independent economics

Economic impact of selected macroeconomic shocks

This report was prepared for the Parliamentary Budget Office

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Independent Economics is an independent provider of economic modelling services to support economic policy analysis and forecasting. We are strongly committed to independent modelling that provides robust analysis and real solutions to meet client needs. In Australia, we provide services to government and industry, and we also provide services internationally.

Postal Address:

Independent Economics
PO Box 4129
KINGSTON ACT 2604
AUSTRALIA

Street Address:

Independent Economics
Unit 4
4 Kennedy Street
KINGSTON ACT 2604
AUSTRALIA

Phone: +61 2 6295 8884

Email: office@independenteconomics.com.au

Web-site: www.independenteconomics.com.au

Entity: Econtech Pty Ltd (ACN 056 645 197) trading as Independent Economics

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Executive summary

This report has been prepared for the Parliamentary Budget Office (PBO). The PBO supports the Australian Parliament by providing independent analysis of the budget cycle, fiscal policy, and the financial implications of proposals. The PBO are preparing a report on the Commonwealth Budget's sensitivity to macroeconomic shocks, such as changes to world mining prices. Macroeconomic shocks influence key economic parameters that affect the Budget by impacting revenue collections and government expenditure.

The PBO has commissioned Independent Economics to analyse the impact of several macroeconomic shocks on key economic parameters that influence the Budget. The outputs of the analysis will be used by PBO to adjust the 2014-15 Budget forecasts for those economic parameters. PBO will then use its modelling of the relationship between the economic parameters and the Budget to assess the effects on the Budget of the macroeconomic shocks.

The impacts of the shocks on the economic parameters, expressed as percentage deviations from baseline, are presented on an annual basis from 2014-15 to 2024-25. This provides the PBO with an understanding of the short-term and the long-term economic impacts of the macroeconomic shocks on the key economic parameters that influence the Budget.

This report's analysis of the effects of the macroeconomic shocks on the key economic parameters is undertaken using the Independent Macro-econometric model. That model is well suited to this analysis because it fully integrates short-term and long-term perspectives on the economy, as well as macroeconomic and industry perspectives.

PBO's selected macroeconomic shocks

The PBO has commissioned Independent Economics to assess the economic impact of shocks to productivity, the terms of trade and to labour force participation. For each macroeconomic shock, symmetric 'high and 'low' scenarios around the baseline have been specified. The specific nature of each shock is outlined below.

Labour productivity

From the September quarter 2014, labour productivity growth is shocked by 0.5 percentage points around its baseline rate of 1.5 per cent per year. This design of the high and low scenarios is consistent with the variability in productivity growth rates observed in recent decades, in which trend productivity growth has varied between around 1 and 2 per cent per year.

By the 2024-25 financial year, this shock translates to a 5.4 per cent gain or 5.1 per cent loss in the level of underlying productivity relative to the baseline scenario. This small difference in the magnitude of the cumulative gains and losses reflects the effects of compounding.

It has been assumed that the source of the variation in productivity growth between scenarios is variation in the rate of improvement in technology. In the modelling, this involves adjusting the assumed rates of underlying improvement in the efficiency of use of labour, land and natural resources in each industry. As technology is transferable across borders, similar variations in productivity growth are assumed for other countries. This assumption is implemented by varying the rate of growth in world GDP.

Terms of Trade

Under this alternative scenario, higher (or lower) export demand means that the level of the terms of trade is 10 per cent higher (or lower) than in the baseline scenario. The variations in the terms of trade between scenarios are assumed to be brought about by variations to the projection for world mining prices. Specifically, relative to baseline, world mining prices are increased (reduced) by 35 per cent to achieve the 10 per cent gain (loss) in the terms of trade.

Participation rate

The baseline scenario reflects current trends under which population ageing is projected to gradually reduce the labour force participation rate from 65.2 per cent in 2012-13 to 63.5 per cent in 2024-25, a decline of 1.7 percentage points. Alternatively, the high scenario assumes that longer life expectancies lead to longer working lives, keeping the labour force participation rate almost steady at 65.1 per cent. Symmetrically, in the low scenario the labour force participation rate declines by over 3 percentage points.

This implies that, relative to baseline, by 2024-25 the labour force participation rate is 1.6 percentage points (or 2.5 per cent) higher in the high scenario and 1.6 percentage points (or 2.5 per cent) lower in the low scenario.

Approach

The economic impact of the selected macroeconomic shocks has been estimated using the Independent Macro-econometric Model (Macro Model). The Macro Model is well suited for analysing the economic effects of macroeconomic shocks for the following reasons.

- It is able to *consistently analyse the economic impacts of macroeconomic shocks in the short, medium and long term*. Consistent modelling through time is particularly important for analysing economics shocks such as a gain in the terms of trade, where there are different, important effects in both the short-term and long-term.

- It features *fully-integrated industry modelling*, which models the inter-linkages between six different industries (including mining) and the broader economy within one model. This allows for a fuller analysis of the effects of macroeconomic shocks, such as changes to world mining prices.

- The Macro Model has a *fully-integrated demographic model*. This allows the Macro Model to robustly estimate the economic effects of population ageing, including its effects on the labour force participation rate.

- The model incorporates a *sophisticated production structure* that allows for the importance of fixed factors such as land and natural resources in industries such as Agriculture, Mining and housing services (Ownership of Dwellings). This enables the model to provide more realistic estimates of the responses of these industries to macroeconomic shocks, such as changes in labour productivity.

Each of the macroeconomic shocks listed in the previous section is introduced into the Macro Model under a separate alternative scenario. The outcomes for the economic parameters under each alternative scenario are then compared to the outcomes for the same parameters under the baseline scenario. The

percentage differences in outcomes for economic parameters provide estimates of the economic impacts of the macroeconomic shock. For example, to estimate the economic impacts of an increase in the terms of trade, the alternative scenario where the terms of trade is boosted is compared to the baseline scenario. The impact on an economic parameter, such as the exchange rate, from the shock to the terms of trade is then assessed as the percentage difference in the outcome for the exchange rate in the alternative scenario compared to the baseline scenario.

Importantly, while the baseline scenario for the economy used in this analysis is Independent Economics' baseline scenario, the economic impacts of the macroeconomic shocks are largely unaffected by this choice of baseline scenario. This is because the deviations in economic parameters (or economic impacts) are driven largely by the deviations in model inputs, rather than by the levels of economic variables in the baseline scenario. In light of the minor role of the baseline scenario in influencing the estimates of the economic impacts, this report provides only a summary description of the baseline scenario.

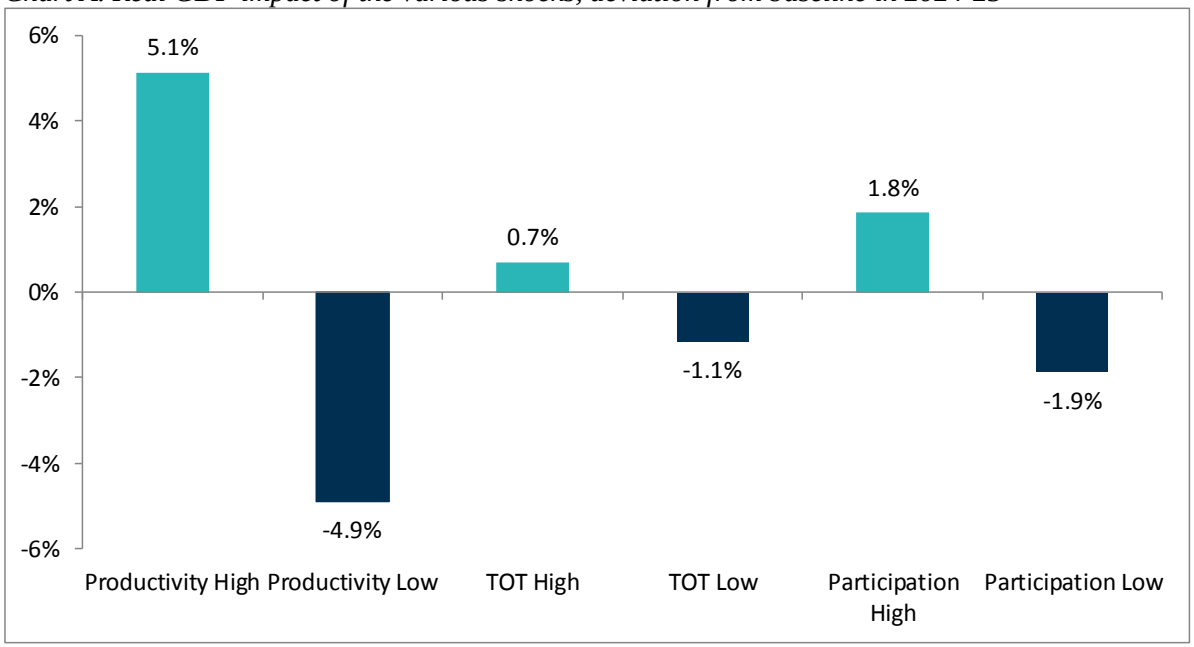
Results

Charts A and B compare the impacts of the shocks between the high and low scenarios. Chart A conducts the comparison for the impacts on real GDP, while Chart B makes the same comparison for the impacts on nominal GDP. The two charts show that the impacts are broadly symmetric between the high and low scenarios. Two differences can be noted.

For the productivity shocks, the economic impacts are slightly larger in the high scenario than in the low scenario. This is because the shock applied to productivity is slightly larger in the high scenario, because of the compounding effect noted earlier.

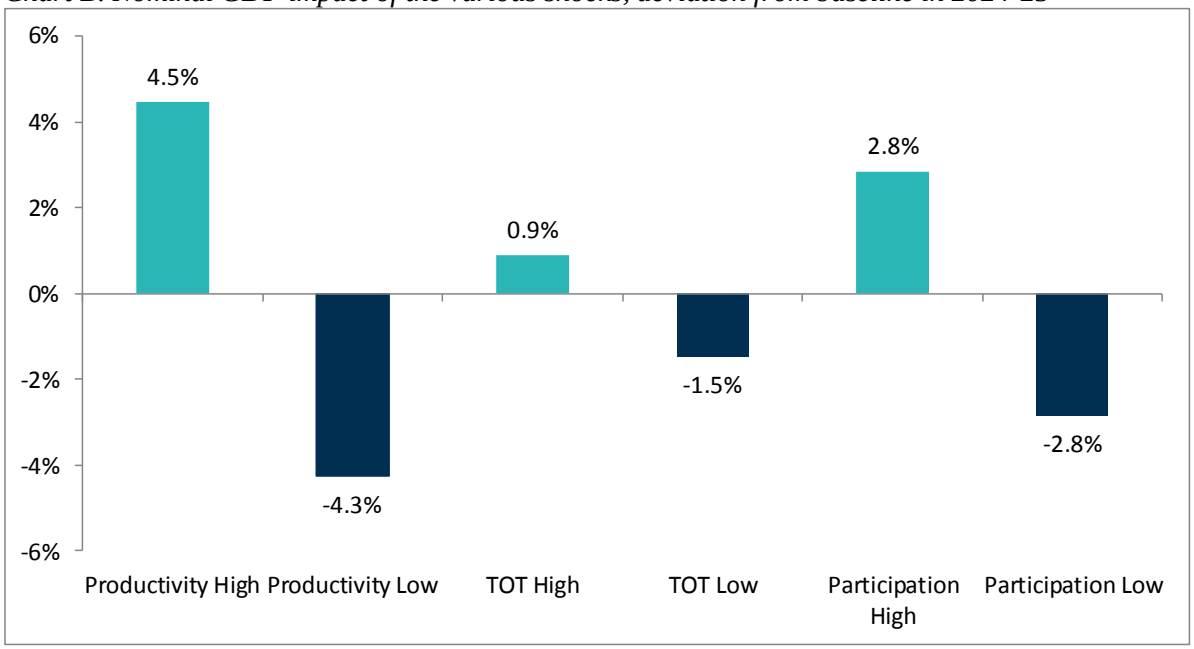
For the terms of trade shocks, the GDP impacts are noticeably smaller in the high scenario than in the low scenario. This is because as mining prices rise, the scope to respond by further expanding mining exports is increasing limited by the available supply of mineral resources.

Chart A. Real GDP impact of the various shocks, deviation from baseline in 2024-25



Source: Independent Economics

Chart B. Nominal GDP impact of the various shocks, deviation from baseline in 2024-25



Source: Independent Economics

The general impact of each shock on prices can be inferred by comparing the results between Charts B and A. In particular, the difference between the impacts on nominal GDP shown in Chart B and real GDP shown in Chart A reflect the impacts on the price deflator for GDP. The largest price impacts are observed for the participation rate shock. For example, in the high participation scenario, a price impact of 1.0 per cent is implied by the difference between the nominal impact of 2.8 per cent and the real impact of 1.8 per cent.

This impact on the general price level in the high participation rate scenario arises as follows. Higher labour force participation flows through to higher employment, production and export supply. Without a corresponding increase in labour force participation in the rest of the world, there is no change in export demand, so higher export supply pushes down export prices and the terms of trade. The lower terms of trade leads to a depreciation of the Australian dollar, which pushes up the general price level via higher prices for traded goods. This leads to a tightening of monetary policy, which eventually succeeds in restoring the annual inflation rate to the midpoint of the Reserve Bank's range of 2 to 3 per cent, but only after the general price level has risen by 1.0 per cent relative to baseline.

If monetary policy responded in a more (less) aggressive way, the increase in the general price level would be less (more), but the long-run impact on real variables, including real GDP, would be unaffected. This suggests that the main focus should be on the long-run impacts of shocks on real variables and relative prices, rather than on the general price level. This is consistent with the fact that the Reserve Bank does not aim to target any particular price level with monetary policy, but rather targets the inflation rate.

