Horticulture Innovation Australia

Final Report

Economic modelling of the vegetable industry

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Summary

Introduction

This report uses economic modelling to analyse the Australian vegetable growing industry. It quantifies the key drivers of the vegetable growing industry as well as its linkages to other industries, including vegetable processing. This report, which was commissioned by Horticulture Innovation Australia Limited (HIA Ltd), places a particular emphasis on those parts of the vegetable growing industry that are subject to either the vegetable levy or the potato levy ("levied vegetables") rather than other vegetables ("non-levied vegetables"), some of which are subject to a different levy.

According to the ABS, the gross value of vegetable production in 2012-13 was $3.8 billion. This was divided into $2.6 billion of levied vegetables and $1.2 billion of non-levied vegetables. For individual vegetables with annual production of over $100 million, potatoes, lettuce, carrots, beans, capsicums and broccoli are levied vegetables, while tomatoes, mushrooms, onions and melons are non-levied vegetables.

The Economic Modelling Approach

This study uses the Independent Extended CGE model of Australia to simulate seven scenarios affecting levied vegetable growing. This model goes further than previous Australian modelling in capturing the industry detail of the Australian economy, there being 288 industries compared to around 110 in comparable models. For this study, the industry detail for vegetable growing and vegetable processing has been developed to distinguish six vegetable growing and four vegetable processing industries.

The model is used to draw out the key economic drivers and economic linkages for the vegetable growing industry through the simulation of seven separate scenarios. Those scenarios are as follows:

- introduction of *GST on basic food*;
- *more export market access* for Australian fresh and processed levied vegetables;
- a *local consumer subsidy* in recognition of the health benefits of levied fresh vegetables;
- *lower vegetable import prices* affecting fresh and processed levied vegetables;
- a protracted *fresh vegetable disease outbreak* that affects the growing of levied vegetables;
- *no diesel fuel rebate for Agriculture*, but with retention of the diesel rebates for mining and transport; and
- a *productivity boost for fresh vegetables* from increased R&D investment for levied vegetables.

The economy-wide impacts of each of the scenarios are now compared. This is followed by a separate analysis for each scenario of the impacts on production of vegetables. Finally, the region-level impacts of each of the seven scenarios are discussed.

Economy-wide Impacts

Three of the seven scenarios impact directly on the Government budget. Extending the GST to cover basic food would add around $5.4 billion to the annual Budget balance (in 2013/14 terms), as seen in Chart A. Ending the diesel fuel rebate for Agriculture, Forestry and Fishing would add around $1.0 billion to the Government Budget. A 5 per cent subsidy on local consumption of levied fresh vegetables would cost around $0.3 billion. The remaining scenarios have only minor impacts on the Government Budget, which arise indirectly via the impacts of the scenarios on economic parameters that influence the Budget.

Chart A: Impacts on Government Budget ($million, 2013/14 terms)
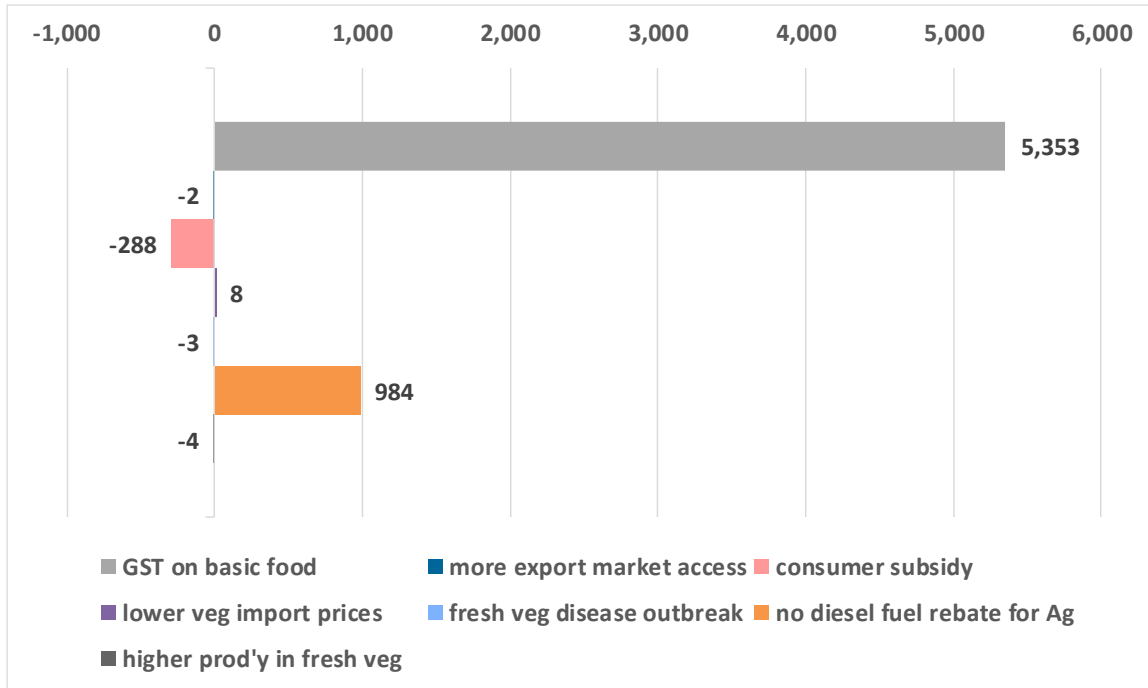
Legend:
- GST on basic food
- more export market access
- consumer subsidy
- lower veg import prices
- fresh veg disease outbreak
- no diesel fuel rebate for Ag
- higher prod'y in fresh veg

