National Home Improvement Scheme

Beyond Zero Emissions |
2021-22 Pre-Budget Submission

January 27, 2021

Summary

The National Home Improvement Scheme is an initiative to stimulate the private sector to improve millions of Australian homes. The scheme will upgrade 45,000 homes in the first two years and then go on to improve 1.4 million existing homes to a net-zero energy standard. This will bring significant energy bill savings to Australian households, improve living conditions, boost the construction sector and reduce greenhouse gas emissions.

- A $110 million Commonwealth investment to pay for start-up costs, a national training package and a capital guarantee.
- Phase 1 of this scheme would stimulate $1.35 billion in private finance to improve the energy performance of 45,000 homes within two years.
- The subsequent Phase 2 rollout to 1.4 million homes would attract over $30 billion in private investment and create over 100,000 on-going jobs.
- Independent analysis by economist Chris Murphy found that the scheme would lift GDP by 0.19% and real after-tax wages by 0.31%. It would also lead to increases in the value of industries such as housing services (1.2%), residential building construction (1.7%) and construction services (0.6%).

Proposal Title:

National Home Improvement Scheme

Affected Agency:

Department of Industry, Science, Energy and Resources

Department of Social Services

Department of Education, Skills and Employment

Financial Implications

	2021/22	2022/23	2023/24	Total
Cost of proposal (federal funding, $m)	**26**	**67**	**17**	**110**
Capital Guarantee for Phase 1 ($m)		50		50
Training package ($m)	20	15	15	50
Start-up and administration ($m)	6	2	2	10

Outline of Proposal

The National Home Improvement Scheme is an ideal opportunity for the Federal Government to leverage private capital and deliver thousands of jobs.

Many Australian families waste money on unnecessarily high household energy bills. Our research shows that thousands of jobs will be created in delivering simple energy improvements to Australian homes that will save Australian families thousands of dollars in utility bills while eliminating **10 million tonnes of annual emissions**. This creates a major business opportunity for large-scale home energy improvements. However, there are several barriers to establishing this industry, such as the absence of a system of quality control (see Implementation section). The Commonwealth Government is well-placed to overcome these barriers with some relatively low-cost measures:

- $50 million to establish a new training program for installers
- $50 million as a capital guarantee[1] to reduce business risk
- $10 million to set up the administrative structures to manage the scheme.

[1] A capital guarantee means businesses are effectively insured against losses up to the amount of the guarantee. This lowers their risk profile, and therefore the rate of return they expect.

With these measures in-place, the Government would seek private sector interest in delivering an initial Phase 1 of around 45,000 Home Improvements. A scheme of this size would result in $1.35 billion worth of private investment, leveraging $12 for every $1 of government money spent. Phase 1 of the scheme would set up the large-scale replication in Phase 2, which would involve a private sector-led National Home Improvement Scheme for 1.4 million homes. Phase 2 of the scheme would lead to the creation of a national industry worth over $30 billion employing over 100,000 people.

Home energy improvements

Under a National Home Improvement Scheme, householders would receive whole house energy efficiency improvements. The aim of an upgrade would be to create a net-zero energy home – a home that eliminates energy bills for consumers. This is now possible for most homes through a combination of practical steps:

- Rooftop solar PV
- Home battery systems (not required in every home)
- Home energy management system
- Replacing gas heaters with split system air-conditioners
- Thermal efficiency (e.g. shading, draught-proofing, insulation)

The average cost of implementing these measures would be $25,000 to $30,000 per home. Our initial analysis shows that in most cases this cost would be paid back in under 10 years through cheaper energy bills. To be eligible for any financing support, the work would need to be undertaken by an accredited tradesperson.

To succeed this scheme will need innovative finance models that mean most householders do not have to pay upfront for their home improvements. There are a range of private funding solutions that spread repayments over long periods and ensure that energy cost savings exceed the repayment burden.

These include:

- providing low-cost credit by allowing homeowners to add the cost of the home energy improvement to their mortgage. Most mortgage providers already offer products to support this option.

- allowing the cost of energy home improvements to be claimed as an investment deduction. This could help encourage landlords to carry out Home Improvements on their rental properties.
- repaying the home improvement costs over 20 years through a monthly energy bill that costs less than the householder's previous average energy bill, inclusive of all on-going energy costs. This business model is similar to mobile phone contracts where customers pay a flat fee for an agreed level of service.

One of the first tasks of Phase 1 of a National Home Improvement Scheme would be to identify customers and suitable business models. Any model should make the Home Improvement process simpler than any service available today, aiming to provide householders with:

- whole house upgrade completed in under a week
- clear communication of their future energy performance, including costs and savings
- guaranteed level of service and warranties
- technical and financial aspects handled by third parties.

Strategic Policy Alignment

The National Home Improvement Scheme closely aligns with the proposed National Construction Code 2022 updates for residential buildings and the COAG Project "Trajectory for Low Energy Buildings" with its aims to a national pathway towards zero energy buildings. In particular, the National Home Improvement Scheme builds on COAG's "Report for Achieving Low Energy Existing Homes", expanding its ambitions and accelerating the timeframe to maximise the benefits of this transition for existing homes. This not only helps households and families save money earlier, it also brings a multitude of health and living condition improvements, particularly during extreme weather events; many of these benefits are outlined in the joint ACOSS statement "Healthy Affordable Homes".

The National Home Improvement Scheme also supports the Commonwealth Government's JobMaker incentive for businesses to employ additional young job seekers. The scheme would create thousands of new installation and manufacturing jobs and apprenticeships across the country, with many in regional areas.

The National Home Improvement Scheme will involve the installation of many thousands of home battery systems. This has strong synergy with the government's $1.9B investment package in future technologies and Low Emissions Technology Statement; particularly as it will accelerate the commercialisation of energy storage, one of the statements' priority technologies.

Wide-scale battery installation also supports the Grid Reliability Fund and ideas presented in the AEMO ISP report in relation to Distributed Energy Resources. For example, domestic battery energy storage systems can be managed as virtual power plants to support grid reliability by handling the intermittency of renewable energy.

> "*The COAG Energy Council should engage with relevant portfolio areas including housing, and with state, territory and local governments, to identify …options for subsidised funding mechanisms for the supply of energy-efficiency appliances, rooftop solar photovoltaic, and battery storage systems for low-income consumers*."
>
> Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future (Finkel Review), June 2017.

Rationale

Most of Australia's housing stock was built before minimum energy efficiency requirements were introduced with existing homes having an average NatHERS rating of only 1.7 stars. This means that these households need more than three times as much energy to heat and cool their homes and are paying significantly more in electricity and gas bills when compared to a minimum compliant home built today. At the same time, energy bills from increased time spent at home during COVID-19 and downturns in the construction sector combine to make a strong case to carry out deep energy upgrades in millions of homes.

Energy efficient homes are not just cheaper to run, but are healthier and more comfortable, especially in summer and winter. The speed with which Australians have adopted rooftop solar suggests a National Home Improvement Scheme is likely to be extremely popular.

A National Home Improvement Scheme could create many thousands of new jobs, off-setting COVID-19 related job losses in the construction sector. It is also an opportunity to train thousands of workers in the skills needed for the 21st century building sector. Thousands more jobs could be created in training, auditing and in domestic manufacturing of appliances and materials.

Independent analysis of BZE's Million Jobs Plan by ANU Economist Chris Murphy (attached as appendix) considered the economic impacts of a national scheme involving 1.4 million home improvements over five years. The analysis found that the scheme would lift GDP by 0.19% and real after-tax wages by 0.31%. It would also lead to increases in the value of several industries, in particular:

- housing services – 1.2% increase
- residential building construction – 1.7% increase
- construction services (mainly tradespeople) – 0.6% increase.

Implementation

The National Home Improvement Scheme would require $110 million in Commonwealth funding. The aim of this funding is to set up the system architecture and enable Phase 1 for around 45,000 homes. After this initial phase it is expected that the private sector will finance and implement the rollout of the National Home Improvement Scheme. However, the following barriers currently prevent the private sector from taking advantage of the large business opportunity from large-scale home energy improvements:

- difficulty of aggregating sufficient consumer demand
- a lack of qualified installers
- absence of a system of quality control
- the costs of setting up the required system architecture (described below)
- the financial risk for investors.

The $110 million will overcome these barriers with some low-cost measures:

1. **$50 million capital guarantee.** This would lower the financial risks of investing in Phase 1 of the scheme. A $50 million capital guarantee could stimulate approximately $1.35 billion in

private finance – enough to finance the first 45,000 homes. Potential areas for Phase 1 include Geelong, Latrobe Valley and Hunter Valley.

2. **$50 million for a national training package**. An accelerated expansion of relevant TAFE courses will build workforce expertise in deep energy improvements for existing housing stock.
3. **$10 million for start-up costs** and administration of the national scheme covering quality, standards, financing and establishing the system architecture and certification mechanisms.
4. **Setting a target** and timelines for home energy improvements (e.g. one million homes by 2025).

Once the scheme has been proven and running for 2 years, the program administration would be self-sustaining. After Phase 1, the capital guarantee would need to increase to accommodate the scheme's growth. By backing new investment grade securities each year, the government could ensure continued investment from the private finance sector.

Alternatively, the government could encourage energy improvements of rental properties. There are currently few incentives for landlords or tenants to upgrade the energy efficiency of rented homes. Action in this area would provide low-income tenants with cheaper energy bills.

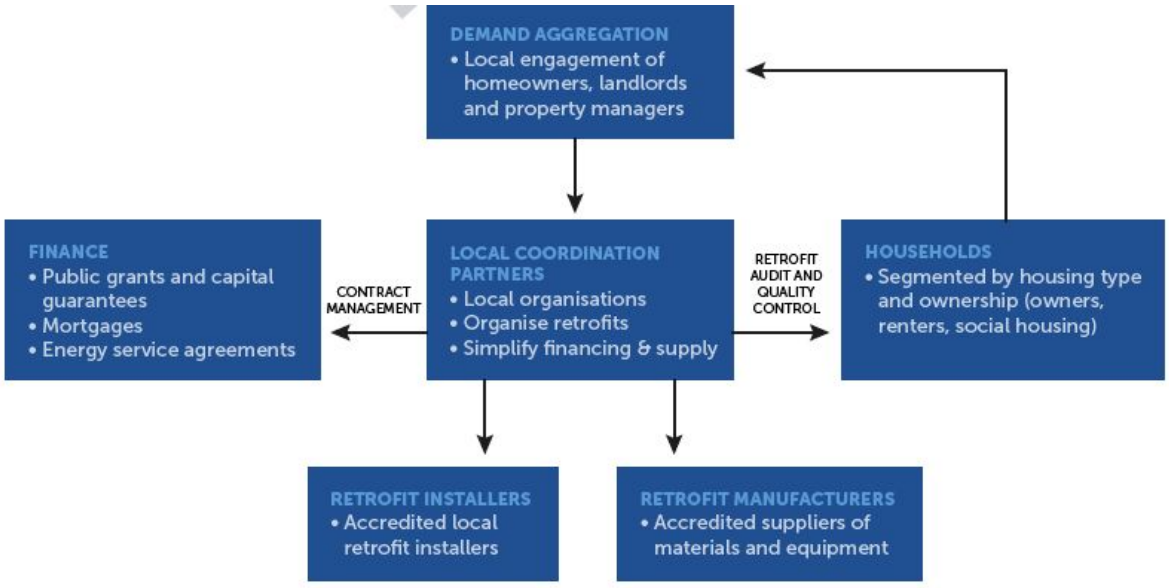
System architecture

To be successful a National Home Improvement Scheme would need to bring together a network of organisations (Figure 1). The organisations involved, and their specialist roles, are outlined below.

- **Local Coordination Partners** will coordinate the Home Improvement scheme in a particular location. These entities will conduct the initial energy audit, and then organise Home Improvements for eligible householders by arranging the installation and finance. Existing organisations that already play this type of role, such as the Australian Energy Foundation, may provide a model.
- **Demand aggregators**. Entities to engage and work with householders in local districts to collate databases of householders interested in home energy improvements. This could include local governments and community organisations. This aggregation creates economies of scale, as well as a market signal for local installers and suppliers.

- **Accredited installers** who install solar panels, batteries and thermal upgrades to agreed standards and provide local jobs. These would be accredited by a government body or by an industry association such as Master Builders Association or the Housing Industry Association.
- **Accredited manufacturers** of equipment such as batteries, reverse cycle air conditioners and energy efficiency materials such as insulation. A national database would list approved suppliers and could prioritise domestic manufacture including existing Clean Energy Council suppliers.
- **Finance organisations** providing the loans and financial products that enable Home Improvements to occur at no, or low, cost upfront to householders.
- **Certification bodies** to ensure quality of accredited equipment, certification of installers and final Home Improvement. Existing bodies such as the Master Builders Association or the Housing Industry Association could play this role.

Figure 1 | System architecture for a National Home Improvement Scheme



How to attract private finance

The money Australians currently waste powering inefficient homes and appliances creates enormous investment opportunities. One such opportunity is lending to households to fund Home Improvements. The Australian financial system has the structural capacity to convert these loans into investment products suited to institutional investment and bank lending worth billions of dollars. Current financial sector activity demonstrates the appetite for this type of investment:

- the willingness of all banks to allow homeowners to add the cost of energy improvements to their mortgage
- the availability of wholesale finance for peer-to-peer and non-bank lenders providing loans for energy efficiency upgrade
- the existing market for securitisation structures where the underlying loan pool is unsecured energy upgrade loans facilitating investment from superannuation funds
- the existing market for Environmental Upgrade Agreements (EUAs) used in commercial property (but available to certain residential properties) facilitating bank lending.
- Australia's banks and superannuation firms have the capacity to fund millions of home energy upgrades. However, first they need a scalable project – large numbers of potential customers and a ready-made system architecture (see above).

How to ensure quality

Quality control and safety is critical to the success of a National Home Improvement Scheme. The quality of upgrade will depend on use of properly trained accredited workers. A National Home Improvement Scheme is an opportunity to build a workforce with expertise in deep energy upgrades. Many workers already have skills required for energy upgrades, but there will be a need to address skills shortages in some areas, especially as the scheme scales up. Home energy upgrade quality will also depend on an effective mechanism for and certifying equipment and completed Home Improvements.

The following steps will help ensure high quality home energy upgrades:

- A national Home Improvement Builders Training Program to train workers in best-practice techniques for residential retrofitting. These courses can be delivered through the TAFE system and
- accredited by Australian Qualifications Framework (AQF) and Australian Skills Quality Authority (ASQA)
- Accreditation of workers by the Master Builders Australia (MBA)
- Certification of materials and equipment by governments, in consultation with the Master Builders Australia and other bodies
- Approval and certification of finished Home Improvements by governments or a public body.

Value for Money

During Phase 1 of 45,000 homes, the National Home Improvement Scheme will result in $1.35 billion worth of private investment. This represents an initial leveraging of $12 for every $1 of government money spent. However, the true potential is to create a national Home Improvement industry worth over $30 billion employing over 100,000 people. This would require only modest additional government funding, for example an extension of the capital guarantee and continued funding of training programs.

By transforming Australia's housing stock, this scheme could reduce bills for millions of Australians, while making their homes healthier and more comfortable. There could also be additional benefits to manufacturers of insulation, draught proofing, batteries and energy efficient appliances and other associated industries.

The reduction in grid demand will also free up energy supply for industry and accelerate the uptake of future technologies such as electric vehicles, hydrogen production and low carbon materials. Improved living conditions, health benefits and money saved from energy bills will all contribute to a healthier, happier and more productive economy.

National Home Improvement Scheme | APPENDIX

National Economic Impacts of the Million Jobs Plan

This report was prepared for Beyond Zero Emissions

24 August 2020

Enquiries to: Chris Murphy
Email: murphy@murphyeconomics.com.au
Postal Address: PO Box 4129
KINGSTON ACT 2604
AUSTRALIA

Acknowledgement:

I would like to acknowledge the considerable assistance provided by the staff of Beyond Zero Emissions in providing background information on the Million Jobs Plan including the four specific projects modelled here.

Contents

Executive summary

Introduction

The Million Jobs Plan ('the Plan') developed by Beyond Zero Emissions (BZE) envisages certain sectors investing in a low-carbon recovery from the COVID-19 recession. The Plan includes several hundred projects estimated by BZE to directly account for 1.8 million job years (BZE, 2020) over the 5-year period from 2021 to 2025, while the projects are in their investment phases. For modelling purposes, it is assumed that a selection of those projects is adopted that account for 1.0 million of the job years or 200,000 jobs on average.

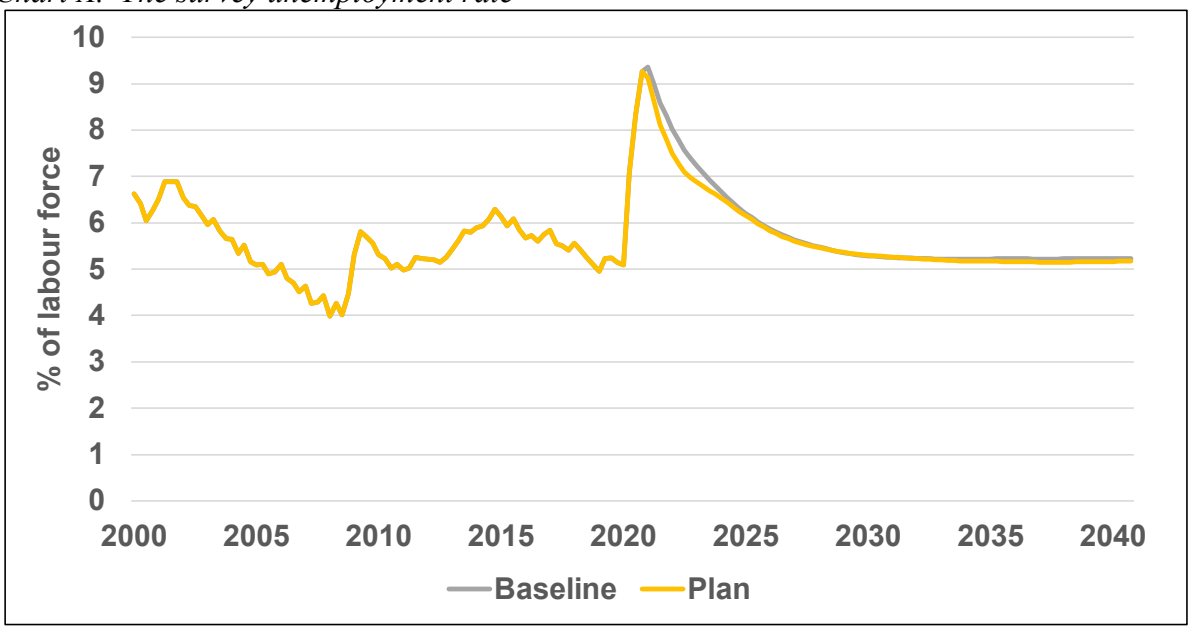
This report contains macro modelling to show how adoption of the Plan would affect the 20-year outlook for the Australian economy. Economic outcomes in a Plan scenario are compared to economic outcomes in a Baseline scenario in which the Plan is not adopted. These scenarios are generated by a prominent macroeconomic model of Australia (Murphy, 2020).

