

# Appendix A: Simulations of increased government expenditure in the care sectors

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## **Key statistics and findings**

1. More than 900 thousand Australians who have unpaid caring responsibilities for young children, the elderly, or people with disabilities would like to work more hours in paid employment. If this could be facilitated by greater provision of government-funded care services, labour supply would increase by over 2 per cent.
2. More than 70 per cent of this additional labour input would be supplied by women, alleviating some of the disadvantage experienced by women in the labour market.
3. Supporting carers with additional government-funded service delivery and higher wage growth in the child care, aged care and disabled care sectors underpins additional economic growth such that GDP in 2030 would be 1.64 per cent higher than it otherwise would have been. This is equivalent to an average of \$1266 per person per year in 2018-19 prices, or more than \$30 billion per year in aggregate.
4. Additional employment and higher wages in the care sector also directly supports women's employment and incomes, as these sectors account for a high proportion of women's employment.
5. This economic growth dividend underpins increased revenue from taxes on income and consumption, offsetting much of the cost to government of increased service delivery (including higher wages) in the care sector. In 2030, we estimate the cost of the additional service delivery to be \$19 billion, yet the additional impact on the government deficit is less than \$3 billion.

## 1 Introduction and background

This note describes two simulations of the Australian economy over the next decade in which government expenditure in the care sectors is increased significantly.

## 2 Methodology and model inputs

### 2.1 Methodology

The simulations are run using VUEF-G, a variant of the Victoria University Employment Forecasting (VUEF) model, a Computable General Equilibrium model of the Australian economy with a detailed representation of the labour market and gender. The model is described in the Appendix.

A key feature of VUEF-G is the modelling of time use by cohort. Cohorts are defined by highest level and field of educational attainment and gender (e.g. “Certificate III-IV, Society and Culture, Female”). Time use for each cohort is divided into paid employment, leisure, and unpaid employment (such as caring for children or elderly relatives or maintaining a household). Cohorts allocate time according to preferences (as revealed in existing time use data derived from the Census), and change their allocation through time according to changes in wages and the cost (or availability) of care services that can replace unpaid employment. By this mechanism, an increase in wages provides an incentive to forgo some leisure time and supply more labour. Similarly, an increase in the user cost of care services creates an incentive for people to forgo paid employment and provide care services themselves, for example, a parent may forgo an additional day per week of paid employment if child care costs increase.

For cohorts with significant time allocated to unpaid employment, the scope to increase employment by greater provision of government-funded care services is large. Across all levels of educational attainment, women allocate more time than men to unpaid employment, and both men and women with lower levels of educational attainment allocate more time to unpaid employment. The time-use theory in VUEF-G uses this information to estimate the labour supply response to provision of additional care services for every cohort. The aggregate impacts for men and women are calibrated to the shocks described in Section 2.2.2.

Model results are generally expressed as percentage deviations from a business-as-usual base case. The base case does not take into account the Covid-19 pandemic.

### 2.2 Model inputs

#### 2.2.1 Expenditure

The key economic shocks are increases in expenditure on the care sectors.

In VUEF, the care sectors are Child Care, Residential Aged Care, Residential Disabled Care and Other Social Assistance (Disabled). Shocks to the quantity of output for each sector are introduced over four years (2021-22 to 2024-25) as set out in Table 1. Over the same time interval, wage increases are applied to two occupations, Child Carers and Personal Carers and Assistants, as set out in Table 1.

To facilitate the rapid increase in output in the care sector, shocks are applied to investment from 2020-21, one year in advance of the shocks to output. This ensures that sufficient capital stocks are in place to support the expansion.

Table 1: Expenditure shocks applied by industry and occupation (%)

	Total increase (over 4 years)	Annual increase
<u>Service delivery by industry</u>		
Child Care	35.0	7.79
Residential Aged Care	8.3	2.02
Residential Disabled Care	8.3	2.02
Other Social Assistance (Disabled)	8.3	2.02
<u>Wage increase by occupation</u>		
Child Carers	21.6	5.0
Personal Carers and Assistants	21.6	5.0

The expansion in output and increase in wage costs are absorbed by an increase in government expenditure. Higher wage costs increase the price of care, which has a negative impact on household (private) consumption of care services. Therefore the expansion in government expenditure covers not only the net expansion of the care sectors, but also replaces some private expenditure.

### 2.2.2 Labour supply

The increase in the care economy is assumed to be government-funded and large enough to remove all impediments to labour market participation experienced by carers in the informal sector. This drives a significant increase in labour supply. The calculation of the shock to labour supply involves determining the number of people for which caring responsibilities act as a barrier to labour force participation, determining a suitable increase in average hours worked if formal care was made available, and converting this into a percentage increase in labour supply.

Shocks to labour supply are calculated using data from the ABS (ABS Cat. No. 6239.0, 2020), in which 923,000 people with caring responsibilities reported that they wanted to work more hours (Table 2). Approximately two-thirds of these are women, and approximately half cared for children under the age of 5.

Informal primary carers for aged and disabled people provide an average of 35.2 hours of care per week (152 hours per month), while non-primary carers provide an average of 10 hours per week (43 hours per month) (Deloitte, 2020). We assume that the increase in supply of formal care relieves primary and non-primary carers of some of their responsibilities and enables them to enter the labour force or increase their hours of formal work. We assume that primary carers increase formal employment by an average of 100 hours per month, and informal carers by 10 hours per month. Around one-third of aged and disabled carers are classified as primary carers (Deloitte, 2020).

