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Climate Change Mitigation, Economic Growth And The Distribution of Income

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Abstract

In October 2008, the Australian Government released a major report on *Australia's Low Pollution Future: The Economics of Climate Change Mitigation*. In that report, various scenarios are used to explore the potential economic effects of climate mitigation policy in Australia. One of the scenarios, designated CPRS-5, a Carbon Pollution Reduction Scheme (CPRS) aims to reduce emissions to 5 per cent below 2000 levels by 2020. It is consistent with stabilisation at around 550 parts per million of carbon dioxide equivalent (ppm CO₂-e) in the atmosphere by 2100.

In assessing the likely effects these policies on the future growth of output and employment by industry, the Government's report relies mainly on economic modelling using the MMRF applied general equilibrium model of the Australian economy. Results are reported for 58 industries. This paper begins by using the same model to closely reproduce the analysis of the CPRS-5 scenario conducted for the report. However, this time the MMRF model is enhanced by a labour market extension MLME which allows the employment results to be extended to 81 occupations and 64 skill groups. The enhanced model is then used in a top-down configuration with an income distribution extension MIDE and a microsimulation extension MMSE to generate changes in income.

In MIDE, income redistributions between households (taken collectively), corporate trading enterprises, financial trading enterprises, the government and foreigners (the "institutions") are modelled by the inclusion of the associated current and capital accounts from the Australian System of National Accounts. Within the household sector, changes in disposable income from unincorporated enterprises (differentiated by 17 industries), compensation of employees (differentiated by 81 occupations), property income, and net transfers from other institutions are separately modelled. On the income side, one hundred types of recipient are identified corresponding to personal income percentiles. On the expenditure side, six hundred types of household are identified, this time differentiated by household income and the ages of its members. This arrangement allows changes in real income to be computed using household specific CPIs.

The microsimulation extension MMSE uses MIDE results to update the incomes of more than 13,500 persons. The effects of the climate change mitigation policies on the incomes of various socio-economic groups are then be obtained by aggregation.

JEL codes: C68, D31, D58, J23, O56, Q52

Keywords: CGE modelling, climate change mitigation, distribution of employment, distribution of income, microsimulation

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1. Introduction

In October 2008, the Australian Government released a report on *Australia's Low Pollution Future: The Economics of Climate Change Mitigation* (Australian Treasury, 2008). In preparing that report, it engaged the Centre of Policy Studies, Monash University to assist in the modelling of a number of scenarios using the MONASH Multi-Regional Forecasting (MMRF) model of the Australian economy. Two of those scenarios are considered here. The first is a Basecase scenario, or 'business as usual' projection, in which a sequence of annual forecasts is constructed using external forecasts for macro variables, extrapolations of recent trends in industry technologies and household tastes, and estimates of the effects of existing energy policies. In effect, the Basecase scenario shows what might be expected to happen if there were no change to existing greenhouse policies. The second, referred to as the CPRS-5 scenario, includes the effect of a carbon pollution reduction scheme designed to reduce emissions to 5 per cent below 2000 levels by 2020. It is consistent with stabilisation at around 550 parts per million of carbon dioxide equivalent (ppm CO₂-e) in the atmosphere by 2100.

The specification of the scenarios, the methodology for their implementation in MMRF, and an explanation of the model's results have all been provided in detail elsewhere¹. The purpose of the present paper is to extend the range of the MMRF results to include the distribution of employment and income. To this end, the projections of employment by industry at the national level² are fed into a model describing the operation of occupational labour markets. Results from both models are then used to drive a microsimulation model which generates income results.

The remainder of the paper is organised as follows. Sections 2, 3 and 4 respectively discuss the MMRF model, the labour market model and the microsimulation model, together with selected results derived from the related simulations. Section 5 provides concluding remarks.

¹ A general description of the MMRF model, including enhancements made to facilitate greenhouse gas analyses, is contained in Adams et al. (2003). Its particular application to the Treasury climate change simulations is described in a report by Centre of Policy Studies (2008). Details of the simulation design, results and explanations are provided in the main report by the Treasury (2008).

² The extended results do not contain a regional dimension.

2. The MMRF Simulations

MMRF is a detailed, dynamic, multi-sectoral, multi-regional, computable general equilibrium (CGE) model of the Australian economy. The version used here distinguishes 58 industries, 63 commodities, 8 states/territories and 56 sub-state regions. Of the 58 industries, three (*Coal*, *Oil* and *Gas*) produce primary fuels, one (*Petroleum Products*) produces refined fuel, six generate electricity and one supplies electricity to final customers. The six generation industries are defined according to primary source of fuel: *Electricity-coal* includes all coal-fired generation technologies; *Electricity-gas* includes all plants using gas turbines, Cogen and combined cycle technologies driven by burning gas; *Electricity-oil* covers all liquid-fuel generators; *Electricity-hydro* covers hydro generation; *Electricity-other* covers the remaining forms of renewable generation from biomass, biogas, wind etc. *Electricity-nuclear* is included for the sake of completeness. It can be triggered, if desired, at a specified CO2 price.

Apart from *Grains* and *Petroleum Products*, each industry produces a single commodity. The *Grains* industry produces grains for animal and human consumption and a small amount of biofuel. The *Petroleum Products* industry produces 5 commodities – *Gasoline*, *Diesel*, *LPG*, *Aviation Fuel*, and *Other Refinery Products*. Thus, 63 commodities in total are produced by the 58 industries.

There are five types of agents in the model: producers, investors, households, governments, and foreigners. For each industry in each region there is an associated investor who assembles units of capital that are specific to the industry. Each region in contains a single household and a regional government. There is also a federal government. Finally, there are foreigners whose behaviour is summarised by export demand curves for the commodities of each region and by supply curves for international imports to each region.

MMRF determines regional supplies and demands of commodities through optimising behaviour of agents in competitive markets. Optimising behaviour also determines industry demands for labour and capital. Labour supply at the national level in the long run is determined by demographic factors, while national supply of capital responds to changes in rates of return. Labour and capital can cross regional borders so that each region's endowment of productive resources reflects regional employment opportunities and relative rates of return.

The specifications of the supply of, and the demand for, commodities are co-ordinated through market clearing equations which comprise the general equilibrium core of the model. There are four blocks of equations in addition to the core. The first two describe regional and federal government finances, and the operation of regional labour markets. The third block contains dynamic equations that describe physical capital accumulation and lagged adjustment processes in the national labour market. The final block contains enhancements for the study of greenhouse gas issues.

The national employment projections from MMRF for the two scenarios are set out in Table 1³. In most cases, the difference between terminal-period (2024-25) employment in the Basecase and CPRS-5 scenarios for a particular industry is small compared to the growth in employment between the base period (2004-05) and the terminal period. This result is evident in the similarity of the growth rate rankings shown in the table. The industry 7 *Forestry* and the forestry-intensive industry 17 *Wood Products* improve their rankings the most when CPRS-5 is introduced. The industries 8 *Coal* and 32 *Electricity Supply*, together with the electricity-intensive industry 27 *Aluminium*, suffer the largest falls in their rankings.