This report also contains long-term, computable general equilibrium (CGE) modelling of four representative projects from the Plan. This modelling shows the industry and general economic impacts of the projects, which represent the Better Buildings, Electricity Transmission, Renewable Energy Generation and Low-carbon Manufacturing streams of the Plan.

Baseline Scenario

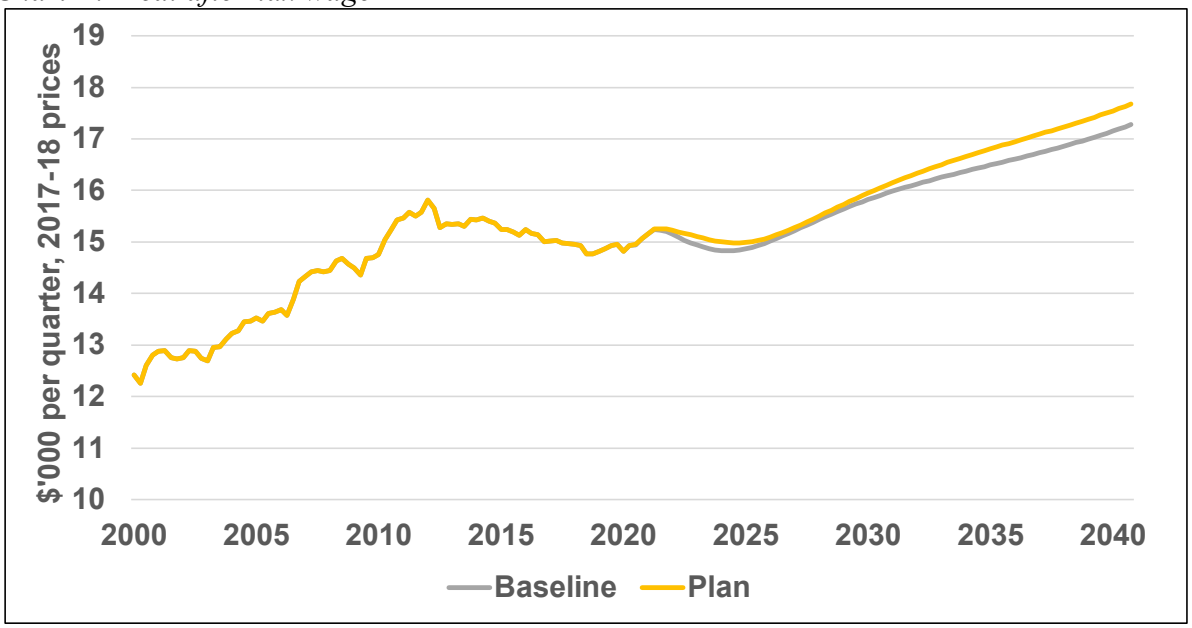
The Baseline scenario shows the recession in Australia that has been generated by COVID-19. The world recession, international travel restrictions and domestic economic restrictions, partly offset by government income compensation measures, have pushed the unemployment rate to an expected peak of between 9 and 10 per cent at the end of 2020 (Chart A). The recovery in unemployment may be gradual, with the rate not returning to 7 per cent until mid-2023.

Chart A. The survey unemployment rate



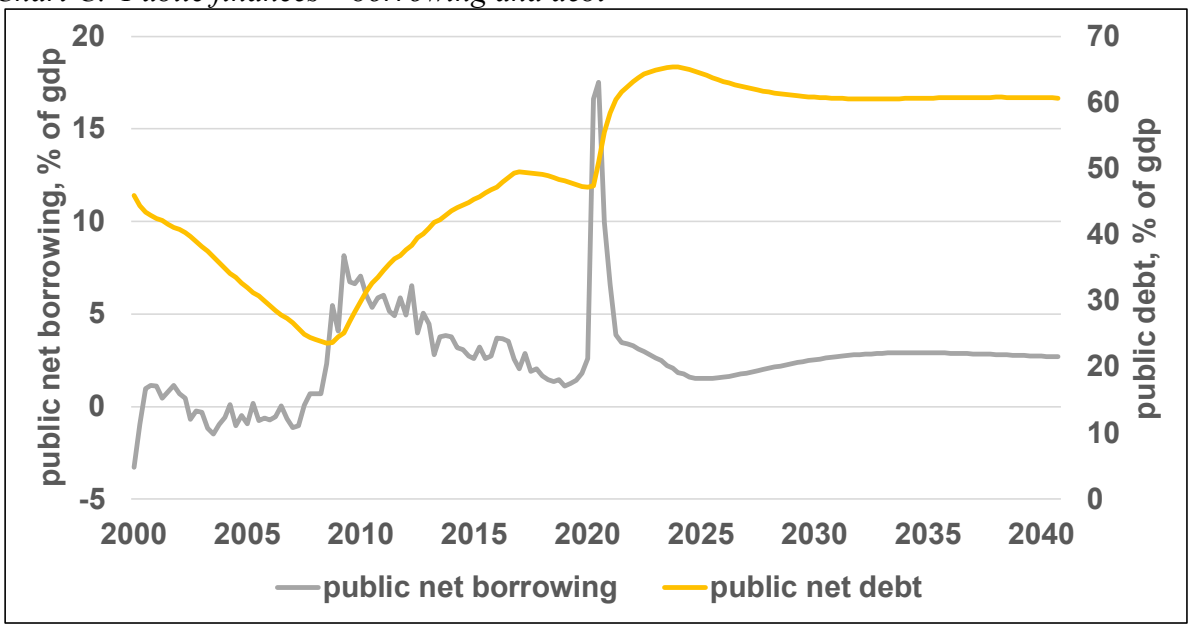
This medium-term weakness in the labour market means that the consumer real after-tax wage, a key indicator of living standards, is expected to be static for the next four years (Chart B). This follows a decade of lack of progress in this measure. This has been caused by a combination of low productivity growth and rising average rates of personal income tax reflecting the role of bracket creep in reducing the budget deficit.

Chart B. Real after-tax wage



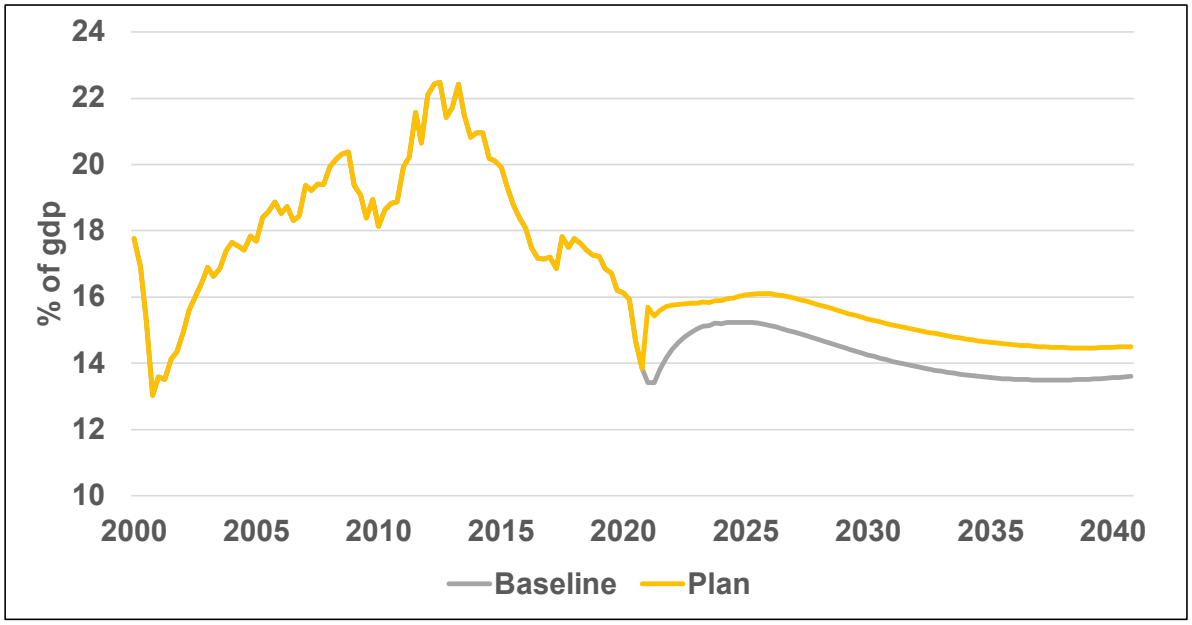
The Federal Government income compensation measures, led by JobKeeper, have added $200 billion to public borrowing in 2019-20 and 2020-21. These temporary measures have lessened the blow of the COVID-19 economic restrictions but have also produced an enormous spike in public net borrowing (Chart C). While public debt relative to annual GDP was on a downward path pre-COVID, post-COVID it is likely to have leapt by around 18 percentage points.

Chart C. Public finances – borrowing and debt



Private investment relative to GDP was already low pre-COVID, and post-COVID is likely to be even lower (Chart D). The implied low rate of capital accumulation keeps growth in productivity low, with a flow-on to low growth in real GDP and real wages.

Chart D. Private investment



Million Jobs Plan Scenario

The Baseline scenario shows that we face three key macroeconomic challenges. The first challenge is to achieve a more rapid decline in the unemployment rate than is projected in the Baseline. The second challenge is to generate growth in real after-tax wages. The third challenge is to stabilise public debt relative to GDP, following the large COVID-related uplift.

The Million Jobs Plan ('Plan') can assist in meeting all three challenges. The Plan involves modest govt support through seed funding, smoother approval processes and the like to assist a low-carbon recovery from the COVID-19 recession. The Plan's approach of using government support to leverage private investment helps meet the third macroeconomic challenge of stabilising public debt relative to GDP, compared to alternative strategies relying more on public spending.

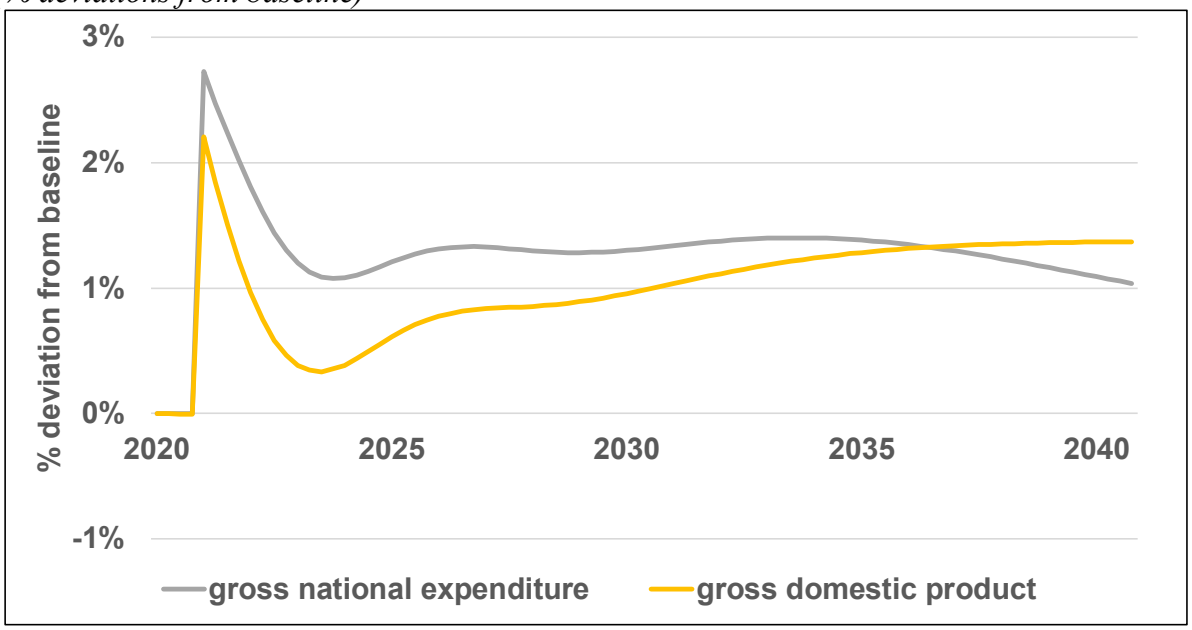
The Plan helps boost private investment relative to its low level in the Baseline scenario (Chart D). In 2021 the Plan boosts private investment from 13.7 per cent of GDP to 15.6 per cent of GDP or nearly two percentage points, with more modest boosts of around 1 percentage point in the subsequent years.

This front end loading of investment stimulates demand, helping to reduce unemployment more quickly. By the end of 2021, unemployment is down to 7.8 per cent in the Plan scenario compared to 8.3 per cent in the Baseline scenario (Chart A). This more rapid fall in unemployment helps meet the first macroeconomic challenge of reducing unemployment more rapidly. Put another way, over the period from 2021-22 to 2023-24, in the Plan unemployment is reduced around six months ahead of the schedule achieved in the Baseline scenario.

In the longer term, the Plan's accumulation of additional capital raises productivity relative to the Baseline scenario. This leads to sustained gains in living standards. Compared to the Baseline scenario in the same years, real after-tax wages are 1% higher in 2022-23 and 2% higher by 2035-36 (Chart B). This helps meet the second major macroeconomic challenge of generating growth in real after-tax wages.

The gains in productivity from the Plan, besides flowing to higher real wages, also flow through to higher real GDP and GNE (Chart E). The Plan adds 1 to 2 per cent to the level of real GDP compared to its Baseline scenario path.

Chart E. GNE and GDP
(% deviations from baseline)



Besides this macro modelling of the full Plan, CGE modelling has been used to assess the economy-wide and more detailed industry impacts of four representative projects from the Plan. The author's main previous uses of the CGE model used here include an analysis of the relative economic costs of a wide range of taxes (Murphy, 2016) and an analysis of the investment and other gains from reducing our reliance on corporate tax (Murphy, 2018).

The long-term modelling results support the finding from the macro modelling that the Plan projects add to real GDP and real after-tax wages (Table A). The largest gains are from the largest project, a national housing refit to reduce carbon emissions, while the smallest gains are from the smallest project involving battery manufacturing. The other two projects are in the electricity industry. These four projects are now considered one-by-one, in more detail.

Table A. Economy-wide Impacts of the Four Representative Projects

	housing retrofit	transmission	pumped hydro	battery manufacturing
real GDP:				
per cent	0.19%	0.06%	0.02%	0.02%
$ million at 2017-18 prices	3,570	1,022	394	287
real after-tax wages:				
per cent	0.31%	0.08%	0.04%	0.02%
$ per year at 2017-18 prices	210	57	24	12

National Retrofit Scheme

The National Retrofit Scheme is part of Better Buildings in the Million Jobs Plan. Homes are retrofitted so that they use less energy and emit less carbon. With planned expenditure per dwelling of about $25,000, around 1.4 million homes are retrofitted over five years for a total expenditure of $35 billion. This total expenditure represents an expansion of 1.7 per cent in the value of the existing dwelling stock of $2,100 billion.

The policy mechanism for implementing this scheme is under development, but may involve providing loans through NHFIC. The long-run modelling simulates the expansion in the value of the dwelling stock of 1.7 per cent by slightly reducing the required real rate of return for investment in dwellings.

The retrofitting activities in the scheme add to residential building construction, which expands by 1.66 per cent relative to baseline (Table B). That industry then requires additional construction services (mainly tradespersons), which expands by 0.59 per cent. The resulting improvements to the housing stock raise the value of housing services, for both owner-occupied and rented housing.

Table B. Real Gross Production: industries most affected by the Housing Retrofit Scheme (% deviation from baseline, long run)

3001Z Residential Building Construction	1.66%
3201Z Construction Services	0.59%
6701A Housing services: owner-occupied	1.03%
6701B Housing services: rented	0.81%

Victoria-NSW Interconnector

The Victoria-NSW Interconnector is part of Renewable Energy in the Million Jobs Plan. A more highly developed transmission network means renewable energy projects can be located to a greater extent where conditions are more suitable, less tied to the location of end users of energy. This particular project would facilitate the dispatch of Snowy 2.0 electricity to Victoria.

Planned capital expenditure is $1.7 billion. BZE proposes that the government fund the project to side-step the regulatory investment test for transmission (RIT-T).

The CGE modelling simulates this project by expanding the effective capital stock of the electricity transmission and distribution industry. As a result, the output of that industry expands by 0.94 per cent (Table C). This flows on to a general expansion in the electricity industry. For example, electricity retailing expands by 0.78 per cent.

Table C. Real Gross Production: electricity industries
(% deviation from baseline, long run)

2601A Fossil Fuel Electricity Generation*	0.79%
2601B Other Electricity Generation	1.38%
2605A Electricity Transmission, Distribution	0.94%
2605M Electricity Retail	0.78%

* Because the modelling simulates a generic expansion in electricity transmission, there are gains in activity on both the fossil fuel and renewable sides of the generation industry. In reality, the proposed project specifically supports Snowy 2.0, which in turn supports renewable generation. Thus, in reality, this project is likely to boost renewable generation (i.e. other electricity generation) but not than fossil fuel generation.

Oven Mountain Pumped Hydro

The Oven Mountain Pumped Hydro Energy Storage project is part of Renewable Energy generation in the Million Jobs Plan. Planned capital expenditure is $1.4 billion for a planned capacity of 600MW. This represents an addition of about 7 per cent to existing national hydro capacity of about 8,000 MW.

In April 2020, ARENA announced funding of $951,000 for a study into the benefits of the project. The proponents are seeking a further $3 million for project design and contract tender costs.

The CGE modelling simulates this project by expanding the effective capital stock of the renewable generation industry. This is consistent with the idea that pumped hydro acts like a battery supporting the National Grid, increasing the potential for reliance on renewable energy.

The main effect of the project is to expand the renewable energy generation industry by 6.26 per cent (Table D). This additional generation is partly at the expense of the larger fossil fuel generation industry, which shrinks by 0.54 per cent. An overall net increase in electricity generation results in expansions in electricity transmission and distribution and electricity retailing.

Table D. Real Gross Production: electricity industries
(% deviation from baseline, long run)

2601A Fossil Fuel Electricity Generation	-0.54%
2601B Other Electricity Generation	6.26%
2605A Electricity Transmission, Distribution	0.51%
2605M Electricity Retail	0.52%

Energy Renaissance Battery Manufacturing

The Energy Renaissance Battery Manufacturing project is part of the Manufacturing stream in the Million Jobs Plan. Lithium-ion batteries, designed to resist Australia's hot conditions, are manufactured for energy storage.

Planned capital expenditure is $0.21 billion. The project proponents are seeking government funding of $30 million to accelerate project growth. Adding storage capacity to the National Grid allows an increased reliance on renewable generation.

The CGE modelling simulates this project by expanding the effective capital stock of the electrical equipment manufacturing industry, which contains battery manufacturing. As a result, the output of that industry expands by 2.65 per cent (Table E).