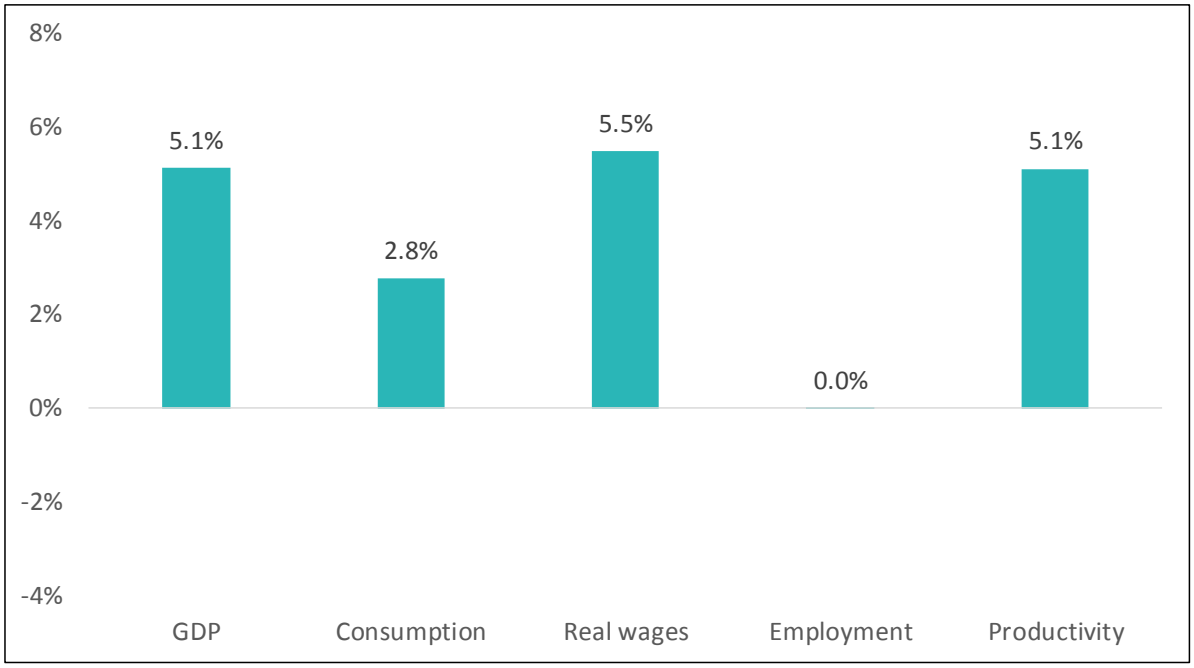
Because the economic impacts are broadly symmetric between the high and low scenarios, the discussion that follows focusses only on the high scenario for each shock.

Labour productivity

In the high scenario, underlying annual labour productivity growth is 0.5 percentage points per year above its baseline rate. Over the 11 years to 2024-25, this cumulates to a gain in the level of underlying labour productivity, relative to baseline, of 5.4 per cent.

As seen in Chart C, this flows through to a similar gain in actual labour productivity of 5.1 per cent. With unemployment driven to its sustainable rate or NAIRU (non-accelerating inflation rate of unemployment), employment is little affected. Therefore the gain in actual productivity flows through to a similar percentage gain in GDP. Real wages gain approximately in line with productivity, leaving real unit labour costs broadly unaffected.

Chart C. Effect of a 0.5 percentage point increase in annual productivity growth, deviation from baseline in 2024-25



Source: Independent Economics

In a faster growing economy, a higher share of GDP needs to be allocated to investment, to support faster growth in capital stocks. Thus, there is a shift in the pattern of spending in favour of investment, with all categories of fixed investment gaining by more than 8 per cent by 2024-25. To make room for this, the gain in household consumption is around 3 per cent, below the gain in GDP as a whole of around 5 per cent.

Terms of trade

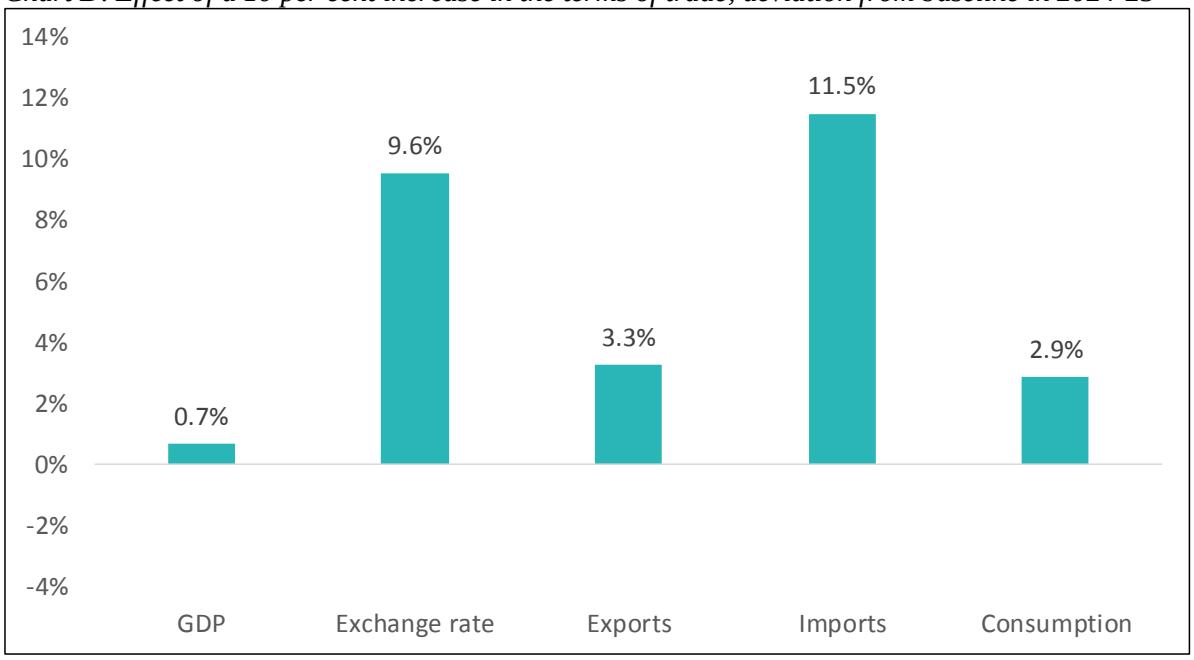
With higher world demand for mining exports, a lift in world mining prices of 35 per cent leads to a lift in the terms of trade of around 10 per cent. This gain in the terms of trade means that more imports can be purchased for a given volume of exports. Thus, by 2024-25, the gain in import volumes of 11.5 per cent easily exceeds the gain in export volumes of 3.3 per cent, as can be seen in Chart D.

This gain in imports relative to exports implies that the gain in real GNE exceeds the gain in real GDP of 0.7 per cent. For example, the gain for the largest component of GNE, real household consumption, is 2.9 per cent.

To induce the gain in imports relative to exports, the exchange rate appreciates by 9.6 per cent. This is consistent with the general finding for Australia that movements in the terms of trade tend to lead to similar percentage movements in the exchange rate.

The gain in the terms of trade leads to a change in the industry structure of the Australian economy. Higher world mining prices encourage the Mining industry to increase its output. However, the appreciation of the exchange rate crowds out other trade-exposed industries, notably Agriculture and Manufacturing. On the other hand, Housing Services expand as part of the expansion in household consumption.

Chart D. Effect of a 10 per cent increase in the terms of trade, deviation from baseline in 2024-25

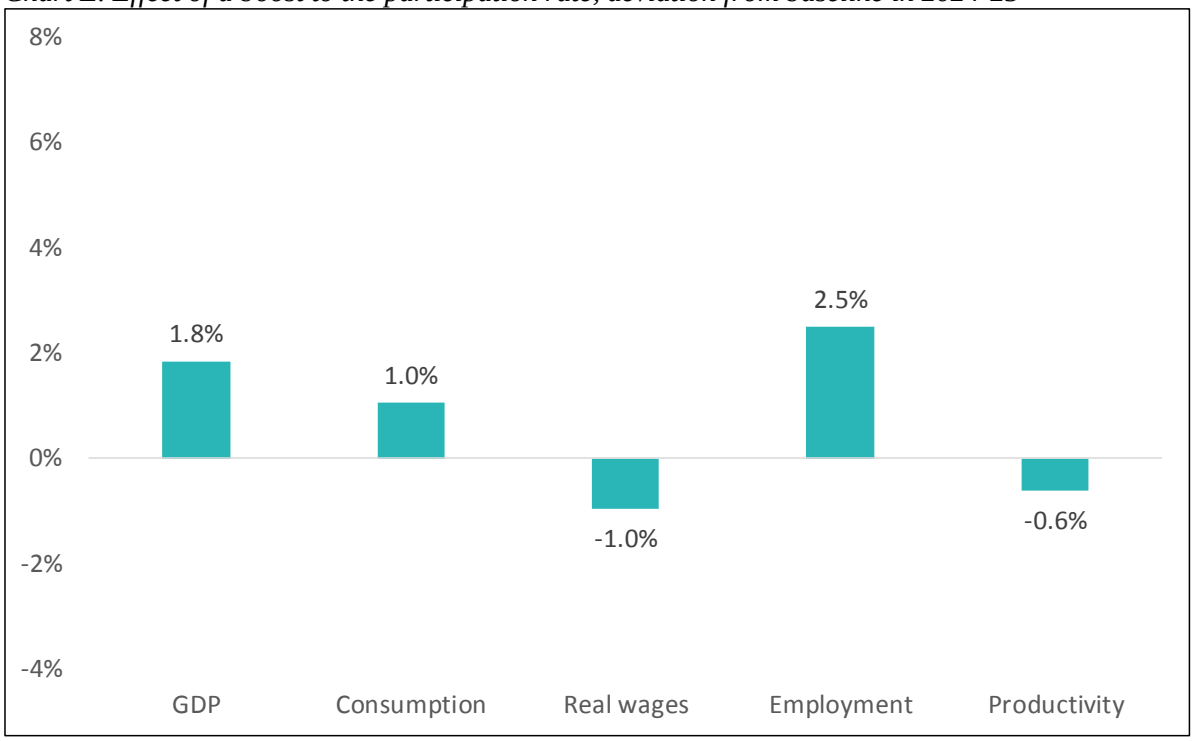


Source: Independent Economics

Participation Rate

A gradual lift in the labour force participation rate of 1.6 percentage points by 2024-25, relative to baseline, translates to gain in the labour force of 2.5 per cent. With the unemployment rate driven to the NAIRU, there is a matching 2.5 per cent gain in employment, as seen in Chart E.

Chart E. Effect of a boost to the participation rate, deviation from baseline in 2024-25



Source: Independent Economics

The percentage gain in real GDP is 1.8 per cent, which reflects the responses in all of the key factors of production. On the one hand, there is the employment gain of 2.5 per cent, but adjustments of capital stocks lag a little behind and the supplies of fixed factors of production such as land and natural resources are assumed to be unchanged.

With the percentage gain in employment outstripping the percentage gains in other factors of production, labour productivity is weaker. Consequently, real wages are lower by 1.0 per cent.

In a faster growing economy, a higher share of GDP needs to be allocated to investment, to support faster growth in capital stocks. Thus, there is a shift in the pattern of spending in favour of investment, with all categories of fixed investment gaining by more than 2.5 per cent by 2024-25. To make room for this, the gain in household consumption is around 1 per cent, below the gain in GDP as a whole of 1.8 per cent.

1 Introduction

This report has been prepared for the Parliamentary Budget Office (PBO). The PBO supports the Australian Parliament by providing independent analysis of the budget cycle, fiscal policy, and the financial implications of proposals. The PBO are preparing a report on the Commonwealth Budget's sensitivity to macroeconomic shocks, such as changes to world mining prices. Macroeconomic shocks influence key economic parameters that affect the Budget by impacting revenue collections and government expenditure.

The PBO has commissioned Independent Economics to analyse the impact of several macroeconomic shocks on key economic parameters that influence the Budget. The macroeconomic shocks involve changes to productivity, the terms of trade and labour force participation. For each macroeconomic shock, symmetric 'high and 'low' scenarios around the baseline have been specified.

The impacts of the shocks on the economic parameters, expressed as percentage deviations from baseline, are presented on an annual basis from 2014-15 to 2024-25. This provides the PBO with an understanding of the short-term and the long-term economic impacts of the macroeconomic shocks on the key economic parameters that influence the Budget.

The outputs of the analysis will be used by PBO to adjust the 2014-15 Budget forecasts of economic parameters. PBO will then use its modelling of the relationship between the economic parameters and the Budget to assess the effects on the Budget of the macroeconomic shocks.

1.1 Methodology: the Independent macro-econometric model

This report's analysis of the effects of the macroeconomic shocks on the key economic parameters is undertaken using the Independent Macro-econometric model. Our Macro Model is well suited for analysing the economic effects of the macroeconomic shocks for the following reasons.

- It is able to *consistently analyse the economic impacts of macroeconomic shocks in the short, medium and long term*. Consistent modelling through time is particularly important for analysing economics shocks such as a gain in the terms of trade, where there are different, important effects in both the short-term and long-term.

- It features *fully-integrated industry modelling*, which models the inter-linkages between six different industries (including mining) and the broader economy within one model. This allows for a fuller analysis of the effects of macroeconomic shocks, such as changes to world mining prices. The six industries are Agriculture, Mining, Manufacturing, Government Services, Other Services and Housing Services

- The Macro Model has a *fully-integrated demographic model*. This allows the Macro Model to robustly estimate the economic effects of population ageing, including its effects on the participation rate.

- The model incorporates a *sophisticated production structure* that allows for the importance of fixed factors such as land and natural resources in industries such as Agriculture, Mining and housing services (Ownership of Dwellings). This enables the model to provide more realistic

estimates of the response of these industries to macroeconomic shocks, such as changes in labour productivity.

Other features of the model that are useful for the analysis include:

- forecasts on a quarter-by-quarter basis to a long-term horizon;
- strong data consistency for more accurate forecasting;
- solid theoretical foundations for more robust policy analysis;
- an understanding of how the Reserve Bank pursues its inflation target in setting monetary policy, taking into account developments in inflation, unemployment and the bond market;
- modelling of consumer and investment behaviour that allows for the GFC;
- a new approach to modelling household consumption that uses a target for asset holdings based on labour income;
- a detailed representation of the interactions between building and construction activity in each industry and the broader economy;
- an allowance for structural change in the labour market;
- sophisticated modelling of financial markets in which market agents are forward looking and instantaneously respond to new information. This is a more realistic approach to modelling financial markets and helps the model provide credible short-term forecasts;
- an industry satellite model that disaggregates selected forecasts for the six broad industries in the macro model to 37 more detailed industries; and
- a states satellite model that disaggregates selected national forecasts from the macro model to the state level.

1.2 Outline of this report

The report is set out as follows.

- **Section 2** provides further details on assumptions and concepts that underpin the baseline scenario and the shocks applied to the scenario for the scenario analysis;
- **Section 3** provides a brief overview of the baseline outlook;
- **Section 4** explains the impact on the economy of the shock to productivity;
- **Section 5** explains the impact on the economy of the shock to the terms of trade;
- **Section 6** explains the impact of the shock to labour force participation;
- **Appendix A** provides a detailed explanation of the Independent macro-econometric model, which has been used to develop the results presented in this report; and
- **Appendix B** provides detailed results for each of the six scenarios.

While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference of PBO 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 provide PBO with an analysis of the economic impact of selected economic shocks.