MMRF tracks emissions of greenhouse gases at a detailed level. It breaks down emissions according to emitting agent (58 industries and a residential category), emitting state or territory (8) and emitting activity (8). Most of the emitting activities are the burning of fuels (*Coal, Natural Gas* and the five types of petroleum products). A residual category, named *Activity*, covers emissions such as fugitives and agricultural emissions not arising from fuel burning.

The resulting $58 \times 8 \times 8$ matrix of emissions is designed to include all emissions except those arising from land clearing. Emissions are measured in terms of carbon dioxide equivalents. MMRF accounts for domestic emissions only, so a change in world emissions as a result of an increase of Australian exports of, say, coal is not accounted for.

³ As noted above, the MMRF model contains six different industries for producing and distributing electricity. As no information was available for differentiating between the mix of occupations in these industries, they have been combined into a single industry in this paper. The industry as a whole accounts for less than half a per cent of aggregate employment, so the results of the analysis are unlikely to be significantly compromised.

Table 1. Employment by Industry, Thousands of Hours Per Week

Code	Industry	(1)	(2)	(3)	(4)	(5)
		2004-05	Basecase 2024-25		CPRS-5 2024-25	
			Growth (%)	Rank	Growth (%)	Rank
1	Sheep and Cattle	4401	54.99	4	51.72	4
2	Dairy	933	28.78	10	34.56	10
3	Other Animal Farming	530	-25.05	46	-20.38	40
4	Grains	3735	67.05	3	73.63	3
5	Other Agriculture	4243	44.99	7	48.93	6
6	Agricultural Services and Fishing	1585	18.58	15	21.77	14
7	Forestry	495	1.32	21	25.74	12
8	Coal	754	-6.87	32	-20.10	39
9	Oil	200	-23.52	44	-23.02	44
10	Gas	48	5.41	19	1.70	21
11	Iron Ores	521	23.58	13	29.02	11
12	Non-ferrous Metal Ores	1315	-19.40	40	-19.67	37
13	Other Mining	1047	-22.09	42	-20.81	41
14	Meat Products	1829	10.21	18	6.77	18
15	Other Food Products	4493	1.05	22	4.24	20
16	Textile, Clothing and Footwear	2100	-23.48	43	-21.84	43
17	Wood Products	2416	-3.67	30	0.11	22
18	Paper Products	704	-8.85	33	-6.60	31
19	Printing	3826	-1.39	27	-0.60	27
20	Refinery Products	224	21.27	14	6.07	19
21	Chemicals	1950	-36.56	51	-35.37	51
22	Rubber and Plastic Products	1476	-15.64	37	-14.35	35
23	Non-metal Construction Products	658	-14.90	36	-13.34	34
24	Cement	1031	-1.98	28	-3.11	29
25	Iron and Steel	1048	-24.94	45	-23.62	45
26	Alumina	176	43.77	8	39.51	8
27	Aluminium	641	26.82	11	-21.10	42
28	Other Metals Manufacturing	480	-71.76	52	-67.20	52
29	Metal Products	3438	-17.96	38	-19.15	36
30	Motor Vehicles and Parts	3367	-27.98	48	-26.32	47
31	Other Manufacturing	8085	-21.06	41	-20.02	38
32	Electricity Supply	1845	-18.22	39	-23.89	46
33	Gas Supply	190	-30.93	49	-32.06	50
34	Water Supply	829	-27.93	47	-27.61	48
35	Construction	31073	15.33	17	11.97	16
36	Trade	59879	16.20	16	15.58	15
37	Accommodation and Hotels	14365	51.26	6	48.92	7
38	Road Transport, Passengers	2180	-4.72	31	-5.98	30
39	Road Transport, Freight	7430	-9.84	35	-10.01	33
40	Rail Transport, Passengers	852	5.31	20	11.08	17
41	Rail Transport, Freight	568	-2.26	29	-2.68	28
42	Water Transport	473	-9.50	34	-9.54	32
43	Air Transport	5172	80.02	2	79.00	2
44	Community Services	6421	-31.30	50	-31.50	49
45	Financial Services	12626	24.31	12	24.37	13
46	Business Services	39472	97.82	1	97.30	1
47	Ownership of Dwelling	0	0.00	26	0.00	26
48	Public Services	67890	39.17	9	39.29	9
49	Other Services	19634	52.77	5	51.03	5
50	Private Transport	0	0.00	25	0.00	25
51	Private Electricity	0	0.00	24	0.00	24
52	Private Heating	0	0.00	23	0.00	23
53	All Industries	328670	31.29		30.73	

Table 2. Emission Intensities, Selected Industries, 2004-05.

Code	Industry	(1)	(2)	(3)	(4)
		Direct Intensities		Adjusted Intensities	
		Intensity	Rank	Intensity	Rank
1	Sheep and Cattle	4.400	2	1.477	7
2	Dairy	1.818	4	0.379	15
7	Forestry	-8.263	52	-2.644	52
8	Coal	1.034	7	1.020	9
9	Oil	0.119	28	0.042	46
14	Meat Products	0.008	46	1.984	4
17	Wood Products	0.047	35	-0.525	51
18	Paper Products	0.211	25	-0.129	50
24	Cement	1.738	5	0.485	11
26	Alumina	1.573	6	1.685	5
27	Aluminium	0.826	12	3.194	1
29	Metal Products	0.005	48	0.283	22
30	Motor Vehicles and Parts	0.003	49	0.107	37
32	Electricity Supply	6.553	1	2.998	2
33	Gas Supply	0.780	13	0.024	47
35	Construction	0.011	43	0.106	38
45	Financial Services	0.000	51	0.004	49
46	Business Services	0.006	47	0.055	45
47	Ownership of Dwelling	0.000	50	0.012	48
51	Private Electricity	0.073	32	1.646	6
52	Private Heating	0.722	14	2.088	3
53	All Industries	0.248		0.248	

Notes. 1. Intensities are expressed as emissions per unit output. Emissions are measured in kilotonnes of CO₂ equivalent. The unit of output is the amount that can be bought for \$1million in 2004-05. Adjusted intensities are obtained by attributing the emissions associated with the production of intermediate inputs to the using industry.

Table 2 shows the emissions intensities (i.e., the emissions per unit output) in 2004-05. Emissions are measured in kilotonnes of CO₂ equivalent. The unit of output is the amount that can be bought for \$1million in 2004-05. According to column 1 of Table 2, the industry 27 *Aluminium* is only a moderate emitter of greenhouse gases (rank 12). However, the industry uses large amounts of 32 *Electricity* in its production, and *Electricity* has the highest emissions intensity. Hence, a better indicator of the influence of the various industries on atmospheric pollution can be obtained by attributing the emissions associated with the production of intermediate inputs to the using industry. This is done in column 3 of Table 2. According to the adjusted emissions intensities, *Aluminium* rather than *Electricity* is the worst polluter. The intensity for *Electricity* is more than halved, with significant electricity-related emissions now being attributed to 51 *Private Electricity* and 52 *Private Heating* as well as to *Aluminium*. Similarly, some of the emissions produced by 1 *Sheep and Cattle* are attributed to 14 *Meat products* and 16 *Textiles, Clothing and*

Footwear, some produced by *2 Dairy* are attributed *15 Other Food Products*, and some produced by *33 Gas Supply* are attributed to *52 Private Heating*. On the other side of the pollution ledger, some of the reduction in emissions resulting from production in the industry *7 Forestry* are now attributed to the industries which use forestry products as inputs, particularly *17 Wood Products* and *18 Paper Products*. The change to the accounting system reduces the range of the emission intensities by more than half.