Table E. Real Gross Production: electricity equipment manufacturing (% deviation from baseline, long run)

2403Z Electrical Equipment Manufacturing	2.65%

1 Introduction

The Million Jobs Plan ('the Plan') developed by Beyond Zero Emissions (BZE) envisages certain sectors investing in a low-carbon recovery from the COVID-19 recession. The Plan includes several hundred projects estimated by BZE to directly account for 1.8 million job years (BZE, 2020) over the 5-year period from 2021 to 2025, while the projects are in their investment phases. For modelling purposes, it is assumed that a selection of those projects is adopted that account for 1.0 million of the job years or 200,000 jobs on average. This is equivalent to 1.5 per cent of pre-COVID-19 national employment.

The Plan targets investment in multiple areas of the economy that assist in reducing carbon emissions. These include Better Buildings, Electricity Transmission, Renewable Energy Generation and Low-carbon Manufacturing.

BZE is interested in a fuller understanding of the national economic impacts of the Plan. It commissioned Chris Murphy to model those economic impacts from two perspectives, the macro perspective of the Plan as a whole and the project-level perspective of representative individual projects that are included in the Plan.

The macro perspective modelling simulates how adoption of the Plan would affect the outlook for the Australian economy. This involves comparing economic outcomes if the Plan is adopted (Plan scenario) with economic outcomes if the Plan is not adopted (Baseline scenario). This comparison is conducted over the 20-year period from 2021 to 2040.

Over about the first five years, the projects are in their development phases and the modelling results show how that development work can hasten Australia's recovery from the current recession. Once that development work has created productive assets, the projects enter their operational phases and the modelling results for the outyears show the economic payoff from the utilisation of those assets. This analysis was undertaken using the macro model (Murphy, 2020).

The project perspective modelling simulates the long-term industry impacts from four representative Plan projects. The chosen projects represent the Better Buildings, Electricity Transmission, Renewable Energy Generation and Low-carbon Manufacturing areas of the Plan. For each project, the modelling shows the impact on the project industry, upstream and downstream industries and the economy as a whole. This analysis was undertaken using a computable general equilibrium (CGE) model (Murphy, 2016), which has been used extensively to analyse corporate and other tax reforms (Murphy, 2018).

This study addresses the national economic impacts of the Plan. It is acknowledged that some of the larger individual projects included in the Plan will also have significant regional impacts that are outside of the scope of this study. Nevertheless, the Plan contains hundreds of projects and these are located throughout Australia, and so it is reasonable to suppose the national economic impacts reported here also give some indication of the regional impacts.

Importantly, the Plan is directed at reducing carbon emissions. BZE has already assessed that the individual projects included in the Plan meet that aim. The more macro view of the Plan taken in this modelling study is not suited to estimating impacts on carbon emissions.

Sections 2 and 3 contain the macro perspective modelling.

- **Section 2** sets out the Baseline scenario.
- **Section 3** develops the Plan scenario and compares it to the Baseline scenario to show the macroeconomic effects of the Plan.

Sections 4 to 7 presents the project perspective modelling.

- **Section 4** simulates the National Retrofit Scheme from Better Buildings.
- **Section 5** models the Victoria-NSW Interconnector as an example of an Electricity Transmission project.
- **Section 6** simulates Oven Mountain Pumped Hydro Energy Storage to illustrate the Renewable Energy generation projects.
- **Section 7** models Energy Renaissance Battery Manufacturing as an example of Low-carbon Manufacturing.

While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference of Beyond Zero Emissions (BZE) and are designed to be used only for the specific purpose set out below. If you believe that your terms of reference are different from those set out below, or you wish to use this report or information contained within it for another purpose, please contact us.

The specific purpose of this report is to model the national economic impacts of the Million Jobs Plan from the macro perspective of the Plan as a whole and the project-level perspective of four representative projects.

The findings in this report are subject to unavoidable statistical variation. While all care has been taken to ensure that the statistical variation is kept to a minimum, care should be taken whenever using this information. This report only takes into account information available to the author up to the date of this report and so its findings may be affected by new information. The information in this report does not represent advice, whether express or inferred, as to the performance of any investment. Should you require clarification of any material, please contact us.

2 Baseline scenario

The macro perspective modelling simulates how adoption of the Plan would affect the outlook for the Australian economy in a Plan scenario compared to a Baseline scenario in which the Plan is not adopted. This section sets out the Baseline scenario, while the following section develops the Plan scenario. The only difference between the two scenarios is in whether the Plan is included.

This section begins by explaining the general nature of the macro model that is used to generate the scenarios. It then explains the key inputs that are fed into the model regarding the world economy, population, productivity growth in each industry and budget policy, and how these are influenced by COVID-19. Finally, the Baseline scenario then generated by the model is summarised, including the outlook for GDP, unemployment and government finances.

2.1 Macro model

This macro perspective modelling uses Chris Murphy's latest macro model of Australia. He has developed a series of Australian macro models since the 1980s. These models have been used to produce forecasts and analyse macro policies for government and private clients and academic publications. He has developed similar models for the governments of New Zealand, Singapore and Malaysia. He is currently macro modelling adviser to the Monetary Authority of Singapore and the Australian Treasury.

The Australian macro model uses quarterly data and is used to generate scenarios over a 40-year horizon. It belongs to the class of macro-econometric models. Such models generally aim to balance principles from macroeconomic theory with econometric analysis of historical data. Other classes of macro models include DSGE models, which generally place more weight on the theory, and VAR models, which usually place more weight on the data. In the author's view, macro-econometric models offer a good balance between theory and data.

In the macro model, economic activity is driven mainly by demand in a Keynesian short run. However, it transitions to a neoclassical long run in which economic activity is driven by supply. Financial markets are forward-looking, so asset prices such as the exchange rate respond immediately and fully to new information.

The latest macro model (Murphy, 2020) was developed and refined over the period from 2013 to 2020. Other comparable Australian models are EMMA at the Treasury and MARTIN at the Reserve Bank of Australia (Ballantyne et al., 2020). Compared to EMMA and MARTIN, the macro model used here has finer industry and budget policy detail, which is helpful in allowing for the economic impacts from COVID-19, including the economic restrictions and the government income compensation policies.

The macro model identifies six broad industries. For clarity, the names used by the ABS for each industry are shown in parentheses in cases where the ABS names differ from the names used in the model.

- Agriculture ('agriculture, forestry and fishing')
- Mining
- Manufacturing
- Government services ('public administration and safety', 'education and training' and 'health care and social assistance')
- Other private services (all industries not included elsewhere)
- Housing services ('residential property operators').

Of these broad industries, other private services is the largest, accounting for 60 per cent of total employment in 2019, prior to the COVID-19 pandemic. It is also the industry that is most affected by the government COVID-19 economic restrictions.

In the macro model, the government budget refers to the budgets of all three levels of government (federal, state and local) consolidated together. Following extensive model development work in 2020, there are now levers for changing government budget policy in all of the following areas.

- General government transfers
  - age-related
  - child-related
  - disability-related
  - unemployment-related
  - transfers overseas
  - other transfers
- General government final demand
  - consumption
  - investment
- Personal income tax
- Company income tax
  - tax rate
  - option for immediate expensing for machinery & equipment
  - option for immediate expensing of structures
- GST
  - rate
  - option for fully broadening the base in any industry
- payroll tax
- land-related taxes (municipal rates, state government land tax)
- conveyancing duty
- mining royalties
- other production taxes in any industry
- other product taxes
- target for the public debt to GDP ratio

In the macro model there are 55 estimated equations. The estimation method used is OLS. The estimation period generally starts in the September quarter 1985, but more recent start dates

are used in cases where structural change is considered to be an issue. The estimation period ends in the most recent quarter for which there is a full set of data, currently the March quarter 2020.

There are a total of 790 equations. These include the estimated equations, calibrated equations for equilibrium supply-side relationships in each industry, asset accumulation equations and accounting identities.

For the model inputs, there are 106 exogenous variables. The more important categories of exogenous variables are for the world economy, population, productivity growth in each industry and budget policy. The settings for those model inputs used in generating the Baseline scenario are summarised, including how they are influenced by COVID-19.

2.2 Baseline inputs

To generate the Baseline scenario, we choose paths for the model inputs. These paths extend from the beginning of the scenario in June quarter 2020 to the end in March quarter 2061.

In addition, the values for some model outputs in the June quarter 2020 are already known and so are imposed on the scenario. The main examples where June quarter outcomes are known are for the financial, commodity and labour markets. The June quarter outcomes for GDP, including its breakdown by industry and expenditure category, will not be known until the June quarter national accounts are released on 2 September, and so must be simulated by the model.

COVID-19 economic restrictions

COVID-19 and the government responses to it have cast a long shadow over the world and Australian economies. The world recession has reduced demand for some Australian exports. Our international travel restrictions have severely restricted net overseas migration, inbound tourism, outbound tourism and numbers of foreign students. Domestic social distancing restrictions have severely constrained activity in the accommodation and food services industry and the arts and recreation industry. There have also been major government spending programs to compensate the economic agents who have lost income from the restrictions.

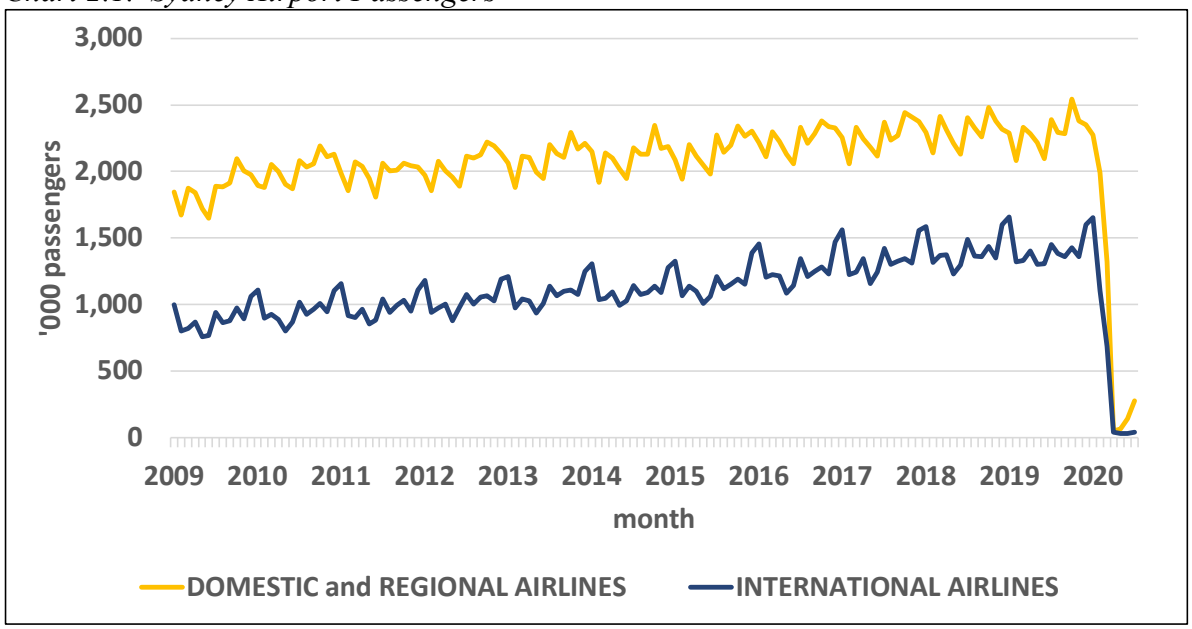
The inputs into the model depend importantly on how long the international restrictions, domestic restrictions and income compensation programs are expected to last. The likely duration of those three government policies introduced in response to COVID-19 are now considered in turn.

The Australian Government ban on international travel, imposed in March 2020, resulted in international passenger movements almost ceasing at Australian airports. The most recent data is for Sydney airport and is shown in Chart 2.1. Sydney international passenger movements fell from 1,102 thousand in February to only 41 thousand in April and have remained around that level.

The government aims to keep COVID-19 infections at a ‘suppressed’ (low) level and so has signalled that it expects to maintain the international travel restrictions for some time. The

Reserve Bank of Australia or RBA (2020) assumes that international travel restrictions 'ease around the middle of 2021' and the same assumption is made here.

Chart 2.1. Sydney Airport Passengers



Sources: Bureau of Infrastructure, Transport and Regional Economics, Sydney Airport.

The domestic restrictions, like the international travel ban, were introduced in March 2020. The main industries directly constrained were the accommodation and food services industry and the recreation and culture industry, with smaller percentage impacts on other industries. After the rate of new infections fell to low levels, those restrictions were partially eased in May 2020. However, a second wave of COVID-19 in Victoria led to the original restrictions being reimposed in that state in June, and then being tightened in August to partly constrain the manufacturing, construction and retail industries.

The rate of new infections is now falling again in Victoria and elsewhere. If that trend continues, domestic restrictions are likely to be gradually eased. It is assumed that domestic restrictions have been fully lifted by March 2021, with the possible exception of restrictions on mass gatherings in confined spaces because of their high infection risk.

As the restrictions are lifted, the government spending programs designed to compensate for those restrictions can also be expected to be lifted. The largest of those programs, JobKeeper, is assumed to end in March 2021, as currently scheduled.

World economy

World GDP had been growing at a steady annual rate of over 3 per cent in the years leading up to the COVID-19 recession. However, as a result of the economic restrictions introduced around the world in response to COVID-19, world GDP fall by an estimated 4 per cent from the June quarter 2019 to the June quarter 2020. Hence, the level of world GDP has fallen about 7 per cent below the path projected before the onset of the COVID-19 induced recession. World GDP is assumed to take three years to recover back its pre-COVID path. In other words,

world GDP growth is expected to be above normal until 2023, in a catch up from the lost growth of 2020.

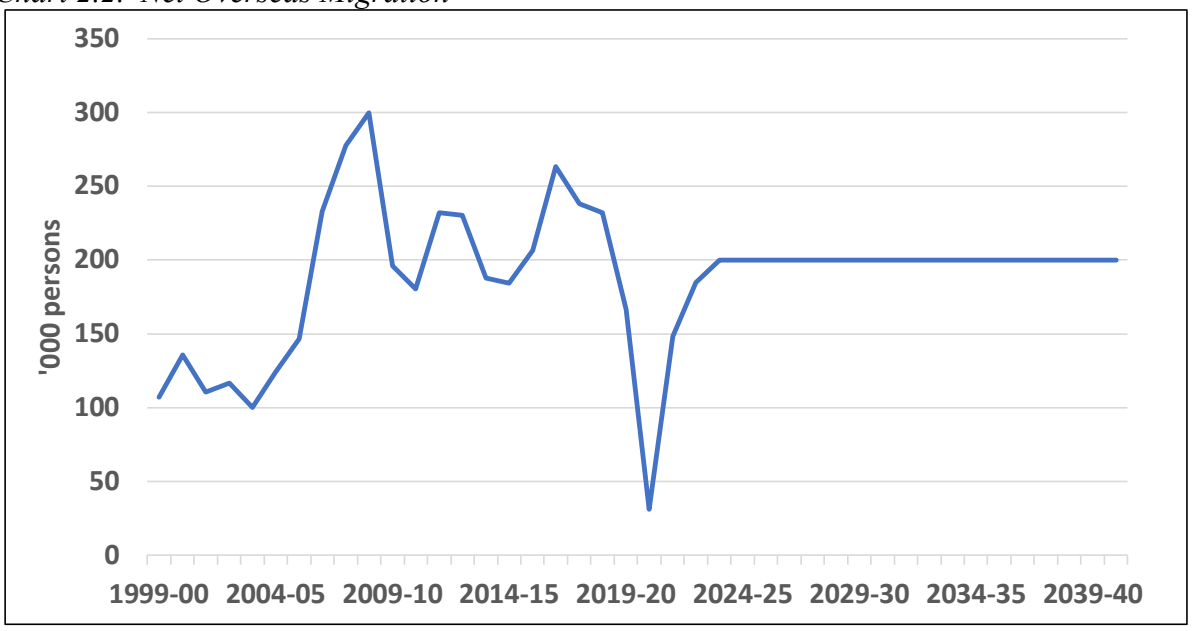
Fortunately for Australia, the world recession has not flowed through into a fall in aggregate commodity prices so far in 2020. Specifically, the Reserve Bank's commodity price index, expressed in SDRs, was 95.0 in July 2020, virtually unchanged from its reading of 94.8 in December 2019. Falls in rural and base metals prices have been offset by rises in bulk minerals prices. However, this good fortune seems unlikely to last. The world recession is forecast to lead to moderate falls in real commodity prices between now and the June quarter 2022.

The world recession has seen monetary authorities reduce short-term interests from levels that were already low by historical standards. US, Euro, UK and Japanese 3-month inter-bank offer rates have all been around zero since June. Futures markets believe that these short-term interest rates will remain close to zero for three years or more.

Population

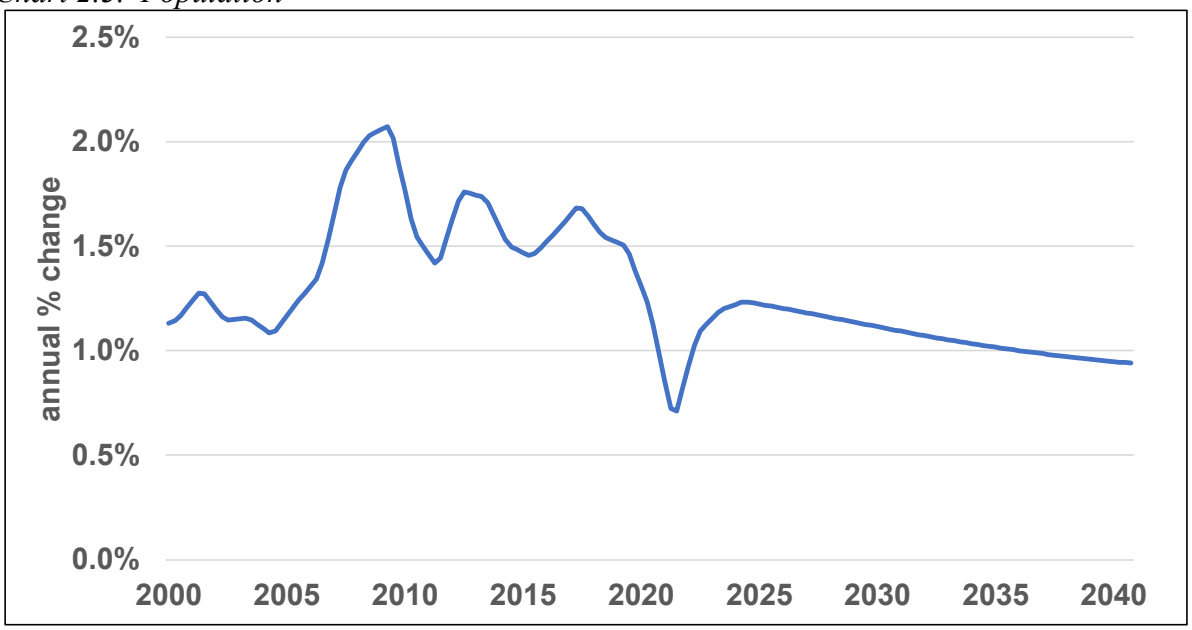
The international travel ban reflected in Chart 2.1 has disrupted net overseas migration (NOM). NOM is forecast to nose dive from 232 thousand persons in 2018-19 to only 31 thousand in 2020-21, as seen in Chart 2.2. It is then forecast to gradually recover to be 200 thousand from 2023-24 onwards.