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 Independent Economics 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 The macroeconomic shocks

This section explains how the various scenarios from the Macro Model were generated. This includes the baseline scenario, as well as the six scenarios covering the high and low cases for each of the three macroeconomic shocks.

Each of the macroeconomic shocks is introduced into the Macro Model under a separate alternative scenario. The outcomes for an economic parameters under each alternative scenario are then compared to the outcomes for the same parameters under the baseline scenario. The percentage differences in outcomes for economic parameters provide estimates of the economic impacts of the macroeconomic shock. For example, to estimate the economic impacts of an increase in the terms of trade, the alternative scenario where the terms of trade is boosted is compared to the baseline scenario. The impact on an economic parameter, such as the exchange rate, from the shock to the terms of trade is then assessed as the percentage difference in the outcome for the exchange rate in the alternative scenario compared to the baseline scenario.

2.1 Baseline scenario

The macroeconomic shocks involve varying the baseline assumptions for productivity, the terms of trade and labour force participation. Those baseline assumptions are summarised in Table 2.1.

Table 2.1. Assumptions used in the baseline outlook to 20124-25 and their explanation

	Units	Assumption in baseline sceanrio	Explanation
Long-term productivity growth	per cent per year	1.5	The baseline scenario's productivity growth rate of 1.5% p.a. per person employed matches average growth over the last 20 years. It is also consistent with the Australian Government's 2010 Intergenerational report. That report assumed productivity growth of 1.6% p.a. per hour worked, which is consistent with productivity growth of 1.5% p.a. on a per person employed basis.
Terms of trade in long run	Per cent deviation from 2011-12 peak	-25	The assumption that the terms-of-trade continues to decline until it is 25% below its peak in 2011/12 is similar to the projection in Treasury Working Paper 2014-1 (p. 31) and the 2014/15 Budget (Budget Paper No 1, 2-15).
Participation rate in 2024-25	Per cent	63.5	This projected decline in the labour force participation rate is taken from the Independent demographic model. It reflects assumptions consistent with the ABS 'series B' population projection (which assumes current trends continue) and Independent's own analysis.

2.2 Productivity shock

From the September quarter 2014, labour productivity growth is shocked by 0.5 percentage points around its baseline rate of 1.5 per cent per year. This design of the high and low scenarios is consistent with the variability in productivity growth rates observed in recent decades, in which trend productivity growth has varied between around 1 and 2 per cent per year.

By the 2024-25 financial year, this shock translates to a 5.4 per cent gain or 5.1 per cent loss in the level of underlying productivity relative to the baseline scenario. The small difference in the magnitude of the cumulative gains and losses reflects the effects of compounding.

It has been assumed that the source of the variation in productivity growth between scenarios is variation in the rate of improvement in technology. In the modelling, this involves adjusting the assumed rates of underlying improvement in the efficiency of use of labour, land and natural resources in each industry. As technology is transferable across borders, similar variations in productivity growth are assumed for other countries. This assumption is implemented by varying the rate of growth in world GDP.

The level of general government final demand in Australia has also been adjusted so that it expands in line with the variations in the high and low scenarios in the productive capacity of the economy.

2.3 Terms of trade shock

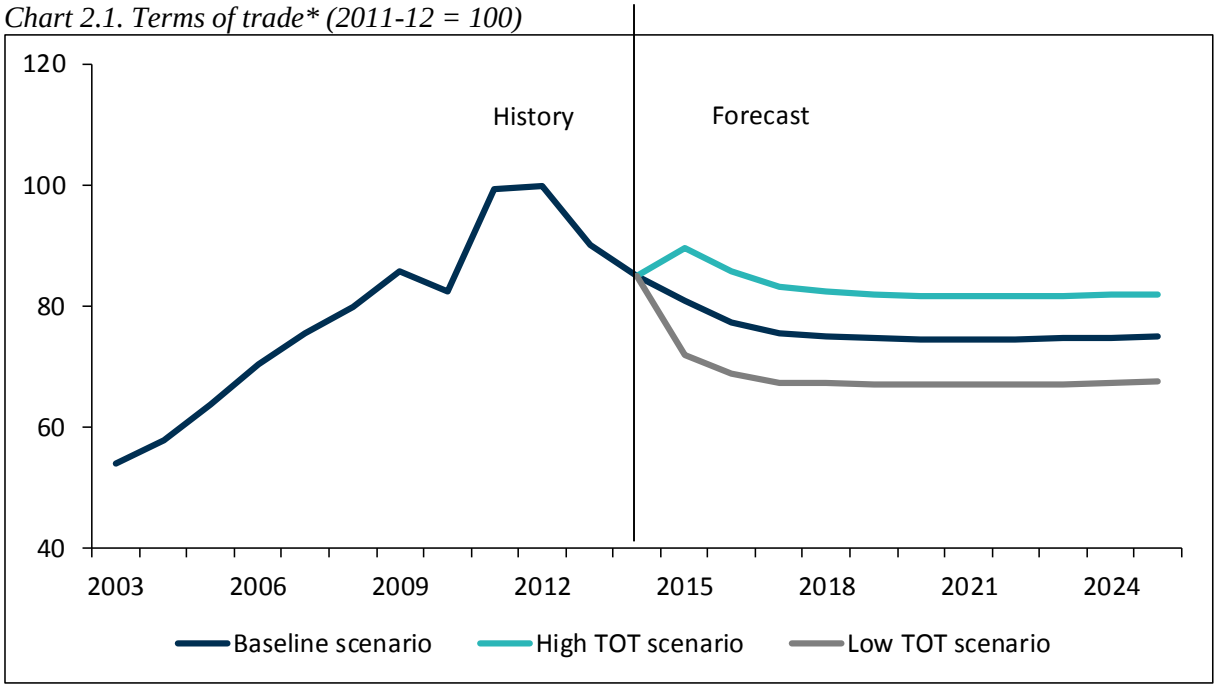
Under this alternative scenario, the level of the terms of the trade is 10 per cent higher (or lower) than in the baseline scenario.

The variations in the terms of trade between scenarios are assumed to be brought about by variations in world demand for mining exports, leading to variations in world mining prices. Specifically, relative to baseline, world mining prices are increased (reduced) by 35 per cent to achieve the 10 per cent gain (loss) in the terms of trade. Because Australia is a net export of minerals and energy, positive shocks to world mining prices have a positive impact on the terms of trade.

The terms of trade aims to capture the level of export prices, relative to the level of import prices. However, as defined in the national accounts, it is also affected by changes in the composition of exports and imports. Thus, this report uses an adjusted terms of trade, which removes the compositional effect by holding the composition of exports and imports fixed at their baseline scenario paths.

The high, low and baseline scenarios for the adjusted terms of trade are shown in Chart 2.1.

Chart 2.1. Terms of trade (2011-12 = 100)*



* Calculated using baseline scenario volumes for the components of exports and imports
Source: Independent Economics

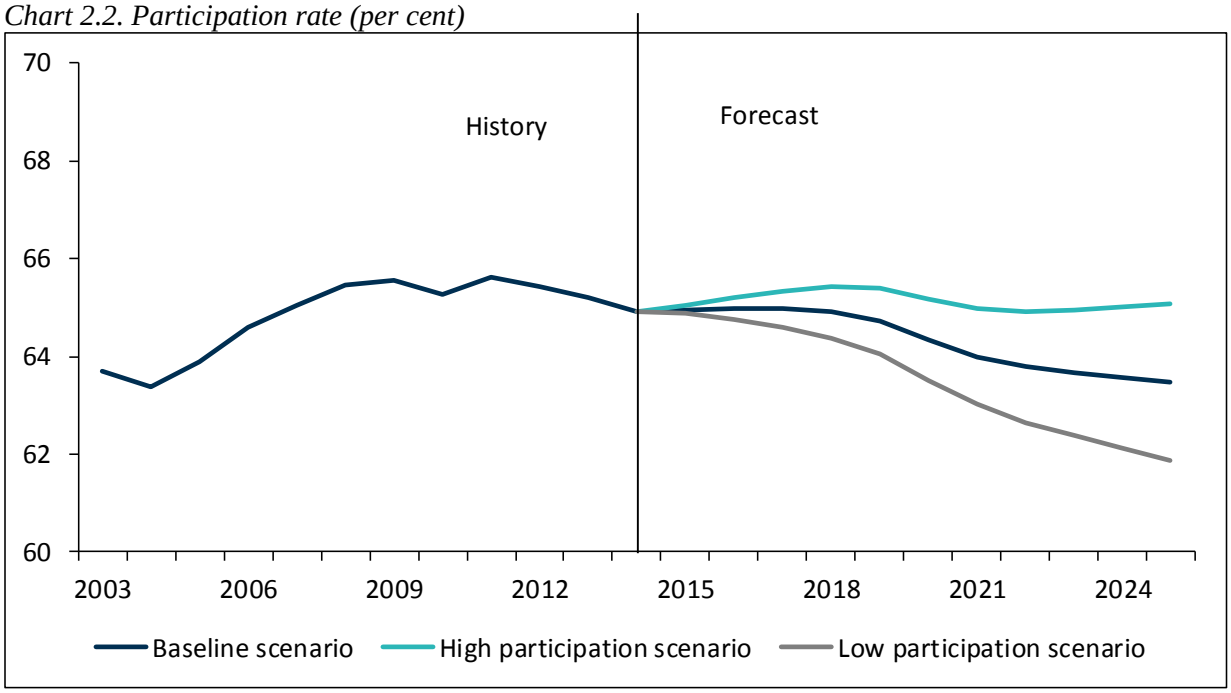
2.4 Labour force participation shock

The baseline scenario reflects current trends under which population ageing is projected to gradually reduce the labour force participation rate from 65.2 per cent in 2012-13 to 63.5 per cent in 2024-25, a decline of 1.7 percentage points. Alternatively, the high scenario assumes that longer life expectancies lead to longer working lives, keeping the labour force participation rate almost steady at 65.1 per cent. Symmetrically, in the low scenario the labour force participation rate declines by over 3 percentage points.

This implies that, relative to baseline, by 2024-25 the labour force participation rate is 1.6 percentage points (or 2.5 per cent) higher in the high scenario and 1.6 percentage points (or 2.5 per cent) lower in the low scenario. The high, low and baseline scenarios for the labour force participation rate are shown in Chart 2.2.

The level of general government final demand in Australia has also been adjusted so that it expands in line with the variations in the high and low scenarios in the productive capacity of the economy.

Chart 2.2. Participation rate (per cent)



Source: Independent Economics

2.5 Timing of the shocks and expectations

The macroeconomic shocks apply from the beginning of the 2014-15 financial year, whereas the model projections commence part-way through the 2013-14 financial year. Given that financial markets are forward looking in the model, the question arises as to whether financial markets anticipate the macroeconomic shocks at the start of the projection period and respond then, or whether the shocks are unexpected, so that financial markets respond at the start of the 2014-15 financial year.

The default assumption in the model is that shocks are anticipated. Thus, in the absence of adjustments, forward-looking variables adjust in the first quarter of the projection period, which is the December quarter of 2013. Those forward-looking variables include the exchange rate, the government bond rate and long-term inflation expectations.

Rather than use the default assumption that shocks are anticipated, it was decided to instead assume that the shocks are unanticipated. This makes the interpretation of the results more straightforward, as it means that there are no economic impacts until the shocks are introduced at the beginning of the 2014-15 financial year. In the model, implementing the assumption that the shocks are unanticipated involves making residual adjustments to the forward-looking equations in the period leading up to the shocks. Following these residual adjustments, the model shows no economic impacts from the shocks until they are introduced at the beginning of the 2014-15 financial year.

3 The baseline outlook

This section describes Independent Economics' baseline scenario. However, the economic impacts of the macroeconomic shocks are largely unaffected by this choice of baseline scenario. This is because the deviations in economic parameters (or economic impacts) are driven largely by the deviations in model inputs, rather than by the levels of economic variables in the baseline scenario. In light of the minor role of the baseline scenario in influencing the estimates of the economic impacts, this section provides only a summary description of the baseline scenario.

The baseline scenario was prepared in February 2014 and therefore is based on national accounts up to the September quarter of 2013. National accounts data is now available up to the June quarter of 2014. While use of this more recent data would lead to a slightly different baseline scenario, this would have little influence on the estimates of the economic impacts, for the reason explained above.

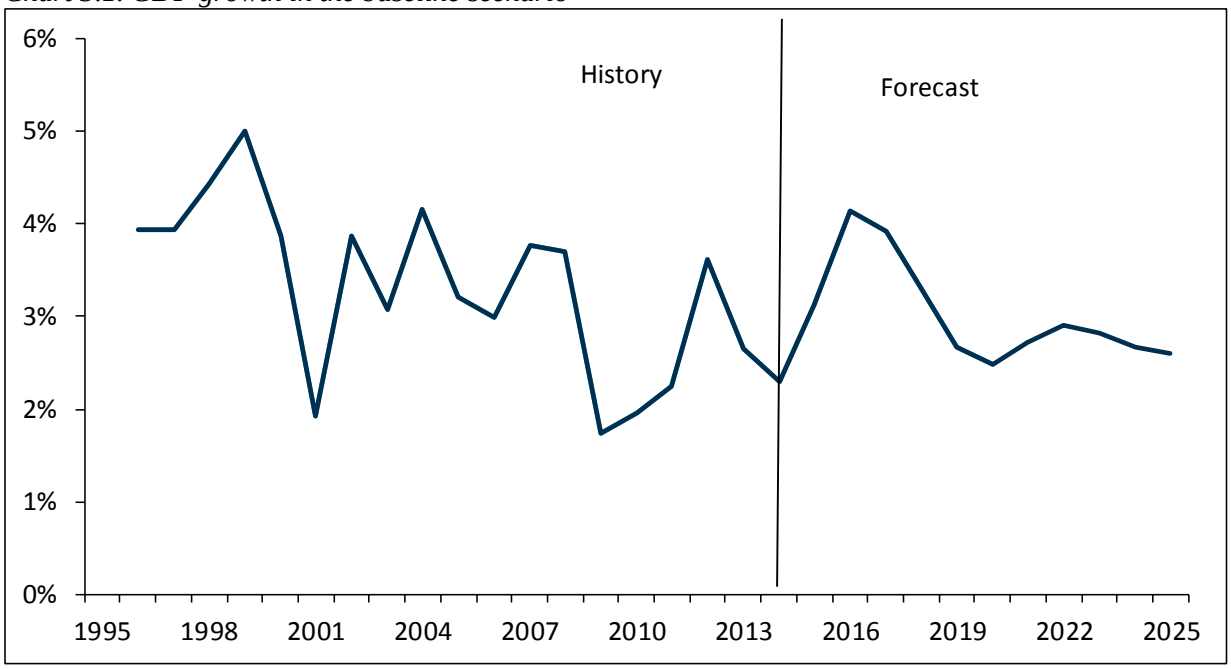
3.1 The baseline outlook

Currently, the Australian economy is in a soft-patch; GDP grew by 2.7 per cent in 2012-13 and is expected to grow by only 2.3 per cent in 2013/14, weighed down by mining investment falling back from an unprecedented high. This compares to average growth of 3.4 per cent[1] between 1993-94 and 2011-12. This current soft patch is seen in Chart 3.1. This slow economic growth has pushed the unemployment rate up to around 6 per cent.