We assume that people who care for children could increase their employment by 40 hours per month if sufficient child care was available.

Based on these assumptions, an additional 37 million hours of labour would be supplied per month, of which 27 million would be supplied by women. This is equivalent to an increase in overall labour supply of 2.06 per cent. Labour supply increases for both men and women: Men's labour supply increases by 0.93 per cent and women's by 3.74 per cent.

The increases in labour supply are treated as shocks to the VUEF-G model, and introduced over four years (2021-22 to 2024-25) alongside the increases in expenditure on the care sectors.

Table 2: Labour supply impacts

	Male	Female	Persons
<u>People who want to work more hours ('000 persons)</u>			
Cared for someone with a long-term illness or disability	106	152	258
Cared for an elderly person	78	142	219
Youngest child aged under 5	108	337	446
Total	292	631	923
<u>Additional hours supplied per person per month if sufficient care available (assumed)</u>			
Aged/disabled primary carer	100	100	100
Aged/disabled non-primary carer	10	10	10
Child carer	40	40	40
Percentage of aged/disabled carers who are primary carers	21	41	32
<u>Economy-wide aggregates</u>			
Total additional hours supplied per month (million)	10	27	37
Average monthly hours worked, 2018-19 (million)	1044	726	1770
Percentage increase	0.93	3.74	2.06

### 2.2.3 Other macro settings

The shocks as described are run in two macroeconomic environments. In both cases, standard CGE macroeconomic settings apply: household consumption is a fixed proportion of household income, government consumption expenditure (other than on the caring sectors) is fixed to the baseline, and real wages adjust slowly to return the unemployment rate to the baseline.

In **Scenario 1**, the increase in government expenditure on the caring sectors is deficit-financed, with no explicit policy measures taken to recover the deficit.

In **Scenario 2**, the increase in government expenditure on the caring sectors is offset by a reduction in government-funded investment in infrastructure.

### 2.2.4 Limitations

The modelling provides insights into the macroeconomy and the household sector as a whole, but does not differentiate between individuals or households by income. The key finding that greater availability of government-funded care services will have a positive impact on labour supply, is of a general nature, and we make no recommendations about the distribution of these services. The existing childcare subsidy scheme is particularly complex and creates strong disincentives to work for individuals (usually mothers) in some families. Recommendations on how to simplify this system and

remove these disincentives (see for example KPMG, 2020) are not able to be derived from the CGE model.

### 3 Results and Discussion

#### 3.1 Scenario 1

The increase in labour supply facilitated by additional supply of caring services is absorbed gradually by the market. By 2026, labour supply is 2.24% above the base case, and employment is 1.85% above base case, with female employment accounting for the majority of the increase (Figure 1). After 2026, labour supply stops increasing and employment gradually catches up (unemployment returns to base case level).

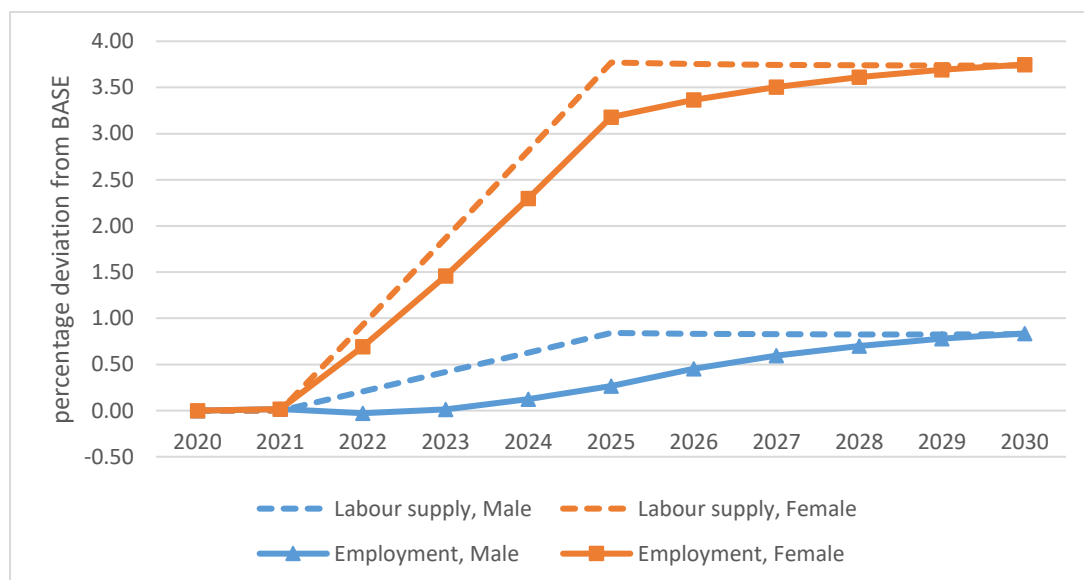


Figure 1: Employment and labour supply impacts, Scenario 1

The increase in labour supply causes slower overall wage growth (notwithstanding specific increases imposed on some occupations) but the net impact on labour income (higher employment and lower wages) is positive. There is a very slight slowing of income growth for males, and a strong increase in income growth for females (Figure 2).