Chart 2.2. Net Overseas Migration



This disruption to net overseas migration reduces population growth. In the year to the June quarter, population growth is forecast to fall from 1.5 per cent in 2019 to only 0.7 per cent in 2021, as seen in Chart 2.3. Population growth is then forecast to partially recover to reach 1.2 per cent from 2023. These population projections are generated by a separate population model based on assumptions for NOM, fertility and mortality.

Chart 2.3. Population



Productivity growth

Trend growth in labour productivity growth per employed person has been 1.5 per cent per year over the 35 years from 1985-86 to 2018-19. However, there is some evidence that trend growth has weakened over this period. In the sub-period from 1985-86 to 1998-99 trend growth was 2.0 per cent, while in the sub-period from 1998-99 to 2018-19 it weakened to 1.0 per cent. Low investment appears to be one factor in this apparent weakening in labour productivity growth, which has been widespread across advanced economies, but it is not fully understood.

Given this lack of understanding, and for the purposes of projecting decades into the future, the Baseline scenario uses the longer term average for trend productivity growth of 1.5 per cent. It is acknowledged that productivity growth could actually turn out to be as high as in the first sub-period or as low as in the second sub-period.

Historical trend productivity growth has also varied noticeably across the industries in the model. There has been trend productivity growth in agriculture of 3.6 per cent, mining of 0.7 per cent, manufacturing of 1.6 per cent, government services of 0.3 per cent and other services of 1.7 per cent.

In generating the Baseline scenario, these historical trend productivity growth rates are used as follows. In each industry, the efficiency level of labour is assumed to growth in line with the historical, industry-specific, trend productivity growth rates listed above. On the other hand, the efficiency level of the fixed factor is assumed to grow in line with the economy-wide rate of 1.5 per cent. This is on the basis that there seems no strong reason to believe that productivity growth for a fixed factor such as land would vary between industries.

It is implausible to assume that the historical divergence between industries in their rates of productivity growth continues indefinitely. That would eventually lead to the complete

dominance of industries with faster productivity growth. Hence, industry rates of labour efficiency growth are assumed to gradually converge to the economy-wide average rate of 1.5 per cent, and are close to that rate by 2035.

Budget policy

The Federal Government has introduced an array of temporary fiscal measures mostly designed to compensate economic agents experiencing income losses as a result of the international and domestic restrictions introduced in response to COVID-19. Those measures are included in Table 2.1. That table shows the costs of all Federal Government Budget policy decisions taken between the Mid-Year Economic and Fiscal Outlook (MYEFO) of December 2019 and the Economic and Fiscal Update of July 2020 (JEFU). It also includes the further cost from the relaxation of access to JobKeeper announced on 7 August 2020.

Table 2.1. Cost of Federal Government policy decisions taken since MYEFO ($ billion)

Policy Measure	2019-20	2020-21	2021-22	Total
JobKeeper payment	20.6	80.7		101.3
boosting cash flow for employers	14.9	17.0		31.9
accelerated depreciation:				
backing business investment		1.5	5.2	6.7
enhancements to instant asset write-off		2.4	0.8	3.2
Jobseeker & related supplements	5.9	11.9		17.8
Other measures	17.0	20.5	1.5	39.0
Total	**58.4**	**134.0**	**7.5**	**199.9**

Sources: Australian Government (2020), Prime Minister and Treasurer (2020).

As seen in the table, the measure with biggest Budget cost of over $100 billion is JobKeeper. Currently, JobKeeper provides businesses who experienced a decline in turnover beyond a specified percentage with a payment of $1,500 per fortnight for each eligible employee, who in turn must be paid at least that amount. JobKeeper is in full operation in the June and September quarters of 2020, and the payment amount will be phased down in the December quarter 2020 and March quarter 2021 with the program then ceasing.

The economic impacts of JobKeeper depend on the circumstances of the businesses who receive it. There are three main cases.

First, there are those businesses who have ceased operations while the restrictions are in place. They pass on the JobKeeper payments to their inactive employees, providing those employees with a superior alternative to the JobSeeker payment available from Centrelink. In that case JobKeeper can be considered as a government transfer payment to the inactive employees, with the business acting as an intermediary. The business receives no benefit from JobKeeper other than keeping the inactive employees on its payroll.

Second, there are those businesses who experienced an initial decline in turnover in the June quarter 2020 sufficient to make them eligible for JobKeeper, but then returned to normal operations by the September quarter after some restrictions were eased (outside of Victoria).

Their employees would now generally be receiving their normal remuneration for their normal work. JobKeeper becomes a windfall gain to such businesses in the September quarter, and can be considered as a government transfer payment to the business owners. Fortunately, those normally-operating businesses will no longer be eligible for JobKeeper in the December quarter, because they will fail the eligibility test based on September quarter turnover.

Third, there are businesses that are operating, but at below their normal capacity, so some of their employees are active and some are inactive. For those in-between businesses, JobKeeper acts as a government transfer payment to the inactive employees and a wage subsidy for the active employees.

The main danger of JobKeeper relates to these in-between businesses once relevant restrictions are lifted. For many of those businesses, it will be more profitable to remain operating at below normal capacity with JobKeeper, than to return to full capacity without JobKeeper. This has the potential to delay full economic recovery. The Treasury (2020) review of JobKeeper identifies some potential adverse disincentive effects but appears to overlook this one. Once this problem is recognised, it becomes clear that it is important that JobKeeper is phased out in tandem with the restrictions. Broadly consistent with this, the Baseline scenario assumes that the government maintains its existing policy under which the payment amount will be phased down in the December quarter 2020 and March quarter 2021 with the program then ceasing.

In summary, JobKeeper is complex from an economic or modelling perspective. It is partly a government transfer payment to employees, partly a government transfer payment to business owners and partly a wage subsidy.

The measure with the next largest Budget cost is 'boosting cash flow for employers'. As seen in Table 2.1, it has a Budget cost of over $30 billion. Employing businesses with an annual turnover of up to $50 million receive two payments totalling between $20,000 and $100,000. The exact amount of the payments depends primarily on the amount of tax that a business has withheld from wages and salaries in either the March month or March quarter 2020.

Unlike JobKeeper, this cash flow boost is not specifically targeted at businesses who have experienced turnover declines from COVID-19. Rather, the amount of the payments is determined from business activity statements that largely refer to the pre-COVID period.

This retrospective nature means that businesses cannot change the amount they receive by changing their behaviour. Consequently, the cash flow boost operates as a government transfer payment to business owners. The aim of this transfer is to assist businesses to stay open rather than to close.

Thus, an economic analysis of the nature of both JobKeeper and 'boosting cash flow for employers' shows that they are primarily government transfer payments, partly made to business owners and partly to inactive labour. In the macro model, both types of government transfer payments are part of a broader category of transfer payments to the private sector. To a lesser extent, there are production subsidies involved, but only to the extent that JobKeeper entails payments for active employees for businesses that also have inactive employees.

In contrast, the Australian Bureau of Statistics (2020) has announced that it will treat both JobKeeper and 'boosting cash flow for employers' as production subsidies rather than government transfer payments in compiling the June quarter national accounts. Using reasoning from the 2008 international system of national accounts (SNA2008), the ABS essentially argues that both payments are made to businesses and that the amounts of the payments are related to production values, so they should be classified as production subsidies.

Irrespective of whether the ABS treatment is technically consistent with SNA2008, it conflicts with the above economic analysis of the likely economic impacts of the measures. Furthermore, simulations with the macro model show that if these extraordinarily large measures were to be (mis)interpreted as production subsidies, a large deflation would be forecast. Instead, wages and prices were virtually static in the June quarter 2020. The trimmed mean CPI fell by only 0.1 per cent and the wage price index rose by 0.2 per cent (seasonally adjusted). Economic forecasters are predicting very low inflation will continue in coming quarters, not the large deflation that would be expected from the introduction of very large production subsidies.

Taking all this into account, the two measures have been split about 75/25 between government transfer payments to the private sector and production subsidies. For modelling simplicity, the JobKeeper payments ($101 billion) are assigned to transfers and the 'boosting cash flow for employers' ($32 billion) to subsidies, although in practice the subsidy component arises from a sub-component of JobKeeper. The very large and somewhat uncertain economic impacts of these two payments is a significant source of uncertainty in preparing the Baseline scenario.

A supplement of $550 per fortnight is being paid to Jobseeker and related recipients in the June and September quarters 2020, to be phased down to $250 in the December quarter 2020 before ceasing. The Budget cost of this, including a broadening in eligibility for Jobseeker, is $18 billion, as shown in Table 2.1. The modelling captures the application of the supplement to those on Jobseeker and Youth Allowance (other), which represents an estimated $12 billion of the total cost.

The government has introduced two measures that increase the availability of accelerated depreciation, at a total Budget cost to 2021-22 of $9.9 billion, as seen in Table 2.1. These accelerated depreciation measures apply to machinery and equipment, but not building or engineering structures.

The enhancements to instant asset write-off extend its availability by raising the eligibility ceiling for annual business turnover from $50 million to $500 million and by raising the value cap for individual assets from $30,000 to $150,000. This enhanced instant write-off is available for assets purchased in the June, September and December quarters 2020.

For assets above the value cap, there is the 'backing business investment' program. This provides for immediate expensing of 50 per cent, rather than 100 per cent, of the value of an eligible asset. This partial immediate expensing is available for assets purchased from the June quarter 2020 to the June quarter 2021.

These immediate expensing provisions are modelled on an accrual basis when the assets are purchased (2019-20 or 2020-21), rather than on a cash basis when the reduction in tax liability is received in the following financial year (2020-21 or 2021-22). This is to better capture the likely timing of the stimulus to investment.

Following the recent model development work in the area of budget policy, the macro model now fully provides for immediate expensing provisions. It also distinguishes between investment in machinery and investment in equipment and structures in each industry. This allows it to appropriately capture the economic impact of these accelerated depreciation measures.

As seen in Table 2.1, there are other recent Federal Government policy measures with a total value of $39 billion, some of which are in response to COVID-19. In addition, state governments have also introduced some relatively modest Budget measures in response to COVID-19. These other measures have not been modelled. Hence, the Baseline scenario captures most, but not all, of the fiscal stimulus introduced in response to the COVID-19 recession.

Judgement

It has just been detailed how many of the effects of the government economic restrictions and stimulus measures introduced in response to COVID-19 have been allowed for in setting the projected paths of a range of model inputs. These include settings encapsulating the world economy, population and government budget policy.

At the same time, economic reasoning and the latest data point to other effects of the COVID-19 policy environment. These are allowed for by using judgemental adjustments to model equations, known as residual adjustments. The major instances of these adjustments are now explained.

As discussed above, the domestic economic restrictions impact most heavily on the accommodation and food services industry and the arts and recreation services industry. Household consumption of these consumer services has been suppressed by government policies. In the macro model, these consumer services form part of the output of the other private services industry. Hence their suppression is modelled by adjusting total household consumption down, and then allocating that reduction to consumption of other private services. Based on the expected duration of the domestic restrictions, these adjustments are phased down so they disappear from the June quarter 2021.

This suppression of demand for other private services has generated uncertainty for this industry, which is likely to translate into temporarily lower levels of business investment. Hence, investment by the other private services industry in machinery and equipment and in structures is suppressed. These adjustments are phased down to disappear from the September quarter 2021. This more extended phase down recognises the delay from when investment decisions are made to when they can be implemented.

Housing approvals data indicates that housing investment is likely to fall by more than would be expected, even after allowing for the slowdown in population growth shown in Chart 2.3, and the weaker labour market. This deeper slowdown may be due to the income uncertainty associated with the uncertain future course of the COVID-19 economic restrictions. It has been taken into account by suppressing housing investment through to the March quarter 2021.

2.3 Baseline scenario

The Baseline inputs were fed into the macro model to generate the Baseline scenario. Our main focus is on the projected outcomes for GDP, the labour market and government finances, and the drivers of those outcomes.

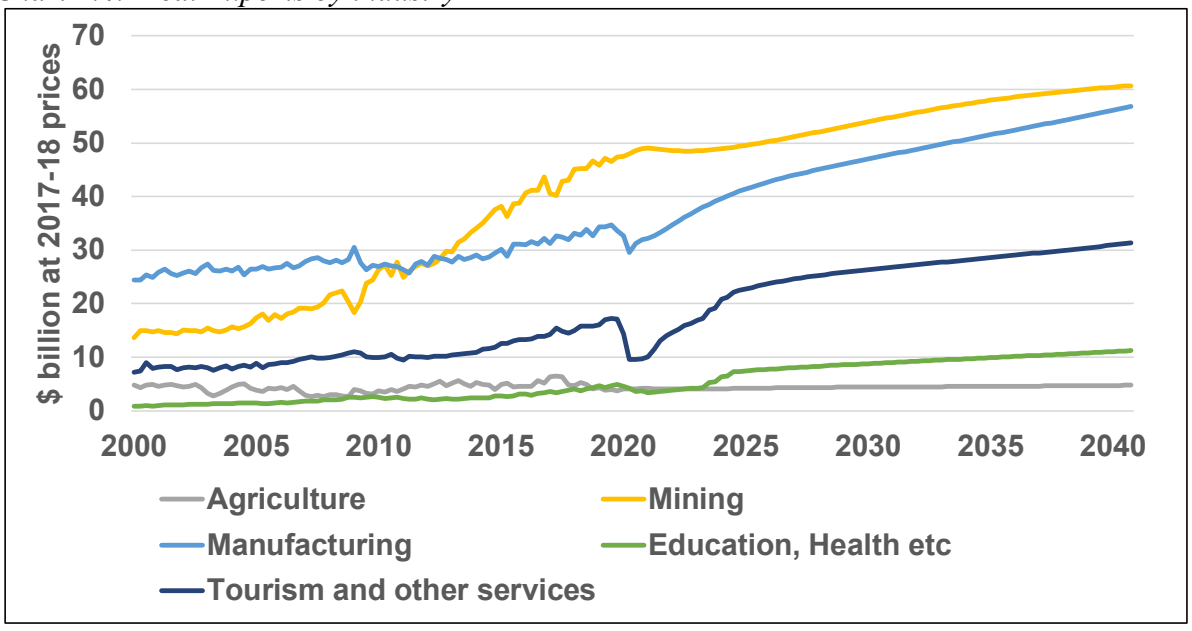
Trade

Chart 2.4 shows the Baseline scenario for real exports by industry. The more dramatic movements in the chart reflect the Australian restrictions on international travel.

Inbound tourism has virtually disappeared, leading to the sharp fall seen in exports of tourism and other services. As stated previously, it is assumed that the international travel restrictions are lifted in July 2021. However, international tourism takes a further two years to fully recover because of the concerns of potential travellers about the infection risk from travel.

The Australian restrictions on international travel have also almost halted the intake of new international students to Australian universities. While the intake is assumed to return to near-normal from second semester 2021, the very low intake since the first semester 2020 means the population of international students in Australia, and their associated expenditures, will remain well below normal until about mid-2024.

Chart 2.4. Real Exports by industry



The associated profile for fees paid by international students is the main driver of the projection for exports of education, health and other government-related services shown in Chart 2.4. That fees profile is broadly consistent with the analysis of Universities Australia (2020).

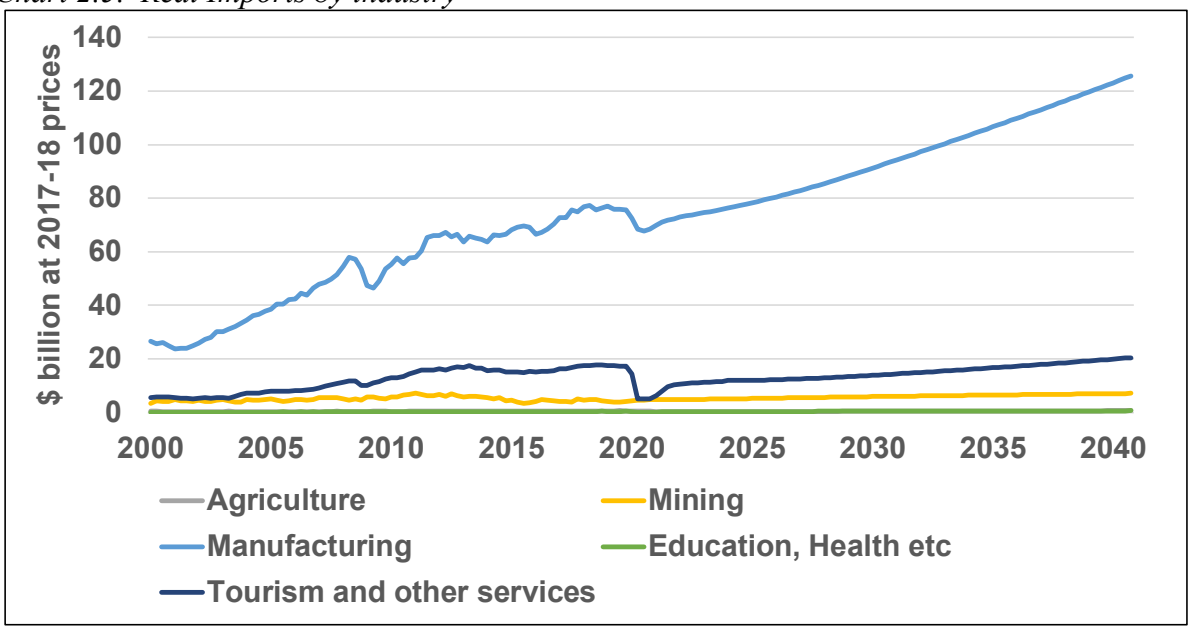
On the positive side, mining export volumes have been largely unaffected by the COVID-19 world recession. However, lower world demand is evident in the weakness seen in manufacturing exports.

Chart 2.5 shows the Baseline scenario for real imports by industry.

The Australian restrictions on international travel have a similar effect on outbound tourism to their effect on inbound tourism. Hence, imports of tourism and other services are very low during the period of assumed restrictions from the June quarter 2020 to the June quarter 2021, before gradually recovering over a two year period to the June quarter 2023. This weakness in outbound tourism helps offset the potential impact on GDP of the weakness in inbound tourism.

Chart 2.5 also shows how the Australian recession leads to temporarily lower demand for imports of manufactured goods.