Values: 5,353; -2; -288; 8; -3; 984; -4

Extending the GST to basic food impacts a large part of the Agriculture, Forestry and Fishing industry. Consequently, its real value added is lower by nearly 2 per cent, as seen in Chart B. Similarly, withdrawing the diesel fuel rebate from all of the Agriculture, Forestry and Fishing industry would result in a loss in its real value added of over 1 per cent. The remaining scenarios involve economic changes that are specific to vegetables and so have smaller impacts on Agriculture, Forestry and Fishing as a whole.

Chart B: Impacts on real Value Added in Agriculture, Forestry and Fishing (per cent)

Legend:
- GST on basic food
- more export market access
- consumer subsidy
- lower veg import prices
- fresh veg disease outbreak
- no diesel fuel rebate for Ag
- higher prod'y in fresh veg

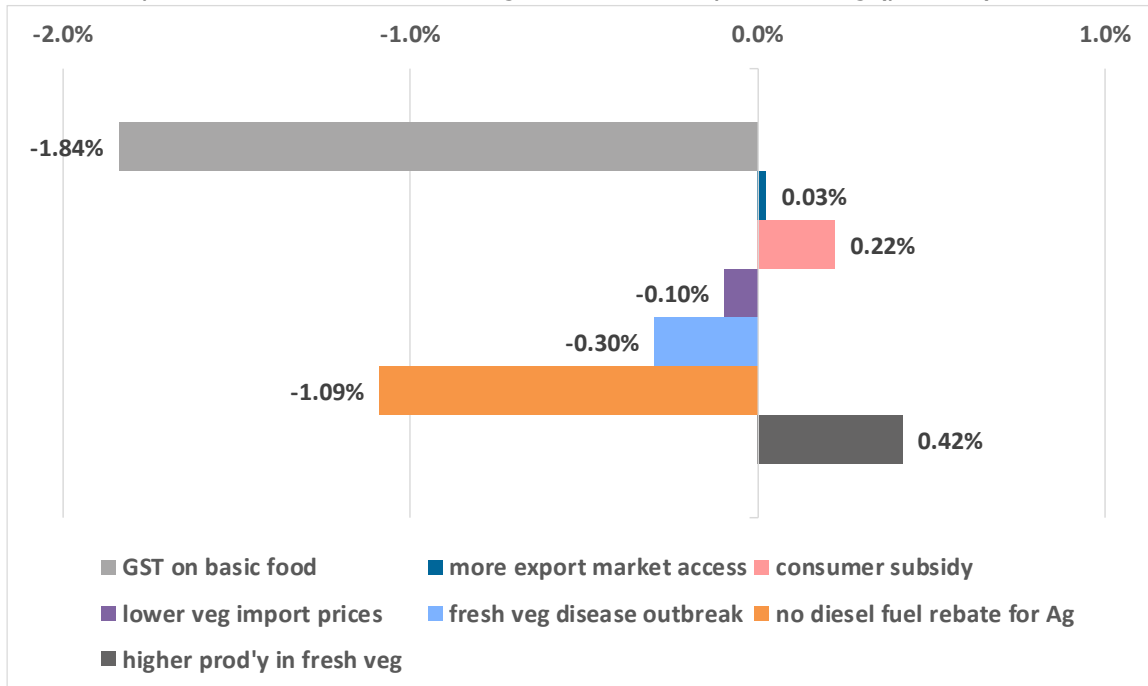Values: -1.84%; 0.03%; 0.22%; -0.10%; -0.30%; -1.09%; 0.42%

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Chart C shows the impacts on consumer welfare of each of the seven scenarios. Extending the GST to basic foods results in an annual loss in consumer welfare estimated at nearly $0.5 billion. However, this loss is relatively small compared to other alternatives for government revenue raising such as raising the rate of GST or raising personal income tax.