The emissions intensities change over time in response to the mitigation policy. The average intensity drops from 0.248 in 2004-05 to 0.208 in 2024-25 in the Basecase scenario, and to 0.148 in the CRPS-5 scenario.

3. The Labour Market Simulations

The labour market effects of the climate change mitigation policy are analysed using the MONASH Labour Market Extension (MLME). This model is designed to be incorporated in the MONASH CGE model (Dixon and Rimmer, 2002), the national model from which the multi-region MMRF model is derived. It describes markets for 81 occupations, the minor groups of the Australian Standard Classification of Occupations. Its purpose is to allow supply constraints on labour by skill to be imposed on demands for labour by industry via the occupational markets. In principle, 67 skill groups are identified, consisting of six education levels cross classified with eleven educational fields plus the residual category No Post-School Qualification. However, three of these categories contained no entries in the base period data and, for operational purposes, the number of groups was reduced to 64. All skill categories are derived from the Australian Standard Classification of Education.

On the supply side, labour by skill can be converted into labour by occupation according to Constant Elasticity Transformation (CET) functions. Figure 1 presents the idea diagrammatically. The position of the transformation curve is determined by the supply of the skill. If the wage rate of occupation 2 increases relative to that of occupation 1, the isorevenue line becomes steeper, and the owners of the skill can increase their income by transforming some of occupation 1 into occupation 2. Hence, they change the occupational mix from E_1 to E_2 . In principle, each of the 64

Figure 1 : Skill Transformations between Occupations

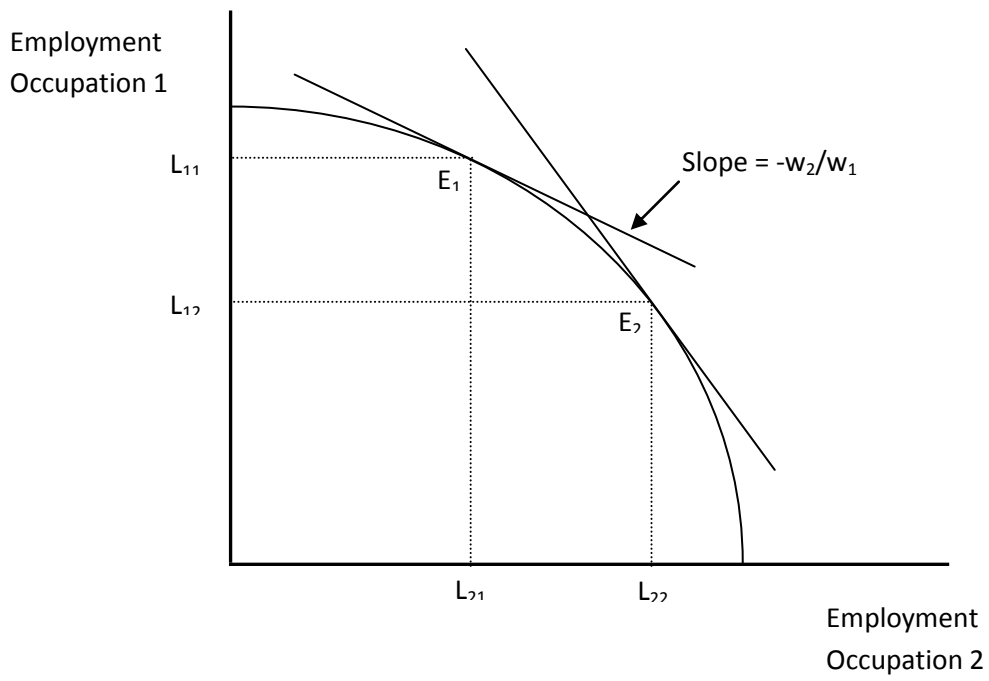
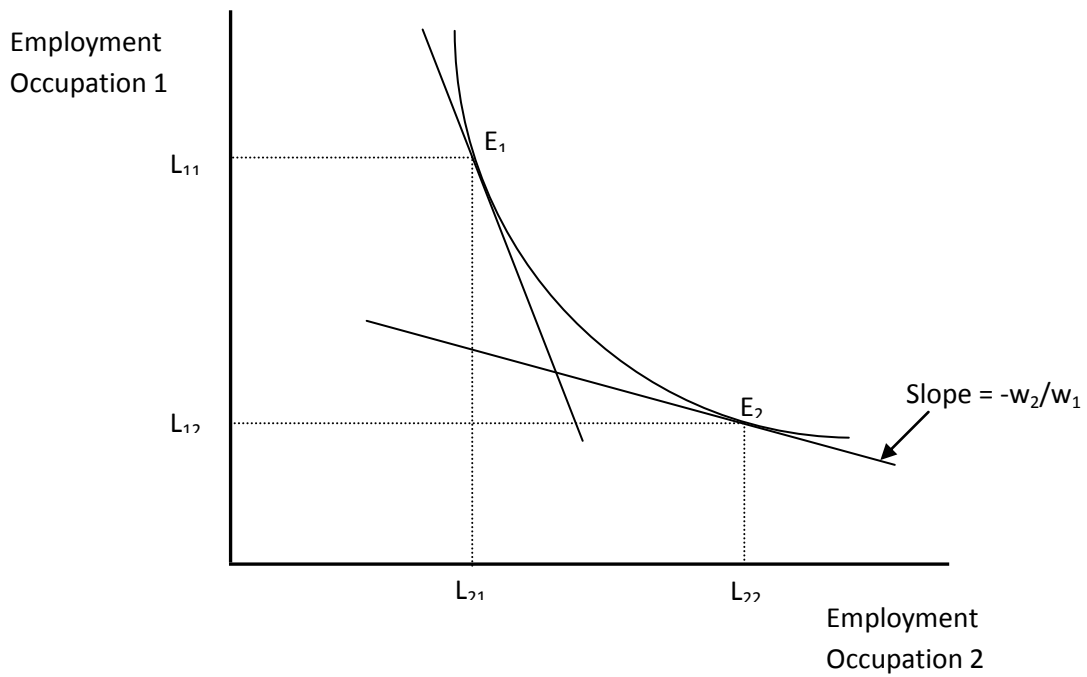


Figure 2: Substitution between Occupations in Industries



skills can be transformed into any of the 81 occupations. However, if none of a particular skill is used in a particular occupation in the base period, none of it will be used in that occupation in any of the simulations.