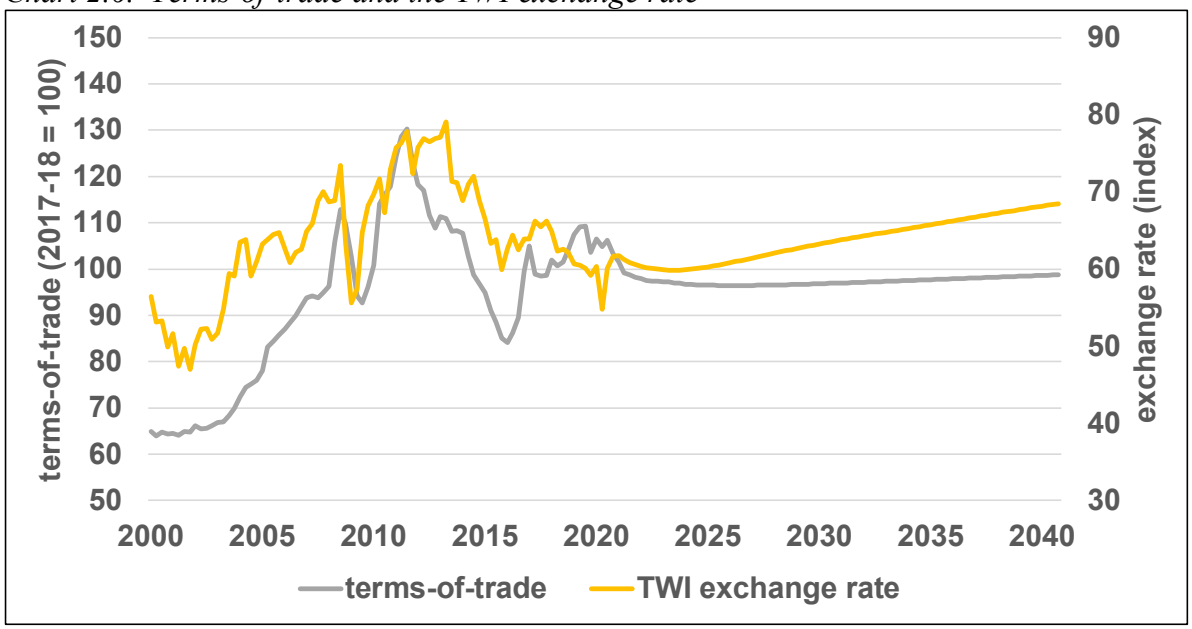
Chart 2.5. Real Imports by industry



As stated previously, in aggregate, real commodity prices have held at strong levels so far, but the world recession is expected to lead to moderate falls between now and the June quarter 2022. This pattern is reflected in the forecast for the ratio of export to import prices or the terms-of-trade.

Specifically, in the March quarter 2021, the terms-of-trade was 107, well below its 2017-18 base year value of 100, as seen in Chart 2.6. However, the forecast falls in real commodity prices see it decline to 97 by the June quarter 2022, before it levels out at what is nevertheless a high level by historical standards. This profile for the terms-of-trade supports the TWI exchange rate at above an index value of 60.

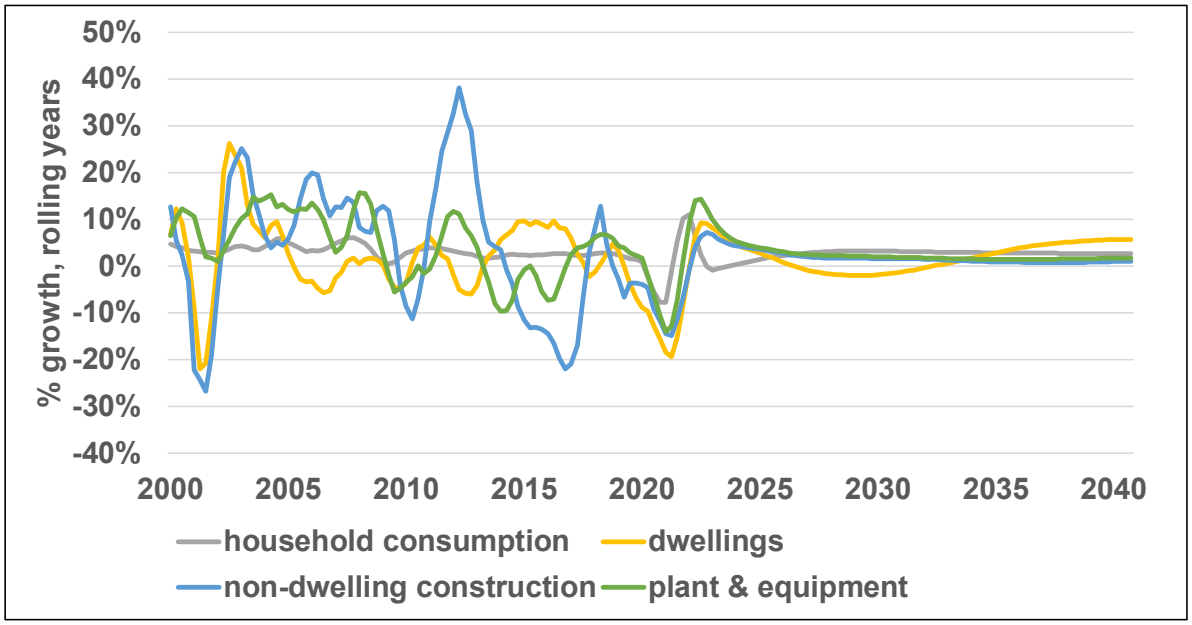
Chart 2.6. Terms-of-trade and the TWI exchange rate



Real Gross Domestic Product (GDP)

At the same time as the international travel restrictions and world recession have weakened export demand, the domestic economic restrictions have weakened domestic demand. Chart 2.7 shows the current broad-based falls in private final demand.

Chart 2.7. Private Final Demand



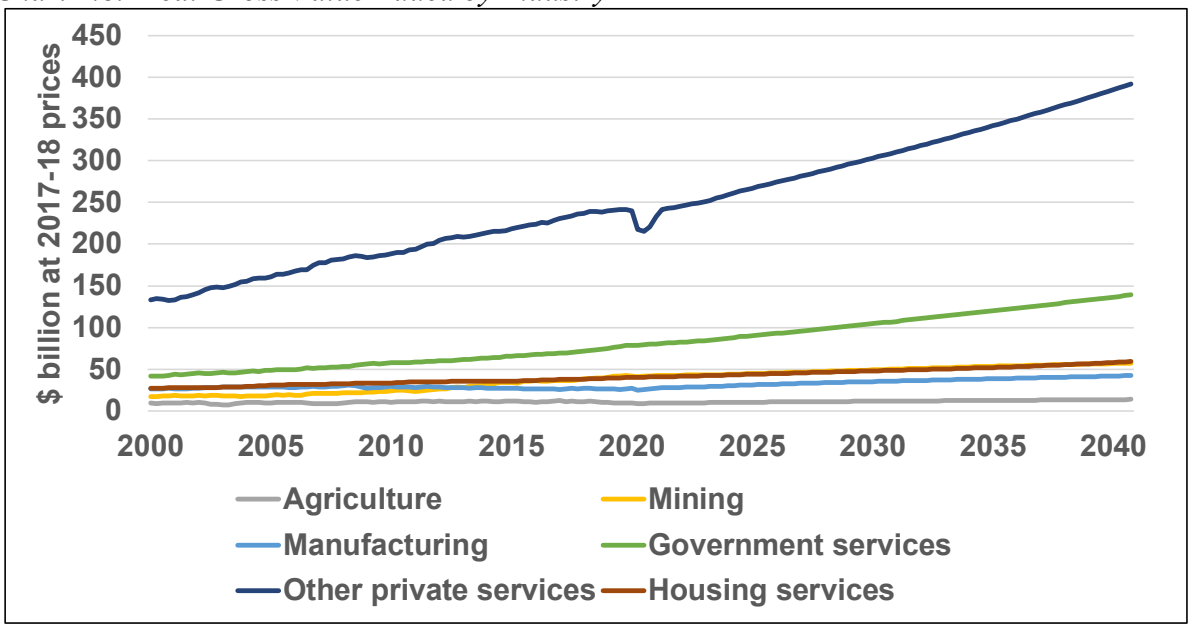
The economic restrictions have suppressed consumer spending on the accommodation and food services industry, the arts and recreation services industry and air passenger transport, in particular. As a result, real household consumption is forecast to be sharply lower in 2020 than in 2019, as seen in Chart 2.7. As the restrictions ease, household consumption is forecast to rebound in 2021.

The environment for housing investment is negative because of the combination of much lower net overseas migration, much higher unemployment and income uncertainty associated with the uncertain future course of the COVID-19 economic restrictions. Very low interest rates are only partly offsetting this array of strong negative factors. Consequently, housing approvals for May and June 2020 were down 18 per cent on the pre-COVID level of six months earlier. This is flowing through to housing activity, which is expected to be much lower in 2020-21 than in 2019-20, as seen in Chart 2.7. As the negative factors dissipate, a steady recovery in housing activity is expected starting from 2021-22.

Similar to housing investment, low net overseas migration and the COVID-19 economic restrictions are pushing business investment down, despite the support from very low interest rates. Thus, private business investment in both plant and equipment and non-dwelling construction is forecast to be sharply lower in 2020-21 than in 2019-20, before beginning to recover from 2021-22.

The combination of lower export demand and lower private domestic demand just discussed is expected to have led to a sharp fall in GDP in the June quarter 2020. Chart 2.8 shows the uneven spread of this downturn across industries.

Chart 2.8. Real Gross Value Added by Industry



The downturn is seen to be concentrated in the model's largest industry, other private services. This is for three main reasons.

First, as noted earlier, the domestic economic restrictions strongly constrain sales to consumers by the foods and beverage service industry and the arts and recreation services industry. Both of these industries fall within the broader industry of other private services.

Second, as also noted previously, the international travel restrictions have brought inbound tourism to a virtual halt. The lost spending in Australia by foreign tourists is largely at the expense of the other private services industry.

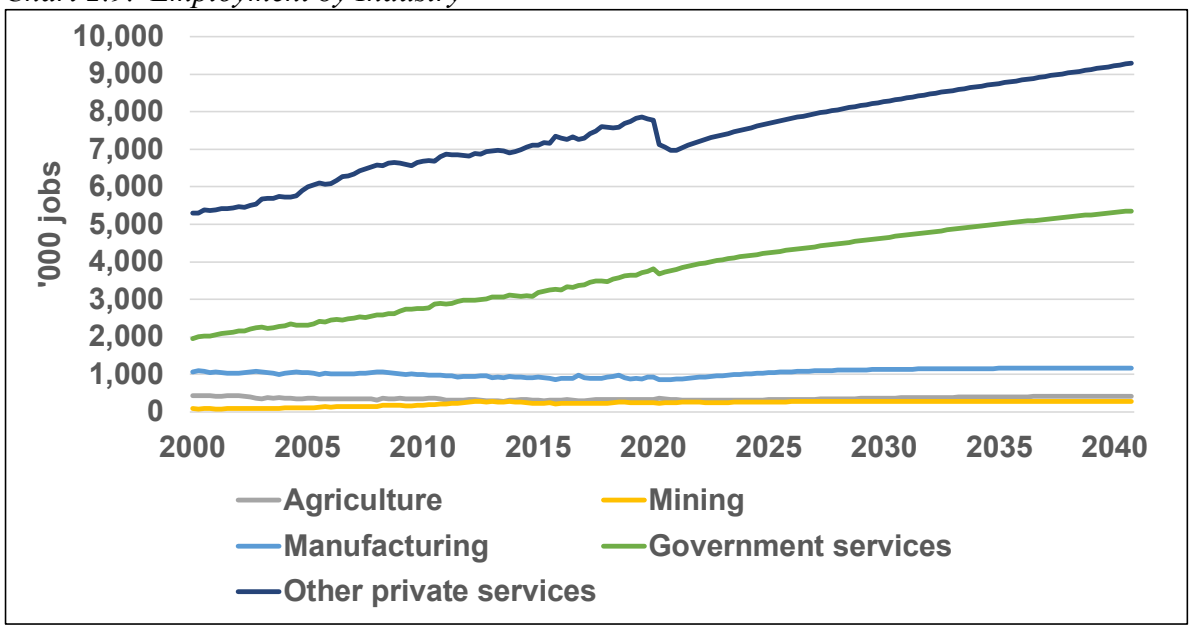
Third, the business and household uncertainty concerning the future course of COVID-19 and the associated economic restrictions is leading to weaker business and housing investment. This is reducing activity in the construction industry, which is part of the broader other private services industry.

Overall, real GDP is forecast to be around 3 per cent lower in 2020 than in 2019. As the economic restrictions and associated uncertainties ease, an economic rebound is expected with GDP growth of 6 per cent for 2021. However, this combined growth over the two years of about 3 per cent falls well short of normal growth for two years of 5 to 6 per cent. A complete economic recovery may be held back by the productivity growth sapping effects of persistently low business investment.

Labour Market

Turning to the labour market, Chart 2.9 shows that the downturn in employment, like the downturn is real Gross Value Added, is concentrated in the other private services industry. In seasonally adjusted terms, employment in that industry fell dramatically from 7.8 million in November 2019 to 7.1 million in May 2020. In the other four employing industries taken together, employment fell relatively modestly over the same period, from 5.2 million to 5.1 million. Total employment is expected to now remain broadly static until the end of 2020, before recovering from 2021.

Chart 2.9. Employment by Industry

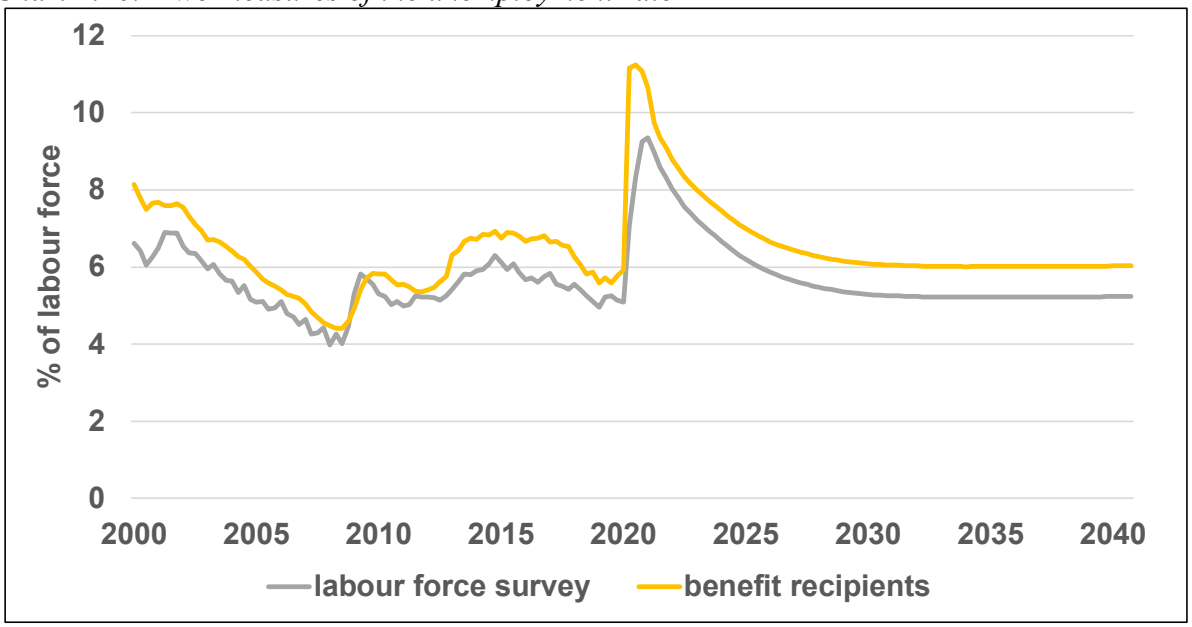


The severity of this downturn in employment has been slow to translate into unemployment, as measured in the seasonally-adjusted data from the ABS Labour Force Survey. From November 2019 to May 2020, employment fell by 6.3 per cent, yet the survey unemployment rate moved up by only 2.0 percentage points, from 5.1 per cent to 7.1 per cent.

Unemployment as alternatively measured from persons receiving unemployment benefit (those on Jobseeker and Youth Allowance (other)), has more fully reflected the fall in employment.

Over the same period, it rose on a seasonally adjusted basis by 4.3 percentage points, from 5.8 per cent to 11.1 per cent, as seen in Chart 2.10. While this still does not fully reflect the fall in employment, this is consistent with the usual fall in the labour force participation rate from the discouraged worker effect operating in a weak labour market.

Chart 2.10. Two measures of the unemployment rate



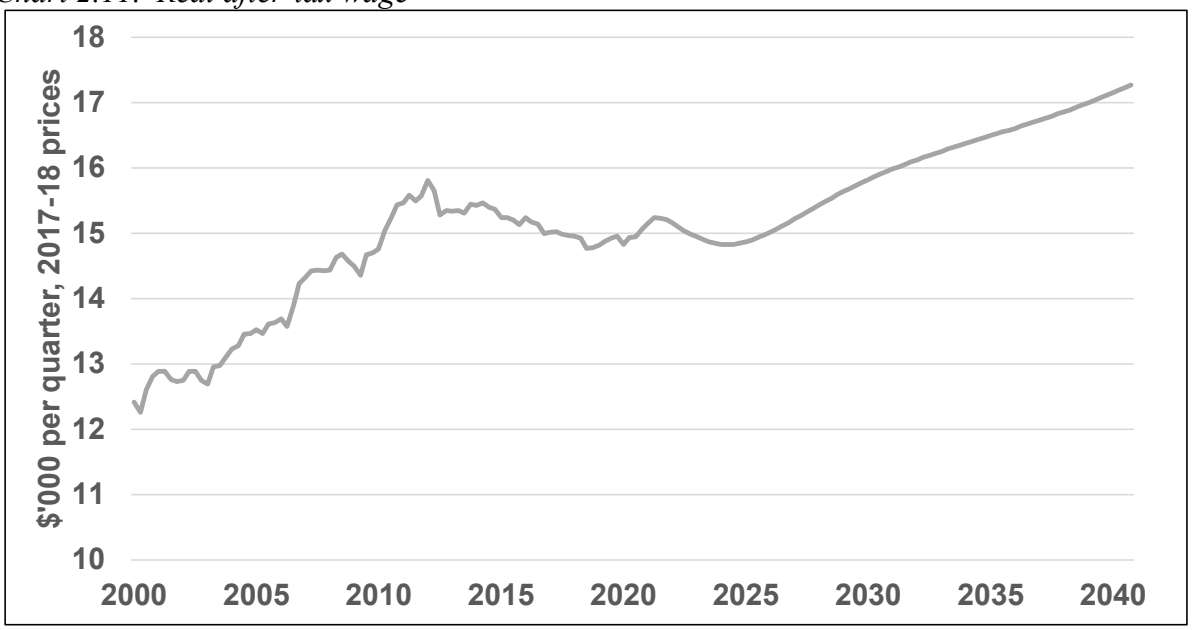
One explanation for the unusual recent differences in movements between the two measures of unemployment is the suspension of the requirement to be actively seeking work to be eligible for unemployment benefit. This so-called 'work test' was suspended because of the lack of employment opportunities in the presence of the economic restrictions. To the extent that this suspension influenced some people who have lost their jobs to obtain unemployment benefit but not look for work, the Labour Force Survey will have classified them as 'not in the labour force', while the benefit recipient numbers will show them as unemployed.