Chart C: Impacts on Consumer Welfare ($million, 2013/14 terms)
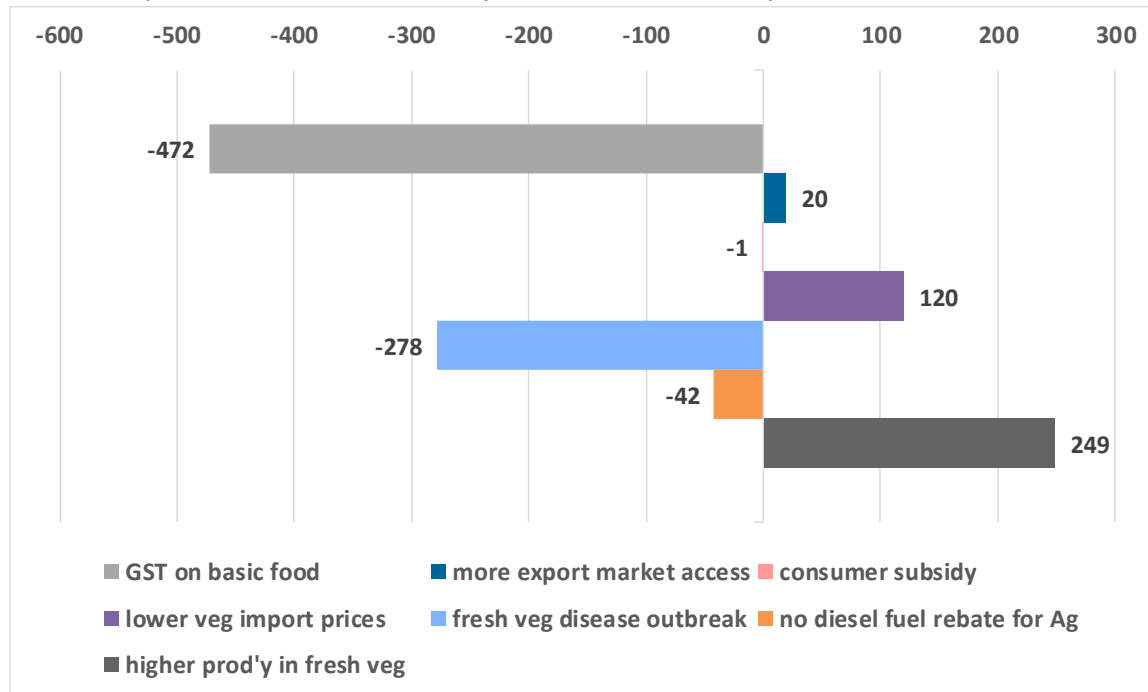
Withdrawing the diesel fuel rebate for the Agriculture, Forestry and Fishing industry has no economic justification because off-road use of diesel fuel in Agriculture, Forestry and Fishing does not involve most of the costs to the public associated with on-road use of diesel fuel. The annual loss in consumer welfare is estimated at around $40 million.

The prolonged disease outbreak results in a loss in land productivity that leads to higher consumer prices for levied vegetables, both fresh and processed. This leads to an annual loss in consumer welfare estimated at nearly $300 million. Conversely, a gain of 5 per cent in total factor productivity (output relative to use of all inputs) in growing levied vegetables leads to lower consumer prices, resulting in an annual gain in consumer welfare estimated at between $200 million and $300 million.

While greater access to export markets and lower import prices have opposite effects on Australian production of levied vegetables, they both raise export prices relative to import prices. This means that, considering international trade as a whole, more imports can be exchanged for the same quantity of exports. The resulting annual gains in consumer welfare are around $20 million for improved export market access and $120 million for lower import prices.

The final scenario involves a subsidy for local consumption of fresh levied vegetables. While this stimulates demand, the modelling shows a broadly neutral impact on consumer welfare. This is because the modelling does not factor in the health benefits likely to arise from higher consumption of fresh vegetables.