Beneficiaries under the scenario include people who are relieved of some caring responsibilities and can work more hours, thus earning more income, and business owners, who can access a greater pool of labour. On the other hand, people who were already employed will experience slower wage

growth than they otherwise would have. Overall stronger income growth underpins higher tax collections on income and consumption.

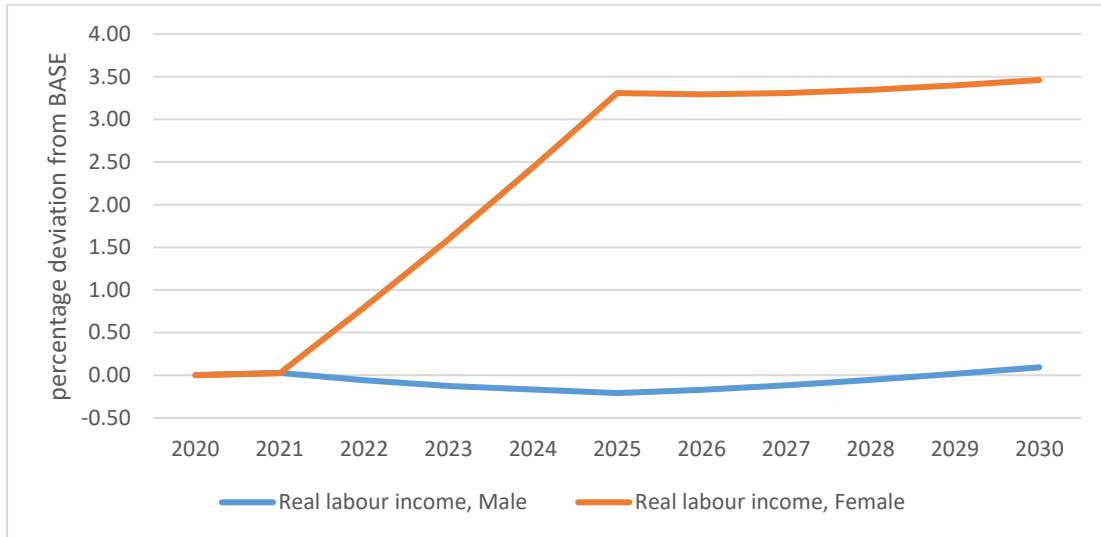


Figure 2: Impact on real labour income, Scenario 1

The increase in employment strengthens GDP growth, which remains at around 1.25 per cent above the base case from 2025 (Figure 3). Public expenditure, which includes the large additional expenditure on the care sector, grows more quickly than GDP, thus increasing its overall share of GDP. This is offset by slower export growth. Growth in household spending and investment follow a similar trajectory to GDP. Household spending is supported by stronger income growth, while investment is stimulated by the need to create more capital stocks to support the expansion in the caring sector and more widely as a response to the larger labour supply.

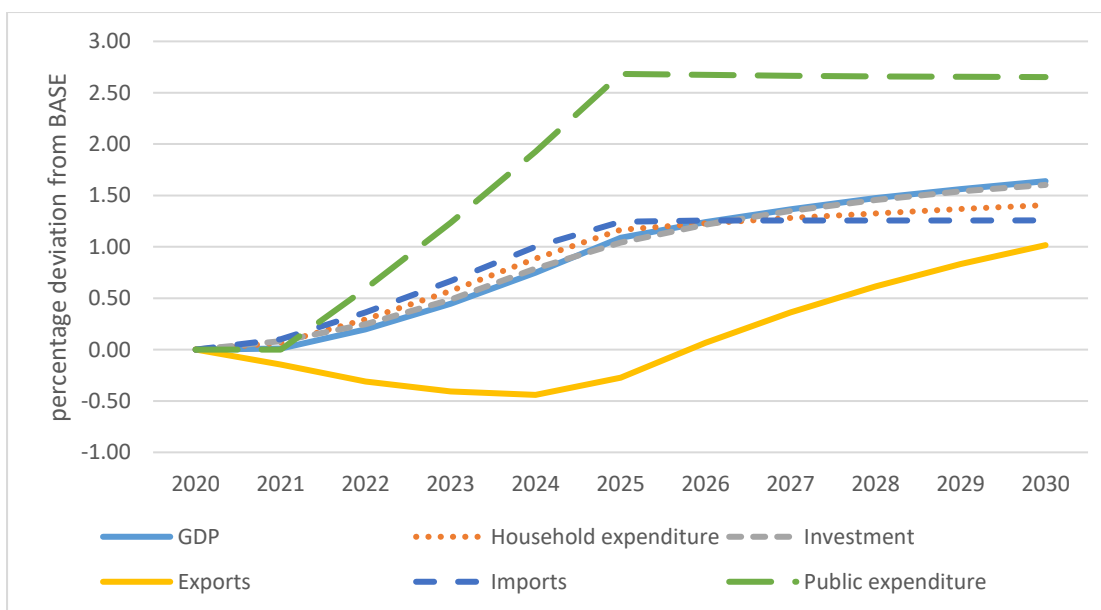


Figure 3: GDP and macroeconomic expenditure impacts, Scenario 1

All industries expand relative to the base case by 2030, but at differing rates (Figure 4). The expansion in Health care and social assistance is well above average, as this sector includes child care and aged and disabled care. Expansion in most other sectors is in the range of 1.5 to 1.75 per cent by 2030, with some exceptions. With strong domestic expenditure, the domestic currency strengthens, which makes trade-exposed industries (those that export or compete with imports, i.e. agriculture, mining, manufacturing, tourism and education) less competitive. Mining expands very little, being trade-exposed and capital-intensive (poorly positioned to take advantage of additional labour supply). Public Administration and Defence expands very little, as policy settings in respect of government expenditure on these activities are assumed not to deviate from the base case.