In keeping with historical experience, this downturn in the business cycle will inevitably be followed by an upswing that returns economic activity to its long-term, trend path. The seeds for this economic recovery have been sown by low interest rates and the recent depreciation in the Australian dollar. Chart 3.1 shows the ensuing economic recovery is forecast for 2015-16 and 2016-17. Average annual GDP growth lifts to 3.6 per cent in the four years to 2017-18. This growth is supported by solid growth in exports, weak growth in imports and a recovery in housing investment. This recovery in economic activity is sufficient to reduce unemployment to its sustainable rate, which is closer to 5 per cent than its current rate of 6 per cent.

[1] This is calculated as the compound annual growth rate (CAGR) between 1993-94 and 2011-12. This CAGR approach is used to calculate average annual growth rates throughout this report.

Chart 3.1. GDP growth in the baseline scenario



Source: Independent Economics

Following the economic recovery, economic growth stabilises at a sustainable rate in the 2020s. This sustainable rate is driven by the three Ps of population, productivity and (labour force) participation.

4 Productivity shock

This section explains the economic impacts of the shock to productivity. As explained in section 2, it is assumed that the source of the variation in productivity growth is in the rate of improvement in technology and that similar technology-driven variations in productivity occur in other countries.

4.1 Overview of impacts

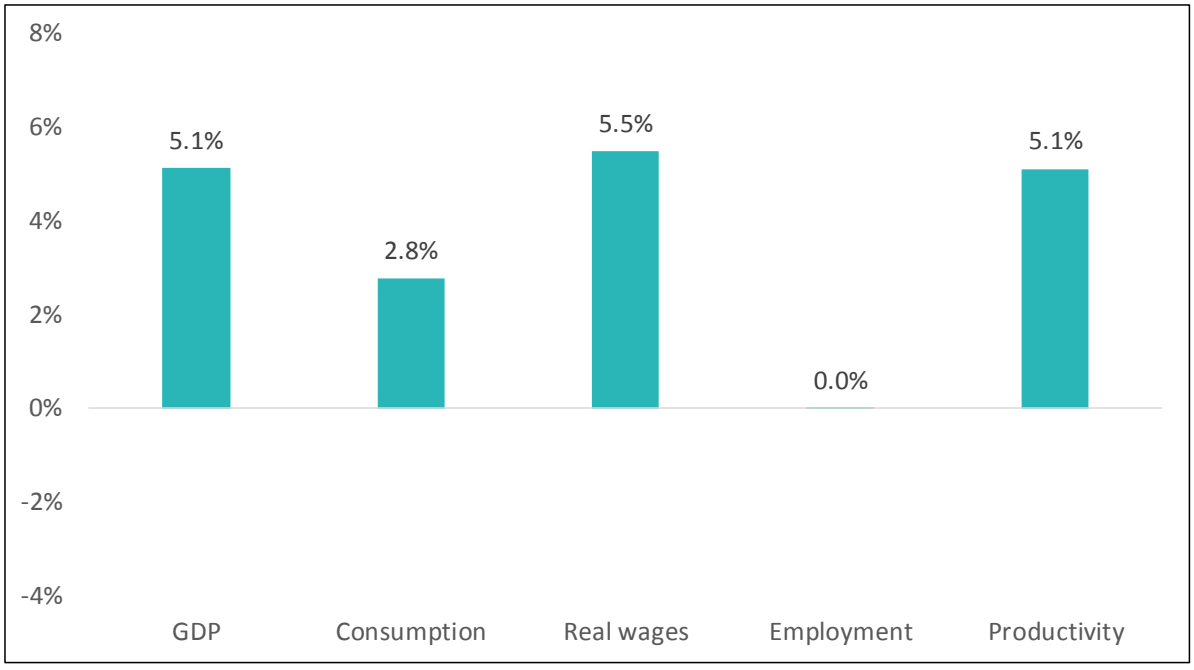
This overview of the economic impacts from the productivity shock focuses on the high scenario as the results in the low scenario are broadly symmetric.

In the high scenario, underlying annual labour productivity growth is 0.5 percentage points per year above its baseline rate, from the September quarter 2014. Over the 11 years to 2024-25, this cumulates to a gain in the level of underlying labour productivity, relative to baseline, of 5.4 per cent.

As seen in Chart 4.1, this flows through to a similar gain in actual labour productivity of 5.1 per cent. With unemployment driven to its sustainable rate or NAIRU (non-accelerating inflation rate of unemployment), employment is little affected. Therefore the gain in actual productivity flows through to a similar percentage gain in GDP. Real wages gain approximately in line with productivity, leaving real unit labour costs broadly unaffected.

In a faster growing economy, a higher share of GDP needs to be allocated to investment, to support faster growth in capital stocks. Thus, there is a shift in the pattern of spending in favour of investment, with all categories of fixed investment gaining by more than 8 per cent by 2024-25. To make room for this, the gain in household consumption is around 3 per cent, below the gain in GDP as a whole of around 5 per cent.

Chart 4.1. Effect of a 0.5 percentage point increase in annual productivity growth, deviation from baseline in 2024-25



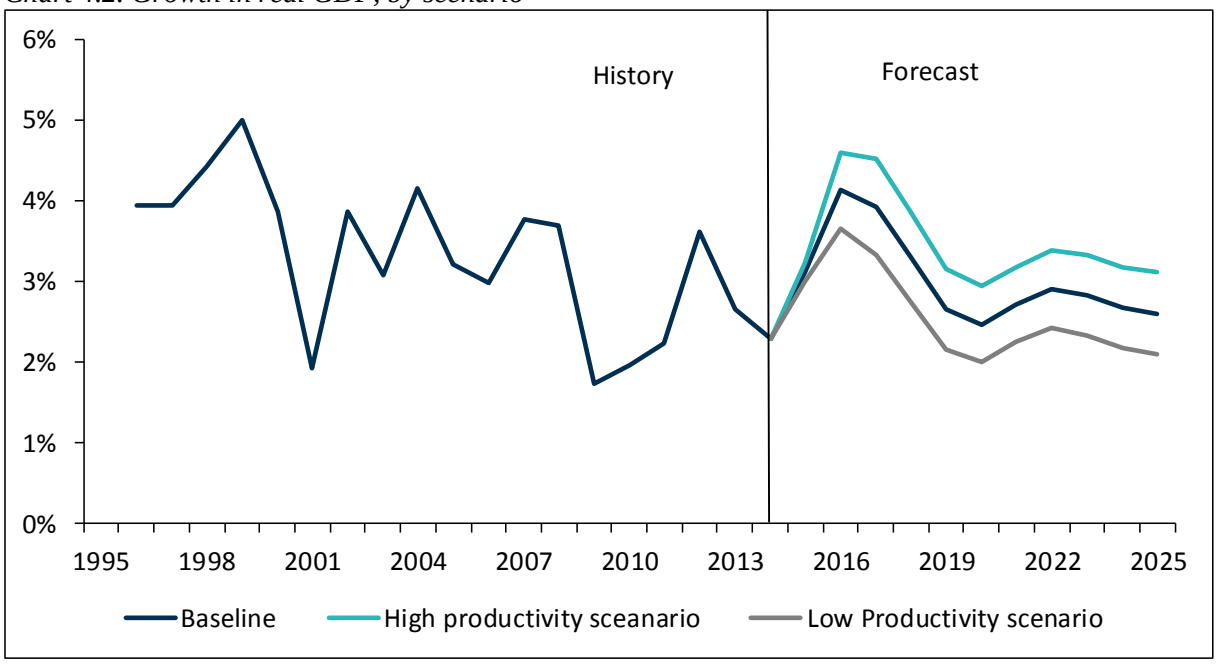
Source: Independent Economics

4.2 Detailed impacts

The shock to labour productivity directly impacts the underlying or *trend* rate of economic growth in Australia. (The drivers of the trend rate of economic growth are the 'three Ps': population, participation and productivity). In the forecast period, economic conditions drives *actual* economic growth away from trend growth in the short-term but in the long-term growth returns to its trend rate. Further, economic growth is always higher in the high productivity than in the baseline scenario, due to higher underlying growth.

In the high productivity scenario, trend growth is higher by 0.5 percentage points per year, in line with the shock to productivity. As a result, in the 11 years to 2024-25, actual economic growth averages 3.5 per cent per year, which is faster than in the baseline scenario (3.0 per cent per year). Average growth is 2.6 per cent per year in the low scenario. This is shown in Chart 4.2.

Chart 4.2. Growth in real GDP, by scenario



Source: Independent Economics

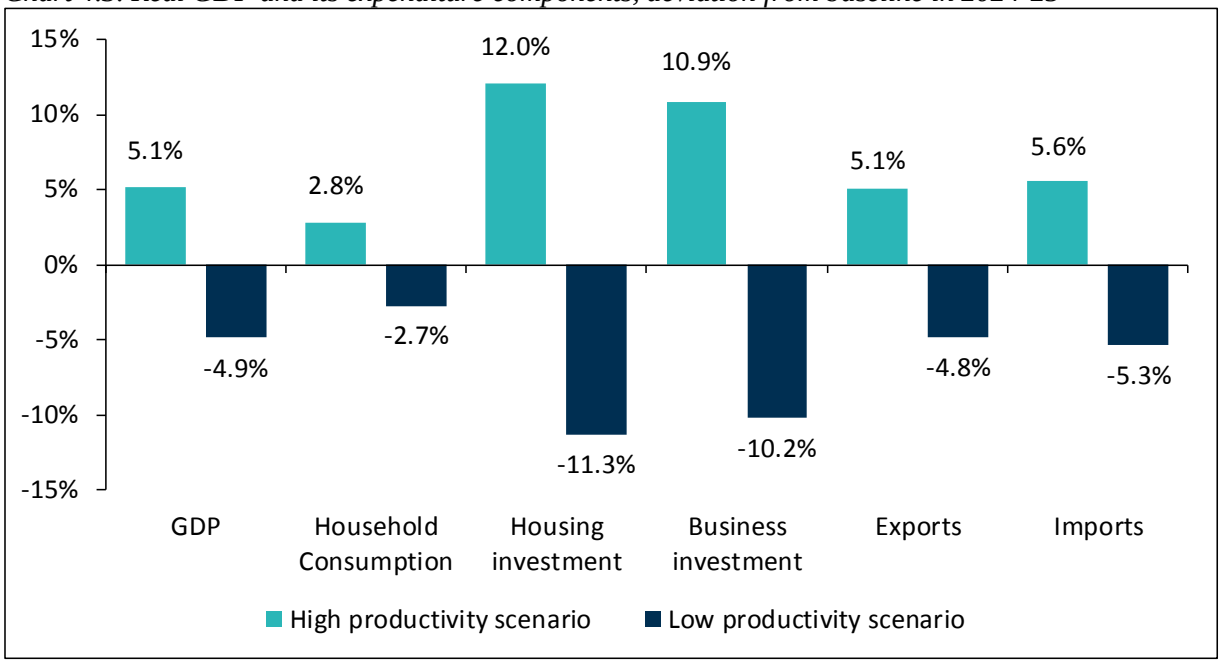
This following discussion focuses on the high scenario, as the results in the low scenario are broadly symmetric.

By 2024-25, the size of the economy is over 5 per cent larger in the high productivity scenario than in the baseline scenario, because this corresponds to the cumulative gain in productivity over the 11 years to 2024-25. Chart 4.3 shows the economy is 5.1 per cent larger in the high scenario in 2024-25 compared to the baseline scenario.

Within the expenditure components of GDP, the largest percentage gains are for housing and business investment. This means investment is *larger*, when measured as a share of GDP, in the high productivity scenario than in the baseline scenario. While replacement investment to cover depreciation depends on the *level* of GDP, net investment (the creation of new capital) depends on the *change* GDP, and therefore accounts for a higher share of GDP when GDP is growing more rapidly in response to faster productivity growth.

Because housing depreciates at a relatively low rate compared to business capital, more of housing investment represents net investment rather than replacement investment. This makes housing investment particularly sensitive to higher economic growth, as seen in Chart 4.3 in its large gain of 12.0 per cent.

Chart 4.3. Real GDP and its expenditure components, deviation from baseline in 2024-25

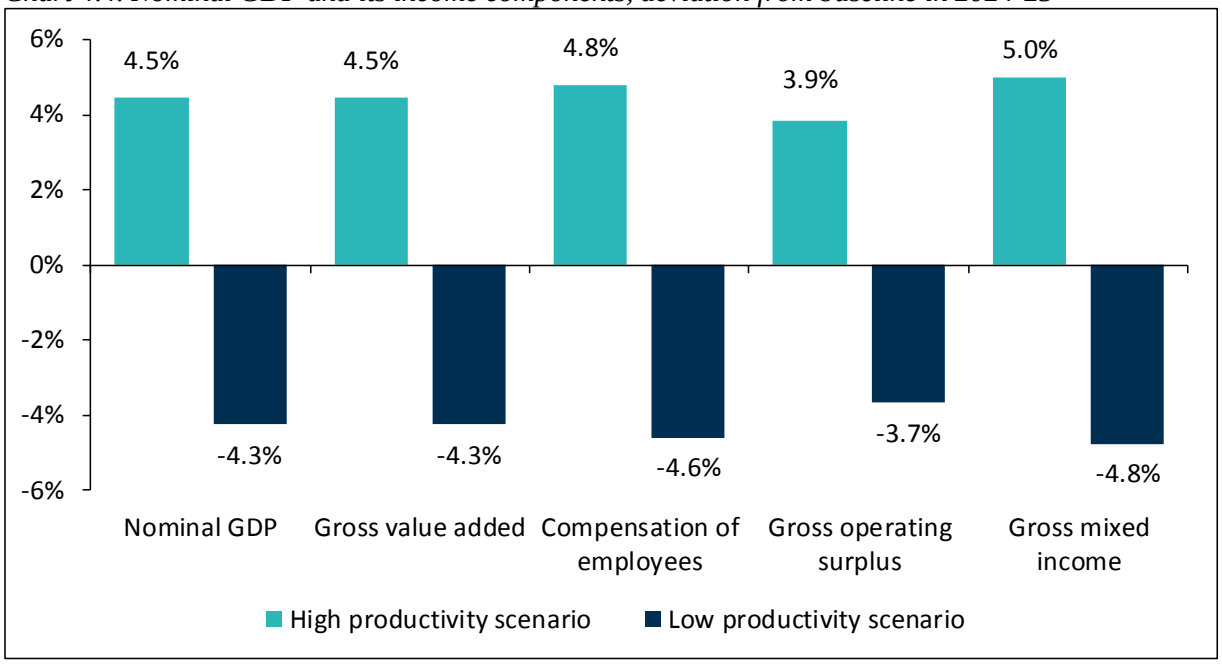


Source: Independent Economics

In 2024-25 exports and imports are higher by over 5 per cent, broadly in line with the expansion in GDP. The gain in household consumption is less at under 3 per cent, as it makes room for the larger expansion in investment

Nominal GDP is 4.5 per cent higher in 2024-25 in high scenario than in the baseline scenario, reflecting the combined impact of the gain in real GDP of 5.1 per cent, and a small fall in the GDP price deflator of 0.6 per cent. Chart 4.4 shows that all components of nominal income expand broadly equi-proportionately with the expansion in nominal GDP. However, the percentage expansion in gross operating surplus is noticeably lower than for other components of income. This is because, as seen in Chart 4.5, the expansion of the GOS of the housing sector lags behind other sectors. Housing services account for a significant share of total gross operating surplus.

