balance is a positive or negative value; hence, the variables can be expressed in a natural logarithm if required. Due to these advantages, the NX ratio has been used in numerous empirical studies, which includes studies by Bahmani-Oskooee & Brooks (1999), Onafowora (2003) and Duasa (2007).

Existing studies which provide empirical evidence on the relationship between GDP levels and the trade flows include Balassa (1967), Goldstein & Khan (1978; 1985), Silvapulle & Phillips (1985), Arize (1987), Lawrence 1990, Koshal *et al.* (1992), Carone (1996), Warr & Wollmer (1996), Belessiotis & Giuseppe (1997), Baharumshah (2001), Boyd *et al.* (2001); Chinn (2004), Havrila (2004), Lau *et al.* (2004), Kyereme (2002) and Duasa (2007).

Based on the above review of empirical studies, the NX model can be expressed in the following form:

$$X_{D(i)}^t / M_{D(i)}^t = f\left[\left(GDP_D^t / GDP_j^t\right)\right] \quad (1)$$

Where: ' X_D ' and ' M_D ' is the Australian (or domestic) X and M respectively, ' i ' is the industry for the category i , ' j ' is the foreign country j and ' t ' is the time period.

Another independent variable that is traditionally used in the analysis of the balance of payment and the trade models is the EXR, where the EXR theoretically determines the relative prices of the X and M volumes, and hence the NX levels. This method in the current literature is known as the 'elasticity approach' or as the 'imperfect substitute' model. The 'elasticity approach' attempts to establish whether the devaluation of the country currency improves the country's trade balance according to the Marshall-Lerner condition³. Studies that analysed the trade balance using the elasticities approach include Frenkel *et al.* (1969), Dornbusch (1975), Johnson (1976) and Boyd *et al.* (2001) and Xu (2008).

From the point of economic theory, the EXR is likely to have a significant impact on the X and M flows and this is supported by an enormous number of empirical studies (see, for instance, Himarios (1989), Bahmani-Oskooee (2001), Kyereme (2002) and Bahmani-Oskooee & Wang (2007)). These studies have found a significant relationship between the trade balance and the EXR. On the other hand, studies by Greenwood (1984), Mahdavi & Sohrabian (1993), Rahman *et al.* (1997) and Duasa (2007) have found rather weak empirical evidence on the relationship between the EXR and the X and M flows. Based on these empirical findings, inconclusive evidence exists as to whether the EXR are statistically significant in determining the X and M flows. In order to shed some light as to whether the EXR is statistically significant in determining the X and M flows between Australia and the selected TD countries and categories, the EXR variable will be included in the NX models estimated in this study. The EXR variable was also used in the studies by Kyereme (2002) and Duasa (2007), which have estimated the NX between the United States of America, Australia, Malaysia and ASEAN countries respectively. The NX model in this form is presented in Equation 2 as follows:

$$X_{D(i)}^t / M_{D(i)}^t = f\left[\left(GDP_D^t / GDP_j^t\right), EXR_{D/F}\right] \quad (2)$$

Where: ' $EXR_{D/F}$ ' is the EXR of the Australian Dollar per one unit of the foreign currency.

Finally, another method used in the analysis of the balance of payments can be viewed from a 'monetary' point of view. This approach puts forward that the MS and demand for money is likely to influence the country's trade balance and other components of the balance of payments. According to the monetary approach, the excess MS in the economy causes a balance of payments deficit and as a result, the balance of payments dis-equilibrium should be addressed with an appropriate monetary policy. Polak (1957), Hahn (1959), Prais (1961) and Mundell (1971) argue that the balance of payment should be viewed primarily from a 'monetary' point of view. Recent empirical studies, which have included money variables in the trade models, include Liew *et al.* (2003), Kyereme (2002) and Duasa (2007). As a result, the MS variable will be included in the NX model and the NX model in this form is presented in Equation 3 as follows:

³ The Marshall-Lerner condition stipulates that if the sum of the price elasticity of the X and M (in absolute values) exceed unity, the devaluation of the country's currency will improve the trade balance. However, based on empirical evidence, the relative depreciating of the currency in relations to other trading partners currencies will lead to the improvement in trade balance only in the long-run, while in the short-run, the trade balance will deteriorate. This phenomenon is known as a 'J-curve' (Dornbusch *et al.*, 2002); however, the empirical support for the J-curve phenomena is inconclusive, and some studies show the evidence for the J-curve phenomena (Bahmani-Oskooee, 1985), while others such as Himarios (1989) do not.

$$X_{D(i)}^t / M_{D(i)}^t = f\left[\left(GDP_D^t / GDP_j^t\right), EXR_{D/F}^t, \left(MS_D^t / MS_j^t\right)\right] \quad (3)$$

Where: ' MS_D ' and ' MS_j ' is the Australian and foreign country MS (M3) respectively.

According to Tang (2008, p.128), the independent variables GDP, EXR and MS presented in Equation 3 represents an 'open economy' macro equilibrium variables rather than from the 'absorption approach' and the 'monetary' point of view. Tang (2008) criticised Duasa (2007) for estimating the NX model presented in this above form, and suggested that the IR should be included in the NX model. Following the suggestion by Tang (2008) and the empirical study by Kyereme (2002), the NX model in this study incorporates the IR variable and the NX model in this form is presented in Equation 4 as follows:

$$X_{D(i)}^t / M_{D(i)}^t = f\left[\left(GDP_D^t / GDP_j^t\right), EXR_{D/F}^t, \left(MS_D^t / MS_j^t\right), \left(IR_D^t / IR_j^t\right)\right] \quad (4)$$

Where: ' IR_D ' and ' IR_j ' is the Australian and foreign country IR respectively.

By referring to the Keynesian Investment-Saving and Liquidity Preference-Money Supply (IS-LM), the equilibrium in an open economy is achieved when equilibrium in the goods and money market exists. The Saving (S) is likely to play an important part in the trade balance determination. Based on the S and Investment (I) framework, the Current Account (CRA) = S – I, which can be also expressed as a Trade Balance = S – I (Griswold, 2007 and Tang, 2008). Based on this S and I framework, there is a strong argument to include the SVR as an additional independent variable in the NX model. Tang (2008) suggests the importance of the inclusion of the SVR variable in this model, while Kyereme (2002) suggests that the estimation of NX model without a SVR variable should be subject to a further model modification and/or inclusion of an additional variable(s). Based on this review, an additional independent variable - the SVR will be included in the NX model and the NX model in this form is presented in Equation 5 as follows:

$$X_{D(i)}^t / M_{D(i)}^t = f\left[\left(GDP_D^t / GDP_j^t\right), EXR_{D/F}^t, \left(MS_D^t / MS_j^t\right), \left(IR_D^t / IR_j^t\right), \left(SVR_D^t / SVR_j^t\right)\right] \quad (5)$$

Where: ' SVR_D ' and ' SVR_j ' is the Australian and foreign country SVR respectively.

Based on this review, the NX model which will be estimated is presented in Equation 6 as follows:

$$NX_{ij}^t = \alpha_0 + \alpha_1 GDP^t + \alpha_2 EXR^t + \alpha_3 MS^t + \alpha_4 IR^t + \alpha_5 SVR^t + \varepsilon^t \quad (6)$$

Where: ' α_0 ' is the intercept, ' $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ ' are the slope coefficients, ' ε ' is a random error, ' NX ' is the ratio of the Australian X over the Australian M, ' GDP^t ' is the ratio of the Australian GDP level over foreign country GDP level, ' EXR^t ' is the EXR of the Australian Dollar per one unit of the foreign currency, ' MS^t ' is the ratio of the Australian MS (M3) over foreign country MS (M3) levels, ' IR^t ' is the ratio of the Australian IR over foreign country IR, ' SVR^t ' is the Australian SVR over foreign country SVR, ' i ' is the industry for the category i , ' j ' is a country j and ' t ' is a time period.

The expected a priori signs for variables in Equation 6 are negative for ' $\alpha_1, \alpha_2, \alpha_3$ ' and positive for ' α_4, α_5 '. For ' α_1 ' other things being equal, as the Australian GDP relative to foreign GDP increases by a greater amount, it is expected that the trade balance will worsen (as the M volume tends to increase and as a result the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For ' α_2 ' other things being equal,

as the Australian dollar appreciates against the foreign currency, it is expected that the trade balance will worsen (as an appreciation of the Australian currency is likely to increase the M levels and to decrease the X levels and as a result, the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For ' α_3 ' other things being equal, as the Australian MS increases by greater amounts than the foreign MS, it is expected that the trade balance will worsen (as the M volume tend to increase and as a result, the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For ' α_4 ' other things being equal, as the Australian IR increases by a greater amount than a foreign IR, it is expected that the trade balance will improve (as the M volume tends to decrease and as a result, the ratio of the Australian X over the Australian M will increase), hence a positive a priori sign. Finally, for ' α_5 ' other things being equal, as the Australian SVR increases by a greater amount than a foreign SVR, it is expected that the trade balance will improve (as the M volume tends to decrease and as a result, the ratio of the Australian X over the Australian M will increase), hence a positive a priori sign.

Having determined the the theoretical NX model, an important aspect to consider is whether to use a linear or non-linear NX model. According to Khan & Ross (1975; 1977) and Salas (1982), when the estimated model is used for forecasting, the linear model is a more suitable form. However, when the purpose of the study is to establish to what degree the changes in the explanatory variables affect the dependant variable overtime, the preferred model is the log-log form. Model estimation in log-log form has been adopted in a vast number of studies (see, for instance, Kyereme (2002) and Duasa (2007)). Hence, the functional form for the NX model, which will be estimated for the selected TD categories and countries, will be in the log-log form. According to Gujarati (2003, p.421), this approach will not only produce elasticities but it is also likely to reduce the problems with heteroscedasticity⁴. The adopted functional form for the NX in the log-log form is presented in Equation 7 as follows:

$$\text{LnNX}_{ij}^t = \alpha_0 + \alpha_1 \text{LnGDP}^t + \alpha_2 \text{LnEXR}^t + \alpha_3 \text{LnMS}^t + \alpha_4 \text{LnIR}^t + \alpha_5 \text{LnSVR}^t + \varepsilon^t \quad (7)$$

Where: ' Ln ' is the natural logarithm for the corresponding variables.

The aim of the methodology used in this study is to ensure that all NX models estimated are conforming to the 9 classical model assumptions (Gujarati, 2003), in order to obtain an unbiased estimates for the population parameters. If one or more of these assumptions are violated, it can lead to problems associated with biased coefficient and standard error estimates. This in turn will ultimately affect the validity of the inferential statistics about estimates and finally, the distribution assumed during the tests will become inappropriate. According to Phillips (1986), if these assumptions are violated, the t-tests and F- tests are unlikely to be reliable. On the other hand, if these 9 classical assumptions are satisfied, the regression model is likely to produce the Best Unbiased Estimators (BUE) for the population regression parameters. However, the classical assumptions for the regression model estimation assume that the time-series data for both the dependent and independent variable(s) are stationary. This implies that the mean, variances and autocovariances do not change overtime. On the contrary, this assumption is frequently violated and as a result, it is likely to lead to autocorrelation, a non-normality problem and most importantly to cause spurious regression⁵ (Gujarati, 2003).

⁴ Heteroscedasticity is a common problem when cross-sectional data is used, which is the case in this study.

⁵ A spurious regression produces a high R-square and high t-statistics; however, despite these desirable properties of the overall regression results, they are without any economic meaning. For a more detail explanation of the properties of the spurious regression, refer to Granger & Newbold (1974). According to Gujarati (2003), another indication of spurious regression is when R-square > DW, where DW is Durbin-Watson statistic.