Labour of different occupations can be converted, in turn, into effective units of industry specific labour according to Constant Elasticity Substitution (CES) functions. In Figure 2, the position of the isoquant is determined by the demand for labour in the industry. If the wage rate of occupation 2 decreases relative to that of occupation 1, the isocost line becomes flatter, and the producers in the industry can reduce their costs by substituting some of occupation 2 for occupation 1. Hence they change the occupational mix from E_1 to E_2 . In principle, each of the 52 industries can employ any of 81 occupations but, as before, none of a particular occupation will be used by an industry in a simulation if none of it was used by that industry in the base period.

As the isoquant is convex to the origin, the number of hours of occupation 2 required to replace an hour of occupation 1 and remain on the isoquant (i.e., and deliver the same amount of industry-specific labour) increases as the amount of occupation 2 already being used increases. More generally, the efficiency of an additional hour of an occupation in an industry decreases as the number of hours of the occupation already being used in that industry increases. In the MONASH and MMRF model, employment by industry is measured in efficiency units. In the MLME model, separate accounting systems are maintained for labour measured in efficiency units and labour measured in hours. However, results are only reported in terms of the latter.

In MMRF, the average real-wage is initially assumed to be sticky so employment can deviate from its Basecase value in response to the CPRS. Over time, though, it is assumed that real wage adjustment steadily eliminates most, if not all, of the short-run consequences for aggregate employment. This means that, in the long run, the costs of reducing emissions are realised almost entirely as a fall in the average real wage rate, rather than as a fall in aggregate employment. This labour market assumption reflect the idea that in the long-run aggregate employment is determined by demographic factors, which are largely unaffected by the adoption of an emissions reduction policy. Relative wage rates across industries are assumed to remain constant at the levels that prevailed in the base period, 2004-05.

Here, MLME is used in a top-down configuration with MMRF. In other words, MLME accepts the assumption of constant relative wage rates, and accepts the values of aggregate employment,

employment by industry and the average wage rate determined by MMRF. That being the case, there is no room for imposing labour supply constraints in MLME and the supply of labour by skill plays no role in the determination of the distributional results. Each industry simply retains the same mix of occupations that it employed in the base period.

Table 3 presents MLME results for the two simulations. According to the table, employment of the occupation *1 General Managers and Administrators* was 2618 thousand hours per week (thpw) in 2004-05. For the Basecase, employment of the occupation is projected to increase to 3499 thpw in the terminal period (i.e., 2024-25). For the CPRS-5 simulation, the increase is only 3486 thpw. Hence, relative to base period employment, the implementation of the mitigation policy results in a reduction in employment of 0.493 per cent. If the 81 ASCO minor groups are reordered according to the increase in employment projected for the terminal period, *1 General Managers and Administrators* is ranked 47th.

The occupation with the largest increase is *7 Farmers and Farm Managers*, its employment increasing by 2.161 per cent. The source of the increase can be understood in terms of the contributions of the industries which provide employment to the occupation. Table 4 shows the most important contributors, both positive and negative. Not surprisingly, all are agricultural industries. Australia is a large exporter of agricultural and mining commodities, and of processed food. From Table 2, several of these industries (including *1 Sheep and Cattle*, *8 Coal* and *14 Meat Products*) also have high emission intensities. When the CPRS is introduced, their costs increase and their exports fall, inducing a depreciation of the Australian dollar. All export-oriented and import-competing industries benefit from the change in the exchange rate. For industries *4 Grain*, *5 Other Agriculture*, *2 Dairy* and *3 Other Animal Farming*, the exchange-rate effect is sufficient to deliver an increase in employment in the terminal period, and hence to deliver an increase in employment of *Farmers and Farm Managers*. For industry *1 Sheep and Cattle*, the emissions-intensity effect outweighs the exchange-rate effect and its employment decreases. However, the resulting negative contribution to *Farmers and Farm Managers* is more than offset by the contributions of the expanding agricultural industries.

Table 4 also identifies the main industry contributors for three other occupations with large employment increases in the terminal period. The occupations *79 Agricultural and Horticultural Labourers* and *66 Intermediate Textile Clothing and Related Machine Operators* are heavily

Table 3. Deviations in Demand for Labour, Relative Wage Rates Constant

Code	Occupation	(1)	(2)	(3)	(4)	(5)
		Employment 2004-05	Demand for Labour 2024-25			Rank
			Basecase	CPRS-5	Deviations	
1	General Managers and Administrators	2618	3499	3486	-0.493	47
2	Miscellaneous Generalist Managers	4301	4838	4769	-1.594	69
3	Resource Managers	2931	3989	3977	-0.410	36
4	Engineering Distribution and Process Managers	4751	5631	5614	-0.346	30
5	Sales and Marketing Managers	4348	5564	5546	-0.427	41
6	Miscellaneous Specialist Managers	3670	5174	5167	-0.187	26
7	Farmers and Farm Managers	9662	14504	14713	2.161	1
8	Natural and Physical Science Professionals	2436	3509	3526	0.709	6
9	Building and Engineering Professionals	5245	7539	7496	-0.832	62
10	Accountants Auditors and Corporate Treasurers	5539	8734	8709	-0.452	45
11	Sales Marketing and Advertising Professionals	3248	4286	4273	-0.392	34
12	Computing Professionals	6886	10933	10905	-0.405	35
13	Professionals	5281	8061	8039	-0.433	42
14	Medical Practitioners	2333	3257	3259	0.105	15
15	Nursing Professionals	5584	7823	7828	0.093	18
16	Miscellaneous Health Professionals	2727	3691	3691	-0.007	21
17	School Teachers	10642	14819	14831	0.115	14
18	University and Vocational Education Teachers	2046	2855	2857	0.089	19
19	Miscellaneous Education Professionals	1219	1729	1728	-0.057	23
20	Social Welfare Professionals	2864	4160	4148	-0.434	43
21	Miscellaneous Social Professionals	2993	5355	5343	-0.413	39
22	Artists and Related Professionals	4234	6121	6096	-0.599	54
23	Miscellaneous Professionals	1629	2271	2269	-0.098	24
24	Medical and Science Technical Officers	1124	1543	1545	0.259	11
25	Building and Engineering Associate Professionals	4246	5600	5540	-1.413	68
26	Finance Associate Professionals	4001	5161	5159	-0.043	22
27	Miscellaneous Business and Administration Associate Professionals	10806	16441	16380	-0.564	50
28	Shop Managers	10179	12166	12101	-0.637	56
29	Hospitality and Accommodation Managers	6829	10069	9939	-1.902	73
30	Miscellaneous Managing Supervisors (Sales and Service)	4225	5786	5763	-0.551	49
31	Enrolled Nurses	768	1078	1078	0.098	17
32	Welfare Associate Professionals	703	1018	1017	-0.148	25
33	Miscellaneous Health and Welfare Associate Professionals	845	1118	1119	0.146	13
34	Police Officers	1498	2288	2262	-1.700	71
35	Miscellaneous Associate Professionals	1751	2497	2481	-0.937	63