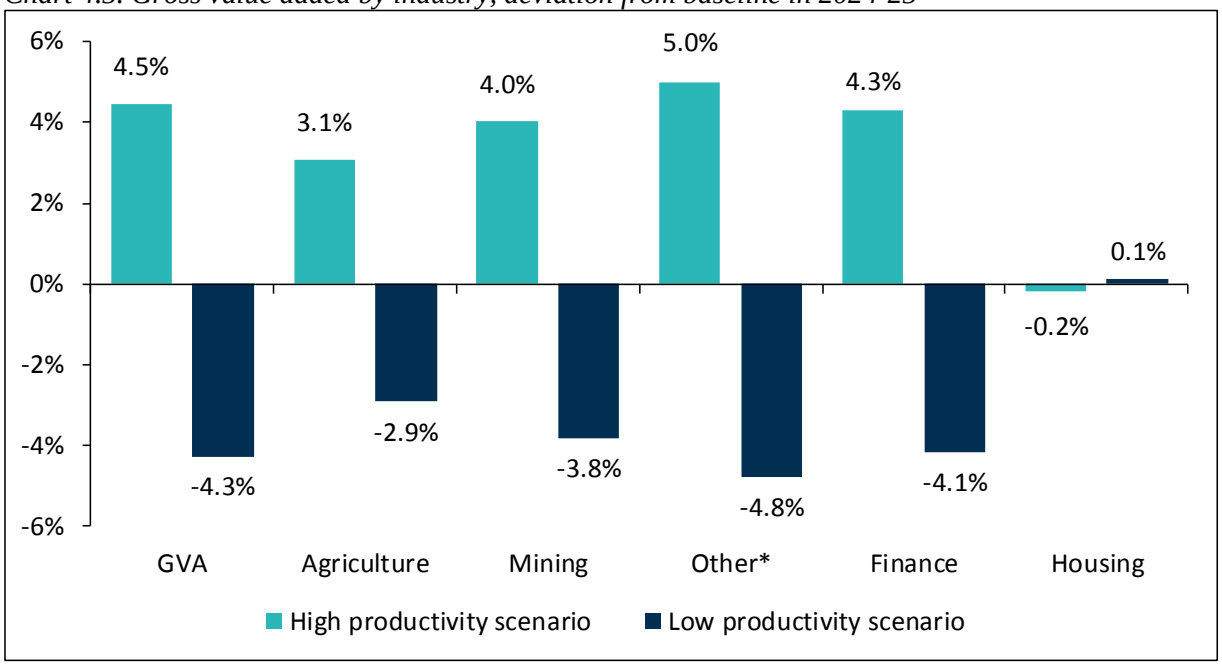
Chart 4.4. Nominal GDP and its income components, deviation from baseline in 2024-25



Source: Independent Economics

Across most industries, the effects of the productivity gain are broadly uniform, as shown in Chart 4.5. This reflects the fact the shock boosts underlying productivity for labour, land and natural resources by the same percentage in each industry. However, in the housing services sector, supply responds more quickly than demand to the productivity gains, putting downward pressure on the price of housing services in the early years of the simulation. However, beyond 2024-25, demand and prices for housing services expand strongly, bringing the percentage gain in nominal gross value added more into line with that in other industries.

Chart 4.5. Gross value added by industry, deviation from baseline in 2024-25



* Includes finance and excludes housing
Source: Independent Economics

5 Terms of trade shock

This section explains the economic impacts of the shock to the terms of trade that was described in section 2.

5.1 Overview of impacts

This overview of the economic impacts from the terms of trade shock focuses on the high scenario as the results in the low scenario are in the opposite direction but are broadly similar. However, one difference is notable. As shown in Charts A and B of the Executive Summary, the GDP impacts are noticeably smaller in the high scenario than in the low scenario. This is because as mining prices rise, the scope to respond by further expanding mining exports is increasing limited by the available supply of mineral resources.

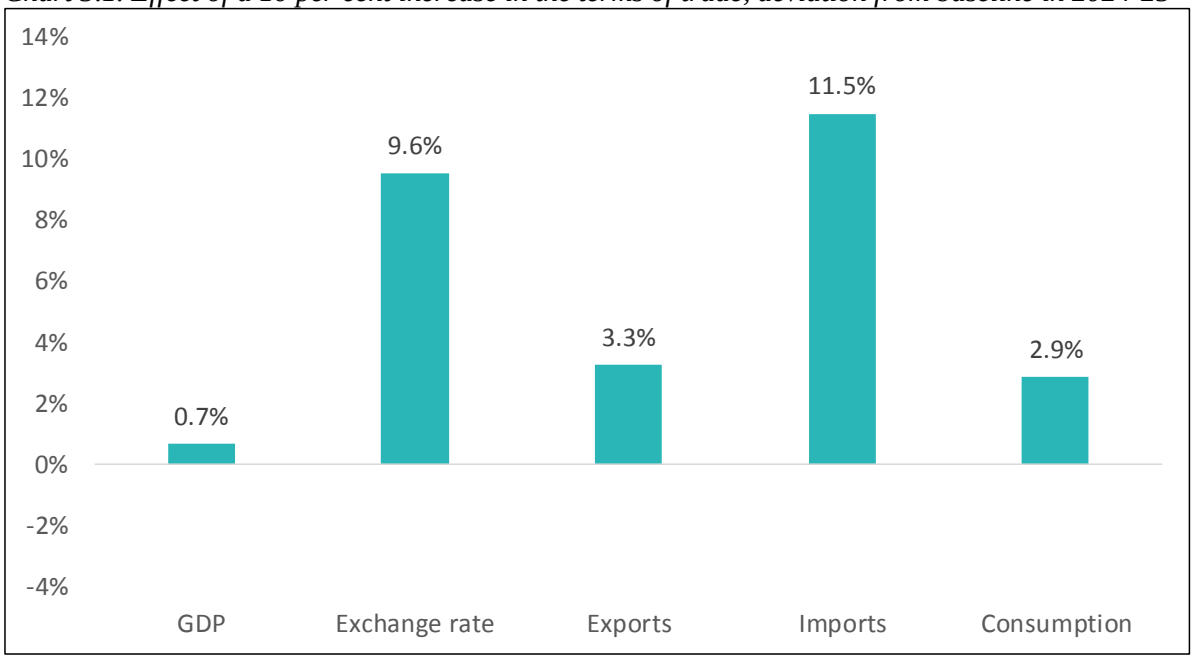
With higher world demand for mining exports, a lift in world mining prices of 35 per cent, relative to baseline, leads to a lift in the terms of trade of around 10 per cent. This gain in the terms of trade means that more imports can be purchased for a given volume of exports. Thus, by 2024-25, the gain in import volumes of 11.5 per cent easily exceeds the gain in export volumes of 3.3 per cent, as can be seen in Chart 5.1.

This gain in imports relative to exports implies that the gain in real GNE exceeds the gain in real GDP of 0.7 per cent. For example, the gain for the largest component of GNE, real household consumption, is 2.9 per cent.

To induce the gain in imports relative to exports, the exchange rate appreciates by 9.6 per cent. Recalling that the boost to the terms of trade is around 10 per cent, these results are consistent with the general finding for Australia that movements in the terms of trade tend to lead to similar percentage movements in the exchange rate.

The gain in the terms of trade leads to a change in the industry structure of the Australian economy. Higher world mining prices encourage the Mining industry to increase its output. However, the appreciation of the exchange rate crowds out other trade-exposed industries, notably Agriculture and Manufacturing. On the other hand, Housing Services expand as part of the expansion in household consumption.

Chart 5.1. Effect of a 10 per cent increase in the terms of trade, deviation from baseline in 2024-25



Source: Independent Economics

5.2 Detailed impacts

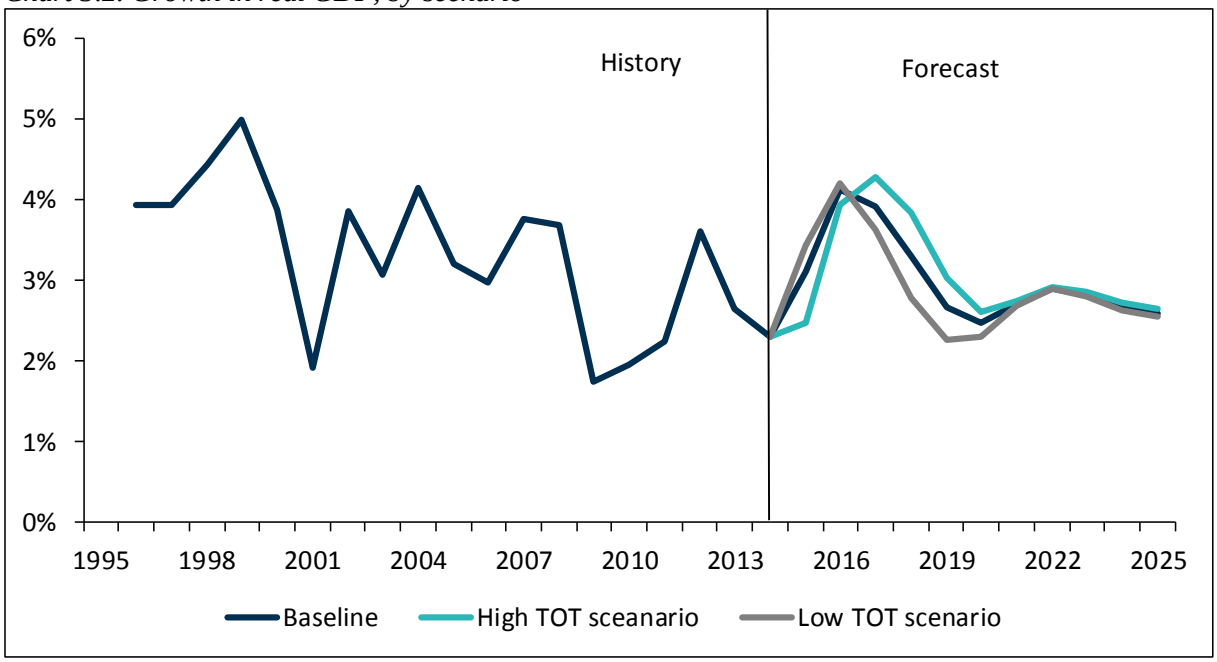
The shocks applied to the terms of trade (TOT) do not substantially change the trend rate of growth in the Australian economy, because changes to mining prices do not directly affect the 'three Ps'. As a result, in the 11 years to 2024-25, economic growth does not vary much between the baseline scenario and the two TOT scenarios. This is show in Chart 5.2.

Chart 5.2 shows that, in the short term, GDP growth is slightly *lower* in the high TOT scenario. This is because in the high scenario the exchange rate appreciates immediately once mining prices strengthen, and this leads to a contraction in other trade-exposed industries, especially manufacturing and agriculture. The mining industry, which benefits from higher mining prices, is slower to respond than manufacturing and agriculture.

In particular, there is a lag of around five years before half of the gain in activity in the mining industry has accrued, whereas the corresponding lags for the losses in activity in manufacturing and agriculture are only around one year. While it is plausible that mining supply is slower to adjust than manufacturing and agriculture supply, it is considered that the difference in lags is probably overstated in the current version of the model, leading to overstated weakness in the response in GDP in the initial years of the simulation. This area of the model will be reviewed in coming months.

In the long term, the mining industry expands enough for GDP to ultimately be higher. That is, in the long term the gain to GDP from higher activity in mining outweighs the losses to GDP from lower activity in manufacturing and agriculture. This result is considered to be robust, as it is based on consensus long-run elasticities.

Chart 5.2. Growth in real GDP, by scenario

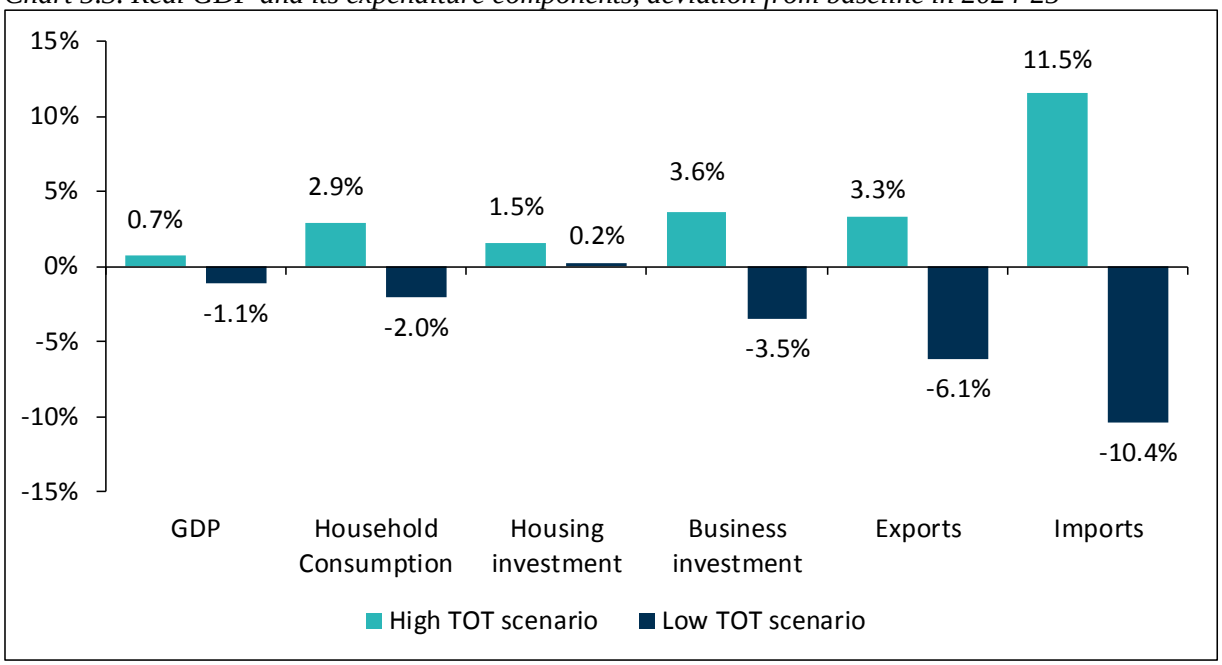


Source: Independent Economics

The following discussion of economic impacts focusses on the high TOT scenario.