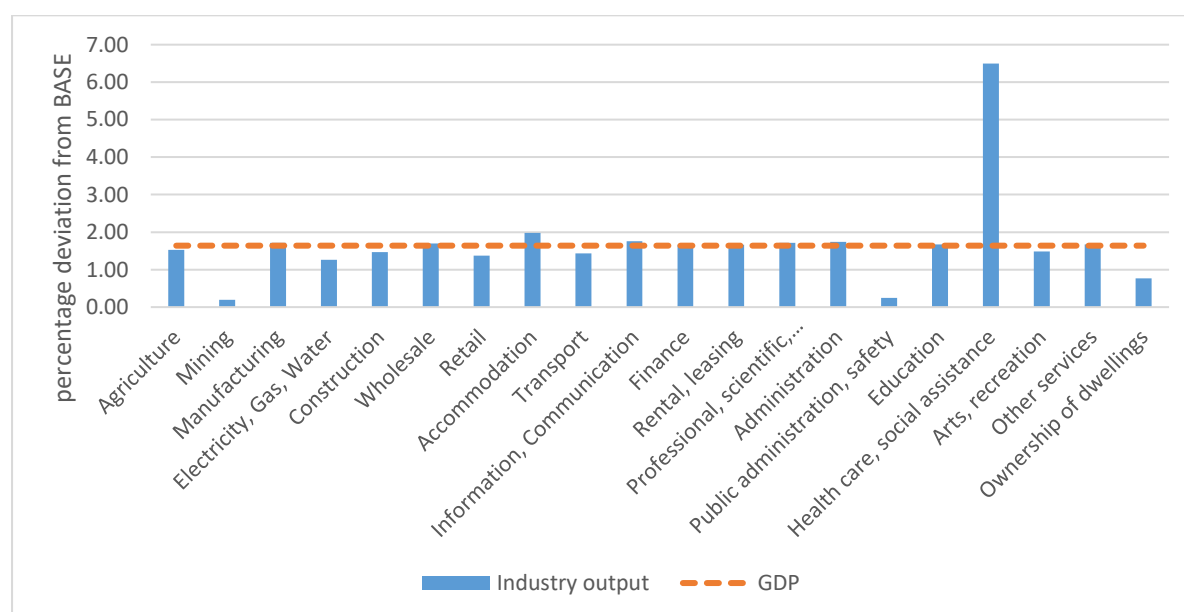


Figure 4: Impact on industry output, 2030, Scenario 1

The additional spending on care services leads to higher budget deficits over the ten-year forecast period (Figure 5). Over 2022-25, the years in which the spending is brought in, the negative impact on budget deficits increases each year, to just below \$7 billion in 2025. After 2025, economic growth and the associated tax revenues begin to offset an increasing proportion of the additional care expenditure. By 2030, the deficit is less than \$3 billion larger than it otherwise would have been, while the cost of the additional service delivery is almost \$19 billion.

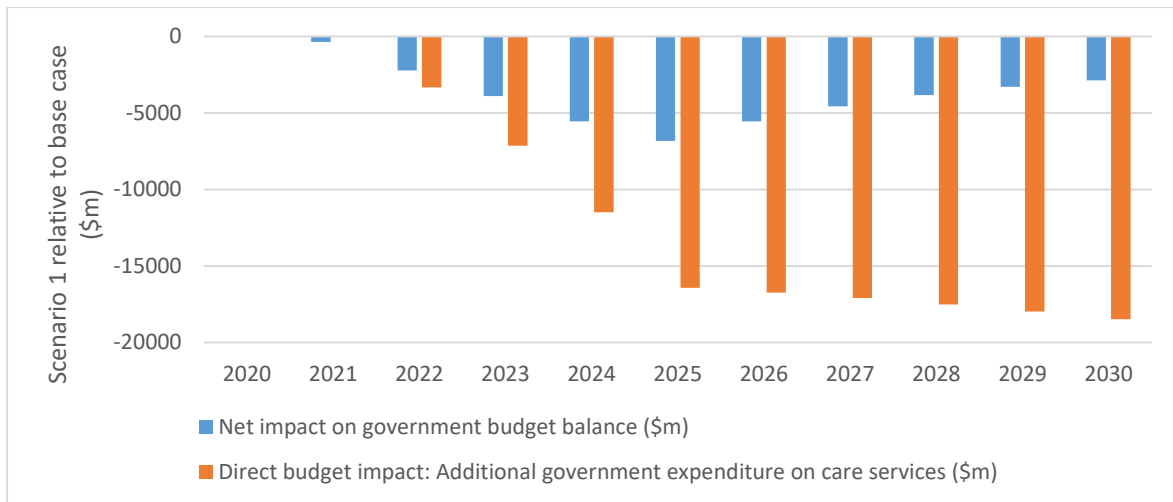


Figure 5: Impact on government budget balance relative to base case (\$m), Scenario 1

### 3.2 Scenario 2

In Scenario 2, the budgetary cost of the additional expenditure on care is offset by a reduction in government expenditure on infrastructure investment. The overall results are very similar to Scenario 1.