Since the 9 classical assumptions and stationarity are critical, the adopted estimation procedures will commence by testing the variables for the presence of the unit root (non-stationarity). The tests for non-stationarity will include both informal and formal procedures. The informal procedure includes plotting the time-series data and observing the trend (both the linear and non-linear) and any possible relationship and the formal method will include the Dickey-Fuller Test (DFT), Augmented Dickey-Fuller Test (ADFT) (Dickey & Fuller, 1979) and the Phillips-Perron Test (PPT) (Phillips & Perron, 1988).

Once the variables are tested for non-stationarity and if none of the variables have a unit root, the Ordinary Least Squares (OLS) will be applied, followed by the standard diagnostic tests. If some variables have a unit root and some do not, the first difference or second difference (if required) will be taken off the variables which have a unit root. Once these variables (with a unit-root) after differencing becomes stationary, the OLS will be applied followed by the standard diagnostic tests. If all variables have a unit root and such variables are stationary in the first difference form I(1) or in any other form i.e. I(2)⁶, I(3), such variables can be potentially cointegrated, consequently, the Johansen Maximum Likelihood Procedure (JMLP) test for cointegration will be carried out. If the JMLP reveals one cointegrating equation, the Error Correction Model (ECM) will be applied followed by the standard diagnostic tests. However, if the JMLP reveals more than one cointegrating equation, the Vector Autoregression Model (VARM) will be applied, followed by the standard diagnostic tests.

IV. DATA AND DATA SOURCES

The Australian X and M trade data for all the selected trading partner countries and categories are obtained from the Trade Data International (TDI). The Australian GDP (ABS, 2008 d) and the SVR (ABS, 2008a) data are obtained from the Australian Bureau of Statistics (ABS). The Australian EXR⁷ for all the selected TD countries except for Thailand (RBA, 2009a), MS (RBA, 2009c) and IR (RBA, 2009d) are obtained from the Reserve Bank of Australia (RBA).

The units of the X and M between Australia and the selected TD countries and categories in the monetary values are expressed in millions of Australian Dollars (AUD) in both the HS-2 and HS-4 (Harmonized Commodity Description and Coding System - Second and fourth Levels of aggregation).

Furthermore, the units of the X and M values based on Quantity (QTY) in all estimated models between Australia and the selected TD countries are in single units. Finally, the Australian GDP and SVR⁸ are expressed in millions of AUD, MS is expressed in billions of AUD, and the IR⁹ are expressed in percentage per annum.

The data for China is obtained from the Organization for Economic Cooperation and Development (OECD), RBA and The People's Bank of China. The GDP data is obtained from OECD (2008a), the EXR are obtained from the RBA (2009a), the MS, IR data are obtained from OECD (2008b), and the SVR data is obtained from The People's Bank of China (2009). The GDP¹⁰ and MS¹¹ are expressed in billions of Chinese Yuan, the SVR¹²

⁶ If it is more than 2 '>I(2)', the coefficient(s) estimated cannot be meaningfully interpreted.

⁷ The EXR data from the RBA are originally in monthly time-intervals and for the purpose of this analysis converted to quarterly time-series by taking an average of the corresponding 3 monthly EXR's, while the EXR for Thailand are originally in quarterly time intervals. Furthermore, all EXR (except for the TWI) are expressed as value of one unit of foreign currency in terms of the Australian currency.

⁸ The Australian SVR originally is expressed in millions of Australian Dollars.; however, these figures are converted to AUD bill. in order to be consistent with most of the other TD countries data.

⁹ The lending standard variable rates.

¹⁰ The Chinese GDP data is only available from 1995:Q1 and is expressed in billions of Yuan, while these data are converted to AUD, mill. in order to be consistent with the Australian GDP data.

¹¹ The Chinese MS (M3) data is converted to billions of AUD in order to be consistent with the Australian MS data.

data is expressed in 100s of millions of Yuan, and the IR is expressed in percentage per annum.

The data for France and Germany are obtained from the Bank of France (BOF), Deutsche Bundesbank, OECD and RBA. The GDP data for France and Germany are obtained from the OECD (2008a), the EXR¹³ is obtained from the RBA (2009a), and the MS data for France and Germany are obtained from the BOF (2008a) and Deutsche Bundesbank (2009) respectively. Furthermore, the IR data for France and Germany are obtained from the OECD (2008b) and the SVR data for France and Germany are obtained from BOF (2008b) and OECD (2008b) respectively. The GDP¹⁴ data for both France and Germany are expressed in billions of euro, the MS¹⁵ is expressed in millions of euro and the IR¹⁶ for France and Germany are expressed in percentage per annum. The SVR¹⁷ for France is expressed in millions of euro, while the SVR¹⁸ for Germany is expressed in billions of euro.

The data for Malaysia is obtained from the Department of Statistics Malaysia (DOSM) and the RBA. The GDP data is obtained from the DOSM (2009) and the EXR is obtained from the RBA (2009a), while the Malaysian GDP¹⁹ is expressed in millions of Malaysian Ringgit.

The data for Singapore is obtained from the Monetary Authority of Singapore (MAS), the RBA and the Singapore Department of Statistics. The GDP data is obtained from the Singapore Department of Statistics (2009), the EXR is obtained from RBA (2009a), while the MS (MAS, 2008a), IR (MAS, 2008b) and SVR (MAS, 2008c) data are obtained from the MAS. The GDP²⁰, MS²¹ and SVR²² are expressed in millions of Singaporean Dollars (SGD) and the IR²³ is expressed in percentage per annum.

The data for Thailand is obtained from the Bank of Thailand (BOT) and the Thailand National Economic and Social Development Board (NESDB). The GDP data is obtained

¹² The Chinese SVR refers to net savings data and is only available from 2000:Q1. The net savings data is originally expressed in monthly intervals and in 100s Yuan, mill. These data are converted to quarterly time intervals (as the values at the end of the period) and to billions of AUD in order to be consistent with the Australian SVR data.

¹³ The structural break in the EXR for France and Germany exists, due to the introduction of the Euro currency on January 1, 1999, when France's Franc and Germany's Mark were replaced by the common European currency Euro. Consequently, the EXR for these 2 countries is proxy by the Trade-Weighted Index (TWI). This proxy can be considered reliable, since according to the RBA (2009b), the European Euro is on the third highest position in the TWI table, where the total Australian trade weight with the European countries (which includes France and Germany) accounts for 11.65 per cent of the total Australian trade.

¹⁴ The GDP data for France and Germany is converted to millions of AUD in order to be consistent with the Australian GDP. Furthermore, as the EXR for Euro is not available before January 1999, the period between 1990:Q1 and 1998:Q4 is the EXR estimate only, which has been used for conversion of the France and German GDP to millions of AUD for this period.

¹⁵ The original MS data (M3) for France and Germany are expressed in millions of euro and are in monthly intervals. These data are converted to billions of AUD and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data. Additionally, the MS data for these 2 countries correspond to the MS for the whole Euro Area and are available only from 1997:Q3, consequently the MS for period between 1990:Q1 and 1997:Q2, are again estimates only. The main reason why the whole Euro Area MS data for these 2 countries is used is due to the nature of the MS data for individual European countries (individual European countries MS is available only as a contribution by each country to the total MS for the whole Euro Area). However, since such contribution can be negative (for any individual country contribution), such data are considered not suitable since the log values cannot be taken from negative values. Due to this, the MS data for France and Germany used in this study are those for the whole Euro Area.

¹⁶ The IR data for France and Germany due to breakdowns in series, which are associated with the European Union integration, are proxy by the 10-year government bonds yield.

¹⁷ The France SVR are originally expressed in monthly intervals and in millions of euro; these data are converted to quarterly time intervals (as the values at the end of the period) and are converted to billions of AUD in order to be consistent with the Australian SVR data.

¹⁸ The Germany SVR are originally expressed in quarterly intervals and in billions of euro. These data are converted to AUD, bill. in order to be consistent with the Australian SVR data.

¹⁹ The Malaysian GDP data is obtained from the DOSM on special request. This data is originally expressed in millions of Malaysian Ringgit, which is converted to millions of AUD in order to be consistent with the Australian GDP data.

²⁰ The GDP data for Singapore is converted to millions of AUD in order to be consistent with the Australian GDP.

²¹ The original MS data (M3) for Singapore is expressed in millions of Singaporean Dollars, in monthly intervals and are available from 1991:Q1. This data is converted to billions of AUD, and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data.

²² The Singaporean SVR is originally expressed in millions of Singaporean Dollars, in monthly intervals and are available from 1991:Q1. This data is converted to the quarterly time-series (as the values at the end of the period) and to billions of AUD in order to be consistent with the Australian SVR data.

²³ The IR data for Singapore is originally in monthly time-intervals, which are converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

from the NESDB (2008), while the EXR (BOT, 2008a), the MS (BOT, 2008b), the IR (BOT, 2007a) and the SVR (BOT, 2007b) data are all obtained from the BOT. The GDP²⁴, MS²⁵ and SVR²⁶ are expressed in millions of Thai baht and the IR²⁷ are expressed in percentage per annum.

The data for the United Kingdom is obtained from the Bank of England (BOE), the OECD and the RBA. The GDP data is obtained from the OECD (2008a), the EXR from the RBA (2009a), the MS from the OECD (2008b), whilst the IR (BOE, 2009a) and SVR (BOE, 2009b) are obtained from the BOE. The GDP²⁸, MS²⁹ are expressed in billions of Pound Sterling and SVR³⁰ is expressed in millions of Pound Sterling, while the IR is expressed in percentage per annum.

The data for the United States of America is obtained from the OECD, the RBA and the U.S. Board of Governors of the Federal Reserve System. The GDP data is obtained from the OECD (2008a), the EXR from the RBA (2009a), the MS from the OECD (2008b), whilst the IR (The U.S. Board of Governors of the Federal Reserve System, 2008a) and the SVR (The U.S. Board of Governors of the Federal Reserve System, 2008b) are obtained from the U.S. Board of Governors of the Federal Reserve System. The GDP³¹, MS³² are expressed in millions of U.S. dollars (USD) and SVR³³ are expressed in billions of USD, while the IR³⁴ are expressed in percentage per annum.

²⁴ The GDP data for Thailand is converted to millions of AUD, in order to be consistent with the Australian GDP, while Thailand's GDP data is available from 1993:Q1.

²⁵ The original MS data (M3) for Thailand is expressed in millions of Thai baht and are in monthly intervals. This data is converted to billions of AUD, and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data.

²⁶ Thailand's SVR is originally expressed in millions of Thai baht, in quarterly time intervals and are available from 1992:Q4. This data is converted to millions of AUD, in order to be consistent with the Australian SVR data.

²⁷ The IR data for Thailand is originally in monthly time-intervals, which are converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

²⁸ The GDP data for the United Kingdom is converted to millions of AUD, in order to be consistent with the Australian GDP.

²⁹ The original MS data (M3) for the United Kingdom is converted to billions of AUD, in order to be consistent with the Australian MS data.

³⁰ The United Kingdom's SVR is converted to billions of AUD, in order to be consistent with the Australian SVR data.

³¹ The GDP data for the United States of America is converted to millions of AUD, in order to be consistent with the Australian GDP.