The work test is gradually being re-instated and as this occurs the historical relationship between the two measures of unemployment is forecast to be largely restored. This occurs with a rise in the survey measure of unemployment to a peak of around 9.3 per cent in the December quarter 2020, as seen in Chart 2.10.

Thereafter, the economic recovery gradually flows through into lower unemployment. On a survey basis, the December quarter unemployment rate is forecast to move down to 8.3 per cent in 2021, 7.4 per cent in 2022, 6.8 per cent in 2023 and 6.3 per cent in 2024. It takes considerably longer to return to a normal rate of about 5 per cent, as seen in Chart 2.10.

This medium-term weakness in the labour market means that the consumer real after-tax wage, a key indicator of living standards, is expected to be static for the next four years (Chart 2.11). This follows a decade of lack of progress in this measure. This has been caused by a combination of low productivity growth and rising average rates of personal income tax reflecting the role of bracket creep in reducing the budget deficit.

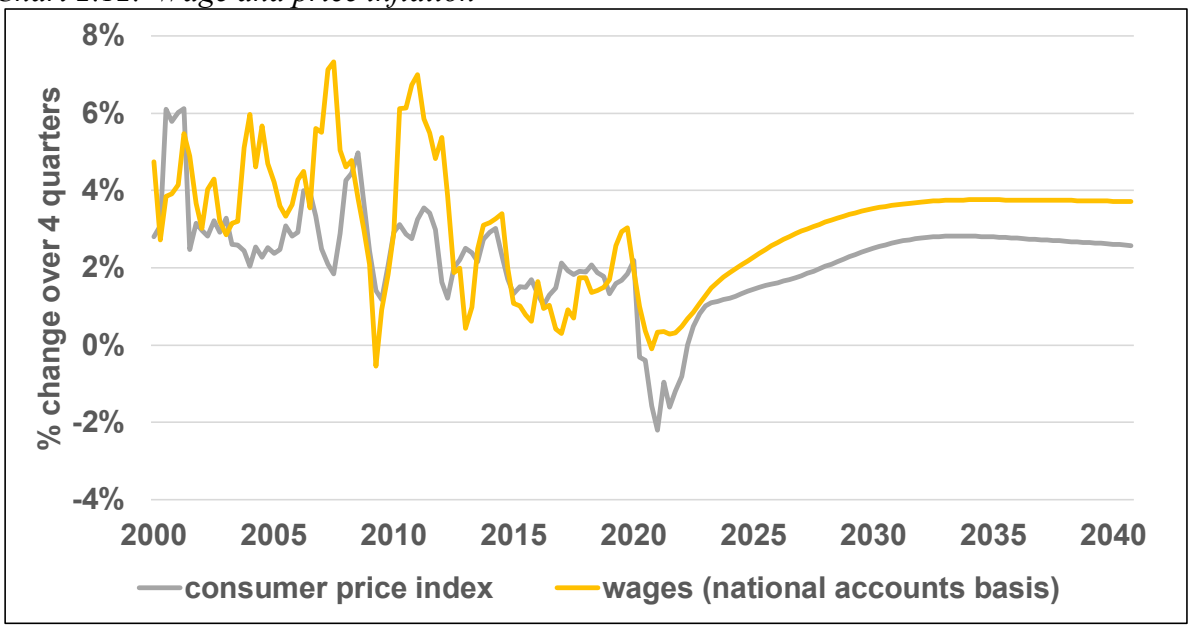
Chart 2.11. Real after-tax wage



Inflation and monetary policy

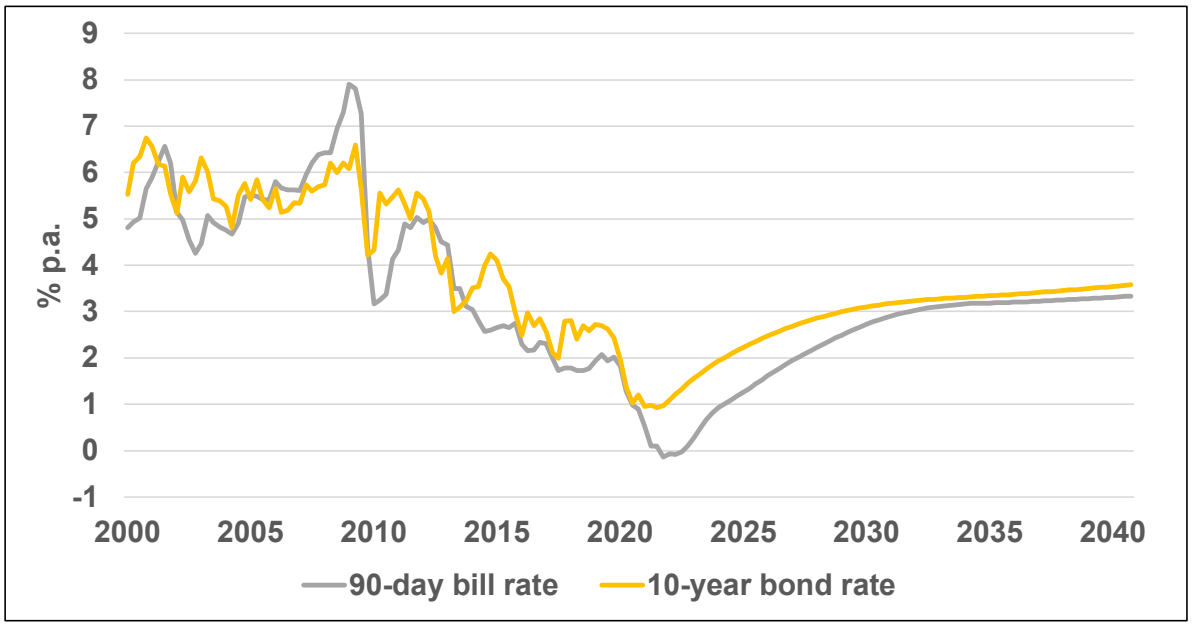
The weakness in demand for labour and output associated with the recession leads to lower wage and price inflation (Chart 2.12). Indeed, CPI inflation is forecast to be negative in 2021 before becoming positive again from 2022. Wage and price inflation do not fully normalise until around 2028.

Chart 2.12. Wage and price inflation



This environment of unemployment well above normal, low investment and low inflation for an extended period keeps interest rates very low. Interest rates do not fully normalise until around the end of the decade.

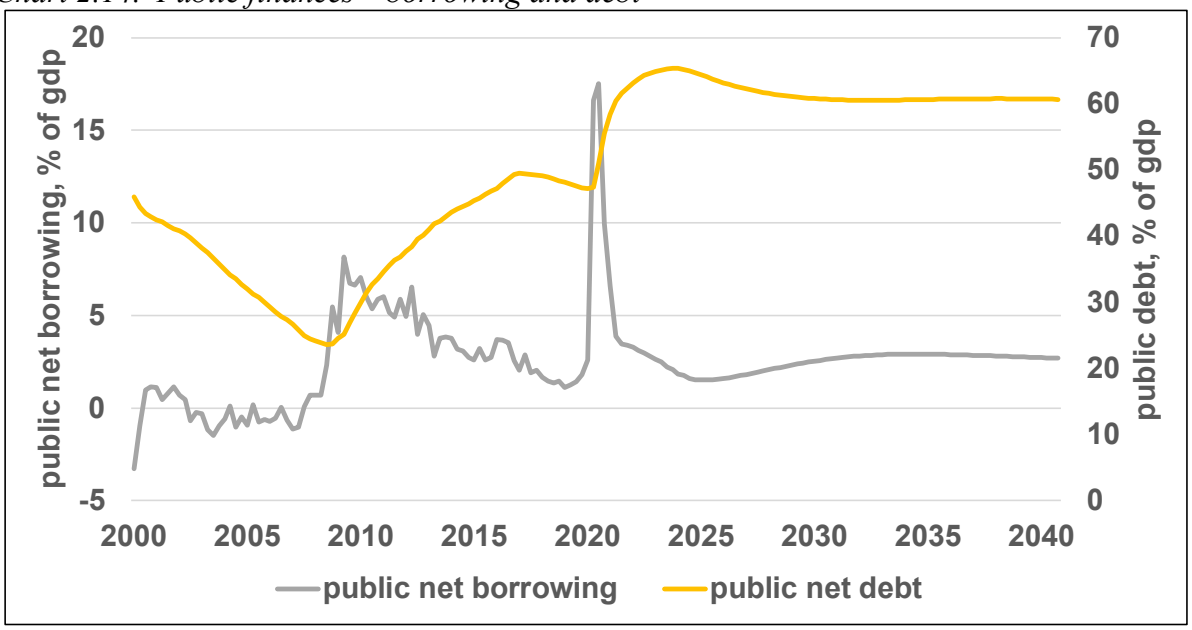
Chart 2.13. Interest rates



Public finances

As noted earlier in Table 2.1, the Federal Government income compensation measures, led by JobKeeper, have added $200 billion to public borrowing in 2019-20 and 2020-21. These temporary measures have lessened the blow of the COVID-19 economic restrictions but have also produced an enormous spike in public net borrowing (Chart 2.14). While public debt relative to annual GDP was on a downward path pre-COVID, post-COVID it is likely to have leapt by around 18 percentage points.

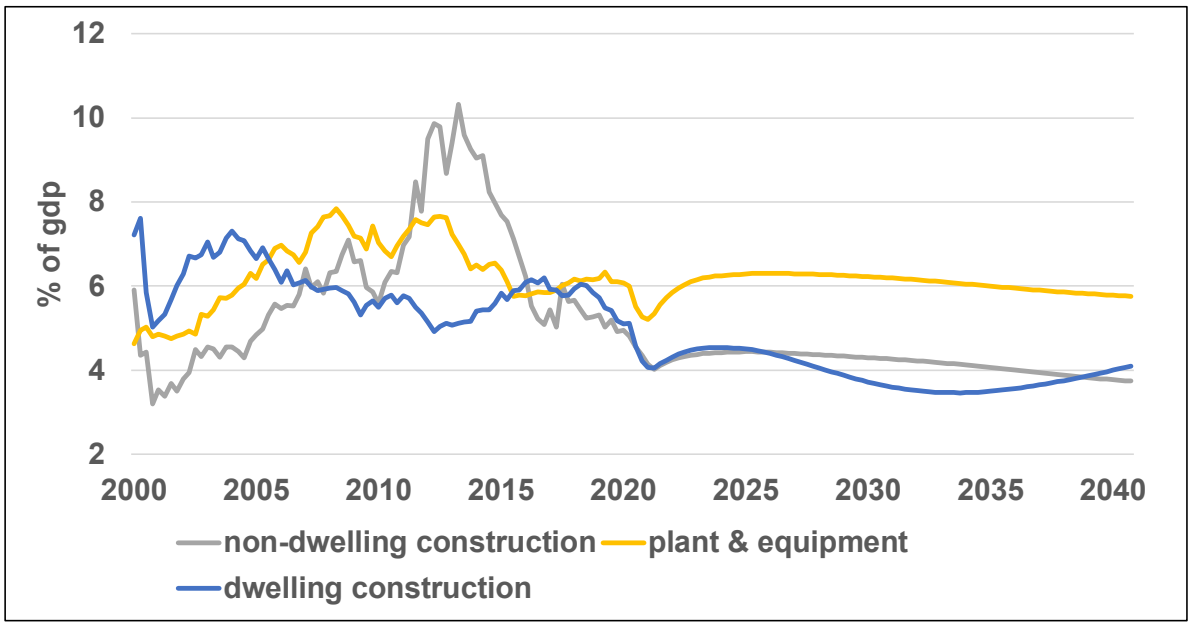
Chart 2.14. Public finances – borrowing and debt



Private investment

Private investment relative to GDP was already low pre-COVID, and post-COVID is likely to be even lower (Chart 2.15). This is true for all three components of private investment – non-dwelling construction, machinery and equipment and dwelling construction.

Chart 2.15. Private investment



The implied low rate of capital accumulation keeps growth in productivity low, with a flow-on to low growth in real GDP and real wages seen in earlier charts.

3 Million Jobs Plan scenario

This section develops the Plan scenario and compares it to the Baseline scenario to show the macroeconomic effects of the Plan.

The Baseline scenario shows that we face three key macroeconomic challenges. The first challenge is to achieve a more rapid decline in the unemployment rate than is projected in the Baseline. The second challenge is to generate growth in real after-tax wages. The third challenge is to stabilise public debt relative to GDP, following the large COVID-related uplift.

The Million Jobs Plan ('Plan') can assist in meeting all three challenges. The Plan involves modest govt support through seed funding, smoother approval processes and the like to assist a low-carbon recovery from the COVID-19 recession.

The Plan includes several hundred projects estimated by BZE to directly account for 1.8 million job years (BZE, 2020) over the 5-year period from 2021 to 2025, while the projects are in their investment phases. For modelling purposes, it is assumed that a selection of those projects is adopted that account for 1.0 million of the job years or 200,000 jobs on average. This is equivalent to 1.5 per cent of pre-COVID-19 national employment.

The investment projects in the Plan would mainly take place in the manufacturing, other private services and housing services industries of the macro model used here. To simulate the Plan, investment was stimulated in these industries by slightly reducing hurdle rates of return. This is consistent with the modest levels of support being sought, and the BZE finding that the projects represent cost-effective ways of pursuing a strategy to reduce carbon emissions.

This approach of using government support to leverage private investment helps meet the third macroeconomic challenge of stabilising public debt relative to GDP, compared to alternative strategies relying more on public spending.

The Plan helps boost private investment relative to its low level in the Baseline scenario (Charts 3.1, 3.2 and 3.3). In 2021 the Plan boosts private investment from 13.7 per cent of GDP to 15.6 per cent of GDP or nearly two percentage points, with more modest boosts of around 1 percentage point in the subsequent years.

This front end loading of investment stimulates demand, helping to reduce unemployment more quickly. By the end of 2021, unemployment is down to 7.8 per cent in the Plan scenario compared to 8.3 per cent in the Baseline scenario (Chart 3.4). This more rapid fall in unemployment helps meet the first macroeconomic challenge of reducing unemployment more rapidly. Put another way, over the period from 2021-22 to 2023-24, in the Plan unemployment is reduced around six months ahead of the schedule achieved in the Baseline scenario.