Despite the reduction in government-funded infrastructure investment, the impact on aggregate investment is still positive in Scenario 2, albeit smaller than in Scenario 1 (Figure 6). This detracts only slightly from GDP growth.

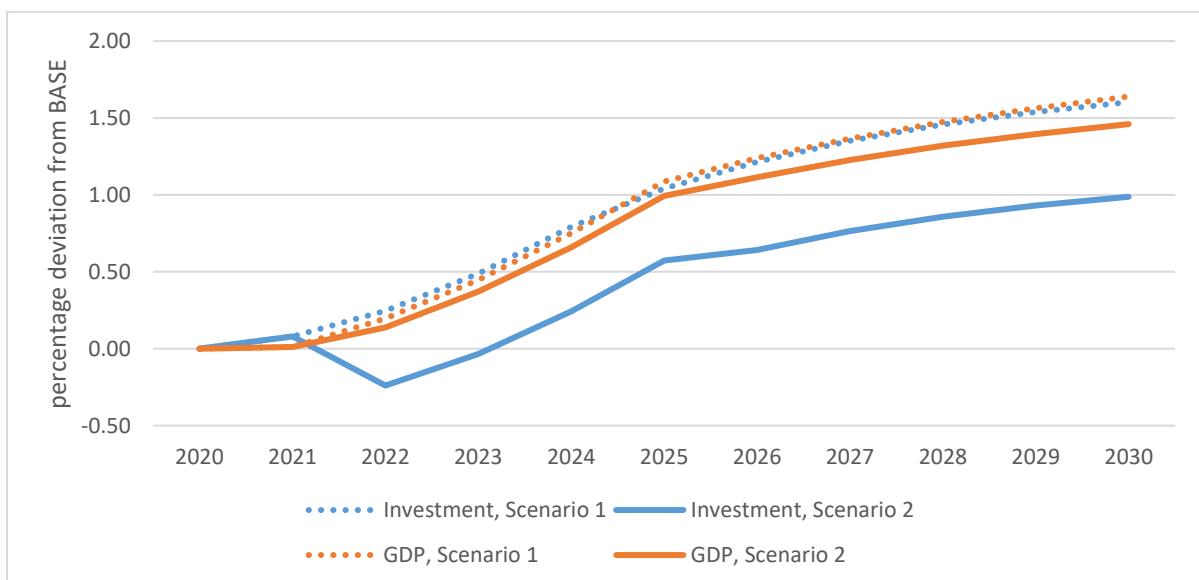


Figure 6: Comparison of GDP and Investment impacts, Scenario 1 and Scenario 2



Industry impacts are similar except there is a notable difference in output in the Construction sector (Figure 7).

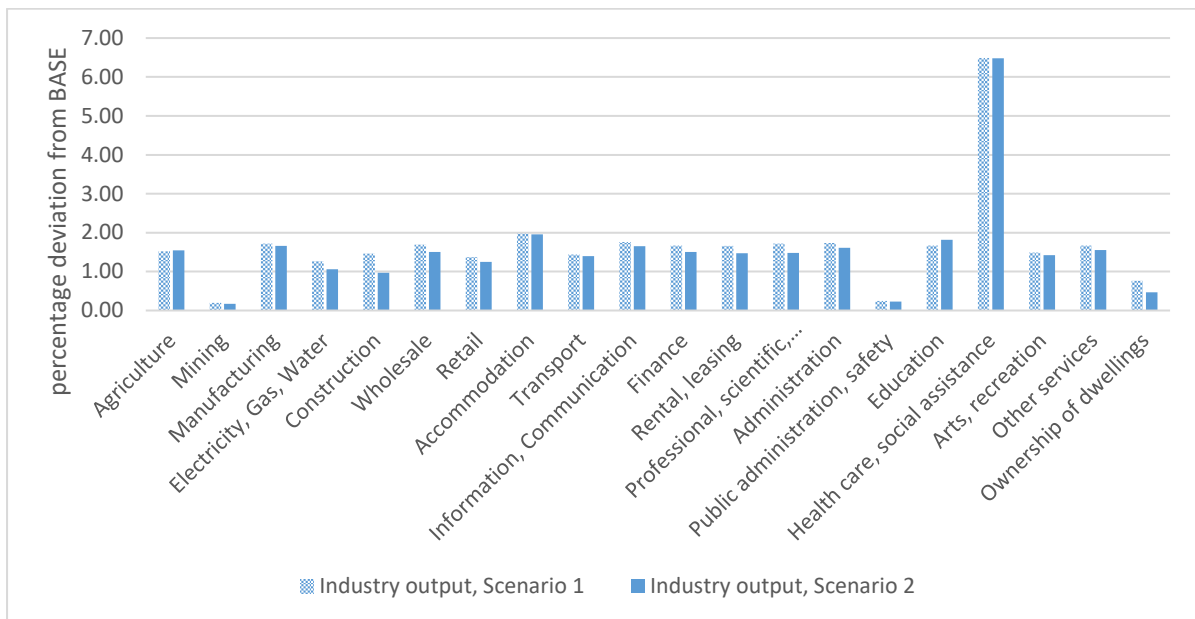


Figure 7: Impact on industry output, 2030, Scenarios 1 and 2

Unlike Scenario 1, in which the government deficit is greater than the base case throughout the simulation period, in Scenario 2, the average deficit is approximately the same as the base case average (Figure 8).