³² The original MS data (M3) for The United States of America is converted to billions of AUD in order to be consistent with the Australian MS data. Furthermore, this data is only available until 2005:Q4 as the Board of Federal Reserve System has ceased the publication of the 'M3' and its components for The United States of America on March 23, 2006. For more information visit: <http://www.federalreserve.gov/releases/h6/discm3.htm>

³³ The United States of America's SVR is originally in monthly time-intervals, which are converted to quarterly time-series (as an average of the corresponding 3 months period) and to billions of AUD, in order to be consistent with the Australian SVR data.

³⁴ The IR data for The United States of America is originally in monthly time-intervals, which is converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

V. EMPIRICAL FINDINGS

Table 1 shows the NX models that will be estimated in this section. This table consists of 29 NX models, however, as each of these models are estimated based on AUD and QTY values, the NX models estimated in this study are 58 in total. Tables 2-5 shows all 58 NX models estimated, which includes the estimated coefficients, corresponding t-ratios and diagnostic tests results.

Table 1: NET EXPORT – ESTIMATED MODELS (AUD & QTY)

HS-2				
AUSTRALIA -	30	84	85	87
China	Yes (n=28) ^l	Yes (n=28) ^l	Yes (n=28) ^l	Yes (n=28) ^l
France	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=42) ^g
Germany	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a
Malaysia	No	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a
Singapore	No	Yes (n=64) ^b	Yes (n=64) ^b	Yes (n=64) ^b
Thailand	No	Yes (n=56) ^d	Yes (n=56) ^d	Yes (n=56) ^d
United Kingdom	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a	Yes (n=68) ^a
United States of America	Yes (n=64) ^c	Yes (n=64) ^c	Yes (n=64) ^c	Yes (n=64) ^c

^a 1990:Q1 - 2006:Q4; ^b 1991:Q1 - 2006:Q4; ^c 1990:Q1 - 2005:Q4; ^d 1993:Q1 - 2006:Q4; ^e 1996:Q3 - 2006:Q4; ^f 2000:Q1 - 2006:Q4

Table 2 (Part A): NET EXPORT MODELS – CATEGORY 30* (AUD & QTY)

AUSTRALIA - CHINA						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	3.092	0.917	R ²	0.107	LMT F(2,19)	0.716
Δ(LnGDP)	0.119	0.329	Adj. R ²	0.106	LMT F(Prob.)	0.502
Δ(LnEXR)	-8.877	-0.890	F(5,21)	0.5***	BPGT F(5,21)	1.434
Δ(LnMS)	-8.004	-0.802	F(Prob.)	0.072	BPGT F(Prob.)	0.253
Δ(LnLR)	-1.037	-1.052***	DW	2.277	RESET F(1,20)	0.364
LnSVR	0.590	1.007***	AIC	2.090	RESET F(Prob.)	0.553
			SC	2.378	JBT χ ² (2)	0.256
			LL	-22.22	JBT χ ² (Prob.)	0.880
						-Incorrect sign for GDP; IR.
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	8.980	1.525***	R ²	0.294	LMT F(2,19)	1.302
Δ(LnGDP)	-0.447	-0.707	Adj. R ²	0.126	LMT F(Prob.)	0.295
Δ(LnEXR)	-46.873	-2.691**	F(5,21)	1.8***	BPGT F(5,21)	1.489
Δ(LnMS)	-44.979	-2.581**	F(Prob.)	0.067	BPGT F(Prob.)	0.236
Δ(LnLR)	2.354	1.368***	DW	1.362	RESET F(1,20)	0.513
LnSVR	1.792	1.752***	AIC	3.205	RESET F(Prob.)	0.482
			SC	3.492	JBT χ ² (2)	0.151
			LL	-37.261	JBT χ ² (Prob.)	0.927
AUSTRALIA - FRANCE						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	3.351	0.510	R ²	0.555	LMT F(2,57)	1.090
Δ(LnGDP)	1.056	0.940	Adj. R ²	0.510	LMT F(Prob.)	0.343
Δ(LnEXR)	-0.768	-0.271	F(6,59)	12.28*	BPGT F(5,60)	0.679
LnMS	2.155	0.930	F(Prob.)	0.000	BPGT F(Prob.)	0.641
Δ(LnLR)	0.219	0.123	DW	1.835	RESET F(1,58)	0.749
LnSVR	-0.010	-0.612	AIC	2.668	RESET F(Prob.)	0.391
AR(1)	0.726	8.387*	SC	2.900	JBT χ ² (2)	19.272*
			LL	-81.040	JBT χ ² (Prob.)	0.000
						-Residuals are not normally distributed. -Incorrect sign for GDP; MS; SVR.
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	7.104	1.129***	R ²	0.356	LMT F(2,57)	2.148
Δ(LnGDP)	16.080	4.611*	Adj. R ²	0.291	LMT F(Prob.)	0.126
Δ(LnEXR)	-3.779	-0.466	F(6,59)	5.447*	BPGT F(5,60)	0.269
LnMS	3.683	1.663***	F(Prob.)	0.000	BPGT F(Prob.)	0.929
Δ(LnLR)	4.772	0.998	DW	2.137	RESET F(1,58)	7.238*
LnSVR	-0.051	-1.199***	AIC	4.521	RESET F(Prob.)	0.009
AR(1)	0.334	2.775*	SC	4.753	JBT χ ² (2)	2.673
			LL	-142.2	JBT χ ² (Prob.)	0.263

* Pharmaceutical Products

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 2 (Continued - Part B): NET EXPORT MODELS – CATEGORY 30* (AUD & QTY)

AUSTRALIA - GERMANY						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.181	0.236	R ²	0.176	LMT F(2,57)	2.349
$\Delta(\text{LnGDP})$	-1.952	-1.359***	Adj. R ²	0.093	LMT F(Prob.)	0.105
$\Delta(\text{LnEXR})$	-2.339	-1.121***	F(6,59)	2.1***	BPGT F(5,60)	0.911
LnMS	-0.047	-0.171	F(Prob.)	0.066	BPGT F(Prob.)	0.480
$\Delta(\text{LnIR})$	0.484	0.452	DW	2.177	RESET F(1,58)	0.776
$\Delta(\text{LnSVR})$	0.004	0.479	AIC	1.950	RESET F(Prob.)	0.382
AR(1)	-0.359	-2.863*	SC	2.182	JBT $\chi^2(2)$	0.246
			LL	-57.36	JBT $\chi^2(\text{Prob.})$	0.884
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	16.455	3.004*	R ²	0.288	LMT F(2,57)	2.91***
$\Delta(\text{LnGDP})$	3.490	0.842	Adj. R ²	0.215	LMT F(Prob.)	0.063
$\Delta(\text{LnEXR})$	-3.052	-0.334	F(6,59)	3.973*	BPGT F(5,60)	4.104*
LnMS	5.971	3.050*	F(Prob.)	0.002	BPGT F(Prob.)	0.003
$\Delta(\text{LnIR})$	0.502	0.092	DW	2.086	RESET F(1,58)	0.070
$\Delta(\text{LnSVR})$	-0.064	-1.693***	AIC	4.699	RESET F(Prob.)	0.793
AR(1)	0.227	1.806***	SC	4.931	JBT $\chi^2(2)$	0.235
			LL	-148.18	JBT $\chi^2(\text{Prob.})$	0.889
						-Residuals are serially correlated. -Residuals are Heteroscedastic. -Incorrect sign for GDP; MS; SVR.
AUSTRALIA - UNITED KINGDOM						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.573	-16.986*	R ²	0.455	LMT F(1,58)	0.014
$\Delta(\text{LnGDP})$	0.392	0.875	Adj. R ²	0.400	LMT F(Prob.)	0.905
$\Delta(\text{LnEXR})$	0.651	0.407	F(6,59)	8.213*	BPGT F(5,60)	1.094
$\Delta(\text{LnMS})$	1.014	0.626	F(Prob.)	0.000	BPGT F(Prob.)	0.373
$\Delta(\text{LnIR})$	-0.161	-0.324	DW	1.908	RESET F(1,58)	1.551
LnSVR	-0.001	-0.184	AIC	0.187	RESET F(Prob.)	0.218
AR(1)	0.651	6.569*	SC	0.420	JBT $\chi^2(2)$	2.139
			LL	0.820	JBT $\chi^2(\text{Prob.})$	0.343
						-Incorrect sign for GDP; EXR; MS; IR; SVR.
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	2.676	3.899*	R ²	0.303	LMT F(1,58)	5.409**
$\Delta(\text{LnGDP})$	1.728	0.320	Adj. R ²	0.232	LMT F(Prob.)	0.024
$\Delta(\text{LnEXR})$	21.934	1.169***	F(6,59)	4.281*	BPGT F(5,60)	0.934
$\Delta(\text{LnMS})$	32.546	1.714***	F(Prob.)	0.001	BPGT F(Prob.)	0.466
$\Delta(\text{LnIR})$	-8.476	-1.499***	DW	2.176	RESET F(1,58)	4.057**
LnSVR	-0.100	-2.030**	AIC	4.946	RESET F(Prob.)	0.049
AR(1)	0.467	4.021*	SC	5.178	JBT $\chi^2(2)$	1.351
			LL	-156.22	JBT $\chi^2(\text{Prob.})$	0.509
						-Residuals are serially correlated. -Model is mis-specified. -Incorrect sign for GDP; EXR; MS; IR; SVR.
AUSTRALIA - UNITED STATES						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.505	-8.414*	R ²	0.501	LMT F(2,53)	4.164**
$\Delta(\text{LnGDP})$	2.068	2.307**	Adj. R ²	0.447	LMT F(Prob.)	0.021
$\Delta(\text{LnEXR})$	2.718	0.722	F(6,55)	9.220*	BPGT F(5,56)	0.416
$\Delta(\text{LnMS})$	0.014	0.004	F(Prob.)	0.000	BPGT F(Prob.)	0.836
$\Delta(\text{LnIR})$	0.126	0.120	DW	2.390	RESET F(1,54)	4.997**
LnSVR	0.012	1.388***	AIC	1.447	RESET F(Prob.)	0.030
AR(1)	0.635	6.135*	SC	1.687	JBT $\chi^2(2)$	2.127
			LL	-37.84	JBT $\chi^2(\text{Prob.})$	0.345
						-Residuals are serially correlated. -Model is mis-specified. -Incorrect sign for GDP; EXR; MS.
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.010	0.126	R ²	0.262	LMT F(2,55)	2.311
$\Delta(\text{LnGDP})$	-4.138	-2.440*	Adj. R ²	0.198	LMT F(Prob.)	0.109
$\Delta(\text{LnEXR})$	-12.105	-2.009**	F(5,57)	4.053*	BPGT F(5,57)	0.578
$\Delta(\text{LnMS})$	-4.125	-0.731	F(Prob.)	0.003	BPGT F(Prob.)	0.716
$\Delta(\text{LnIR})$	0.951	0.742	DW	2.409	RESET F(1,56)	0.175
$\Delta(\text{LnSVR})$	0.017	1.730***	AIC	1.952	RESET F(Prob.)	0.678
			SC	2.156	JBT $\chi^2(2)$	0.850
			LL	-55.48	JBT $\chi^2(\text{Prob.})$	0.654

* Pharmaceutical Products

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

As shown in Table 2, all 10 NX models in Category 30 are significant. Additionally, in most of the estimated models, the variable SVR is significant, while the variables GDP, EXR, MS and IR are mostly not significant.