... continued

Table 3. (continued)

Code	Occupation	(1)	(2)	(3)	(4)	(5)
		Employment 2004-05	Demand for Labour 2024-25			Rank
			Basecase	CPRS-5	Deviations	
36	Mechanical Engineering Tradespersons	5157	5530	5500	-0.596	51
37	Fabrication Engineering Tradespersons	3306	3112	3058	-1.639	70
38	Automotive Tradespersons	5736	6617	6587	-0.522	48
39	Electrical and Electronics Tradespersons	7527	8440	8288	-2.021	74
40	Structural Construction Tradespersons	7695	8781	8573	-2.713	77
41	Final Finishes Construction Tradespersons	2387	2866	2801	-2.740	78
42	Plumbers	2547	2949	2874	-2.960	80
43	Food Tradespersons	3007	3769	3748	-0.682	59
44	Skilled Agricultural Workers	709	1032	1035	0.418	10
45	Horticultural Tradespersons	2366	3258	3230	-1.184	66
46	Printing Tradespersons	1078	1116	1123	0.672	7
47	Wood Tradespersons	1485	1337	1362	1.690	3
48	Hairdressers	1476	2245	2220	-1.707	72
49	Textile Clothing and Related Tradespersons	588	528	533	0.775	5
50	Miscellaneous Tradespersons and Related Workers	2838	3373	3338	-1.240	67
51	Secretaries and Personal Assistants	5218	7533	7500	-0.639	57
52	Advanced Numerical Clerks	3430	4618	4598	-0.599	53
53	Service Workers	1781	2650	2644	-0.325	28
54	General Clerks	4517	6119	6100	-0.413	38
55	Keyboard Operators	2577	3601	3592	-0.342	29
56	Receptionists	4291	6178	6160	-0.425	40
57	Intermediate Numerical Clerks	7537	9778	9752	-0.350	31
58	Material Recording and Despatching Clerks	4134	4978	4961	-0.412	37
59	Miscellaneous Intermediate Clerical Workers	4952	6575	6561	-0.276	27
60	Intermediate Sales and Related Workers	5348	6311	6286	-0.457	46
61	Carers and Aides	7355	10327	10330	0.034	20
62	Hospitality Workers	3737	5602	5522	-2.152	75
63	Miscellaneous Intermediate Service Workers	3970	6057	6026	-0.788	61
64	Mobile Plant Operators	4831	5805	5784	-0.440	44
65	Intermediate Stationary Plant Operators	2498	2520	2448	-2.877	79
66	Intermediate Textile Clothing and Related Machine Operators	964	855	863	0.860	4
67	Miscellaneous Intermediate Machine Operators	1703	1656	1665	0.491	8
68	Road and Rail Transport Drivers	12062	12364	12319	-0.369	33
69	Intermediate Mining and Construction Workers	1899	2006	1948	-3.051	81
70	Miscellaneous Intermediate Production and Transport Workers	5686	6586	6592	0.098	16
71	Elementary Clerks	1866	2115	2109	-0.352	32
72	Sales Assistants	13189	15676	15586	-0.680	58
73	Miscellaneous Elementary Sales Workers	4273	5428	5402	-0.618	55
74	Elementary Service Workers	3212	5256	5234	-0.688	60

... continued

Table 3. (continued)

Code	Occupation	(1)	(2)	(3)	(4)	(5)
		Employment	Demand for Labour 2024-25			Rank
		2004-05	Basecase	CPRS-5	Deviations	
75	Cleaners	4965	8147	8118	-0.599	52
76	Process Workers	4849	4669	4680	0.238	12
77	Product Packagers	2236	2463	2473	0.427	9
78	Mining Construction and Related Labourers	4422	5208	5105	-2.342	76
79	Agricultural and Horticultural Labourers	4112	5764	5838	1.808	2
80	Elementary Food Preparation and Related Workers	2462	3310	3286	-0.973	64
81	Miscellaneous Labourers and Related Workers	2493	3248	3220	-1.125	65
82	All occupations	328670	431506	429665	-0.560	

Notes. Columns 1 to 3 are measured in thousands of hours per week. Column 4 measures the deviations between the demand for labour in the CPRS-5 (column 3) and the Basecase (column 2) simulations expressed as a percentage of base period employment (column 1). The ranks in column 5 are based on the deviations in column 4.

influenced by the exchange rate depreciation, the former via the export-oriented agricultural industries previously discussed and the latter via the import-competing industry *16 Textiles Clothing and Footwear*. The occupation *47 Wood Tradespersons*, on the other hand, owes its employment increase to the industry *7 Forestry*; it alone has a negative direct emission intensity and a large negative intensity at that. Hence the introduction of the CPRS actually reduces the costs of production in *Forestry* and its down-stream processing industries *17 Wood Products* and *18 Paper Products*. The resulting employment increase in *Wood Products* is largely responsible for the favourable result for *Wood Tradespersons*.

Table 5 is similar to Table 4, but this time it identifies the industry contributors to the occupations which experience the largest reductions in employment in the terminal period. Prominent among them are the high emission-intensity industries *8 Coal* and *27 Aluminium*. However, the industry *35 Construction* is also an important negative contributor, and its emission intensity is relatively low. In this case, the result derives from the fact that several of the high emission-intensity industries are also very capital intensive. Hence, when the CPRS is introduced, the demand for investment goods falls relative to the demand for consumption goods, both private and public. It

Table 4. Contributions to Deviations in Employment, Expanding Occupations

Code	Occupation / Contributing Industry	(1)	(2)	(3)	(4)
		Employment Shares	Contributions to Employment		
			Basecase	CPRS-5	Deviations
7	Farmers and Farm Managers				
4	Grains	29.49	19.771	21.711	1.940
1	Sheep and Cattle	34.74	19.104	17.968	-1.136
5	Other Agriculture	18.71	8.420	9.156	0.736
2	Dairy	7.48	2.152	2.585	0.433
3	Other Animal Farming	2.69	-0.674	-0.548	0.126
	Other Industries	6.89	1.336	1.398	0.062
	All Industries	100.00	50.109	52.270	2.161
79	Agricultural and Horticultural Labourers				
5	Other Agriculture	31.89	14.346	15.600	1.254
4	Grains	9.08	6.087	6.684	0.597
1	Sheep and Cattle	10.70	5.881	5.532	-0.350
49	Other Services	13.82	7.295	7.054	-0.241
7	Forestry	0.76	0.010	0.196	0.186
	Other Industries	33.76	6.548	6.909	0.360
	All Industries	100.00	40.168	41.976	1.808
47	Wood Tradespersons				
17	Wood Products	35.26	-1.293	0.038	1.331
31	Other Manufacturing	50.50	-10.634	-10.112	0.522
35	Construction	4.49	0.689	0.537	-0.151
36	Trade	5.18	0.839	0.807	-0.032
30	Motor Vehicles and Parts	1.22	-0.340	-0.320	0.020
	Other Industries	3.36	0.779	0.779	0.001
	All Industries	100.00	-9.960	-8.271	1.690
66	Intermediate Textile Clothing and Related Machine Operators				
16	Textile Clothing and Footwear	58.67	-13.773	-12.815	0.958
27	Aluminium	0.40	0.108	-0.085	-0.193
31	Other Manufacturing	9.22	-1.941	-1.846	0.095
15	Other Food Products	2.70	0.028	0.114	0.086
35	Construction	2.04	0.312	0.244	-0.069
	Other Industries	26.98	4.027	4.009	-0.018
	All Industries	100.00	-11.238	-10.378	0.860

Notes. Column 1 contains employment shares, measured in per cent, for the base period 2004-05. Columns 2 and 3 contain the industry contributions, measured in percentage points, to the growth in employment of the nominated occupation between 2004-05 and 2024-25. Column 4 contains the contributions each industry makes to the deviations in employment of the nominated occupation, measured in percentage points. They are calculated by subtracting column 2 from column 3.