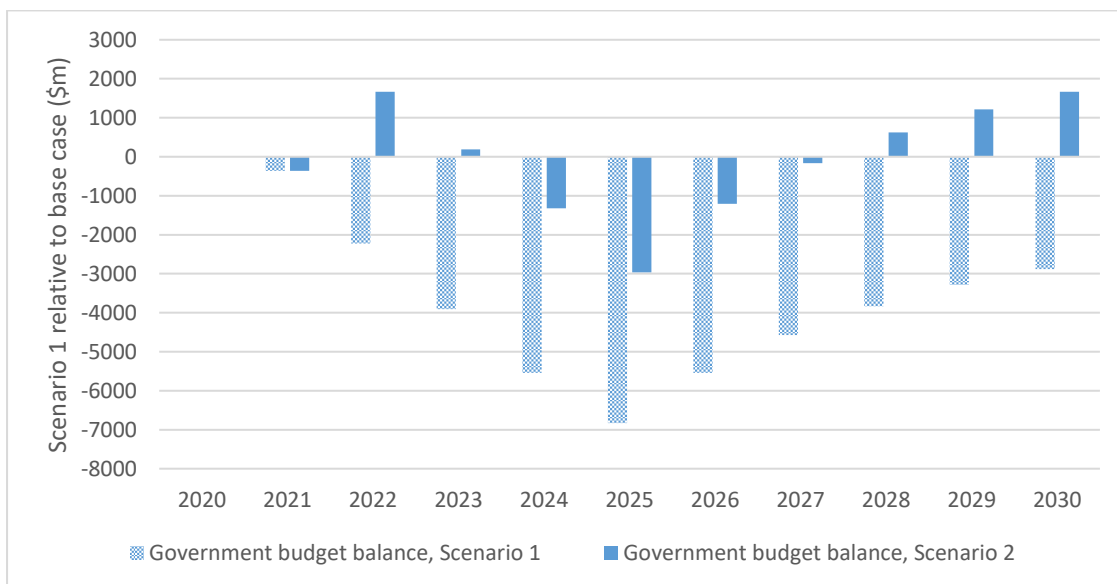


Figure 8: Impact on government budget balance relative to base case (\$m), Scenarios 1 and 2

## 4 Conclusions

An increase in expenditure on care services delivers clear economic benefits and helps to alleviate female economic disadvantage. Spending on care services delivers a double dividend, of job creation

in the care sector, and positive labour supply impacts for over 900 thousand Australians who perform unpaid work caring for the elderly, disabled and children. More than 70 per cent of the labour supply impact benefits women.

The economic growth derived from additional employment underpins an increase in budget revenue that offsets much of the cost to government of increased service delivery.

An option for achieving a complete offset of the costs of the additional service delivery is to reduce government spending on infrastructure. This option leads to smaller impacts on investment and construction activity, nonetheless the impacts are still positive, as is the overall outcome for GDP and employment.

## 5 References

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## 6 Tables

Note – in all tables, “2020” refers to the year ending June 30, 2020 (financial year).

Table 3: Scenario 1 Macro results (percentage deviation from base case unless otherwise stated)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Macro aggregates</b>											
<b>GDP</b>	0.00	0.01	0.20	0.45	0.75	1.09	1.24	1.37	1.47	1.56	1.64
<b>Household expenditure</b>	0.00	0.07	0.29	0.57	0.89	1.17	1.23	1.28	1.33	1.37	1.41
<b>Investment</b>	0.00	0.08	0.25	0.49	0.79	1.04	1.21	1.35	1.46	1.54	1.60
<b>Exports</b>	0.00	-0.14	-0.31	-0.41	-0.44	-0.27	0.07	0.36	0.62	0.83	1.02
<b>Imports</b>	0.00	0.10	0.36	0.67	1.00	1.25	1.26	1.26	1.26	1.26	1.26
<b>Public expenditure</b>	0.00	0.00	0.59	1.23	1.93	2.68	2.67	2.67	2.66	2.66	2.65
<b>Labour supply</b>											
<b>Male</b>	0.00	0.00	0.21	0.42	0.63	0.84	0.83	0.83	0.83	0.83	0.83
<b>Female</b>	0.00	0.00	0.93	1.87	2.81	3.77	3.75	3.75	3.74	3.74	3.74
<b>Persons</b>	0.00	0.00	0.55	1.11	1.68	2.25	2.24	2.23	2.22	2.22	2.22
<b>Employment</b>											
<b>Male</b>	0.00	0.02	-0.03	0.01	0.12	0.27	0.45	0.59	0.70	0.78	0.84
<b>Female</b>	0.00	0.02	0.69	1.46	2.30	3.18	3.36	3.51	3.61	3.69	3.75
<b>Persons</b>	0.00	0.02	0.32	0.71	1.17	1.67	1.85	1.99	2.10	2.18	2.23
<b>Labour income</b>											
<b>Male</b>	0.00	0.03	-0.06	-0.13	-0.17	-0.21	-0.17	-0.12	-0.05	0.02	0.09
<b>Female</b>	0.00	0.02	0.79	1.59	2.44	3.31	3.29	3.31	3.35	3.40	3.46
<b>Persons</b>	0.00	0.03	0.35	0.70	1.08	1.48	1.49	1.53	1.58	1.64	1.71
<b>Government budget balance (\$m)</b>	0	-360	-2228	-3904	-5540	-6827	-5543	-4570	-3836	-3288	-2882