GST on Basic Food scenario

Extending the GST to basic foods would make sales to consumers of unserved vegetables subject to GST for the first time. The resulting price rises would reduce consumer demand.

Other sales of vegetables would be largely unaffected. Export sales would continue to be GST free. Sales of served vegetables (e.g. in restaurants) or vegetables used in snack foods are already subject to GST and this would continue to be the case.

The impacts on production of levied vegetables will therefore be driven by the share of sales that are affected by the tax change i.e. sales of unserved vegetables to consumers as a proportion of total sales. Overall, production losses range from about 3 to 5 per cent.

For fresh vegetables, Chart D shows that the percentage loss in production is lowest for potatoes. This is because a substantial share of potato production is used in served meals or snack foods, and so is already subject to GST. For processed vegetables, vegetables prepared or preserved are least affected, because a high share of them are sold on export markets and so remain GST free.

Chart D: GST on Basic Food: Impacts on Levied Vegetable Production (per cent)
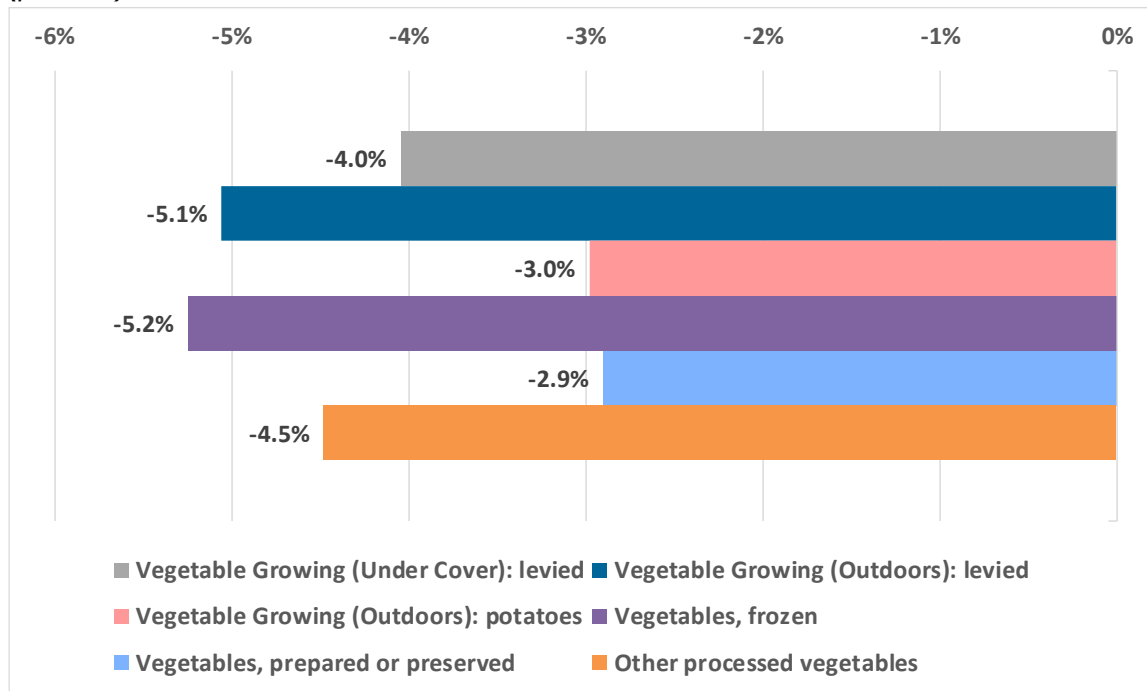
More Export Market Access scenario

Recently concluded free trade agreements with Japan, South Korea and China offer greater export market access for vegetables. To illustrate the potential benefits, this scenario raises the level of export demand by 20 per cent, at any given export price, for all categories of levied vegetables, including both fresh and processed.

Levied vegetables vary greatly in the extent to which they are exported. Improved export market access provides a large boost to production of vegetables prepared or preserved, a high share of which are sold on export markets. This is the case to a lesser extent for fresh vegetables grown under cover. Other categories of fresh and processed levied vegetables have relatively low exposure to export markets and hence the impacts on their production from improved export market access are relatively small.