Table 5. Contributions to Deviations in Employment, Contracting Occupations

Code	Occupation / Contributing Industry	(1)	(2)	(3)	(4)
		Employment Shares	Contributions to Demand		
			Basecase	CPRS-5	Deviations
69	Intermediate Mining and Construction Workers				
8	Coal	11.65	-0.800	-2.341	-1.541
35	Construction	42.04	6.446	5.031	-1.415
27	Aluminium	0.41	0.110	-0.086	-0.196
11	Iron Ores	3.45	0.814	1.001	0.188
29	Metal Products	5.02	-0.902	-0.962	-0.060
6	Other Industries	37.43	-0.065	-0.092	-0.027
7	All Industries	100.00	5.602	2.551	-3.051
42	Plumbers				
35	Construction	86.67	13.289	10.372	-2.917
27	Aluminium	0.06	0.016	-0.012	-0.028
49	Other Services	0.85	0.447	0.432	-0.015
36	Trade	2.27	0.367	0.353	-0.014
29	Metal Products	0.70	-0.126	-0.135	-0.008
6	Other Industries	9.46	1.802	1.824	0.022
7	All Industries	100.00	15.795	12.835	-2.960
65	Intermediate Stationary Plant Operators				
27	Aluminium	5.97	1.601	-1.260	-2.861
35	Construction	12.80	1.963	1.532	-0.431
28	Other Metals Manufacturing	4.48	-3.213	-3.009	0.204
40	Rail Transport Passengers	2.38	0.126	0.263	0.137
29	Metal Products	10.20	-1.832	-1.954	-0.122
6	Other Industries	64.17	2.222	2.417	0.195
7	All Industries	100.00	0.866	-2.011	-2.877
41	Final Finishers Construction Tradespersons				
35	Construction	80.89	12.404	9.681	-2.723
46	Business Services	7.12	6.969	6.932	-0.037
36	Trade	3.24	0.524	0.504	-0.020
31	Other Manufacturing	1.96	-0.412	-0.392	0.020
17	Wood Products	0.42	-0.015	0.000	0.016
6	Other Industries	6.38	0.636	0.640	0.004
7	All Industries	100.00	20.106	17.366	-2.740

Notes. Column 1 contains employment shares, measured in per cent, for the base period 2004-05. Columns 2 and 3 contain the industry contributions, measured in percentage points, to the growth in employment of the nominated occupation between 2004-05 and 2024-25. Column 4 contains the contributions each industry makes to the deviations in employment of the nominated occupation, measured in percentage points. They are calculated by subtracting column 2 from column 3.

follows that industries which mainly service investment loose out to industries which mainly service the other major components of final demand. *Construction* is the prime example.

Policy proposals for climate change mitigation are often based on identifying jobs that can be considered to be “green” in some *a priori* sense. Once identified, the jobs are then recommended for government support of one kind or another as a way of reducing emissions. However, the definitions adopted are often very loose. It may reasonably be thought that a classification based on emission intensities would provide a more rigorous *a priori* definition, and hence provide a more reliable guide as to the contributions that various jobs might make to the mitigation process. Table 6 provides some evidence on this conjecture where “jobs” are identified with occupations.

Carbon pollution is emitted by industries. Hence the emission intensity of an hour of labour can be taken to depend only on the industry in which it is employed and not on the occupation or skill of the associated worker. In Table 6, emission intensities per hour computed according to this definition are compared with the corresponding employment deviations from Table 3. If a green job is taken to be one for which employment expands when the CPRS is introduced, emission intensity is not a reliable predictor of “greenness”. The occupations *7 Farmers and Farm Managers* and *79 Agricultural and Horticultural Labourers* both have high emission intensities but their employment increases more than that of any other occupation as a result of the mitigation policy. Similarly, the emission intensity of the occupation *42 Plumbers* is only moderate but its employment falls by more than that of any other occupation except *69 Intermediate Mining and Construction Workers*. Evidently, “greenness” also depends on other characteristics of a job such as the capital intensity and the exposure to international trade of the industry providing the job.

Table 6. Emission Intensities and Employment Deviations, Selected Occupations

Code	Occupation	(1)	(2)	(3)	(4)
		Emission Intensities		Employment Deviations	
		Intensity	Rank	Deviation	Rank
7	Farmers and Farm Managers	0.1362	79	2.161	1
8	Natural and Physical Science Professionals	0.0022	8	0.709	6
9	Building and Engineering Professionals	0.0849	76	-0.832	62
14	Medical Practitioners	0.0011	4	0.105	15
15	Nursing Professionals	0.0010	3	0.093	18
17	School Teachers	0.0008	2	0.115	14
18	University and Vocational Education Teachers	0.0016	5	0.089	19
31	Enrolled Nurses	0.0007	1	0.098	16
39	Electrical and Electronics Tradespersons	0.1436	80	-2.021	74
40	Structural Construction Tradespersons	0.0048	20	-2.713	77
41	Final Finishes Construction Tradespersons	0.0033	15	-2.740	78
42	Plumbers	0.0063	24	-2.960	80
47	Wood Tradespersons	0.0030	13	1.690	3
49	Textile Clothing and Related Tradespersons	0.0044	18	0.775	5
50	Miscellaneous Tradespersons and Related Workers	0.1104	78	-1.240	67
61	Carers and Aides	0.0016	6	0.034	20
65	Intermediate Stationary Plant Operators	0.0864	77	-2.877	79
66	Intermediate Textile Clothing and Related Machine Operators	0.0150	42	0.860	4
69	Intermediate Mining and Construction Workers	0.1538	81	-3.051	81
78	Mining Construction and Related Labourers	0.0202	50	-2.342	76
79	Agricultural and Horticultural Labourers	0.0496	70	1.808	2
82	All occupations	0.0267	82	-0.560	82

- Notes.
1. Intensities are expressed as emissions per unit of labour input in 2004-05. Emissions are measured in kilotonnes of CO₂ equivalent. Labour is measured in thousands of hours.
 2. The deviations in column 3 are the differences between employment in 2024-25 for the Basecase and CPRS-5 scenarios (see Table 4). They are expressed as a percentage of employment in 2004-05.