The variables GDP and EXR are significant in 4 out of the 10 models, the variables MS and IR are significant in 3 out of the 10 models and the SVR is significant in 7 out of the 10 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 3 out of the 10 models (1 based on AUD and 2 based on QTY), while for these 3 models, the coefficients range for the GDP, EXR, MS, IR and SVR is between (-0.447 and -4.138), (-2.339 and -46.873), (-0.047 and -44.979), (0.484 and 2.354) and (0.004 and 1.792) respectively. Finally, the overall Adj. R-Square for all 10 models in this category ranges between 9.3 and 51 per cent respectively.

In overall, out of the 10 estimated models in this category, 3 models (the NX with Germany based on AUD; the NX with China and The United States of America based on QTY) have the correct signs and have satisfactorily passed all diagnostic tests. The NX model with China shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 0.447, 46.873 and 44.979 per cent respectively; a 1 per cent growth rate in the IR will increase the NX by 2.354 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 1.792 per cent. The NX model with the United States of America shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 4.138, 12.105 and 4.125 per cent respectively, while 1 per cent growth rate in the IR and SVR will increase the NX growth rate on average by 0.951 and 0.017 per cent respectively. The NX model with Germany shows that a 1 per cent growth rate in the GDP and EXR will decrease the NX growth rate by 1.952 and 2.339 per cent respectively; a 1 per cent increase in MS will decrease the NX growth rate by 0.047 per cent, while a 1 per cent growth rate in the IR and SVR will increase the NX growth rate on average by 0.484 and 0.004 per cent respectively. For all of these 3 models, the variables GDP, EXR and MS are mostly elastic, while the variable IR and MS are mostly inelastic. Finally, the Adj. R-Square for China, the United States of America and Germany is 12.6, 19.8 and 9.3 per cent respectively.

Table 3 (Part A): NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)

AUSTRALIA - CHINA						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.716	-0.736	R ²	0.470	LMT F(2,17)	0.469
LnGDP	-0.030	-0.247	Adj. R ²	0.303	LMT F(Prob.)	0.634
$\Delta(\text{LnEXR})$	-2.671	-0.737	F(6,19)	2.81**	BPGT F(5,20)	0.584
$\Delta(\text{LnMS})$	-3.570	-1.013***	F(Prob.)	0.039	BPGT F(Prob.)	0.712
$\Delta(\text{LnIR})$	0.296	1.052***	DW	2.219	RESET F(1,18)	0.143
LnSVR	0.120	0.741	AIC	-0.064	RESET F(Prob.)	0.710
AR(1)	-0.553	-3.132*	SC	0.275	JBT $\chi^2(2)$	1.880
			LL	7.828	JBT $\chi^2(\text{Prob.})$	0.391
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.860	-0.559	R ²	0.404	LMT F(2,17)	0.482
LnGDP	-0.017	-0.040	Adj. R ²	0.216	LMT F(Prob.)	0.626
$\Delta(\text{LnEXR})$	-6.353	-0.536	F(6,19)	2.2***	BPGT F(5,20)	0.947
$\Delta(\text{LnMS})$	-8.905	-0.757	F(Prob.)	0.095	BPGT F(Prob.)	0.473
$\Delta(\text{LnIR})$	0.192	0.193	DW	1.639	RESET F(1,18)	0.407
LnSVR	0.368	0.661	AIC	2.487	RESET F(Prob.)	0.532
AR(1)	-0.634	-3.185*	SC	2.825	JBT $\chi^2(2)$	0.197
			LL	-25.326	JBT $\chi^2(\text{Prob.})$	0.906

*Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 3 (Continued - Part B): NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)

AUSTRALIA - FRANCE						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.820	-2.095**	R ²	0.187	LMT F(2,57)	2.54***
Δ(LnGDP)	2.630	3.371*	Adj. R ²	0.104	LMT F(Prob.)	0.088
Δ(LnEXR)	-2.417	-1.351***	F(6,59)	2.26**	BPGT F(5,60)	0.485
LnMS	-0.263	-0.556	F(Prob.)	0.050	BPGT F(Prob.)	0.786
Δ(LnIR)	-0.228	-0.216	DW	2.151	RESET F(1,58)	5.987**
LnSVR	-0.002	-0.182	AIC	1.497	RESET F(Prob.)	0.018
AR(1)	0.312	2.479**	SC	1.729	JBT χ^2 (2)	18.570*
			LL	-42.399	JBT χ^2 (Prob.)	0.000
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.798	-0.797	R ²	0.279	LMT F(2,57)	1.884
Δ(LnGDP)	-0.240	-0.135	Adj. R ²	0.205	LMT F(Prob.)	0.161
Δ(LnEXR)	-0.015	-0.003	F(6,59)	3.797*	BPGT F(5,60)	1.195
LnMS	0.151	0.090	F(Prob.)	0.003	BPGT F(Prob.)	0.323
Δ(LnIR)	0.611	0.230	DW	2.211	RESET F(1,58)	3.606**
LnSVR	0.049	2.103**	AIC	3.349	RESET F(Prob.)	0.063
AR(1)	0.490	4.327*	SC	3.581	JBT χ^2 (2)	3.357
			LL	-103.52	JBT χ^2 (Prob.)	0.187
AUSTRALIA - GERMANY						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.166	0.428	R ²	0.135	LMT F(2,57)	4.369**
Δ(LnGDP)	0.435	0.629	Adj. R ²	0.047	LMT F(Prob.)	0.017
Δ(LnEXR)	0.108	0.103	F(6,59)	1.535	BPGT F(5,60)	2.28
LnMS	0.064	0.462	F(Prob.)	0.183	BPGT F(Prob.)	0.158
Δ(LnIR)	-0.536	-0.993	DW	2.229	RESET F(1,58)	2.86***
Δ(LnSVR)	0.005	1.103***	AIC	0.546	RESET F(Prob.)	0.097
AR(1)	-0.325	-2.546**	SC	0.778	JBT χ^2 (2)	10.672*
			LL	-11.020	JBT χ^2 (Prob.)	0.005
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.383	-0.437	R ²	0.323	LMT F(2,57)	3.595**
Δ(LnGDP)	2.145	1.695***	Adj. R ²	0.254	LMT F(Prob.)	0.034
Δ(LnEXR)	-4.486	-1.478***	F(6,59)	4.694*	BPGT F(5,60)	0.862
LnMS	0.987	0.874	F(Prob.)	0.001	BPGT F(Prob.)	0.512
Δ(LnIR)	0.502	0.267	DW	2.277	RESET F(1,58)	4.670**
Δ(LnSVR)	-0.013	-1.083***	AIC	2.645	RESET F(Prob.)	0.035
AR(1)	0.501	4.209*	SC	2.878	JBT χ^2 (2)	2.145
			LL	-80.300	JBT χ^2 (Prob.)	0.342
AUSTRALIA - MALAYSIA						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.046	-1.427***	R ²	0.163	LMT F(2,61)	1.343
Δ(LnGDP)	0.250	0.363	Adj. R ²	0.123	LMT F(Prob.)	0.269
Δ(LnEXR)	0.442	0.437	F(3,63)	4.10**	BPGT F(3,63)	0.703
Residuals (-1)	-0.257	-3.473*	F(Prob.)	0.010	BPGT F(Prob.)	0.554
			DW	2.241	RESET F(1,62)	0.676
			AIC	0.150	RESET F(Prob.)	0.414
			SC	0.282	JBT χ^2 (2)	0.055
			LL	-1.029	JBT χ^2 (Prob.)	0.973
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.821	-29.364*	R ²	0.064	LMT F(2,60)	0.348
Δ(LnGDP)	-0.344	-0.252	Adj. R ²	0.019	LMT F(Prob.)	0.708
Δ(LnEXR)	-0.365	-0.168	F(3,62)	1.416	BPGT F(2,63)	1.039
AR(1)	0.256	2.015**	F(Prob.)	0.247	BPGT F(Prob.)	0.360
			DW	1.870	RESET F(1,61)	1.517
			AIC	1.773	RESET F(Prob.)	0.223
			SC	1.906	JBT χ^2 (2)	1.480
			LL	-54.506	JBT χ^2 (Prob.)	0.477

*Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof
 DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at the 5%, ***significance at 10%

Table 3 (Continued - Part C): NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)

AUSTRALIA - SINGAPORE						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.627	-8.606*	R ²	0.298	LMT F(2,53)	0.381
Δ(LnGDP)	0.430	0.823	Adj. R ²	0.222	LMT F(Prob.)	0.685
Δ(LnEXR)	0.583	0.523	F(6,55)	3.896*	BPGT F(5,56)	3.726*
Δ(LnMS)	-0.371	-0.403	F(Prob.)	0.003	BPGT F(Prob.)	0.006
Δ(LnIR)	2.778	3.582*	DW	2.121	RESET F(2,53)	5.394*
LnSVR	0.000	0.069	AIC	0.459	RESET F(Prob.)	0.007
AR(1)	0.479	4.143*	SC	0.700	JBT χ^2 (2)	0.073
			LL	-7.244	JBT χ^2 (Prob.)	0.964
QTY	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.162	-1.186***	R ²	0.395	LMT F(2,54)	0.273
Δ(LnGDP)	1.547	0.706	Adj. R ²	0.330	LMT F(Prob.)	0.763
Δ(LnEXR)	2.404	0.599	F(6,56)	6.081*	BPGT F(6,56)	5.775*
Δ(LnMS)	1.584	0.508	F(Prob.)	0.000	BPGT F(Prob.)	0.000
Δ(LnIR)	0.337	0.150	DW	1.925	RESET F(1,55)	5.138
LnSVR	-0.044	-2.638*	AIC	2.878	RESET F(Prob.)	0.116
Residuals (-1)	-0.473	-4.020*	SC	3.116	JBT χ^2 (2)	4.689*
			LL	-83.65	JBT χ^2 (Prob.)	0.000
AUSTRALIA - THAILAND						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.016	-0.377	R ²	0.505	LMT F(2,46)	0.426
Δ(LnGDP)	-1.393	-1.503***	Adj. R ²	0.443	LMT F(Prob.)	0.656
Δ(LnEXR)	-2.868	-1.449***	F(6,48)	8.156*	BPGT F(6,48)	1.210
Δ(LnMS)	-0.017	-0.009	F(Prob.)	0.000	BPGT F(Prob.)	0.317
Δ(LnIR)	0.601	1.064***	DW	2.081	RESET F(1,47)	0.002
Δ(LnSVR)	0.148	1.415***	AIC	0.611	RESET F(Prob.)	0.963
Residuals (-1)	-0.663	-4.651*	SC	0.866	JBT χ^2 (2)	0.031
			LL	-9.793	JBT χ^2 (Prob.)	0.985
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.478	-12.451*	R ²	0.177	LMT F(2,45)	1.478
Δ(LnGDP)	-0.034	-0.019	Adj. R ²	0.072	LMT F(Prob.)	0.239
Δ(LnEXR)	-2.170	-0.397	F(6,47)	1.687	BPGT F(5,48)	1.499
Δ(LnMS)	-2.727	-0.526	F(Prob.)	0.145	BPGT F(Prob.)	0.208
Δ(LnIR)	0.542	0.341	DW	2.160	RESET F(1,46)	4.680
LnSVR	-0.475	-1.647***	AIC	2.690	RESET F(Prob.)	0.036
AR(1)	0.390	2.877*	SC	2.948	JBT χ^2 (2)	58.650*
			LL	-65.62	JBT χ^2 (Prob.)	0.000
AUSTRALIA - UNITED KINGDOM						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.937	-23.220*	R ²	0.222	LMT F(2,57)	0.147
Δ(LnGDP)	-1.069	-2.690*	Adj. R ²	0.143	LMT F(Prob.)	0.864
Δ(LnEXR)	-1.098	-0.816	F(6,59)	2.80**	BPGT F(5,60)	0.248
Δ(LnMS)	-1.711	-1.259***	F(Prob.)	0.018	BPGT F(Prob.)	0.939
Δ(LnIR)	0.151	0.385	DW	1.961	RESET F(1,58)	0.373
LnSVR	0.003	0.819	AIC	-0.409	RESET F(Prob.)	0.544
AR(1)	0.357	3.196*	SC	-0.177	JBT χ^2 (2)	2.681
			LL	20.513	JBT χ^2 (Prob.)	0.262
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.329	-14.652*	R ²	0.500	LMT F(2,57)	0.892
Δ(LnGDP)	-2.806	-2.903*	Adj. R ²	0.449	LMT F(Prob.)	0.416
Δ(LnEXR)	-3.482	-1.020***	F(6,59)	9.816*	BPGT F(5,60)	0.874
Δ(LnMS)	-1.372	-0.398	F(Prob.)	0.000	BPGT F(Prob.)	0.504
Δ(LnIR)	2.381	2.272**	DW	2.092	RESET F(1,58)	0.404
LnSVR	0.022	2.264**	AIC	1.631	RESET F(Prob.)	0.527
AR(1)	0.575	4.800*	SC	1.864	JBT χ^2 (2)	1.690
			LL	-46.832	JBT χ^2 (Prob.)	0.430

*Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 3 (Continued - Part D): NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)

AUSTRALIA - UNITED STATES						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.009	0.774	R ²	0.441	LMT F(2,54)	1.033
$\Delta(\text{LnGDP})$	0.436	1.727***	Adj. R ²	0.381	LMT F(Prob.)	0.363
$\Delta(\text{LnEXR})$	3.158	3.571*	F(6,56)	7.367*	BPGT F(6,56)	0.726
$\Delta(\text{LnMS})$	1.643	1.991***	F(Prob.)	0.000	BPGT F(Prob.)	0.631
$\Delta(\text{LnIR})$	0.004	0.019	DW	1.900	RESET F(1,55)	0.326
$\Delta(\text{LnSVR})$	-0.002	-1.597***	AIC	-1.881	RESET F(Prob.)	0.570
Residuals (-1)	-0.596	-5.489*	SC	-1.643	JBT χ^2 (2)	0.732
			LL	66.240	JBT χ^2 (Prob.)	0.693
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.135	-31.113*	R ²	0.348	LMT F(2,53)	2.49***
$\Delta(\text{LnGDP})$	2.774	4.125*	Adj. R ²	0.277	LMT F(Prob.)	0.093
$\Delta(\text{LnEXR})$	-0.849	-0.301	F(6,55)	4.897*	BPGT F(5,56)	0.383
$\Delta(\text{LnMS})$	-2.126	-0.783	F(Prob.)	0.000	BPGT F(Prob.)	0.859
$\Delta(\text{LnIR})$	-0.465	-0.619	DW	2.107	RESET F(1,54)	6.945**
LnSVR	-0.002	-0.406	AIC	0.737	RESET F(Prob.)	0.011
AR(1)	0.517	4.315*	SC	0.978	JBT χ^2 (2)	3.643
			LL	-15.861	JBT χ^2 (Prob.)	0.162

*Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwarz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

As shown in Table 3, out of the 16 NX models in Category 84, 13 models are significant and 3 NX models are not significant. The NX models which are not significant are the NX model with Germany based on AUD and Malaysia and Thailand based on QTY values. Furthermore, for most of the models, the majority of the variables are not significant. The variables GDP, EXR, MS, IR are significant in 7, 5, 3 and 4 out of the 16 models respectively, while the variable SVR is significant in 8 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 6 out of the 16 models (3 based on AUD and 3 based on QTY), while for these 6 models, the coefficients range for the GDP, EXR, MS, IR and SVR is between (-0.017 and -2.806), (-0.365 and -6.353), (-0.017 and -8.905), (0.151 and 2.381) and (0.003 and 0.368) respectively. Finally, overall, the Adj. R-Square or all 16 models in this category ranges between 1.9 and 44.9 per cent respectively.

Overall, out of the 16 estimated models in this category, 5 models (the NX with China, Thailand and the United Kingdom based on AUD; the NX with China and the United Kingdom based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China based on AUD shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.03 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 2.671 and 3.57 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.296 per cent, on average, while 1 per cent increase in SVR will increase the NX growth rate by 0.12 per cent. The NX model with Thailand shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 1.393, 2.868 and 0.017 per cent respectively, while 1 per cent growth rate in the IR and SVR will increase the NX growth rate by 0.601 and 0.148 per cent respectively in average. The NX model with the United Kingdom based on AUD shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 1.069, 1.098 and 1.711 per cent respectively, a 1 per cent growth rate in IR will increase the NX by 0.151 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 0.003 per cent. The NX model with China based on QTY shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.017 per cent, a 1 per cent growth rate in the EXR and MS

will decrease the NX growth rate by 6.353 and 8.905 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.192 per cent, on average, while 1 per cent increase in SVR will increase the NX growth rate by 0.368 per cent. The NX model with the United Kingdom based on QTY shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 2.806, 3.482 and 1.372 per cent respectively, a 1 per cent growth rate in IR will increase the NX by 2.381 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 0.022 per cent. For all of these 5 models, the variables GDP, EXR and MS are mostly elastic, while the variable IR and SVR are mostly inelastic. Finally, the Adj. R-Square for China, Thailand and the United Kingdom based on AUD values is 30.3, 44.3 and 14.3 per cent respectively and for China and the United Kingdom based on QTY, the values are 21.6 and 44.9 per cent respectively.

Table 4 (Part A): NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)

AUSTRALIA - CHINA						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.977	-2.427**	R ²	0.434	LMT F(2,19)	0.740
LnGDP	-0.240	-1.366***	Adj. R ²	0.299	LMT F(Prob.)	0.490
$\Delta(\text{LnEXR})$	-1.442	-0.297	F(5,21)	3.22**	BPGT F(5,21)	0.689
$\Delta(\text{LnMS})$	-4.025	-0.830	F(Prob.)	0.026	BPGT F(Prob.)	0.637
$\Delta(\text{LnIR})$	0.873	-1.822***	DW	2.115	RESET F(1,20)	0.273
LnSVR	0.704	-2.472**	AIC	0.647	RESET F(Prob.)	0.607
			SC	0.935	JBT $\chi^2(2)$	3.912
			LL	-2.738	JBT $\chi^2(Prob.)$	0.141
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	7.125	1.519***	R ²	0.264	LMT F(2,19)	1.839
LnGDP	0.041	0.081	Adj. R ²	0.089	LMT F(Prob.)	0.186
$\Delta(\text{LnEXR})$	-9.296	-0.670	F(5,21)	1.5***	BPGT F(5,21)	0.356
$\Delta(\text{LnMS})$	-13.617	-0.981	F(Prob.)	0.093	BPGT F(Prob.)	0.873
$\Delta(\text{LnIR})$	-0.537	-0.392	DW	1.637	RESET F(1,20)	1.928
LnSVR	1.438	1.766***	AIC	2.750	RESET F(Prob.)	0.180
			SC	3.038	JBT $\chi^2(2)$	0.227
			LL	-31.120	JBT $\chi^2(Prob.)$	0.893
						-Incorrect sign for GDP; IR.
AUSTRALIA - FRANCE						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.929	-2.575**	R ²	0.215	LMT F(2,57)	2.343
$\Delta(\text{LnGDP})$	0.858	1.224***	Adj. R ²	0.136	LMT F(Prob.)	0.105
$\Delta(\text{LnEXR})$	0.550	0.327	F(6,59)	2.70**	BPGT F(5,60)	2.30
LnMS	-0.390	-0.725	F(Prob.)	0.022	BPGT F(Prob.)	0.116
$\Delta(\text{LnIR})$	0.054	0.053	DW	2.205	RESET F(1,58)	7.050**
LnSVR	-0.010	-1.173***	AIC	1.414	RESET F(Prob.)	0.010
AR(1)	0.421	3.523*	SC	1.646	JBT $\chi^2(2)$	6.566**
			LL	-39.649	JBT $\chi^2(Prob.)$	0.038
						-Model is mis-specified. -Residuals are not normally distributed. -Incorrect sign for GDP; EXR; SVR.
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.170	-0.826	R ²	0.164	LMT F(2,57)	0.141
$\Delta(\text{LnGDP})$	0.173	0.102	Adj. R ²	0.079	LMT F(Prob.)	0.868
$\Delta(\text{LnEXR})$	4.327	1.143	F(6,59)	1.9***	BPGT F(5,60)	0.576
LnMS	1.153	1.251	F(Prob.)	0.090	BPGT F(Prob.)	0.718
$\Delta(\text{LnIR})$	-4.045	-1.817***	DW	1.997	RESET F(1,58)	0.374
LnSVR	0.009	0.464	AIC	2.980	RESET F(Prob.)	0.544
AR(1)	0.260	2.026**	SC	3.212	JBT $\chi^2(2)$	3.814
			LL	-91.336	JBT $\chi^2(Prob.)$	0.149
						-Incorrect sign for GDP; EXR; MS; IR.

*Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Producers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 4 (Continued - Part B): NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)