In 2024-25, GDP is 0.7 per cent higher in the high TOT scenario than in the baseline scenario. This is shown in Chart 5.3.

Chart 5.3. Real GDP and its expenditure components, deviation from baseline in 2024-25



Source: Independent Economics

Though the impact of the TOT shock on the *level* of GDP is relatively small, its effect on the *structure* of GDP is significant. Higher mining prices induce an appreciation of the exchange rate, which is 9.6 per cent higher in 2024-25 in the high TOT scenario than in the baseline scenario. Higher mining prices and a stronger exchange rate drive significant changes in relative prices that lead to the changes in the

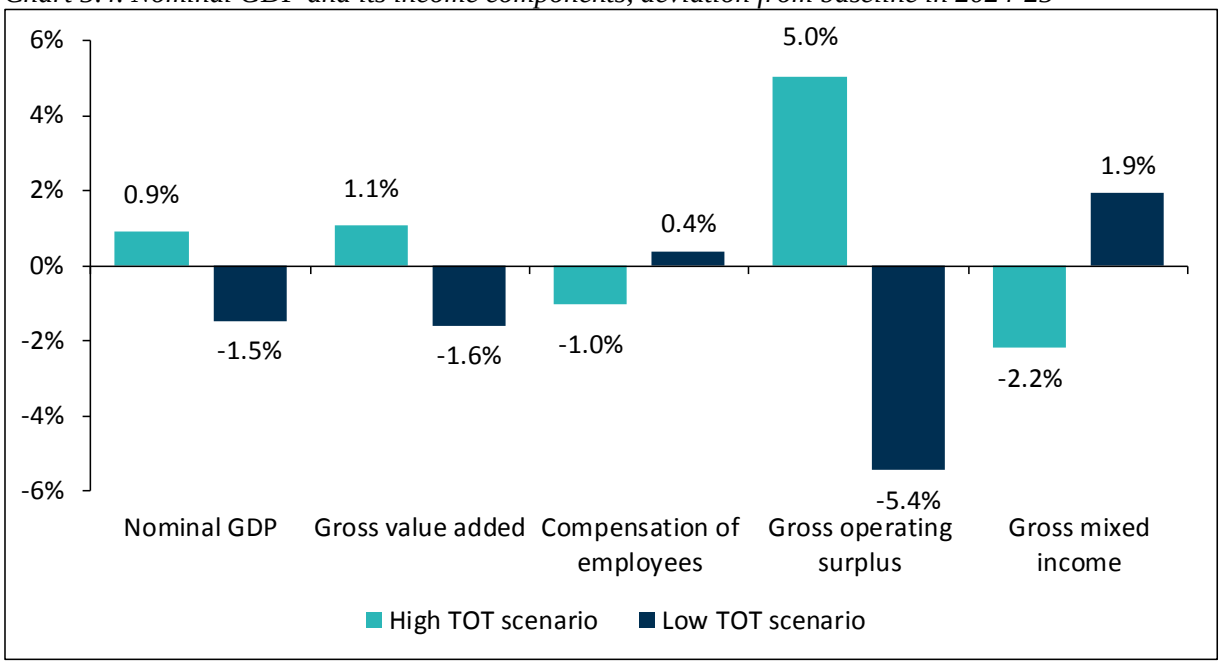
structure of GDP. These structural changes are observable in the expenditure, income and production decompositions of GDP, which are now discussed in turn.

Higher mining prices boost profitability in the mining sector. The mining sector responds by sharply increasing its investment so it can lift its production. This more than offsets a contraction in investment in other trade-exposed sectors, where profits are lower due to the higher exchange rate. In 2024-25, private business investment is 3.6 per cent higher in the high TOT scenario than in the baseline scenario.

Higher world mining prices lead to higher economic rents in the mining industry. Part of this gain in mining rents flows through to boost real household disposable income, and thereby consumption.

The structure of nominal GDP by income also changes in the high TOT scenario. The additional economic rents in the mining industry from high mining prices are reflected in a 5.0 per cent boost to gross operating surplus (GOS). At the same time, compensation of employees of employees is broadly unchanged in real terms, with both real wages and employment close to baseline by 2024-25. In nominal terms compensation of employees (COE) is 1.0 per cent below baseline, as nominal wages fall in line with consumer prices. This is shown in Chart 5.4.

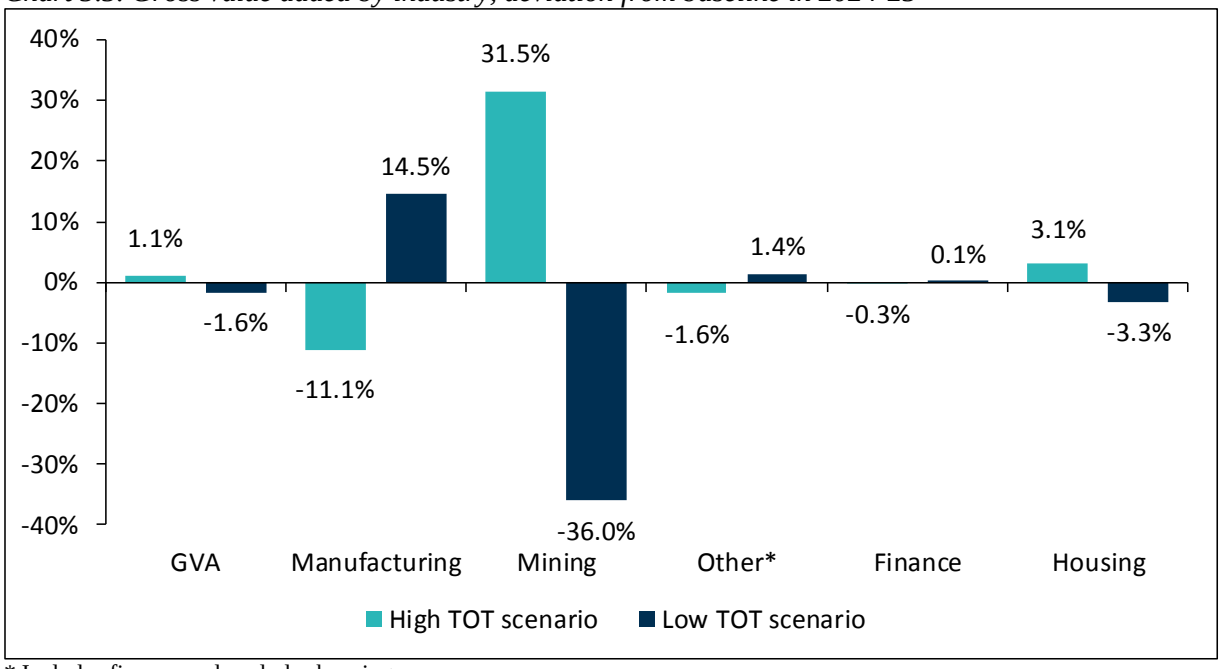
Chart 5.4. Nominal GDP and its income components, deviation from baseline in 2024-25



Source: Independent Economics

The industry structure of GDP also changes. In 2024-25, the size of the mining sector (in nominal terms) is 31.5 per cent larger in the high TOT scenario than in baseline scenario. This reflects higher output prices and, to a lesser extent, a real increase in production (facilitated by substantial investment). The output of industries exposed to the domestic economy, such as housing and construction (which is contained in 'other') is also higher in the high TOT scenario due to higher household consumption. On the other hand, the output of non-mining trade-exposed industries is lower, due to the impact of the higher Australian dollar. Nominal output in manufacturing, for example, is 11.1 per cent lower in 2024-25 in the high TOT scenario compared to the baseline scenario. This is shown in Chart 5.5.

Chart 5.5. Gross value added by industry, deviation from baseline in 2024-25



* Includes finance and excludes housing
Source: Independent Economics

6 Labour force participation shock

This section explains the economic impacts of the shock to the labour force participation rate that was described in section 2.

6.1 Overview of impacts

This overview of the economic impacts from the labour force participation shock focuses on the high scenario as the results in the low scenario are broadly symmetric.

A gradual lift in the labour force participation rate of 1.6 percentage points by 2024-25, relative to baseline, translates to gain in the labour force of 2.5 per cent. With the unemployment rate driven to the NAIRU, there is a matching 2.5 per cent gain in employment, as seen in Chart 6.1.

Chart 6.1. Effect of a boost to the participation rate, deviation from baseline in 2024-25

Source: Independent Economics

The percentage gain in real GDP is 1.8 per cent, which reflects the responses in all of the key factors of production. On the one hand, there is the employment gain of 2.5 per cent, but adjustments of capital stocks lag a little behind and the supplies of fixed factors of production such as land and natural resources are assumed to be unchanged.

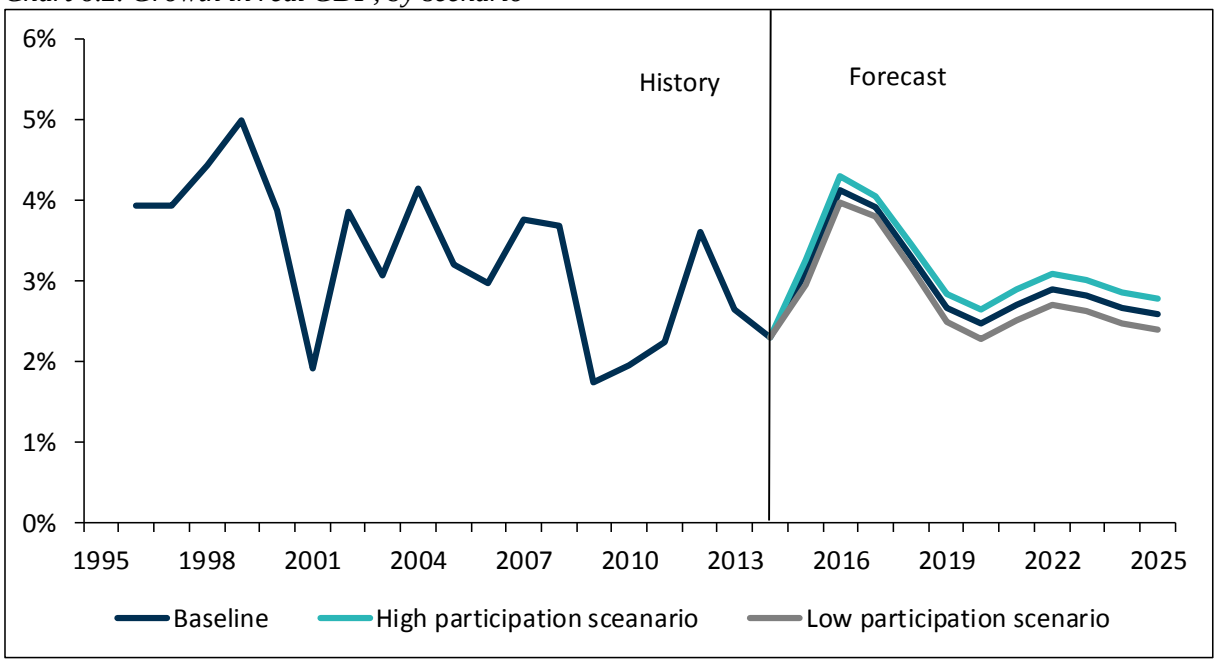
With the percentage gain in employment outstripping the percentage gains in other factors of production, labour productivity is weaker. Consequently, real wages are lower by 1.0 per cent.

In a faster growing economy, a higher share of GDP needs to be allocated to investment, to support faster growth in capital stocks. Thus, there is a shift in the pattern of spending in favour of investment, with all categories of fixed investment gaining by more than 2.5 per cent by 2024-25. To make room for this, the gain in household consumption is 1 per cent, below the gain in GDP as a whole of 1.8 per cent.

6.2 Detailed impacts

The shock to participation directly impacts the underlying or *trend* rate of economic growth. In the high participation scenario, average growth in the 11 years to 2024-25 is 3.2 per cent per year, which compares to average growth of 3.0 per cent in the baseline scenario. In the low participation scenario average growth is 2.9 per cent per year. This is shown in Chart 6.2.

Chart 6.2. Growth in real GDP, by scenario



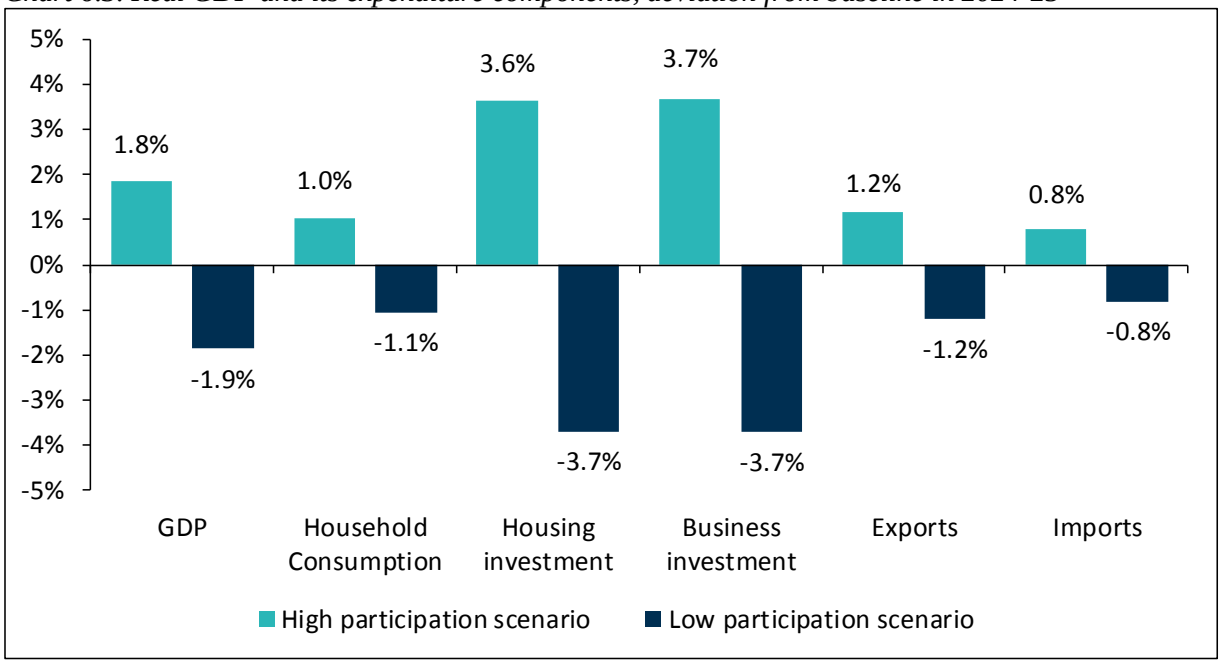
Source: Independent Economics

This section focusses on the high scenario because the results of the low scenario are broadly symmetric.