Chart 3.1. Private non-dwelling construction investment

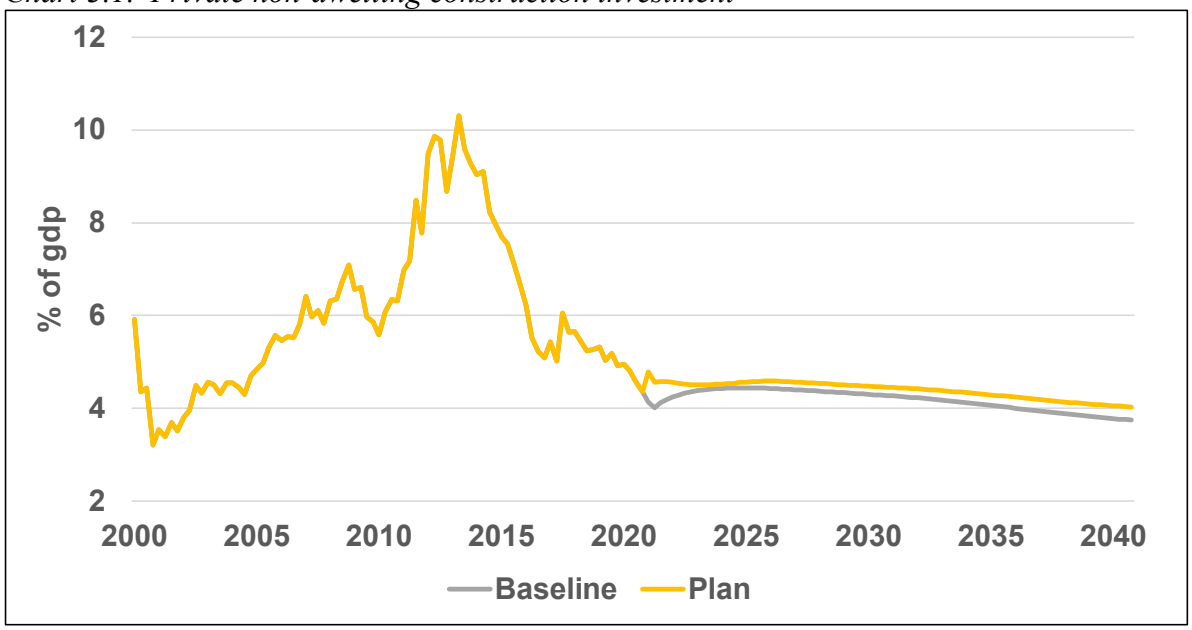


Chart 3.2. Private machinery and equipment investment

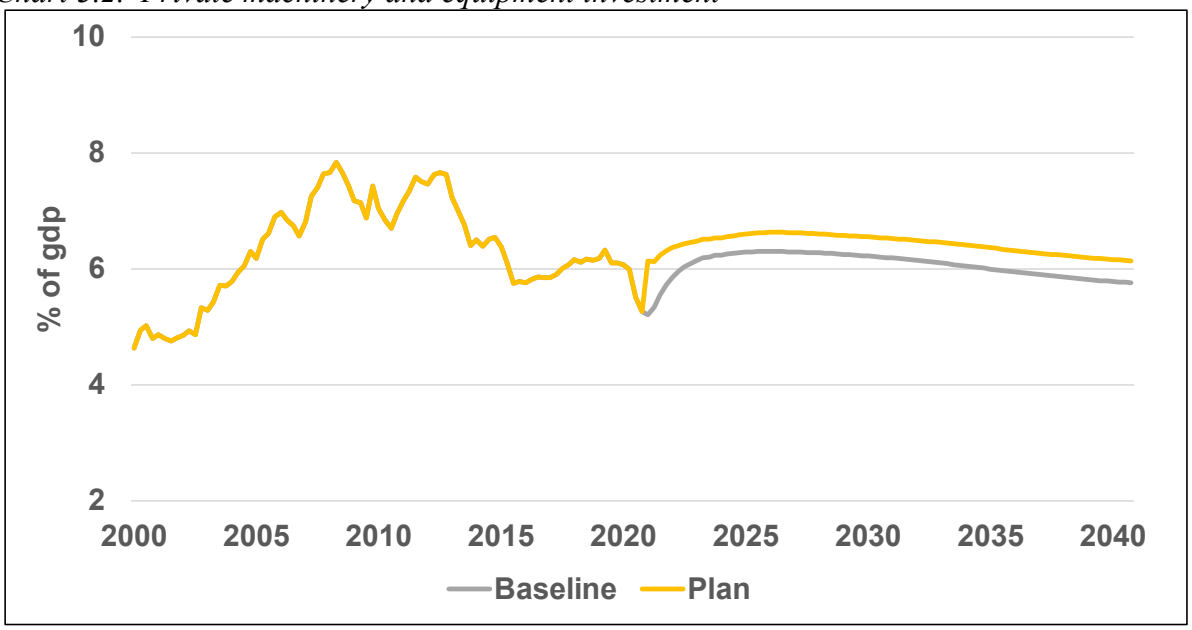


Chart 3.3. Private dwelling construction investment

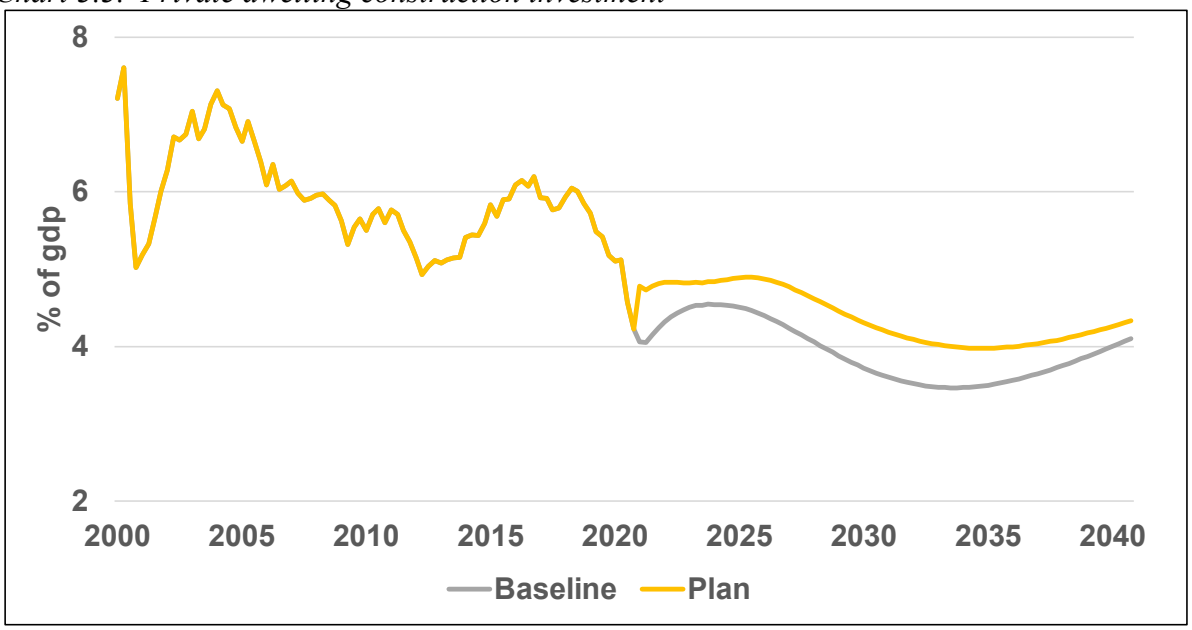
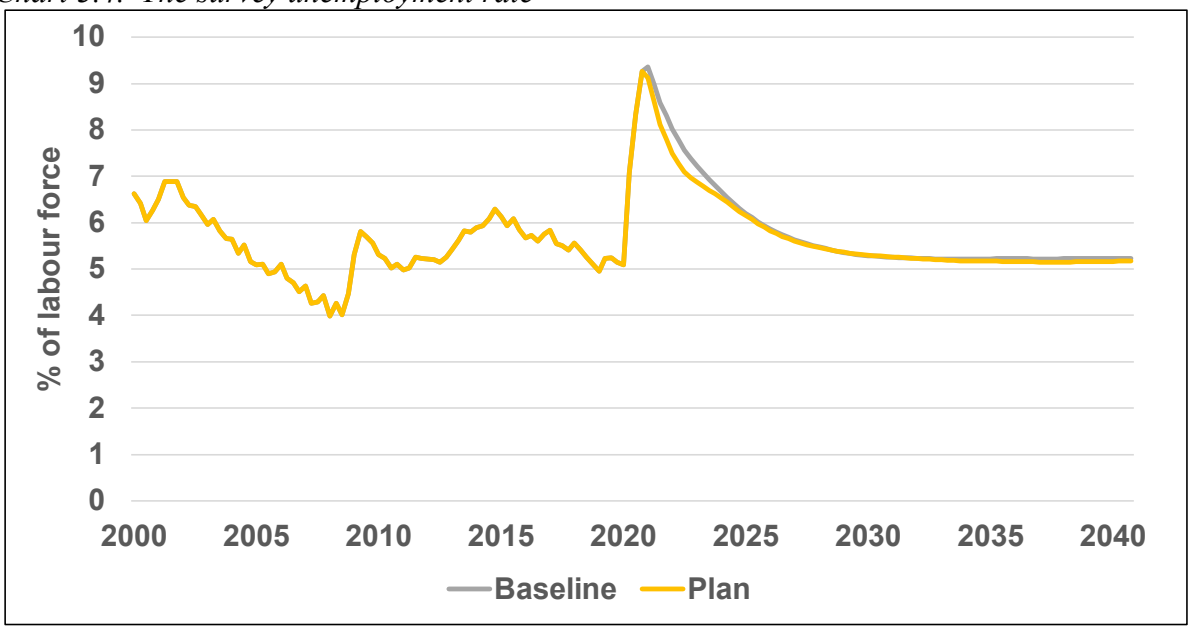


Chart 3.4. The survey unemployment rate



In the longer term, the Plan's accumulation of additional capital raises productivity relative to the Baseline scenario. This leads to sustained gains in living standards. Compared to the Baseline scenario in the same years, real after-tax wages are 1% higher in 2022-23 and 2% higher by 2035-36 (Charts 3.5, 3.6). This helps meet the second major macroeconomic challenge of generating growth in real after-tax wages.

Chart 3.5. Real after-tax wage

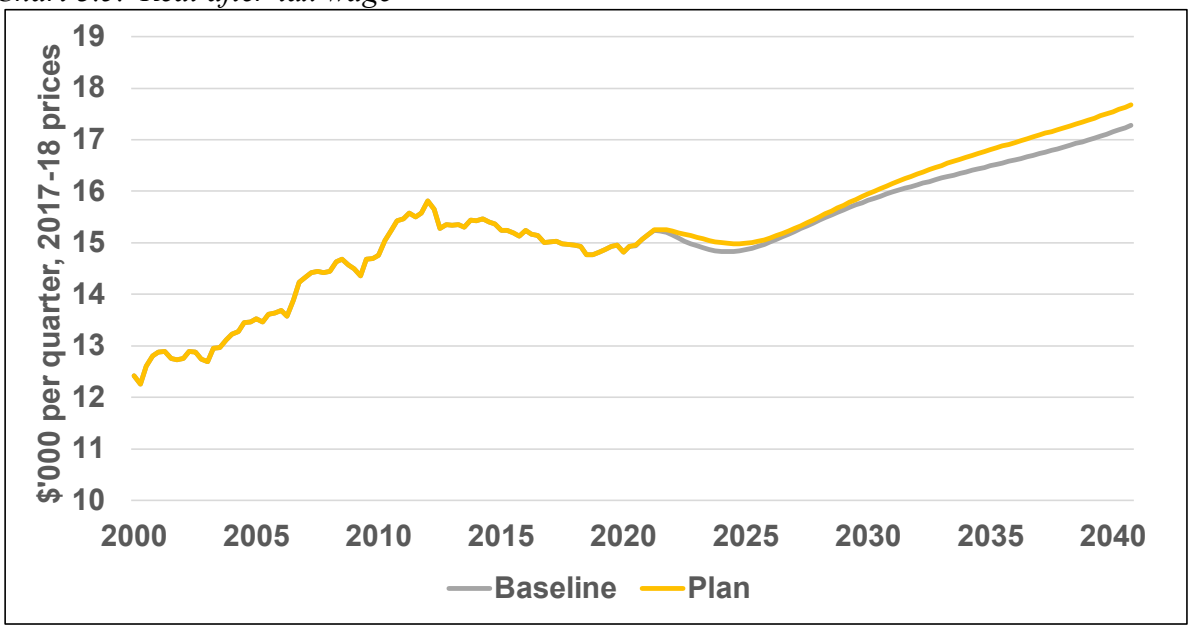
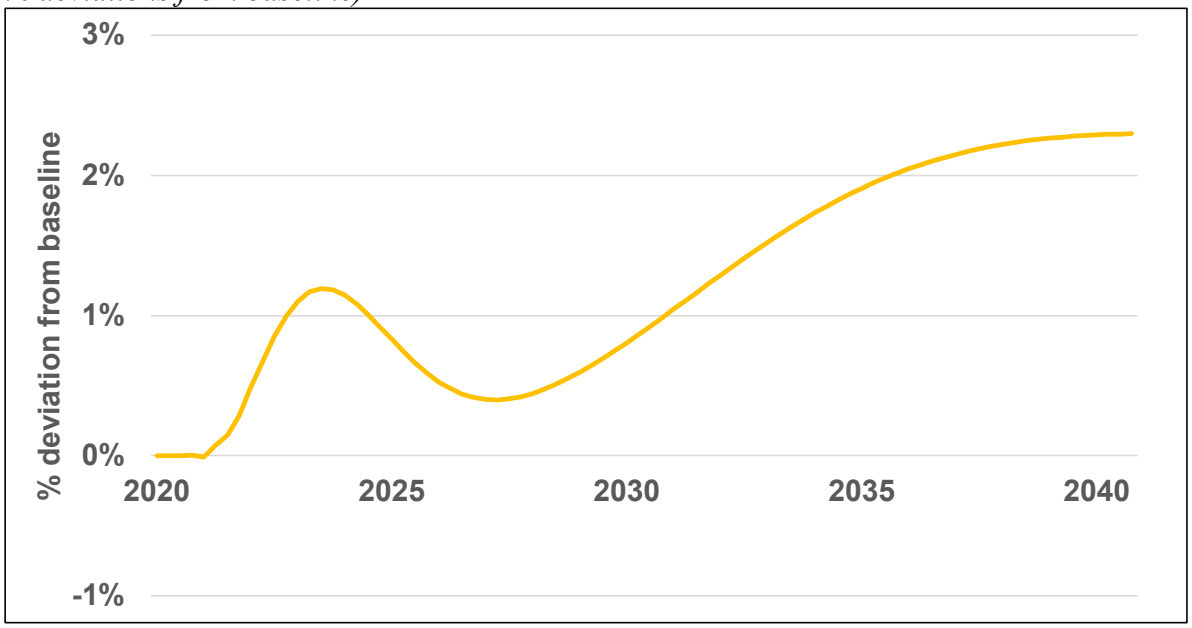


Chart 3.6. Real after-tax wage – a clearer view
(% deviations from baseline)



The gains in productivity from the Plan, besides flowing to higher real wages, also flow through to higher real GDP and GNE (Chart 3.7). The Plan adds 1 to 2 per cent to the level of real GDP compared to its Baseline scenario path. All industry sectors share in this gain (Chart 3.8), apart from mining where the Plan has a neutral impact in the long-run. The temporary, negative impact on mining is a by-product of a stronger Australian dollar as the investment projects of the Plan attract capital inflow. It is not a direct result of the Plan.

Chart 3.7. GNE and GDP
(% deviations from baseline)

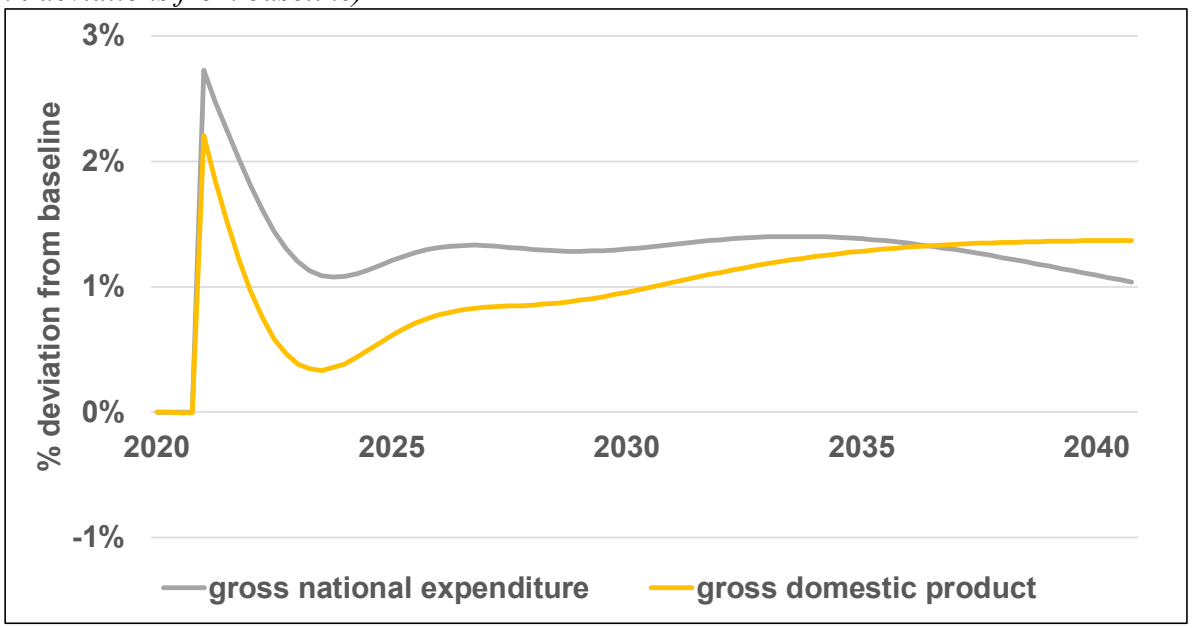
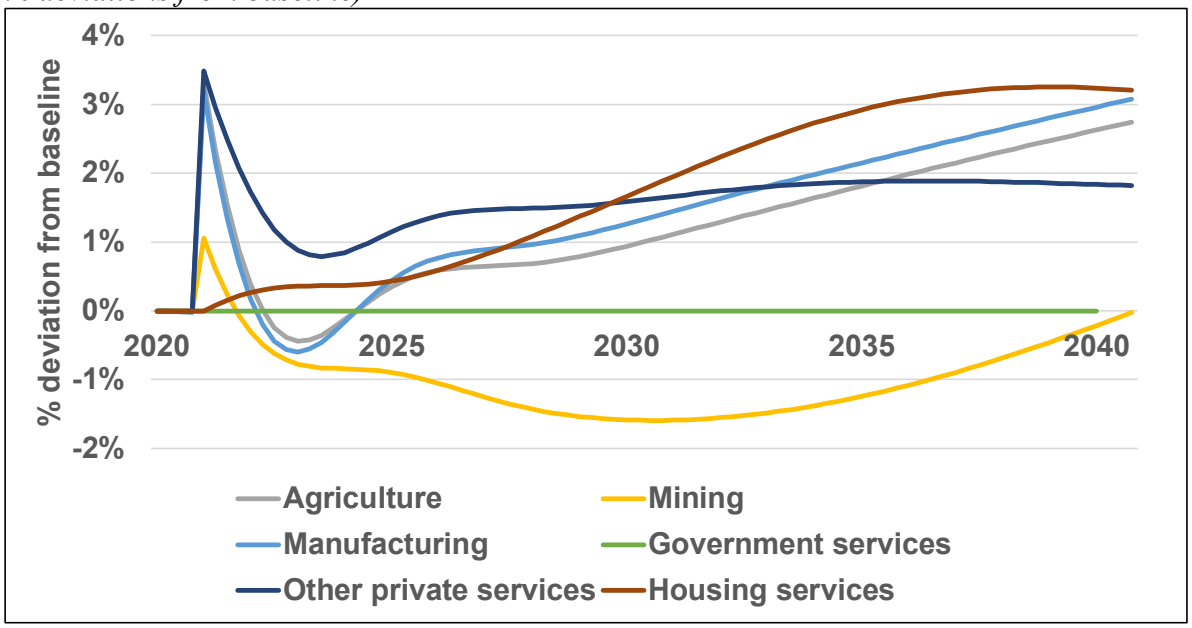


Chart 3.8. Real gross value added by industry
(% deviations from baseline)



4 National Retrofit Scheme

CGE modelling was conducted of four representative projects from the Plan. This modelling covers both the economy-wide and more detailed industry impacts of each project. The CGE model distinguishes 278 industries, compared to about 110 industries in comparable Australian models. This means it can be more specific about the industry of a project and its linkages to other industries. At the same time, the economy-wide approach means projects are modelled based on the model's information about the nature of the project industry, meaning that individual projects may have distinctive features not captured by the modelling.

The CGE model results refer to the long run, after the economy has fully adjusted to a project.

The author's main previous uses of the CGE model used here include an analysis of the relative economic costs of a wide range of taxes (Murphy, 2016) and an analysis of the investment and other gains from reducing our reliance on corporate tax (Murphy, 2018).

This section presents the modelling of the first project, a national retrofit scheme for housing. The remaining projects are discussed in the remaining sections as follows. Section 5 models the Victoria-NSW Interconnector as an example of an Electricity Transmission project. Section 6 simulates Oven Mountain Pumped Hydro Energy Storage to illustrate the Renewable Energy generation projects. Section 7 models Energy Renaissance Battery Manufacturing as an example of Low-carbon Manufacturing.

The National Retrofit Scheme is part of Better Buildings in the Million Jobs Plan. Homes are retrofitted so that they use less energy and emit less carbon. With planned expenditure per dwelling of about $25,000, around 1.4 million homes are retrofitted over five years for a total expenditure of $35 billion. This total expenditure represents an expansion of 1.7 per cent in the value of the existing dwelling stock of $2,100 billion.

The policy mechanism for implementing this scheme is under development, but may involve providing loans through NHFIC. The long-run modelling simulates the expansion in the value of the dwelling stock of 1.7 per cent by slightly reducing the required real rate of return for investment in dwellings.

At the economy-wide level, this larger project adds 0.31 per cent to real after-tax wages and 0.19 per cent to real GDP (Chart 4.1). The retrofitting activities in the scheme add to construction activity, which expands by 0.57 per cent relative to baseline (Table 4.1). The resulting improvements to the housing stock raise the value of housing services by 1.19 per cent.

Looking at a finer level of industry detail, the retrofitting activities in the scheme add to residential building construction, which expands by 1.66 per cent relative to baseline (Table 4.2). That industry then requires additional construction services (mainly tradespersons), which expands by 0.59 per cent. The resulting improvements to the housing stock raise the value of housing services, for both owner-occupied and rented housing.