AUSTRALIA - GERMANY						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.453	0.946	R ²	0.046	LMT F(2,59)	0.271
$\Delta(\text{LnGDP})$	0.009	0.016	Adj. R ²	0.043	LMT F(Prob.)	0.764
$\Delta(\text{LnEXR})$	-0.566	-0.501	F(5,61)	0.451	BPGT F(5,61)	0.630
LnMS	0.152	0.883	F(Prob.)	0.811	BPGT F(Prob.)	0.678
$\Delta(\text{LnIR})$	-0.426	-0.681	DW	2.116	RESET F(1,60)	0.137
$\Delta(\text{LnSVR})$	-0.001	-0.115	AIC	0.558	RESET F(Prob.)	0.713
			SC	0.755	JBT χ^2 (2)	5.77***
			LL	-12.686	JBT χ^2 (Prob.)	0.056
						-Residuals are not normally distributed. -Incorrect sign for GDP; MS; IR; SVR. -Model is not significant.
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.512	-0.547	R ²	0.256	LMT F(2,57)	1.253
$\Delta(\text{LnGDP})$	3.580	2.217**	Adj. R ²	0.181	LMT F(Prob.)	0.293
$\Delta(\text{LnEXR})$	-1.172	-0.475	F(6,59)	3.392*	BPGT F(5,60)	0.648
LnMS	-0.200	-0.596	F(Prob.)	0.006	BPGT F(Prob.)	0.664
$\Delta(\text{LnIR})$	-1.985	-1.541***	DW	1.852	RESET F(1,58)	1.449
$\Delta(\text{LnSVR})$	-0.022	-2.025**	AIC	2.256	RESET F(Prob.)	0.234
AR(1)	-0.300	-2.494**	SC	2.488	JBT χ^2 (2)	234.62*
			LL	-67.443	JBT χ^2 (Prob.)	0.000
						-Residuals are not normally distributed. -Incorrect sign for GDP; IR; SVR.
AUSTRALIA - MALAYSIA						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.019	-0.584	R ²	0.029	LMT F(2,62)	0.397
$\Delta(\text{LnGDP})$	0.845	1.218	Adj. R ²	0.002	LMT F(Prob.)	0.674
$\Delta(\text{LnEXR})$	1.372	1.334	F(2,64)	0.950	BPGT F(2,64)	0.203
			F(Prob.)	0.392	BPGT F(Prob.)	0.817
			DW	2.085	RESET F(1,63)	0.101
			AIC	0.190	RESET F(Prob.)	0.752
			SC	0.289	JBT χ^2 (2)	0.364
			LL	-3.367	JBT χ^2 (Prob.)	0.834
						-Incorrect sign for GDP; EXR. -Model is not significant.
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-4.023	-6.460*	R ²	0.728	LMT F(2,60)	0.737
$\Delta(\text{LnGDP})$	2.648	1.318***	Adj. R ²	0.715	LMT F(Prob.)	0.483
$\Delta(\text{LnEXR})$	3.937	1.130***	F(3,62)	55.34*	BPGT F(2,63)	4.419**
AR(1)	0.771	12.892*	F(Prob.)	0.000	BPGT F(Prob.)	0.016
			DW	2.114	RESET F(2,60)	9.665*
			AIC	3.114	RESET F(Prob.)	0.000
			SC	3.246	JBT χ^2 (2)	0.611
			LL	-98.751	JBT χ^2 (Prob.)	0.737
						-Residuals are Heteroscedastic. -Model is mis-specified. -Incorrect sign for GDP; EXR.
AUSTRALIA - SINGAPORE						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.017	-0.623	R ²	0.119	LMT F(2,54)	0.906
$\Delta(\text{LnGDP})$	0.332	0.671	Adj. R ²	0.025	LMT F(Prob.)	0.410
$\Delta(\text{LnEXR})$	0.328	0.366	F(6,56)	1.266	BPGT F(6,56)	0.247
$\Delta(\text{LnMS})$	-0.368	-0.506	F(Prob.)	0.288	BPGT F(Prob.)	0.959
$\Delta(\text{LnIR})$	-0.144	-0.271	DW	2.224	RESET F(1,55)	0.430
$\Delta(\text{LnSVR})$	0.002	0.623	AIC	-0.089	RESET F(Prob.)	0.515
Residuals (-1)	-0.188	-2.396**	SC	0.149	JBT χ^2 (2)	2.439
			LL	9.799	JBT χ^2 (Prob.)	0.295
						-Model is mis-specified. -Incorrect sign for GDP; EXR; IR. -Model is not significant.
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.011	0.119	R ²	0.366	LMT F(2,54)	1.889
$\Delta(\text{LnGDP})$	-1.811	-1.125***	Adj. R ²	0.298	LMT F(Prob.)	0.161
$\Delta(\text{LnEXR})$	-4.963	-1.705**	F(6,56)	5.376*	BPGT F(6,56)	0.801
$\Delta(\text{LnMS})$	-2.854	-1.282***	F(Prob.)	0.000	BPGT F(Prob.)	0.574
$\Delta(\text{LnIR})$	1.248	0.723	DW	2.229	RESET F(1,55)	1.292
$\Delta(\text{LnSVR})$	0.009	0.718	AIC	2.260	RESET F(Prob.)	0.261
Residuals (-1)	-0.585	-4.925*	SC	2.499	JBT χ^2 (2)	2.449
			LL	-64.206	JBT χ^2 (Prob.)	0.294

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DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 4 (Continued - Part C): NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)

AUSTRALIA - THAILAND						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.735	-3.033*	R ²	0.744	LMT F(3,44)	2.115
Δ(LnGDP)	-1.096	-1.380***	Adj. R ²	0.711	LMT F(Prob.)	0.112
Δ(LnEXR)	3.137	1.207***	F(6,47)	22.72*	BPGT F(5,48)	1.686
Δ(LnMS)	4.052	1.633***	F(Prob.)	0.000	BPGT F(Prob.)	0.156
Δ(LnIR)	-1.058	-1.302***	DW	2.551	RESET F(2,45)	5.698*
LnSVR	-0.108	-0.734	AIC	1.568	RESET F(Prob.)	0.006
AR(1)	0.868	11.244*	SC	1.825	JBT χ^2 (2)	3.248
			LL	-35.324	JBT χ^2 (Prob.)	0.197
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.759	-10.486*	R ²	0.305	LMT F(2,45)	0.339
Δ(LnGDP)	-2.784	-1.659***	Adj. R ²	0.216	LMT F(Prob.)	0.714
Δ(LnEXR)	-3.398	-0.676	F(6,47)	3.434*	BPGT F(5,48)	0.328
Δ(LnMS)	0.734	0.153	F(Prob.)	0.007	BPGT F(Prob.)	0.894
Δ(LnIR)	-3.196	-2.173**	DW	1.937	RESET F(1,46)	0.843
LnSVR	-0.111	-0.417	AIC	2.540	RESET F(Prob.)	0.363
AR(1)	0.408	2.969*	SC	2.798	JBT χ^2 (2)	10.462*
			LL	-61.573	JBT χ^2 (Prob.)	0.005
AUSTRALIA - UNITED KINGDOM						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.010	0.326	R ²	0.346	LMT F(2,58)	0.354
Δ(LnGDP)	0.803	1.264***	Adj. R ²	0.281	LMT F(Prob.)	0.704
Δ(LnEXR)	1.484	0.798	F(6,60)	5.295*	BPGT F(6,60)	0.446
Δ(LnMS)	1.466	0.778	F(Prob.)	0.000	BPGT F(Prob.)	0.845
Δ(LnIR)	0.466	0.949	DW	1.903	RESET F(1,59)	0.013
Δ(LnSVR)	0.003	0.835	AIC	0.072	RESET F(Prob.)	0.909
Residuals (-1)	-0.569	-5.117*	SC	0.302	JBT χ^2 (2)	8.330**
			LL	4.588	JBT χ^2 (Prob.)	0.016
QTY	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.021	0.257	R ²	0.359	LMT F(2,58)	0.600
Δ(LnGDP)	4.824	2.763*	Adj. R ²	0.295	LMT F(Prob.)	0.552
Δ(LnEXR)	-3.340	-0.665	F(6,60)	5.608*	BPGT F(6,60)	0.551
Δ(LnMS)	-5.372	-1.054	F(Prob.)	0.000	BPGT F(Prob.)	0.768
Δ(LnIR)	0.465	0.338	DW	2.117	RESET F(1,59)	0.763
Δ(LnSVR)	0.012	1.114***	AIC	2.070	RESET F(Prob.)	0.386
Residuals (-1)	-0.586	-5.074*	SC	2.300	JBT χ^2 (2)	22.386*
			LL	-62.348	JBT χ^2 (Prob.)	0.000
AUSTRALIA - UNITED STATES						
AUD	DEPENDENT VARIABLE: Δ(LnX/M)					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.016	0.652	R ²	0.397	LMT F(2,54)	1.720
Δ(LnGDP)	1.575	3.077*	Adj. R ²	0.333	LMT F(Prob.)	0.189
Δ(LnEXR)	0.252	0.138	F(6,56)	6.153*	BPGT F(6,56)	0.657
Δ(LnMS)	-1.468	-0.860	F(Prob.)	0.000	BPGT F(Prob.)	0.684
Δ(LnIR)	-0.229	-0.575	DW	2.145	RESET F(1,55)	3.14***
Δ(LnSVR)	-0.002	-0.557	AIC	-0.431	RESET F(Prob.)	0.082
Residuals (-1)	-0.567	-4.843*	SC	-0.193	JBT χ^2 (2)	1.495
			LL	20.580	JBT χ^2 (Prob.)	0.474
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.958	-7.086*	R ²	0.676	LMT F(2,53)	4.157**
Δ(LnGDP)	-1.915	-1.542***	Adj. R ²	0.640	LMT F(Prob.)	0.021
Δ(LnEXR)	0.491	0.093	F(6,55)	19.09*	BPGT F(5,56)	0.552
Δ(LnMS)	1.773	0.344	F(Prob.)	0.000	BPGT F(Prob.)	0.736
Δ(LnIR)	-2.124	-1.417***	DW	2.503	RESET F(1,54)	8.934*
LnSVR	0.002	0.138	AIC	2.308	RESET F(Prob.)	0.004
AR(1)	0.830	11.306*	SC	2.548	JBT χ^2 (2)	5.785
			LL	-64.535	JBT χ^2 (Prob.)	0.134

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As shown in Table 4, out of the 16 NX models in Category 85, 13 models are significant and 3 NX models with Germany, Malaysia and Singapore all based on AUD, are not significant. Furthermore, in most of the models, the variable GDP is significant, while the variables EXR, MS, IR and SVR are not significant.

The variables EXR, MS, IR and SVR are significant in 3, 2, 6 and 5 out of the 16 models respectively, while the variable GDP is significant in 11 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 2 out of the 16 models (1 based on AUD and 1 based on QTY), while for these 2 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.240 and -1.811), (-1.442 and -4.963), (-2.854 and -4.025), (0.873 and 1.248) and (0.009 and 0.704) respectively. Finally, the Adj. R-Square in overall for all 16 models in this category ranges between 0.2 and 71.5 per cent.

Overall, out of the 16 estimated models in this category, only 2 models (the NX with China based on AUD; the NX with Singapore based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China based on AUD shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.240 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 1.442 and 4.025 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.873 per cent, on average, while a 1 per cent increase in SVR will increase the NX growth rate by 0.704 per cent. The NX model with Singapore shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 1.811, 4.963 and 2.854 per cent respectively, on average, while a 1 per cent growth rate in the IR and SVR will increase the NX growth rate by 1.248 and 0.009 per cent respectively. In these 2 models, the variables EXR and MS are elastic; the variables GDP and IR are mixed, while the variable SVR is inelastic. Finally, the Adj. R-Square for China based on AUD values is 29.9 per cent and for Singapore based on QTY, the value is 29.8 per cent.