One aspect of the high participation scenario is that while higher participation underpins faster growth in production and employment in the economy, these positive effects are mitigated by lower worker productivity. In 2024-25, employment is 2.5 per cent higher than in the baseline scenario, but output per worker is 0.6 per cent lower. As noted above, this decline is labour productivity is because, in percentage terms, other factors of production increase by less than employment.

In terms of the expenditure components of real GDP, the effects of this shock to labour force participation are qualitatively similar to those for the shock to productivity. As discussed in Section 4, in percentage terms the expansion in investment relative to baseline is larger than the expansion in GDP because the rate of economic growth has picked up, requiring an increase in investment as a share of GDP balanced by a reduction in consumption as a share of GDP. Thus, in percentage terms household consumption expands by less than GDP, as shown in Chart 6.3.

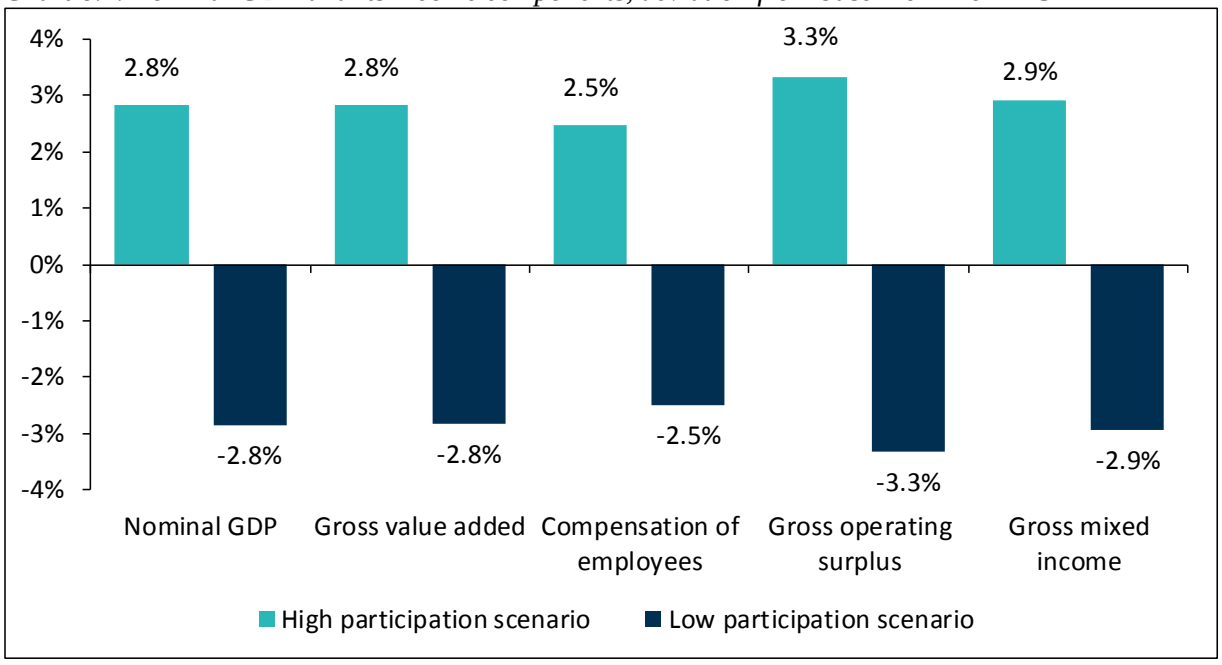
Chart 6.3. Real GDP and its expenditure components, deviation from baseline in 2024-25



Source: Independent Economics

In terms of the income components of nominal GDP, more of the boost to income flows to GOS (which is 3.3 per cent higher than baseline in 2024-25) than to COE (which is 2.5 per cent higher than baseline in 2024-25), as shown in Chart 6.4. This is because weaker worker productivity translates into weaker real wage growth.

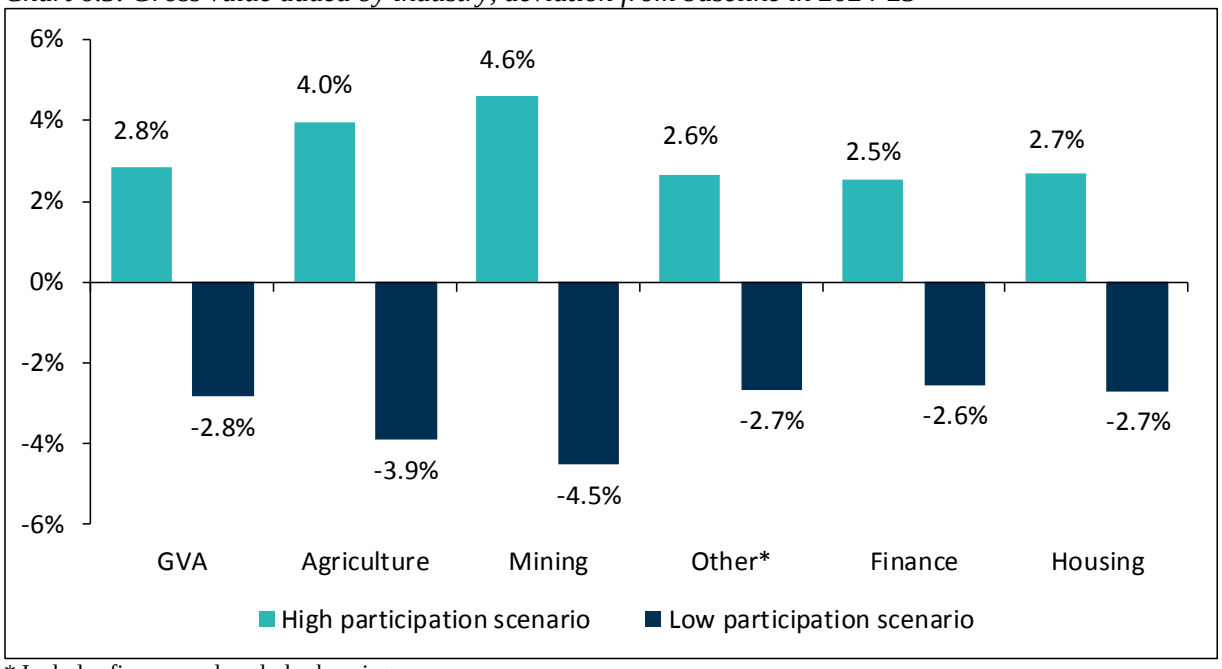
Chart 6.4. Nominal GDP and its income components, deviation from baseline in 2024-25



Source: Independent Economics

All industries share in the gain in nominal GDP, which is 2.8 per cent, as shown in Chart 6.5.

Chart 6.5. Gross value added by industry, deviation from baseline in 2024-25



* Includes finance and excludes housing
Source: Independent Economics

Appendix A: Macro Model

This Appendix provides an overview of the structure of the Independent Macro-econometric Model (Macro Model) that was used to generate the scenarios.

A.1 Economy-wide modelling methodology

Independent Economics has used a suite of linked economy-wide models to develop the economic scenarios. This suite of models includes a demographic model, a macro-econometric model, a states model, and an industry satellite model. This Appendix provides more detail on the macro-econometric model.

1. Introduction

The Independent Macro-econometric model is Independent Economics' forecasting and policy model. It uses economic principles and evidence from the historical data to capture the broad workings of the Australian economy. This makes it a powerful tool to enhance the robustness of economic forecasting whether the time horizon is short (to 2015) or long (to 2050). Notably, the approach taken is rigorous in its application of economic theory; this means that it also delivers powerful insights into fiscal and monetary policies. For example, the six-sector Independent Macro-econometric Model converges to a balanced growth path. In addition, a separate demographic model is used to provide population inputs and to determine long-term trends in the participation rate.

2. Economic Agents

Households

Households supply labour, own capital and government bonds, purchase goods and services from businesses and pay taxes to government.

The household's inter-temporal budget constraint is imposed by assuming that households have a savings target. This savings target is defined as the locally-owned stock of produced capital expressed as a multiple of labour income and its value is estimated from historical data. Since there is a target for the stock of capital that households hold, changes in the government's debt position do not affect the household's stock of real assets in the long run. Consumption gradually adjusts so that this savings target is gradually met. Consumption is positively affected by income from labour, produced capital, natural resources and bonds and transfers. Conversely, consumption is negatively affected by unanticipated inflation.

Once the aggregate level of consumption is determined it is allocated across the six industries identified in the model (Agriculture, Mining, Manufacturing, Government services and Housing services). Households choose their allocation to maximise a Constant Elasticity of Substitution (CES) utility function.

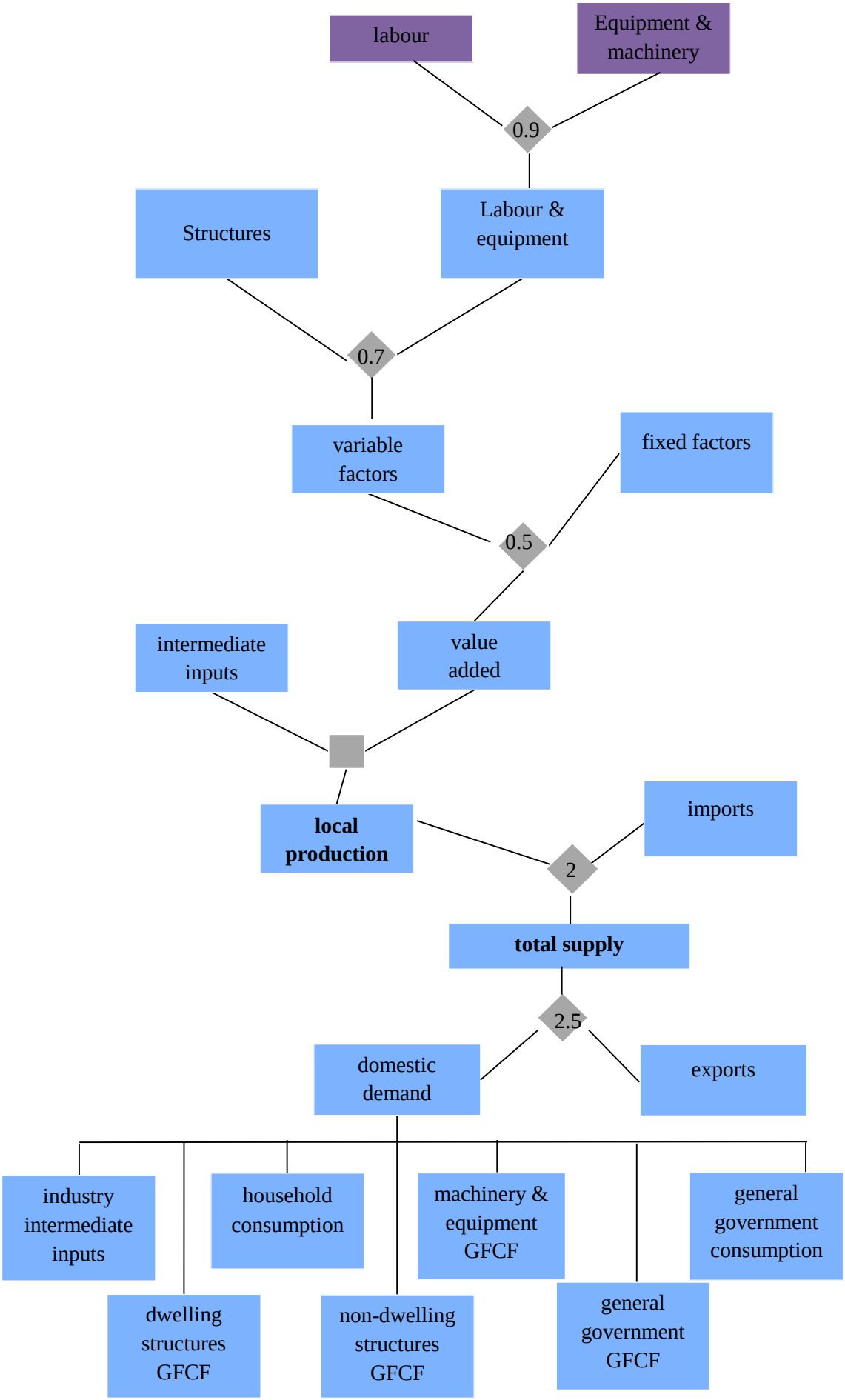
Labour supply is determined by the age and gender structure of the population, underlying trends in the participation rate and an encouraged worker effect.

Businesses

A representative business in each industry produces goods and services using labour, natural resources, structures, other types of capital and intermediate inputs. The six industries featured in the Independent Macro-econometric model are based on the latest Australian and New Zealand Standard Industrial Classification (ANZSIC 2006). The mapping between the model's industries and ANZSIC 2006 industries is shown in the table below.

Macro Model Industry	ANZSIC2006 Industries	ANZSIC2006 Codes
Agriculture (A)	Agriculture, forestry & fishing	A
Mining (B)	Mining	B
Manufacturing (C)	Manufacturing	C
Government services (G)	Public administration & safety Education & training Health care & social assistance	O P Q
Other Service Industries (S)	Electricity, gas, water & waste services Construction Wholesale trade Retail trade Accommodation and food services Transport, postal and warehousing Information media & telecommunications Financial & insurance services Rental, hiring & real estate services Professional, scientific & technical services Administrative and support services Arts and recreation services Other services	D E F G H I J K L M N R S
Housing services (T)	Ownership of Dwellings	-

The production technology for a typical industry in the Independent Macro-econometric model is shown in the figure below.


labour
Equipment & machinery
0.9
Structures
Labour & equipment
0.7
variable factors
fixed factors
0.5
intermediate inputs
value added
local production
imports
2
total supply
2.5
domestic demand
exports
industry intermediate inputs
household consumption
machinery & equipment GFCF
general government consumption
dwelling structures GFCF
non-dwelling structures GFCF
general government GFCF

A representative business in each industry combines labour and non-structures capital (including machinery and equipment) into a labour and equipment bundle using a Constant Elasticity of Substitution (CES) technology with an elasticity of substitution of 0.9. Similarly, structures and the labour and equipment bundle are combined using CES technology to produce a variable factors bundle. Notably, this variable factors bundle is then combined with fixed factors to produce value added. The explicit modelling of fixed factors in production is a key feature of the Independent Macro-econometric model and is important in allowing for the role of land supply in the housing services sector and the role of mineral resources supply in the mining sector.