Chart 4.1. National Retrofit Scheme - economy-wide effects (% deviation from baseline scenario)

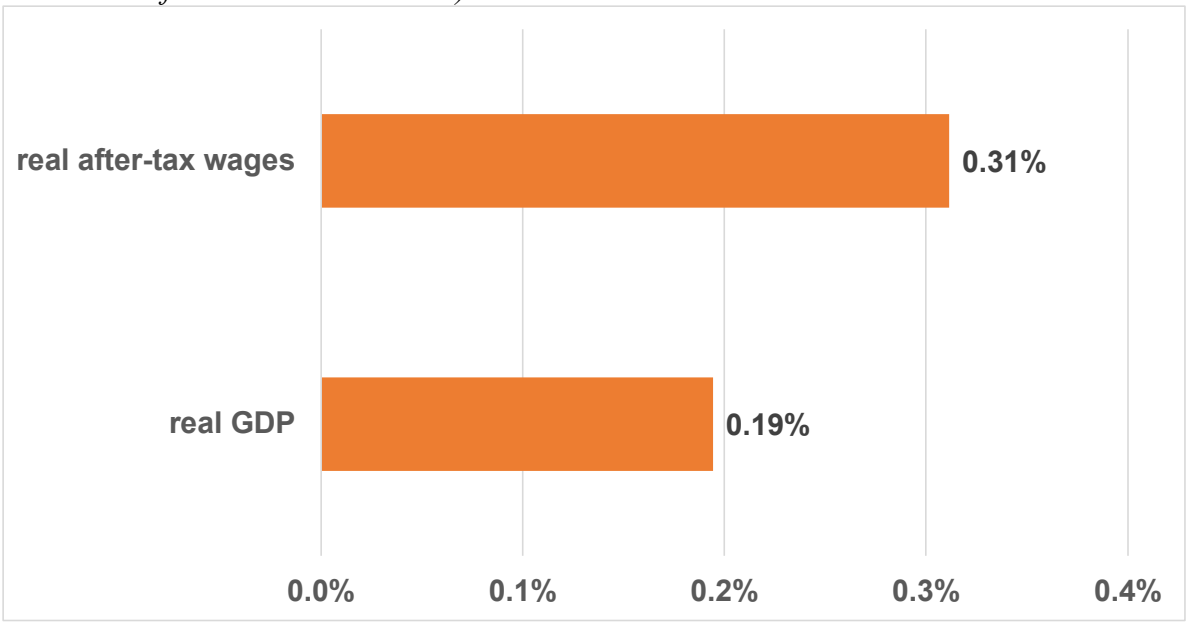


Table 4.1. National Retrofit Scheme – real value added effects (% deviation from baseline, long run)

A Agriculture, Forestry and Fishing	0.03%
B Mining	0.11%
C Manufacturing	0.15%
D Electricity, Gas, Water and Waste Services	0.05%
E Construction	0.57%
F Wholesale Trade	0.08%
G Retail Trade	-0.06%
H Accommodation and Food Services	-0.01%
I Transport, Postal and Warehousing	0.07%
J Information Media and Telecommunications	0.04%
K Financial and Insurance Services	0.14%
L Rental, Hiring and Real Estate Services	0.13%
M Professional, Scientific and Technical Services	0.13%
N Administrative and Support Services	0.09%
O Public Administration and Safety	0.02%
P Education and Training	0.00%
Q Health Care and Social Assistance	-0.02%
R Arts and Recreation Services	-0.03%
S Other Services	0.01%
T Housing Services	1.19%
Taxes less subsidies on production	0.12%
GDPP	0.19%

Table 4.2. National Retrofit Scheme: real gross production effects (% deviation from baseline, long run)

3001Z Residential Building Construction	1.66%
3201Z Construction Services	0.59%
6701A Housing services: owner-occupied	1.03%
6701B Housing services: rented	0.81%

5 Victoria-NSW Interconnector

The Victoria-NSW Interconnector is part of Renewable Energy in the Million Jobs Plan. A more highly developed transmission network means renewable energy projects can be located to a greater extent where conditions are more suitable, less tied to the location of end users of energy. This particular project would facilitate the dispatch of Snowy 2.0 electricity to Victoria.

Planned capital expenditure is $1.7 billion. BZE proposes that the government fund the project to side-step the regulatory investment test for transmission (RIT-T). The CGE modelling simulates this project by expanding the effective capital stock of the electricity transmission and distribution industry.

At the economy-wide level, this project adds 0.08 per cent to real after-tax wages and 0.06 per cent to real GDP (Chart 5.1). As a result of the expansion in the effective capital stock of the electricity transmission and distribution industry, the output of the wider electricity, gas and water industry expands by 0.63 per cent (Table 5.1).

Looking at a finer level of industry detail, the expansion in the effective capital stock of the electricity transmission and distribution industry expands its output by 0.94 per cent (Table 5.2). This flows on to a general expansion in the electricity industry. For example, electricity retailing expands by 0.78 per cent.

Chart 5.1. Interconnector - economy-wide effects
(% deviation from baseline scenario)

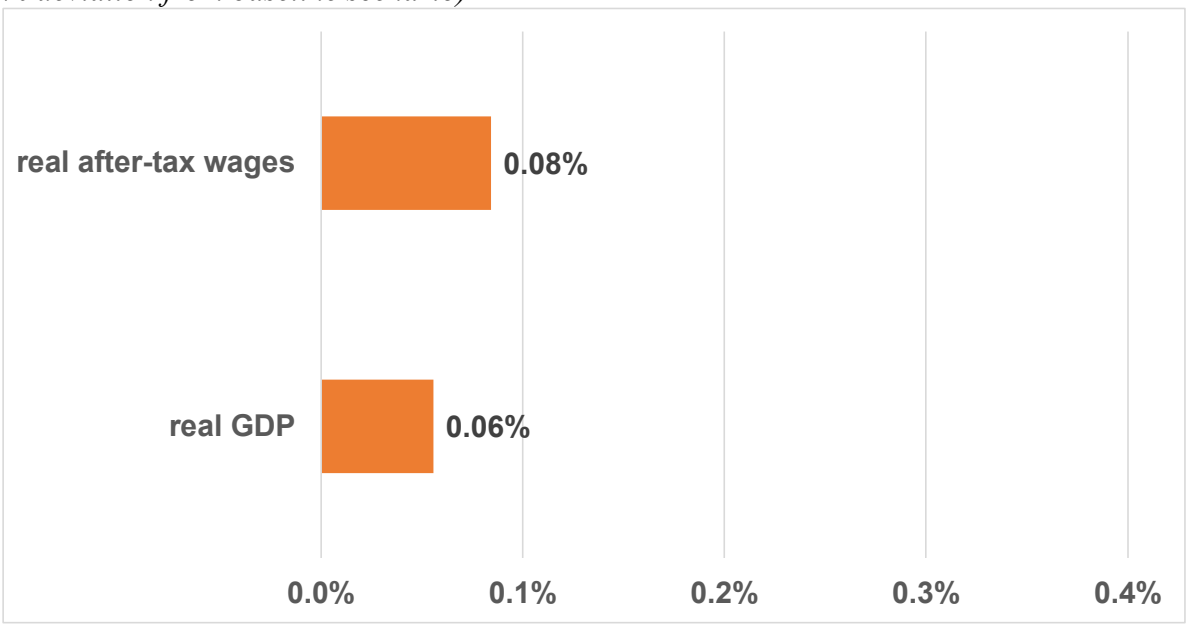


Table 5.1. Interconnector – real value added effects (% deviation from baseline, long run)

A Agriculture, Forestry and Fishing	0.01%
B Mining	0.03%
C Manufacturing	0.06%
D Electricity, Gas, Water and Waste Services	0.63%
E Construction	0.00%
F Wholesale Trade	0.04%
G Retail Trade	0.02%
H Accommodation and Food Services	0.07%
I Transport, Postal and Warehousing	0.04%
J Information Media and Telecommunications	0.06%
K Financial and Insurance Services	0.07%
L Rental, Hiring and Real Estate Services	0.05%
M Professional, Scientific and Technical Services	0.04%
N Administrative and Support Services	0.05%
O Public Administration and Safety	0.00%
P Education and Training	0.01%
Q Health Care and Social Assistance	0.02%
R Arts and Recreation Services	0.05%
S Other Services	0.05%
T Housing Services	0.06%
Taxes less subsidies on production	0.08%
GDPP	0.06%

Table 5.2. Interconnector: real gross production effects (% deviation from baseline, long run)

2601A Fossil Fuel Electricity Generation*	0.79%
2601B Other Electricity Generation	1.38%
2605A Electricity Transmission, Distribution	0.94%
2605M Electricity Retail	0.78%

* Because the modelling simulates a generic expansion in electricity transmission, there are gains in activity on both the fossil fuel and renewable sides of the generation industry. In reality, the proposed project specifically supports Snowy 2.0, which in turn supports renewable generation. Thus, in reality, this project is likely to boost renewable generation (i.e. other electricity generation) but not than fossil fuel generation.

6 Oven Mountain Pumped Hydro

The Oven Mountain Pumped Hydro Energy Storage project is part of Renewable Energy generation in the Million Jobs Plan. Planned capital expenditure is $1.4 billion for a planned capacity of 600MW. This represents an addition of about 7 per cent to existing national hydro capacity of about 8,000 MW.

In April 2020, ARENA announced funding of $951,000 for a study into the benefits of the project. The proponents are seeking a further $3 million for project design and contract tender costs.

The CGE modelling simulates this project by expanding the effective capital stock of the renewable generation industry. This is consistent with the idea that pumped hydro acts like a battery supporting the National Grid, increasing the potential for reliance on renewable energy.

At the economy-wide level, this project adds 0.04 per cent to real after-tax wages and 0.02 per cent to real GDP (Chart 6.1). As a result of the expansion in the effective capital stock of the renewable generation industry, the output of the wider electricity, gas and water industry expands by 0.39 per cent (Table 6.1).

Looking at a finer level of industry detail, the project expands the renewable energy generation industry by 6.26 per cent (Table 6.2). This additional generation is partly at the expense of the larger fossil fuel generation industry, which shrinks by 0.54 per cent. An overall net increase in electricity generation results in expansions in electricity transmission and distribution and electricity retailing of 0.51 per cent and 0.52 per cent respectively.

Chart 6.1. Pumped Hydro - economy-wide effects
(% deviation from baseline scenario)

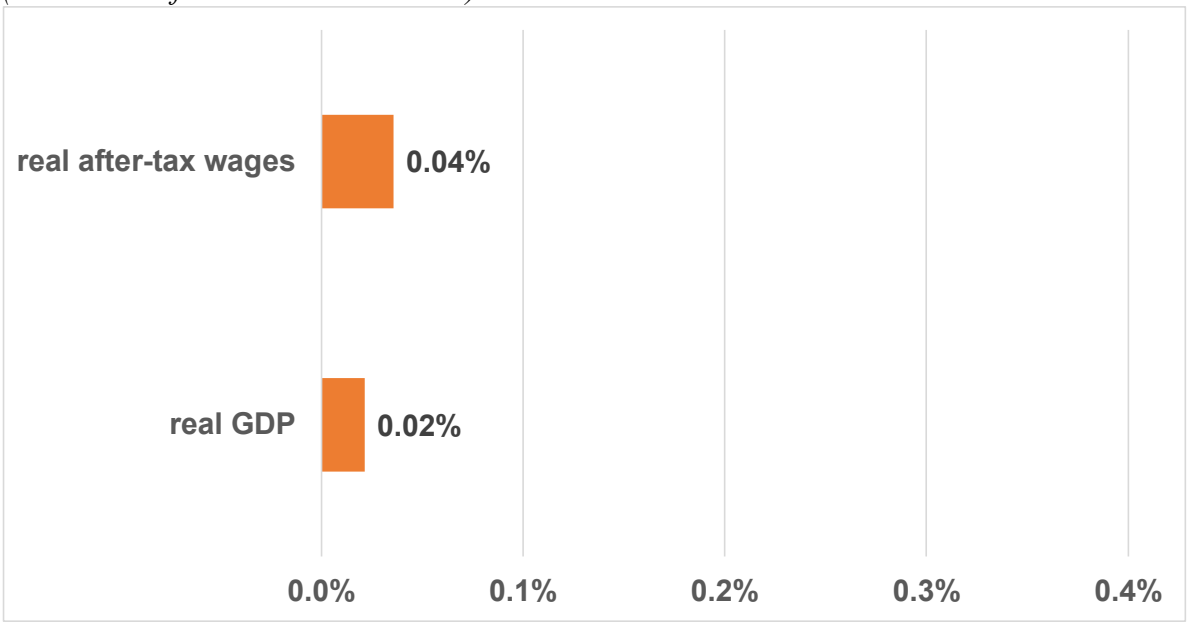


Table 6.1. Pumped Hydro – real value added effects (% deviation from baseline, long run)

A Agriculture, Forestry and Fishing	-0.01%
B Mining	-0.04%
C Manufacturing	0.01%
D Electricity, Gas, Water and Waste Services	0.39%
E Construction	0.00%
F Wholesale Trade	0.01%
G Retail Trade	-0.01%
H Accommodation and Food Services	0.03%
I Transport, Postal and Warehousing	0.01%
J Information Media and Telecommunications	0.02%
K Financial and Insurance Services	0.03%
L Rental, Hiring and Real Estate Services	0.02%
M Professional, Scientific and Technical Services	0.01%
N Administrative and Support Services	0.02%
O Public Administration and Safety	0.00%
P Education and Training	0.00%
Q Health Care and Social Assistance	0.01%
R Arts and Recreation Services	0.02%
S Other Services	0.02%
T Housing Services	0.02%
Taxes less subsidies on production	0.03%
GDPP	0.02%

Table 6.2. Pumped Hydro: real gross production effects (% deviation from baseline, long run)

2601A Fossil Fuel Electricity Generation	-0.54%
2601B Other Electricity Generation	6.26%
2605A Electricity Transmission, Distribution	0.51%
2605M Electricity Retail	0.52%

7 Energy Renaissance Battery Manufacturing

The Energy Renaissance Battery Manufacturing project is part of the Manufacturing stream in the Million Jobs Plan. Lithium-ion batteries, designed to resist Australia's hot conditions, are manufactured for energy storage.

Planned capital expenditure is $0.21 billion. The project proponents are seeking government funding of $30 million to accelerate project growth. Adding storage capacity to the National Grid allows an increased reliance on renewable generation.

The CGE modelling simulates this project by expanding the effective capital stock of the electrical equipment manufacturing industry, which contains battery manufacturing.

At the economy-wide level, this relatively small project adds 0.02 per cent to real after-tax wages and 0.02 per cent to real GDP (Chart 7.1). As a result of the expansion in the effective capital stock of the electrical equipment manufacturing industry, the output of the wider manufacturing industry expands by 0.06 per cent (Table 7.1).

Looking at a finer level of industry detail, the project expands the output of the electrical equipment manufacturing industry by 2.65 per cent (Table 7.2).

Chart 7.1. Battery Manufacturing - economy-wide effects
(% deviation from baseline scenario)

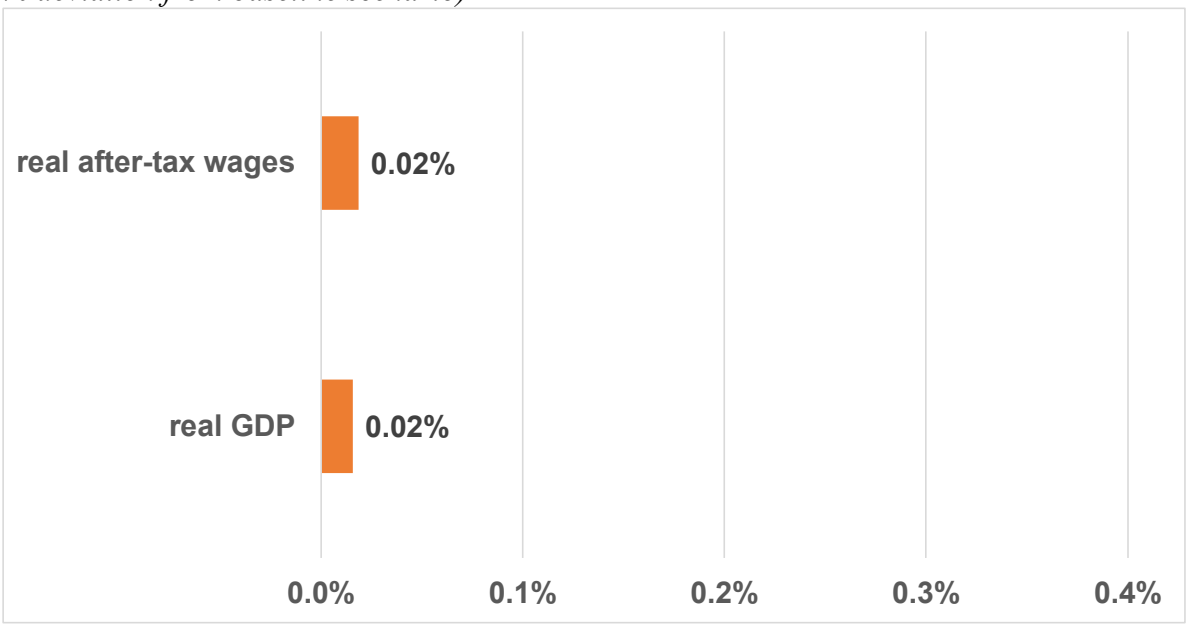


Table 7.1. Battery Manufacturing – real value added effects (% deviation from baseline, long run)

A Agriculture, Forestry and Fishing	-0.04%
B Mining	0.01%
C Manufacturing	0.06%
D Electricity, Gas, Water and Waste Services	0.02%
E Construction	0.01%
F Wholesale Trade	0.02%
G Retail Trade	0.02%
H Accommodation and Food Services	0.01%
I Transport, Postal and Warehousing	0.01%
J Information Media and Telecommunications	0.02%
K Financial and Insurance Services	0.01%
L Rental, Hiring and Real Estate Services	0.02%
M Professional, Scientific and Technical Services	0.02%
N Administrative and Support Services	0.01%
O Public Administration and Safety	0.00%
P Education and Training	0.00%
Q Health Care and Social Assistance	0.00%
R Arts and Recreation Services	0.01%
S Other Services	0.01%
T Housing Services	0.02%
Taxes less subsidies on production	0.01%
GDPP	0.01%

Table 7.2. Battery Manufacturing: real gross production effects (% deviation from baseline, long run)

2403Z Electrical Equipment Manufacturing	2.65%

References

Australian Bureau of Statistics (2020), 'Economic measurement during COVID-19: Selected issues in the Economic Accounts', ABS Cat No. 5261.0, May, Canberra.

Australian Government (2020), 'Economic and Fiscal Update', Canberra, July.

Ballantyne, A., Cusbert, T., Evans, R., Guttmann, R., Hambur, J., Hamilton, A., Kendall, E., McCririck, R., Nodari, G. and Rees, D. (2020), 'MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy', *Economic Record*, forthcoming, https://doi.org/10.1111/1475-4932.12531

Beyond Zero Emissions (2020), 'The Million Jobs Plan', Melbourne, https://bze.org.au/the-million-jobs-plan/.

Murphy, C.W. (2020), 'Decisions in Designing an Australian Macroeconomic Model', *Economic Record*, forthcoming, https://doi.org/10.1111/1475-4932.12534

Murphy, C.W. (2018), 'Modelling Australian corporate tax reforms', *Australian Tax Forum*, vol. 33, No. 1, 5-49.

Murphy, C.W. (2016), 'Efficiency of the tax system: a marginal excess burden analysis', ANU Tax and Transfer Policy Institute Working Paper, 4/2016.

Prime Minister and Treasurer (2020), 'More support for businesses and workers', media release, 7 August, Canberra.

Reserve Bank of Australia (2020), 'Statement on Monetary Policy', August, Sydney.

The Treasury (2020), 'The Job-Keeper Payment: three-month review', June, Canberra.

Universities Australia (2020), 'Submission to Senate Select Committee on COVID-19', May, Canberra.