Table 5 (Part A): NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)

AUSTRALIA - CHINA							
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$						
	Coefficient	t-ratio	Diagnostic Results				Note:
Constant	-2.508	-0.566	R ²	0.224	LMT F(2,19)	0.294	-Residuals are Heteroscedastic. -Incorrect sign for GDP; EXR; MS. -Model is not significant.
LnGDP	0.085	0.179	Adj. R ²	0.039	LMT F(Prob.)	0.748	
$\Delta(\text{LnEXR})$	6.277	0.478	F(5,21)	1.210	BPGT F(5,21)	2.57***	
$\Delta(\text{LnMS})$	10.684	0.814	F(Prob.)	0.339	BPGT F(Prob.)	0.058	
$\Delta(\text{LnIR})$	2.425	1.871***	DW	1.947	RESET F(1,20)	0.000	
LnSVR	0.552	0.716	AIC	2.638	RESET F(Prob.)	0.992	
			SC	2.926	JBT χ^2 (2)	1.857	
			LL	-29.609	JBT χ^2 (Prob.)	0.395	
QTY	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$						
	Coefficient	t-ratio	Diagnostic Results				Note:
Constant	-35.649	-3.198*	R ²	0.565	LMT F(2,17)	2.096	
LnGDP	-2.264	-1.613***	Adj. R ²	0.428	LMT F(Prob.)	0.154	
$\Delta(\text{LnEXR})$	-3.837	-0.098	F(6,19)	4.120*	BPGT F(5,20)	0.486	
$\Delta(\text{LnMS})$	-2.105	-0.054	F(Prob.)	0.008	BPGT F(Prob.)	0.783	
$\Delta(\text{LnIR})$	8.250	2.560**	DW	2.024	RESET F(1,18)	0.676	
LnSVR	6.292	3.377*	AIC	4.965	RESET F(Prob.)	0.422	
AR(1)	-0.701	-4.135*	SC	5.303	JBT χ^2 (2)	1.336	
			LL	-57.542	JBT χ^2 (Prob.)	0.513	

*Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof

DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 5 (Continued - Part B): NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)

AUSTRALIA - FRANCE						
AUD	DEPENDENT VARIABLE: LnX/M		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,33)		
Constant	2.295	0.310	0.787	0.787	1.970	
$\Delta(\text{LnGDP})$	0.787	0.940	Adj. R ²	0.748	LMT F(Prob.)	0.157
$\Delta(\text{LnEXR})$	-1.047	-0.422	F(6,34)	20.27*	BPGT F(5,35)	1.691
LnMS	1.284	0.506	F(Prob.)	0.000	BPGT F(Prob.)	0.163
$\Delta(\text{LnIR})$	4.738	3.472*	DW	2.257	RESET F(2,31)	5.065**
LnSVR	0.545	2.552**	AIC	1.700	RESET F(Prob.)	0.013
AR(1)	0.847	10.285*	SC	1.995	JBT χ^2 (2)	1.563
			LL	-26.997	JBT χ^2 (Prob.)	0.458
QTY	DEPENDENT VARIABLE: LnX/M		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,33)		
Constant	27.182	1.924***	0.155	0.034	1.250	
$\Delta(\text{LnGDP})$	3.978	0.802	Adj. R ²	1.283	LMT F(Prob.)	0.300
$\Delta(\text{LnEXR})$	0.523	0.048	F(6,34)	0.293	BPGT F(5,35)	1.950
LnMS	-11.769	-2.184**	F(Prob.)	0.000	BPGT F(Prob.)	0.111
$\Delta(\text{LnIR})$	4.933	0.938	DW	2.130	RESET F(1,34)	0.507
LnSVR	0.880	0.815	AIC	4.434	RESET F(Prob.)	0.481
			SC	4.685	JBT χ^2 (2)	2.371
			LL	-84.898	JBT χ^2 (Prob.)	0.306
AUSTRALIA - GERMANY						
AUD	DEPENDENT VARIABLE: LnX/M		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,57)		
Constant	-6.012	-1.180***	0.626	0.588	2.246	
$\Delta(\text{LnGDP})$	-0.873	-1.342***	Adj. R ²	0.411	LMT F(Prob.)	0.115
$\Delta(\text{LnEXR})$	-0.552	-0.347	F(6,59)	16.47*	BPGT F(5,60)	0.968
LnMS	-0.812	-0.453	F(Prob.)	0.000	BPGT F(Prob.)	0.445
$\Delta(\text{LnIR})$	1.078	1.068***	DW	2.147	RESET F(1,58)	1.622
$\Delta(\text{LnSVR})$	0.002	0.236	AIC	1.597	RESET F(Prob.)	0.208
AR(1)	0.809	10.454*	SC	1.829	JBT χ^2 (2)	18.010*
			LL	-45.703	JBT χ^2 (Prob.)	0.000
QTY	DEPENDENT VARIABLE: LnX/M		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,57)		
Constant	-10.718	-1.032***	0.466	0.411	0.489	
$\Delta(\text{LnGDP})$	-1.358	-0.561	Adj. R ²	0.411	LMT F(Prob.)	0.616
$\Delta(\text{LnEXR})$	-11.403	-1.897***	F(6,59)	8.568*	BPGT F(5,60)	1.046
LnMS	-2.361	-0.640	F(Prob.)	0.000	BPGT F(Prob.)	0.399
$\Delta(\text{LnIR})$	1.050	0.279	DW	1.839	RESET F(1,58)	1.762
$\Delta(\text{LnSVR})$	0.002	0.096	AIC	4.118	RESET F(Prob.)	0.190
AR(1)	0.667	6.757*	SC	4.350	JBT χ^2 (2)	0.538
			LL	-128.88	JBT χ^2 (Prob.)	0.764
AUSTRALIA - MALAYSIA						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,61)		
Constant	-0.026	-0.349	0.237	0.201	1.598	
$\Delta(\text{LnGDP})$	0.810	0.512	Adj. R ²	0.201	LMT F(Prob.)	0.211
$\Delta(\text{LnEXR})$	1.618	0.688	F(3,63)	6.540*	BPGT F(3,63)	0.479
Residuals (-1)	-0.441	-4.322*	F(Prob.)	0.001	BPGT F(Prob.)	0.698
			DW	1.723	RESET F(1,62)	2.224
			AIC	1.854	RESET F(Prob.)	0.141
			SC	1.986	JBT χ^2 (2)	4.272
			LL	-58.123	JBT χ^2 (Prob.)	0.118
QTY	DEPENDENT VARIABLE: LnX/M		Diagnostic Results			Note:
	Coefficient	t-ratio	R ²	LMT F(2,60)		
Constant	-1.287	-3.096*	0.253	0.217	0.640	
$\Delta(\text{LnGDP})$	-2.664	-0.813	Adj. R ²	0.217	LMT F(Prob.)	0.531
$\Delta(\text{LnEXR})$	-2.516	-0.448	F(3,62)	7.018*	BPGT F(2,63)	1.871
AR(1)	0.526	4.639*	F(Prob.)	0.000	BPGT F(Prob.)	0.162
			DW	2.109	RESET F(1,61)	2.87***
			AIC	3.823	RESET F(Prob.)	0.096
			SC	3.955	JBT χ^2 (2)	0.901
			LL	122.151	JBT χ^2 (Prob.)	0.637

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 DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

Table 5 (Continued - Part C): NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)

AUSTRALIA - SINGAPORE						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.031	-0.669	R ²	0.463	LMT F(2,52)	2.330
$\Delta(\text{LnGDP})$	-0.038	-0.032	Adj. R ²	0.394	LMT F(Prob.)	0.107
$\Delta(\text{LnEXR})$	-2.329	-1.209***	F(7,54)	6.656*	BPGT F(6,55)	0.243
$\Delta(\text{LnMS})$	-1.817	-1.349***	F(Prob.)	0.000	BPGT F(Prob.)	0.960
$\Delta(\text{LnLR})$	-1.713	-1.543***	DW	2.139	RESET F(1,53)	0.631
$\Delta(\text{LnSVR})$	-0.002	-0.223	AIC	1.486	RESET F(Prob.)	0.430
Residuals (-1)	-0.554	-4.356*	SC	1.760	JBT χ^2 (2)	59.248*
AR(1)	-0.332	-2.017**	LL	-38.058	JBT χ^2 (Prob.)	0.000
QTY						
	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	2.873	3.835*	R ²	0.614	LMT F(2,53)	1.064
$\Delta(\text{LnGDP})$	-2.073	-1.068***	Adj. R ²	0.572	LMT F(Prob.)	0.352
$\Delta(\text{LnEXR})$	-5.232	-1.208***	F(6,55)	14.61*	BPGT F(5,56)	0.682
$\Delta(\text{LnMS})$	-0.740	-0.210	F(Prob.)	0.000	BPGT F(Prob.)	0.639
$\Delta(\text{LnLR})$	-2.794	-0.908	DW	2.273	RESET F(2,53)	2.77***
LnSVR	-0.033	-1.262***	AIC	3.405	RESET F(Prob.)	0.072
AR(1)	0.784	8.656*	SC	3.646	JBT χ^2 (2)	1.614
			LL	-98.568	JBT χ^2 (Prob.)	0.446
AUSTRALIA - THAILAND						
AUD	DEPENDENT VARIABLE: $\Delta(\text{LnX/M})$					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.053	-0.536	R ²	0.176	LMT F(2,46)	1.914
$\Delta(\text{LnGDP})$	-1.555	-0.752	Adj. R ²	0.073	LMT F(Prob.)	0.159
$\Delta(\text{LnEXR})$	1.611	0.336	F(6,48)	1.712	BPGT F(6,48)	0.512
$\Delta(\text{LnMS})$	-2.296	-0.511	F(Prob.)	0.139	BPGT F(Prob.)	0.796
$\Delta(\text{LnLR})$	-1.811	-1.530***	DW	1.881	RESET F(1,47)	0.896
$\Delta(\text{LnSVR})$	0.039	0.174	AIC	2.264	RESET F(Prob.)	0.349
Residuals (-1)	-0.171	-1.779***	SC	2.519	JBT χ^2 (2)	2.404
			LL	-55.247	JBT χ^2 (Prob.)	0.301
QTY						
	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-1.609	-1.205***	R ²	0.764	LMT F(2,45)	1.559
$\Delta(\text{LnGDP})$	0.360	0.186	Adj. R ²	0.734	LMT F(Prob.)	0.222
$\Delta(\text{LnEXR})$	-4.354	-0.688	F(6,47)	25.42*	BPGT F(5,48)	0.283
$\Delta(\text{LnMS})$	-5.852	-0.969	F(Prob.)	0.000	BPGT F(Prob.)	0.920
$\Delta(\text{LnLR})$	-1.611	-0.814	DW	2.305	RESET F(1,46)	2.732
LnSVR	-0.765	-2.135**	AIC	3.343	RESET F(Prob.)	0.105
AR(1)	0.863	10.423*	SC	3.601	JBT χ^2 (2)	0.237
			LL	-83.269	JBT χ^2 (Prob.)	0.888
AUSTRALIA - UNITED KINGDOM						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-2.463	-13.987*	R ²	0.553	LMT F(2,57)	3.972**
$\Delta(\text{LnGDP})$	-0.982	-1.415***	Adj. R ²	0.508	LMT F(Prob.)	0.024
$\Delta(\text{LnEXR})$	-0.321	-0.129	F(6,59)	12.18*	BPGT F(5,60)	1.199
$\Delta(\text{LnMS})$	-0.971	-0.385	F(Prob.)	0.000	BPGT F(Prob.)	0.321
$\Delta(\text{LnLR})$	0.313	0.399	DW	2.400	RESET F(1,58)	10.496*
LnSVR	0.016	2.258**	AIC	1.130	RESET F(Prob.)	0.002
AR(1)	0.710	7.620*	SC	1.362	JBT χ^2 (2)	6.666**
			LL	-30.291	JBT χ^2 (Prob.)	0.036
QTY						
	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-3.170	-4.058*	R ²	0.596	LMT F(2,57)	3.787**
$\Delta(\text{LnGDP})$	1.586	0.650	Adj. R ²	0.555	LMT F(Prob.)	0.029
$\Delta(\text{LnEXR})$	-12.349	-1.402***	F(6,59)	14.51*	BPGT F(5,60)	0.418
$\Delta(\text{LnMS})$	7.167	0.804	F(Prob.)	0.000	BPGT F(Prob.)	0.834
$\Delta(\text{LnLR})$	-3.625	-1.303***	DW	2.482	RESET F(1,58)	0.150
LnSVR	0.008	0.330	AIC	3.707	RESET F(Prob.)	0.700
AR(1)	0.765	8.931*	SC	3.939	JBT χ^2 (2)	0.404
			LL	-115.37	JBT χ^2 (Prob.)	0.817

*Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof
 DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at the 5%, ***significance at 10%

Table 5 (Continued - Part D): NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)

AUSTRALIA - UNITED STATES						
AUD	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	-0.858	-4.239*	R ²	0.633	LMT F(2,53)	0.148
Δ(LnGDP)	-2.784	-4.065*	Adj. R ²	0.593	LMT F(Prob.)	0.863
Δ(LnEXR)	-0.947	-0.326	F(6,55)	15.84*	BPGT F(5,56)	0.966
Δ(LnMS)	-3.556	-1.252***	F(Prob.)	0.000	BPGT F(Prob.)	0.446
Δ(LnIR)	1.093	1.339***	DW	1.932	RESET F(1,54)	5.446**
LnSVR	0.013	1.852**	AIC	1.032	RESET F(Prob.)	0.023
AR(1)	0.749	8.365*	SC	1.272	JBT χ^2 (2)	0.514
			LL	-24.995	JBT χ^2 (Prob.)	0.773
QTY	DEPENDENT VARIABLE: LnX/M					
	Coefficient	t-ratio	Diagnostic Results			Note:
Constant	0.079	0.234	R ²	0.482	LMT F(2,53)	2.81***
Δ(LnGDP)	1.014	0.742	Adj. R ²	0.425	LMT F(Prob.)	0.069
Δ(LnEXR)	3.220	0.557	F(6,55)	8.517*	BPGT F(5,56)	1.566
Δ(LnMS)	0.310	0.055	F(Prob.)	0.000	BPGT F(Prob.)	0.185
Δ(LnIR)	-0.713	-0.444	DW	2.009	RESET F(1,54)	1.223
LnSVR	-0.005	-0.397	AIC	2.353	RESET F(Prob.)	0.274
AR(1)	0.703	7.268*	SC	2.593	JBT χ^2 (2)	6.819**
			LL	-65.952	JBT χ^2 (Prob.)	0.033

Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof
 DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%

As indicated in Table 5, out of the 16 NX models in Category 87, 13 models are significant and 3 NX models with China and Thailand based on AUD; and France based on QTY, are not significant, while in most of the models, the majority of the variables are not significant.