4. The Income Simulations

The effects of the mitigation policy on the distribution of income are assessed using two related models: the MONASH Income Distribution Extension (MIDE) and the MONASH Microsimulation Extension (MMSE)⁴. Like MLME, MIDE is designed to be incorporated in the MONASH national CGE model and serves two main functions. Firstly, it contains an aggregate social accounting

⁴ Much of the development work on these models is due to Pang (2014).

matrix made up of current and capital accounts for the household sector, corporate trading enterprises, financial trading enterprises and the government sector, and an account for external sector. These accounts identify the amounts of saving, borrowing and lending undertaken by the various institutions, and allow those variables to be constrained if required. Secondly, it describes income sources for 100 household types differentiated by size of income, and expenditure patterns for 600 household types differentiated by size of income (10 groups) and household composition. The two classifications are connected via a (100 x 600) disposable income matrix. This arrangement allows changes in the distribution of income by household to feed back into changes in expenditure by commodity. Again like MLME, MIDE is used in a top-down configuration with MMRF in the present simulations, and hence does not impose any constraints on the results of the latter. The MMSE model consists of a unit record data file containing 13605 person records derived from the Australian Income Distribution Survey (ABS, 1998) but modified to form a fully integrated system with the MLME database and MMRF database when aggregated to the national level. Consistency is imposed by adopting a hierarchy of sources in which the data at each level is a disaggregation of the data at the preceding level. The main components of the hierarchy are:

- the National Accounts organised into an aggregate social accounting matrix,
- the Input-Output Table,
- the Labour Force Survey,
- the Survey of Education and Work;
- the Income Distribution Survey, and
- The Household Expenditure Survey.

Results from the MMRF and MLME models are used to update many aspects of the unit records in the MMSE model. However, additional information is required to allocate changes in labour force status. To this end, a 2004-05 population matrix is compiled which cross-classifies 83 labour force status categories (employed persons differentiated by occupation, unemployed persons and persons not in the labour force) with 193 demographic categories (12 age groups, two sexes and eight regions). Projections to 2024-25 for the 81 occupations are available from MLME. Projections for the demographic groups and the remaining labour force categories are derived from published estimates by various public and private forecasters. The whole cross-classified

matrix is then updated using the RAS method. The updated matrix, in its turn, provides the where-with-all to revise the weights attached to the unit records.

Table 7 shows results for one of the nine institutional accounts that make up the social accounting matrix in MIDE, namely, the *Household current account*. MIDE contains enough theory to determine the values of all the categories in the account except *Net saving*, which is the residual between the income and expenditure sides. Note that the theory is not always particularly sophisticated, with several categories assumed to move with GDP.

Table 8 shows the corresponding projections for disposable income. *Disposable income* (which was \$631,510m in 2004-05) in Table 8 can be derived from *Total gross income* (\$808,252m) in Table 7 by subtracting *Consumption of fixed capital*, *Interest payments*, *Income taxes* and *Other taxes on income, wealth, etc.* As with the output and employment results, the effect of the mitigation policy on incomes is small compared to the income growth that is projected to occur between 2004-05 and 2024-25 whether the policy is adopted or not.

It has already been indicated that a change in *Compensation of employees* is the cumulative effect of changes in the employment of 81 occupations on the wages of the 13605 persons recognised in the MMSE model. Similarly, a change in *Income from own business* is the cumulative effect of changes in the return to capital in 17 different industries. The income distribution survey generally contains some persons who sustained losses from self employment in the year of the survey. To accommodate this kind of negative income, an estimate is made of the size of the capital stock in the self-employed sector, and the stock then allocated between the relevant persons in the microsimulation model. In particular, persons who achieved large profits *or* sustained large losses in the survey are allocated relatively large amounts of capital. Then, when a change occurs, profits are distributed in proportion to capital ownership rather than in proportion to income from own business before the change. One outcome of this treatment is that the income of the bottom decile tends to be relatively volatile, increasing more than average when the economy expands and decreasing more than average when the economy contracts. The outcome is evident in the distributional results shown in Table 9, where the bottom decile increases its share by a relatively large amount between 2004-05 and 2024-25.

Table 7. Household Current Account

Industry	(1)	(2)	(3)	(4)	(5)
	2004-05	Basecase 2024-25		CPRS-5 2024-25	
	Level (\$m)	Level (\$m)	Growth (%)	Level (\$m)	Growth (%)
Direct income from factors of production	571330	998864	89.80	960461	81.73
Gross operating surplus, dwellings	63690	99544	67.55	95991	60.86
Gross mixed income	99210	188957	108.55	181777	99.87
Compensation of employees	408431	710364	88.71	682694	80.58
Domestic producers	407358	708498	88.71	680900	80.58
Foreign producers	1073	1866	88.71	1793	80.58
Transfers from households	2530	4905	112.69	4743	104.98
Transfers from non-financial corporations	16238	31486	112.69	30443	104.98
Transfers from financial corporations	89427	173404	112.69	167661	104.98
Transfers from general government	128282	243858	108.11	236153	100.91
Transfers from external sector	445	863	112.69	834	104.98
Total gross income	808252	1453381	95.78	1400296	87.90
Private final consumption expenditure	544241	928381	84.70	909825	80.61
Domestic commodities	471203	783229	79.46	766928	75.31
Imported commodities	34666	78734	152.54	77959	149.86
Taxes less subsidies on products	38372	66417	87.71	64939	83.08
Direct taxes	96727	155082	72.40	149940	66.02
Income tax	94108	150799	72.29	145797	65.91
Other current taxes on income wealth etc	2619	4283	76.27	4143	69.85
Current transfers to households	2530	4905	112.69	4743	104.98
Current transfers to non-financial corporations	5834	11312	112.69	10938	104.98
Interest payments	5803	11253	112.69	10880	104.98
Other	31	60	112.69	58	104.98
Current transfers to financial corporations	74642	144734	112.69	139940	104.98
Interest payments	39051	75723	112.69	73215	104.98
Other	35590	69011	112.69	66725	104.98
Current transfers to general government	417	808	112.69	781	104.98
Current transfers to external sector	3879	7521	112.69	7272	104.98
Net saving	30900	116188	331.21	95576	251.17
Consumption of fixed capital	49082	84449	86.47	81280	78.72
Dwellings owned by persons	24588	38430	67.55	37058	60.86
Other	24494	46019	105.45	44222	96.65
Total use of gross income	808252	1453381	95.78	1400296	87.90