Local production is derived by combining value added and intermediate inputs in fixed proportions, a standard assumption in these types of models. A CES function is also used by firms to produce total supply from local production and imports. A high elasticity of substitution (2) is assumed between local production and imports. Finally, domestic businesses decide whether to sell on the domestic or export market based on a Constant Elasticity of Transformation technology, with an elasticity of transformation of 2.5.

In the short term, the quantity of output produced is determined by demand. Businesses are also constrained by the amount of capital they own. Thus, businesses choose the profit maximising level of labour, imports and exports based on a given level of domestic demand, capital, fixed factors, wages, and trade prices.

Over time, domestic prices adjust to equal marginal cost. In addition, the capital stock gradually adjusts so that the marginal product of capital is equal to its user cost. A Tobin's Q formulation is used to model capital stock adjustment. Importantly, the adjustment speed of domestic prices and the capital stock is estimated from quarterly historical data. This means that over time, the short-term constraints on firms are removed and firms simply maximise profits subject to the production technology.

Government

Governments collect taxes from households and businesses, purchase goods and services on behalf of households, invest in the economy, provide transfers to households, borrow from households, and set monetary policy.

The Independent Macro-econometric model recognises the key taxes collected by government and models their impact on behaviour. For example, the model forecasts revenue collections from the corporate income tax and recognises that corporate income tax affects the cost of capital and thus impacts investment decisions. Other taxes recognised in the Independent Macro-econometric model are labour income tax, production taxes by industry, and product taxes by end user.

Similar to households, the government's inter-temporal budget constraint is met by specifying a target deficit relative to nominal GDP. Labour income tax is the swing fiscal policy instrument and gradually adjusts to ensure that the deficit target is met in the long term.

Monetary policy in the Independent Macro-econometric model mimics how the Reserve Bank of Australia (RBA) pursues its inflation-targeting policy. Specifically, a Taylor rule is used to determine how the short-term interest rate reacts to deviations of inflation and the unemployment from their targets. The inflation target is set to 2.5 per cent, the mid-point of the RBA's target band, while the target unemployment rate is the NAIRU, which is estimated from historical data. The responsiveness of the short-term interest rates to deviations of the inflation rate and unemployment rate from their

respective targets is estimated using historical data from the mid-1990s, since this is when the RBA's inflation targeting regime began in earnest.

Foreign sector

The foreign sector provides funds, demands exports and supplies imports. As a small country, Australia is assumed to be a price taker for imports. However, it is assumed that Australia has some market power in export markets. That is, an increase in the volume of exports supplied by Australia leads to a small reduction in export prices.

Since households and the government meet their budget constraints in the long term, this means that external balance is also achieved in the long term and growth in net foreign liabilities is sustainable.

3. Market clearing

There are three key markets in the Independent Macro-econometric model, the labour market, goods market and asset market. For each, prices adjust to clear the market.

Wages are 'sticky' and gradually adjust to clear the labour market. An inflation-expectations augmented Phillips curve is used to model wage adjustment. In the long-run, wage growth is driven by consumer price inflation and growth in labour efficiency and the unemployment rate settles to the NAIRU.

As noted previously, in the short-term demand drives activity so that demand shocks cause business cycles. Over time, prices gradually adjust to clear the goods market. This means that, in the long term, activity is driven by supply-side factors such as the level of population, participation, productivity and the fixed factor.

In asset markets, the rate of return on capital is determined exogenously since Australia is a small, open economy. For financial assets, the rate of return on long-term bonds is based on the expectations theory of the term structure. Uncovered interest rate parity is used in determining the nominal exchange rate. The underlying assumption is that long-term domestic securities, short-term domestic securities and short-term foreign securities are perfectly substitutable.

4. Empirical aspects

Behavioural equations in the Independent Macro-econometric model are estimated econometrically from quarterly data starting, in most cases, from the early 1980s. The general-to-specific approach to incorporating dynamic adjustment is used, so that dynamics are fully captured. Diagnostic tests are performed on each estimated equation to check for model adequacy and statistical fit. This high level of data consistency means that the model is not only suitable for policy analysis, but also for forecasting.

Appendix B: Detailed results

Tables B1 to B6 provide year-by-year economic impacts for the six scenarios.

Table B.1. Low productivity scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	-0.1%	-0.1%	-0.1%	-0.3%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.3%
2016	-0.6%	-0.6%	-0.4%	-0.8%	-0.5%	-0.3%	-0.3%	-0.3%	-0.2%	-0.4%
2017	-1.1%	-1.2%	-0.9%	-1.4%	-1.0%	-0.7%	-0.7%	-0.6%	-0.2%	-0.6%
2018	-1.7%	-1.8%	-1.4%	-2.0%	-1.5%	-1.1%	-1.2%	-0.9%	-0.2%	-0.7%
2019	-2.1%	-2.3%	-1.9%	-2.6%	-1.9%	-1.6%	-1.7%	-1.3%	-0.2%	-0.7%
2020	-2.6%	-2.7%	-2.4%	-3.1%	-2.4%	-2.0%	-2.3%	-1.6%	-0.2%	-0.7%
2021	-3.0%	-3.1%	-2.9%	-3.5%	-2.9%	-2.5%	-2.8%	-2.0%	-0.2%	-0.7%
2022	-3.5%	-3.6%	-3.4%	-3.9%	-3.4%	-2.9%	-3.2%	-2.4%	-0.2%	-0.6%
2023	-3.9%	-4.0%	-3.8%	-4.4%	-3.9%	-3.4%	-3.7%	-2.8%	-0.2%	-0.7%
2024	-4.4%	-4.5%	-4.3%	-4.9%	-4.4%	-3.8%	-4.1%	-3.3%	-0.2%	-0.7%
2025	-4.9%	-5.0%	-4.8%	-5.3%	-4.9%	-4.3%	-4.6%	-3.7%	-0.2%	-0.8%

Source: Independent Economics

Table B.2. High productivity scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	0.1%	0.1%	0.1%	0.3%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%
2016	0.6%	0.6%	0.4%	0.8%	0.5%	0.3%	0.3%	0.3%	0.2%	0.4%
2017	1.1%	1.2%	0.9%	1.4%	1.0%	0.7%	0.7%	0.6%	0.2%	0.5%
2018	1.7%	1.8%	1.4%	2.1%	1.5%	1.1%	1.2%	1.0%	0.2%	0.6%
2019	2.2%	2.3%	1.9%	2.6%	2.0%	1.6%	1.8%	1.3%	0.2%	0.7%
2020	2.6%	2.8%	2.4%	3.1%	2.4%	2.1%	2.3%	1.7%	0.2%	0.6%
2021	3.1%	3.2%	2.9%	3.6%	2.9%	2.6%	2.8%	2.1%	0.2%	0.6%
2022	3.6%	3.7%	3.5%	4.1%	3.5%	3.0%	3.3%	2.5%	0.2%	0.6%
2023	4.1%	4.2%	4.0%	4.6%	4.0%	3.5%	3.8%	2.9%	0.2%	0.7%
2024	4.6%	4.7%	4.5%	5.1%	4.6%	4.0%	4.3%	3.4%	0.1%	0.7%
2025	5.1%	5.2%	5.1%	5.6%	5.1%	4.5%	4.8%	3.9%	0.2%	0.8%

Source: Independent Economics

Table B.3. Low terms of trade scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	0.3%	-0.6%	-0.3%	-4.4%	-0.6%	-2.0%	1.1%	-7.6%	-11.2%	-7.5%
2016	0.4%	-1.0%	-1.1%	-7.6%	-0.7%	-1.1%	1.7%	-7.0%	-11.2%	-7.8%
2017	0.1%	-1.2%	-2.1%	-8.9%	-0.8%	-0.7%	1.9%	-6.1%	-10.7%	-8.1%
2018	-0.4%	-1.6%	-3.0%	-9.6%	-0.9%	-0.6%	1.8%	-5.7%	-10.5%	-8.3%
2019	-0.8%	-2.0%	-3.6%	-10.3%	-0.9%	-0.8%	1.5%	-5.6%	-10.3%	-8.4%
2020	-1.0%	-2.1%	-4.0%	-10.8%	-0.9%	-0.9%	1.3%	-5.6%	-10.2%	-8.3%
2021	-1.0%	-2.1%	-4.4%	-10.9%	-0.8%	-1.1%	1.0%	-5.6%	-10.1%	-8.1%
2022	-1.0%	-1.9%	-4.9%	-10.9%	-0.7%	-1.2%	0.8%	-5.5%	-10.1%	-7.8%
2023	-1.1%	-1.8%	-5.3%	-10.7%	-0.8%	-1.3%	0.6%	-5.5%	-10.0%	-7.6%
2024	-1.1%	-1.7%	-5.7%	-10.5%	-0.8%	-1.4%	0.5%	-5.5%	-10.0%	-7.4%
2025	-1.1%	-1.6%	-6.1%	-10.4%	-0.9%	-1.5%	0.4%	-5.4%	-9.9%	-7.2%

Source: Independent Economics

Table B.4. High terms of trade scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	-0.6%	0.5%	-0.4%	4.6%	0.2%	1.5%	-1.0%	6.2%	10.7%	8.2%
2016	-0.8%	1.0%	-0.6%	7.7%	0.3%	0.7%	-1.8%	5.9%	10.6%	8.7%
2017	-0.5%	1.4%	0.0%	9.2%	0.4%	0.3%	-2.0%	5.2%	10.2%	9.4%
2018	0.0%	2.0%	0.7%	10.2%	0.5%	0.2%	-2.0%	4.9%	9.9%	10.0%
2019	0.4%	2.4%	1.2%	11.0%	0.5%	0.3%	-1.8%	4.8%	9.6%	10.3%
2020	0.5%	2.5%	1.5%	11.6%	0.5%	0.5%	-1.6%	4.8%	9.6%	10.3%
2021	0.6%	2.5%	1.9%	11.8%	0.4%	0.6%	-1.4%	4.8%	9.5%	10.2%
2022	0.6%	2.4%	2.3%	11.8%	0.4%	0.7%	-1.3%	4.9%	9.5%	10.0%
2023	0.6%	2.3%	2.6%	11.7%	0.4%	0.8%	-1.2%	4.9%	9.4%	9.8%
2024	0.6%	2.3%	3.0%	11.6%	0.5%	0.8%	-1.1%	5.0%	9.4%	9.7%
2025	0.7%	2.3%	3.3%	11.5%	0.5%	0.9%	-1.0%	5.0%	9.4%	9.6%

Source: Independent Economics

Table B.5. Low participation scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
2015	-0.1%	-0.1%	-0.1%	0.1%	0.0%	-0.2%	-0.1%	-0.2%	0.1%	0.5%
2016	-0.3%	-0.2%	-0.3%	0.1%	0.0%	-0.4%	-0.3%	-0.6%	0.2%	0.7%
2017	-0.4%	-0.3%	-0.4%	0.0%	0.1%	-0.7%	-0.5%	-0.9%	0.3%	0.9%
2018	-0.6%	-0.4%	-0.5%	0.0%	0.2%	-0.9%	-0.8%	-1.2%	0.3%	1.0%
2019	-0.7%	-0.6%	-0.7%	-0.1%	0.3%	-1.2%	-1.0%	-1.5%	0.4%	1.2%
2020	-0.9%	-0.8%	-0.8%	-0.2%	0.4%	-1.5%	-1.2%	-1.8%	0.5%	1.4%
2021	-1.1%	-1.0%	-0.9%	-0.3%	0.4%	-1.7%	-1.5%	-2.1%	0.5%	1.5%
2022	-1.3%	-1.2%	-0.9%	-0.4%	0.5%	-2.0%	-1.7%	-2.4%	0.6%	1.7%
2023	-1.5%	-1.4%	-1.0%	-0.5%	0.5%	-2.3%	-2.0%	-2.7%	0.6%	1.8%
2024	-1.7%	-1.6%	-1.1%	-0.7%	0.6%	-2.6%	-2.2%	-3.0%	0.7%	2.0%
2025	-1.9%	-1.8%	-1.2%	-0.8%	0.6%	-2.8%	-2.5%	-3.3%	0.8%	2.2%

Source: Independent Economics

Table B.6. High participation scenario: deviation in selected variables from baseline

FY End	Real GDP	Domestic final demand	Exports	Imports	Productivity	Nominal GDP	Compensation of employees	Gross operating surplus	Terms of trade	Exchange rate
2014	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
2015	0.1%	0.1%	0.1%	-0.1%	0.0%	0.1%	0.1%	0.2%	-0.1%	-0.5%
2016	0.3%	0.2%	0.3%	-0.1%	0.0%	0.4%	0.3%	0.6%	-0.2%	-0.6%
2017	0.4%	0.3%	0.4%	0.0%	-0.1%	0.7%	0.5%	0.9%	-0.3%	-0.8%
2018	0.6%	0.4%	0.5%	0.0%	-0.2%	0.9%	0.7%	1.2%	-0.3%	-1.0%
2019	0.7%	0.6%	0.6%	0.1%	-0.3%	1.2%	1.0%	1.5%	-0.4%	-1.2%
2020	0.9%	0.8%	0.7%	0.2%	-0.3%	1.5%	1.2%	1.8%	-0.5%	-1.3%
2021	1.1%	1.0%	0.8%	0.3%	-0.4%	1.7%	1.5%	2.1%	-0.5%	-1.5%
2022	1.3%	1.2%	0.9%	0.4%	-0.5%	2.0%	1.7%	2.4%	-0.6%	-1.6%
2023	1.5%	1.4%	1.0%	0.5%	-0.5%	2.3%	2.0%	2.7%	-0.6%	-1.8%
2024	1.7%	1.6%	1.1%	0.7%	-0.6%	2.6%	2.2%	3.0%	-0.7%	-1.9%
2025	1.8%	1.8%	1.2%	0.8%	-0.6%	2.8%	2.5%	3.3%	-0.7%	-2.0%

Source: Independent Economics