Table 4: Scenario 1: Industry results (percentage deviation from base case)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Industry output</b>											
<b>Agriculture</b>	0.00	-0.05	0.01	0.14	0.33	0.63	0.89	1.10	1.27	1.41	1.52
<b>Mining</b>	0.00	-0.03	-0.08	-0.12	-0.16	-0.16	-0.11	-0.04	0.03	0.12	0.20
<b>Manufacturing</b>	0.00	-0.05	0.00	0.13	0.34	0.66	0.95	1.20	1.41	1.58	1.72
<b>Electricity, Gas, Water</b>	0.00	0.01	0.10	0.24	0.43	0.66	0.82	0.96	1.08	1.18	1.27
<b>Construction</b>	0.00	0.05	0.17	0.36	0.61	0.84	1.02	1.17	1.29	1.39	1.47
<b>Wholesale</b>	0.00	0.02	0.18	0.41	0.71	1.04	1.23	1.39	1.51	1.61	1.70
<b>Retail</b>	0.00	0.06	0.30	0.58	0.91	1.20	1.25	1.29	1.32	1.35	1.37
<b>Accommodation</b>	0.00	-0.02	0.12	0.35	0.65	1.04	1.30	1.52	1.70	1.85	1.98
<b>Transport</b>	0.00	-0.03	0.03	0.17	0.36	0.64	0.86	1.04	1.20	1.33	1.44
<b>Information, Communication</b>	0.00	-0.01	0.14	0.37	0.66	1.01	1.23	1.41	1.55	1.66	1.76
<b>Finance</b>	0.00	0.02	0.18	0.41	0.71	1.03	1.21	1.36	1.48	1.58	1.67
<b>Rental, leasing</b>	0.00	0.00	0.15	0.37	0.65	0.97	1.17	1.33	1.47	1.57	1.66
<b>Professional, scientific, technical services</b>	0.00	0.02	0.16	0.38	0.67	0.98	1.21	1.38	1.52	1.63	1.72
<b>Administration</b>	0.00	-0.01	0.14	0.36	0.65	1.00	1.22	1.39	1.53	1.65	1.74
<b>Public administration, safety</b>	0.00	0.00	0.03	0.07	0.12	0.17	0.20	0.21	0.23	0.24	0.25
<b>Education</b>	0.00	-0.10	-0.13	-0.05	0.11	0.43	0.81	1.11	1.35	1.53	1.67
<b>Health care, social assistance</b>	0.00	0.02	1.43	2.95	4.59	6.35	6.40	6.44	6.46	6.48	6.49
<b>Arts, recreation</b>	0.00	0.02	0.20	0.44	0.73	1.03	1.17	1.28	1.36	1.43	1.49
<b>Other services</b>	0.00	0.03	0.22	0.48	0.80	1.14	1.30	1.43	1.53	1.61	1.67
<b>Ownership of dwellings</b>	0.00	0.00	0.01	0.03	0.09	0.18	0.29	0.41	0.53	0.65	0.77

Table 5: Scenario 2: Macro results (percentage deviation from base case unless otherwise stated)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Macro aggregates</b>											
<b>GDP</b>	0.00	0.01	0.14	0.37	0.66	0.99	1.11	1.23	1.32	1.40	1.46
<b>Household expenditure</b>	0.00	0.07	0.00	0.34	0.69	1.06	1.06	1.12	1.17	1.21	1.25
<b>Investment</b>	0.00	0.08	-0.24	-0.03	0.24	0.57	0.64	0.76	0.86	0.93	0.99
<b>Exports</b>	0.00	-0.14	0.38	0.20	0.09	0.04	0.46	0.70	0.90	1.07	1.22
<b>Imports</b>	0.00	0.10	-0.21	0.18	0.56	0.96	0.87	0.90	0.91	0.93	0.94
<b>Public expenditure</b>	0.00	0.00	0.60	1.24	1.93	2.69	2.67	2.66	2.66	2.65	2.65
<b>Labour supply</b>											
<b>Male</b>	0.00	0.00	0.20	0.41	0.62	0.83	0.82	0.82	0.81	0.81	0.81
<b>Female</b>	0.00	0.00	0.93	1.86	2.81	3.76	3.74	3.73	3.73	3.72	3.72
<b>Persons</b>	0.00	0.00	0.55	1.11	1.67	2.24	2.22	2.22	2.21	2.21	2.21
<b>Employment</b>											
<b>Male</b>	0.00	0.02	-0.11	-0.06	0.06	0.23	0.39	0.54	0.64	0.72	0.78
<b>Female</b>	0.00	0.02	0.61	1.39	2.23	3.14	3.30	3.44	3.55	3.63	3.69
<b>Persons</b>	0.00	0.02	0.23	0.64	1.10	1.63	1.79	1.93	2.04	2.12	2.18
<b>Labour income</b>											
<b>Male</b>	0.00	0.03	-0.21	-0.30	-0.36	-0.39	-0.41	-0.37	-0.33	-0.28	-0.23
<b>Female</b>	0.00	0.02	0.68	1.46	2.28	3.16	3.09	3.08	3.10	3.13	3.17
<b>Persons</b>	0.00	0.03	0.22	0.55	0.91	1.32	1.27	1.29	1.32	1.36	1.41
<b>Government budget balance (\$m)</b>	0	-360	1667	186	-1318	-2963	-1204	-165	622	1218	1670