Table 8. Household Disposable Income

Industry	(1)	(2)	(3)	(4)	(5)
	2004-05	Basecase	2024-25	CPRS-5	2024-25
	Level (\$m)	Level (\$m)	Growth (%)	Level (\$m)	Growth (%)
Income from dwellings, landlords					
Gross operating surplus	17002	26573	56.29	25624	50.72
<i>less</i> consumption of fixed capital	6563	10258	56.29	9892	50.72
<i>less</i> interest payments	6111	9551	56.29	9210	50.72
Income from own business					
Gross mixed income	99210	188957	90.46	181777	83.22
<i>less</i> consumption of fixed capital	24494	46019	87.88	44222	80.54
<i>less</i> interest payments	8039	15278	90.06	14711	83.00
Compensation of employees	408431	710364	73.93	682694	67.15
Actual interest	24786	48062	93.91	46470	87.48
Dividends	12391	24028	93.91	23232	87.48
Unemployment benefits	7621	9891	29.78	9936	30.37
Other taxable benefits	73258	142051	93.91	137346	87.48
Other current transfers, taxable	16779	32535	93.91	31457	87.48
Income from dwellings, owner occupiers					
Gross operating surplus	46688	72971	56.29	70367	50.72
<i>less</i> consumption of fixed capital	18025	28172	56.29	27167	50.72
<i>less</i> interest payments	16784	26232	56.29	25296	50.72
Imputed interest	33703	65352	93.91	63187	87.48
Social assistance benefits, non-taxable	20144	39060	93.91	37766	87.48
Other current transfers, non-taxable	48239	93539	93.91	90440	87.48
<i>less</i> Income taxes	94106	150797	60.24	145795	54.93
<i>less</i> Other taxes on income wealth etc	2619	4283	63.56	4143	58.21
Disposable income	631510	1162790	84.13	1119860	77.33

More generally, the mitigation policy tends to reduce the amount of income inequality, with the ratio of the nominal disposable incomes of the 90th and 10th percentiles falling from 29.058 to 28.938. The table also shows the effect on real disposable incomes where the change in the nominal income of each percentile has been deflated by the percentile-specific consumer price index. The policy again reduces the inequality index. The results do not lend any support to the conjecture that mitigation policy is likely to penalise low-income groups because they spend a disproportionate amount of their income on commodities, particularly electricity, whose prices will rise.

Table 9. Distribution of Household Disposable Income

Industry	(1)	(2)	(3)	(4)	(5)	(6)
	2004-05		Basecase 2024-25		CPRS-5 2024-25	
	Level (\$m)	Share (%)	Level (\$m)	Share (%)	Level (\$m)	Share (%)
Nominal incomes						
Income deciles						
1st	-429	-0.068	1515	0.130	1384	0.124
2nd	10296	1.630	19058	1.639	18421	1.645
3rd	24052	3.809	44727	3.847	43238	3.861
4th	33975	5.380	63505	5.461	61426	5.485
5th	40127	6.354	74168	6.378	71723	6.405
6th	49311	7.808	90394	7.774	87134	7.781
7th	61876	9.798	112882	9.708	108610	9.699
8th	80639	12.769	146596	12.607	140945	12.586
9th	109810	17.389	199893	17.191	192242	17.167
10th	221854	35.131	410052	35.264	394738	35.249
	631510	100.000	1162791	100.000	1119860	100.000
Income percentiles						
10th	434	0.069	799	0.069	772	0.069
90th	12783	2.024	23211	1.996	22332	1.994
90th/10th		29.472		29.058		28.938
Real incomes						
Income deciles						
1st	-429	-0.068	1518	0.131	1385	0.124
2nd	10296	1.630	19049	1.647	18324	1.646
3rd	24052	3.809	44705	3.865	43144	3.875
4th	33975	5.380	63326	5.475	61079	5.486
5th	40127	6.354	73902	6.389	71331	6.406
6th	49311	7.808	90021	7.783	86644	7.782
7th	61876	9.798	112272	9.706	107895	9.690
8th	80639	12.769	145833	12.608	140082	12.581
9th	109810	17.389	198809	17.188	191211	17.173
10th	221854	35.131	407247	35.208	392350	35.238
	631510	100.000	1156682	100.000	1113444	100.000
Income percentiles						
10th	434	0.069	799	0.069	772	0.069
90th	12783	2.024	23087	1.994	22208	1.993
90th/10th		29.472		28.894		28.784

5. Concluding Remarks

The Australian Treasury's analysis of the economics of climate change mitigation has been called "the most thorough, comprehensive and well documented modelling exercise ever conducted in Australia"⁵. This paper has sought to build on this modelling effort by extending an associated MMRF analysis to address distributional issues. The Treasury concluded that "large reductions in emissions do not require reductions in economic activity because the economy restructures in response to emission pricing."⁶ The results presented here suggest that the same sentiment is apposite for distribution.

This relatively benign assessment is somewhat at odds with much of the policy debate concerning climate change and its mitigation. A suitable example of the kind of response such assessments evoke is provided by the UNEP in its influential 2008 report on green jobs:

"(Some) studies, based on macro-economic calculations, do not focus on green industries but seek to determine the likely overall effect on the economy arising from policies aiming to reduce greenhouse gas emissions or other environmental impacts. They focus on the ways in which production costs may change, how demand for products and technologies may be altered by new regulations and standards, etc. The results of such analyses are heavily influenced by the basic assumptions that go into them. ... The nature of these and other assumptions inevitably color the general nature of the findings. Thus, skeptical assumptions about reducing greenhouse gas emissions or other environmental measures will likely produce studies that predict job losses, just as more positive assumptions will yield upbeat results. Most studies agree, however, that the likely impact is a small positive change in total employment."⁷

Having drawn attention to the existence of such studies, and to the effect on aggregate activity they predict, the UNEP then proceeds to ignore them throughout the rest of its report. Its attempt to dismiss economy-wide analyses on the grounds that they are "heavily influenced by

⁵ See Parkinson (2009), p.9. Parkinson is the head of the Australian Department of Climate Change.

⁶ Australian Treasury (2008), p.137.

⁷ UNEP (2008), p.37.

the assumptions that go into them” is, of course, completely spurious. All analyses are heavily influenced by the assumptions that go into them.

The same kind of idea sometimes surfaces in defence of simple models for analysing distributional issues. It is argued that because the values of behavioural parameters are often not well known, it is desirable to assume no behavioural response and rely entirely on income accounting. But “no behavioural response” is itself an estimate of the values of the relevant behavioural parameters, and is a choice that cannot usually be supported empirically. Similarly, analysts sometimes prefer to estimate the “morning after” effects of a policy change on the grounds that forward-looking analyses are too uncertain. Again, if such analyses were really thought to be of no relevance to the day after “the morning after”, they would be of little interest. Policy analysis cannot escape from adopting positions, either explicitly or implicitly, on all the matters that affect the outcome of the policy under consideration.

More specifically, the results presented here depend in part on the view that Australia is unlikely to experience large increases in unemployment over the forecast period. In that case, persons working in occupations adversely affected by the mitigation policy are deemed to be able to pick up jobs in other occupations. Hence there is little scope for employment changes to impact significantly on income inequality. Similarly, persons on low-incomes may spend a larger share of their budget on electricity, but the variation in budget shares across income groups is not generally large enough to drive substantial changes in inequality and, even then, its effect will be ameliorated by economic adjustment to the change in relative prices.

However, the most important implication of the analysis is that the distribution of employment and income in 2024-25 will not be determined so much by mitigation policy as by the characteristics of the Basecase scenario.

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