The variables GDP, EXR, MS, and SVR are significant in 5, 4, 3 and 3 out of the 16 models respectively, while the variable IR is significant in 8 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 6 out of the 16 models (3 based on AUD and 3 based on QTY), while for these 6 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.873 and -2.784), (-0.321 and -11.403), (-0.812 and -3.556), (0.313 and 8.250) and (0.002 and 6.292) respectively. Finally, the Adj. R-Square in overall for all 16 models in this category ranges between 3.4 and 74.8 per cent respectively.

In overall, out of the 16 estimated models in this category, only 2 models (the NX with China and Germany both based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 2.264 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 3.837 and 2.105 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 8.25 per cent, on average, while a 1 per cent increase in SVR will increase the NX growth rate by 6.292 per cent. The NX model with Germany shows that a 1 per cent growth rate in the GDP and EXR will decrease the NX by 1.358 and 11.403 per cent respectively, a 1 per cent increase in the MS will decrease the NX by 2.361 per cent, on average, while a 1 per cent growth rate in the IR and SVR will increase the NX by 1.05 and 0.002 per cent respectively. The variables GDP, EXR, MS and IR in these 2 models are all elastic and the variables SVR is mixed. Finally, the Adj. R-Square for China and Germany in these 2 models is 42.8 and 41.1 respectively.

VI. Empirical Summary and Policy Implications

Overall, 49 out of the 58 models are significant, while the remaining 9 models³⁵ are not significant. The correct coefficient signs for all the variables GDP, EXR, MS, IR and SVR are found in 17 out of the 58 models (8 based on AUD and 9 based on QTY). Furthermore, for these 17 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.017 and -4.138), (-0.321 and -46.873), (-0.017 and -44.979), (0.151 and 8.250) and (0.002 and 6.292) respectively. Finally, the Adj. R-Square in overall for all of the 58 models ranges between 0.2 and 74.8 per cent.

Overall, out of the 58 estimated models, 12 models (the NX with Germany for Category 30 - based on AUD values; China and the United States of America for Category 30 - based on QTY values; China, Thailand and the United Kingdom for Category 84 - based on AUD values; China and The United Kingdom for Category 84 - based on QTY values; China for Category 85 - based on AUD values; Singapore for Category 85 - based on QTY values; China and Germany for Category 87 - based on QTY values) have the correct signs and have satisfactory passed all diagnostic tests. Furthermore, for these 12 models, the coefficients range for the variables GDP, EXR, MS, IR and SVR are between (-0.017 and -4.138), (-1.098 and -46.873), (-0.017 and -44.979), (0.151 and 8.250) and (0.002 and 6.292) respectively. Additionally, the variables GDP, EXR, MS, IR and SVR in these 12 models are also significant finally, the Adj. R-Square for these 12 models ranges between 9.3 and 44.9 per cent respectively.

Almost all NX models estimated are significant, and the estimated models produced similar results based on both AUD and QTY values. Further, overall results suggest that the relative GDP, EXR and the relative MS are elastic variables, which show that relative changes in income, EXR and the MS are very responsive to the level of the NX (trade balance) in these selected TD categories. The most responsive (elastic) variables to the level of the NX is the EXR, followed by relative income, MS and IR. The elasticity for the relative IR is mixed, while the relative SVR is the least responsive variable, as it is mostly inelastic.

On the other hand, the most significant variables in the determination of the NX for all TD categories are a relative SVR; followed by a relative IR, MS and income, while the EXR variable proved to be the least significant. However, the significance and the responsiveness of the individual variables to the NX levels differ when estimated coefficients are observed on a category-by-category basis.

For Category 30, the most significant variables in the determination of the NX level is the relative SVR, followed by the relative income and the EXR, while the variables relative MS and IR are the least significant. In addition, relative MS and the EXR are the most responsive (elastic) variables to the NX levels in this category, followed by the relative income, interest and the SVR.

For Category 84, the most significant variables in the determination of the NX level is the relative SVR, followed by relative income, EXR and the IR, while the variable relative MS is the least significant. In addition, the EXR is the most responsive (elastic) variable to the NX level in this category, followed by the relative MS, income, IR and the SVR.

For Category 85, the most significant variables in the determination of the NX level is the relative income, followed by the relative IR, the SVR and the EXR, while the variable relative MS is the least significant. In addition, the EXR is the most responsive (elastic)

³⁵ Germany for the Category 30 - based on AUD, Malaysia and Thailand for the Category 30 - based on QTY, Germany, Malaysia and Singapore for the Category 85 - based on AUD, China and Thailand for the Category 87 - based on AUD and France for the Category 87 - based on QTY.

variable to the NX levels in this category, followed by the relative MS, income, interest and the SVR.

For Category 87, the most significant variables in the determination of the NX level is the relative IR, followed by the relative savings, the income rates and the EXR, while the variable relative MS is the least significant. In addition, the relative IR and the EXR are the most responsive (elastic) variables to the NX levels in this category, followed by the relative income, MS and the SVR.

In summary, the overall results in the estimated NX models that did not satisfactory pass all diagnostic tests should be viewed with caution; as these NX models require further improvements. These improvements include and are not limited to further corrections, adjustments and/or even considerable modification of most of the models in order to obtain more reliable models which will in turn, make it possible to get a clearer understanding of the determinants of the NX with the selected TD countries in the selected TD categories. Despite, these limitations the estimated NX models which did not satisfactory pass all diagnostic tests are revealing valuable information that can be utilized by trade policy makers and various parties involved in international trade in these selected TD categories.

Finally, by observing only 12 models (5 based on AUD and 7 based on QTY values) that have the correct a-priory signs and have satisfactorily passed all diagnostic tests, the main findings are rather different to the remaining 46 models. The most significant variables in the determination of the NX for all TD categories in these 12 models is a relative income and the EXR; followed by a relative MS and IR, while the relative SVR variable proved to be the least significant. Additionally, the most responsive (elastic) variables to the level of the NX in these 12 models is the EXR, followed by a relative MS, income and IR, while the relative SVR is the least responsive variable.

The most important findings of this study for the models which have satisfactorily passed all diagnostic tests that relationship between the NX (trade balance) and the GDP, EXR and MS is positive, while the relationship between the NX and the IR and SVR is negative. This finding for the independent variables GDP, EXR and MS is consistent with earlier studies conducted by Kyereme (2002) and Duasa (2007) and also with the theoretical expectations. However, the independent variable EXR in this study found to be the second most significant variable (after the GDP, which found to be the most significant variable) in determining the NX in these TD categories, while the studies by Kyereme (2002) and Duasa (2007) found a rather weak or non-existent relationship between the NX and the EXR. This inconsistent finding could be due to numerous reasons; one of the reasons could be that unlike the existing studies which analyse aggregated X and M volumes, this study analyses the specific TD categories. This suggests that the relationship between the NX and the EXR is important in determination of the NX volumes and hence supports for the 'elasticity approach' or as 'imperfect substitute' model when the NX models are estimated. Furthermore, this finding also suggests that the relationship between the NX and the EXR is likely to require further research before definite conclusions are being made. Finally, another important finding in this study is that, the SVR is the least significant and the least responsive variable to the NX levels in these selected TD categories.

Overall the major findings in this study suggests that changes in the relative income and the EXR can have a significant effect on the trade volume in the selected TD categories, while the relative SVR does not have significant effect on the NX levels in these categories.

VII. Conclusions

Overall, the NX models in this study is examined from absorption, elasticity and a monetary perspective, in order to divulge the determinants of the trade balance between Australia and the selected TD countries in the selected TD categories.

The three major differences between this study and the existing ones that estimate the NX models could be summarised as follows: Firstly, unlike the existing NX models in the literature which uses the dependent variable of the overall aggregated X, and M volumes, the dependent variable in this study refers to the specific TD categories. This approach reveals that the specific information as to which variable(s) are significant in the determination of the X and M levels on a category-by-category basis. Secondly, unlike existing studies which only estimate the NX on monetary values, this study estimates the NX based on both the monetary and QTY values for each selected TD category. This allows for a comparison of the disparities (comparative analysis) and an evaluation of the corresponding results from 2 different perspectives. Thirdly, unlike existing NX models, this study incorporates the SVR as an additional independent variable. According to IS-LM framework, the inclusion of such as variable is justifiable. This approach to the best of our knowledge, has not been used in any previous studies, which at the same time, is one of the significant contributions of this study.

Overall, 49 out of 58 NX models are significant, while 12 out of 58 models (5 based on AUD and 7 based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The most significant explanatory variables in the determination of the NX in these models are the relative income and the EXR; closely followed by relative MS and IR, while the relative SVR variable is the least significant. Furthermore, in respect to the most responsiveness to the NX levels, the most responsive variable in these models is the EXR, followed by relative MS, income and IR, while the relative SVR is the least responsive variable.

In summary, the overall findings suggest that, most of the estimated NX models require further improvements. These improvements include and are not limited to further corrections, adjustments and/or even considerable modification of most of the models, in order to obtain more reliable models. This in turn will make it possible to get an overall understanding of the determinants of the NX with all selected TD countries and in all selected TD categories.

Despite these shortcomings, the overall results in this study provide valuable information that can be utilized for trade policy makers when assessing the growing TD deficit in these categories between Australia and the selected TD countries and relevant industries involved in the international trade in these categories. The findings in this study ascertain what the macroeconomic variables and the extent to which these are influencing the NX levels in the selected categories. Findings in this study suggest that macroeconomic variables such as money supply, interest rates and savings rates are having an insignificant effect in the determination of the NX levels in the selected categories. This highlights that domestic monetary policy cannot influence the NX levels in the selected TD categories in Australia. Hence, fiscal policy is more powerful in influencing the NX levels in Australia. It is advisable that governments pay particular attention to the effectiveness of fiscal policy in influencing the NX levels in Australia.

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