Table 6: Scenario 2 Industry results (percentage deviation from base case)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Industry output</b>											
<b>Agriculture</b>	0.00	-0.05	0.23	0.32	0.48	0.70	0.98	1.16	1.32	1.44	1.54
<b>Mining</b>	0.00	-0.03	0.05	0.03	-0.01	-0.06	-0.02	0.02	0.07	0.12	0.17
<b>Manufacturing</b>	0.00	-0.05	0.21	0.30	0.46	0.69	1.00	1.22	1.40	1.54	1.66
<b>Electricity, Gas, Water</b>	0.00	0.01	0.05	0.17	0.34	0.56	0.68	0.80	0.90	0.99	1.06
<b>Construction</b>	0.00	0.05	-0.07	0.05	0.24	0.50	0.60	0.72	0.82	0.90	0.97
<b>Wholesale</b>	0.00	0.02	0.02	0.27	0.57	0.91	1.07	1.22	1.34	1.43	1.51
<b>Retail</b>	0.00	0.06	0.00	0.35	0.72	1.10	1.09	1.15	1.19	1.22	1.25
<b>Accommodation</b>	0.00	-0.02	0.21	0.44	0.73	1.08	1.34	1.55	1.71	1.85	1.96
<b>Transport</b>	0.00	-0.03	0.17	0.29	0.45	0.67	0.89	1.06	1.19	1.30	1.39
<b>Information, Communication</b>	0.00	-0.01	0.15	0.37	0.65	0.98	1.18	1.34	1.47	1.57	1.66
<b>Finance</b>	0.00	0.02	0.09	0.33	0.61	0.94	1.09	1.23	1.34	1.43	1.50
<b>Rental, leasing</b>	0.00	0.00	0.11	0.31	0.56	0.86	1.04	1.18	1.30	1.39	1.47
<b>Professional, scientific, technical services</b>	0.00	0.02	0.06	0.25	0.52	0.84	1.02	1.18	1.31	1.40	1.48
<b>Administration</b>	0.00	-0.01	0.16	0.36	0.62	0.94	1.15	1.31	1.43	1.53	1.61
<b>Public administration, safety</b>	0.00	0.00	0.03	0.07	0.11	0.16	0.18	0.20	0.21	0.22	0.23
<b>Education</b>	0.00	-0.10	0.32	0.33	0.43	0.60	1.05	1.32	1.53	1.70	1.82
<b>Health care, social assistance</b>	0.00	0.02	1.37	2.91	4.56	6.33	6.38	6.42	6.45	6.47	6.48
<b>Arts, recreation</b>	0.00	0.02	0.09	0.36	0.67	1.00	1.11	1.22	1.30	1.37	1.43
<b>Other services</b>	0.00	0.03	0.09	0.38	0.71	1.08	1.20	1.33	1.42	1.50	1.56
<b>Ownership of dwellings</b>	0.00	0.00	0.01	-0.01	0.00	0.05	0.13	0.21	0.29	0.38	0.47

## 7 Appendix: VUEF-G

VUEF-G is a variant of the VUEF model which adds a gender dimension to the existing labour market modelling framework (J.Dixon and Nassios, 2020). We formulate labour supply in a labour-leisure framework in which we also introduce home-produced domestic services (“housework”), which covers activities such as cleaning, cooking, and caring for family members, particularly children. We assume that households choose leisure, domestic services and consumption to maximise utility subject to three constraints: (i) a time constraint on total labour, leisure and housework; (ii) a budget constraint equating household wage income to expenditure on consumption (other than domestic services) and purchased domestic services (such as childcare); and, (iii) a production constraint for domestic services, which are a combination of home-produced and purchased domestic services.

VUEF-G contains all the features of a standard MONASH – style dynamic CGE model [P. Dixon and Rimmer (2002)], namely:

1. equations describing demand for domestic and imported goods and services by industries, investors, households, government and the rest of the world;
2. equations describing demand for factors of production by industries;
3. market clearing conditions for all goods and services and factors of production;
4. zero pure profit conditions determining basic prices of goods and services;
5. equations linking basic and purchaser prices through taxes and margins;
6. equations linking industry-specific capital supply to investment;
7. equations linking investment by industry to expected rates of return; and
8. equations to ensure that wage adjustment is sticky.

These equations are described in detail in many references including P. Dixon and Rimmer (2002) and Adams et al (2015).

VUEF adds to the standard MONASH framework a detailed specification for labour supply. In VUEF, the working-age population is disaggregated into many skill groups. Each skill group chooses its occupational composition of employment by maximising wage income subject to a transformation frontier.

VUEF therefore adds to the standard CGE framework a method for determining occupational employment and wages. However, participation and unemployment rates by skill group are typically exogenous, or simply indexed to their national equivalents. This treatment fails to acknowledge the likelihood that labour supply is more elastic among part time workers, particularly women. VUEF-G addresses this gap by formalizing the differences in time use between men and women.

VUEF-G comprises a large system of non-linear equations which is solved in the GEMPACK software (Horridge et al, 2018).