Chart E: More Export Market Access: Impacts on Levied Vegetable Production (per cent)

Legend:
- Vegetable Growing (Under Cover): levied
- Vegetable Growing (Outdoors): levied
- Vegetable Growing (Outdoors): potatoes
- Vegetables, frozen
- Vegetables, prepared or preserved
- Other processed vegetables

Data values shown: 2.3%, 0.4%, 0.2%, 0.5%, 5.0%, 0.5%
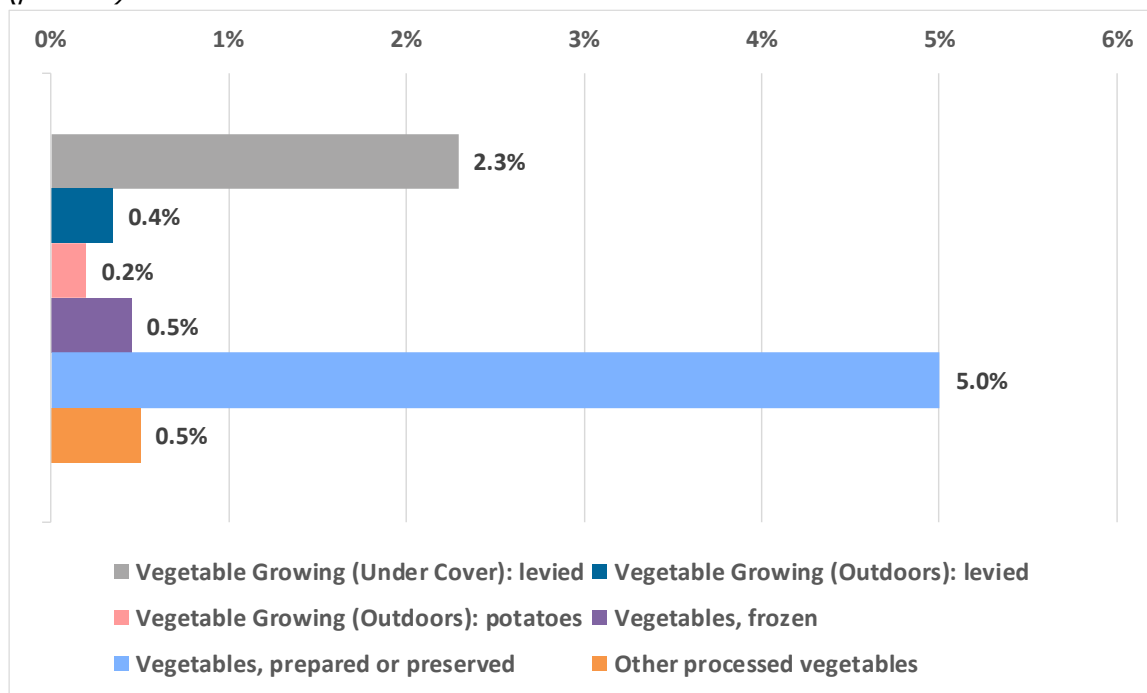
Local Consumer Subsidy scenario

This scenario involves a 5 per cent subsidy on local sales to consumers of levied fresh vegetables. This is in recognition of the health benefits of consuming fresh vegetables.

The consumer subsidy lifts production of levied fresh vegetables by 2 to 4 per cent. The gain for potatoes is at the lower end of this range because a relatively high proportion of potato production is processed. On the other hand, production for other levied fresh vegetables, whether grown under cover or outdoors, gains by around 4 per cent.

As the consumer subsidy does not target processed vegetables, their production is largely unaffected.

Chart F: Fresh Vegetable Consumer Subsidy: Impacts on Levied Vegetable Production (per cent)

Lower Vegetable Import Prices scenario

This scenario is designed to shows the impacts of increased import competition. While import competition is limited for fresh vegetables, there is substantial and rising import competition for processed vegetables, notably from New Zealand and Italy.

This scenario illustrates the effects of increased import competition by lowering import prices for levied fresh and processed vegetables by 10 per cent. This increased import competition leads to lower local production for all categories of levied vegetables. The extent of this production loss varies with the degree of exposure to imports.

Potatoes and other levied vegetables grown outdoors have relatively low exposure to imports. This is also true for vegetables prepared or preserved, which have high exposure to export markets. Thus, production losses for these three categories are relatively small.

The remaining three categories of levied vegetables have moderate exposure to import markets. For them, a ten per cent fall in prices for imports leads to local production losses estimated at around 4 per cent. This includes for levied vegetables grown under cover, frozen vegetables and other processed vegetables.

Chart G: Lower Vegetable Import Prices: Impacts on Levied Vegetable Production (per cent)
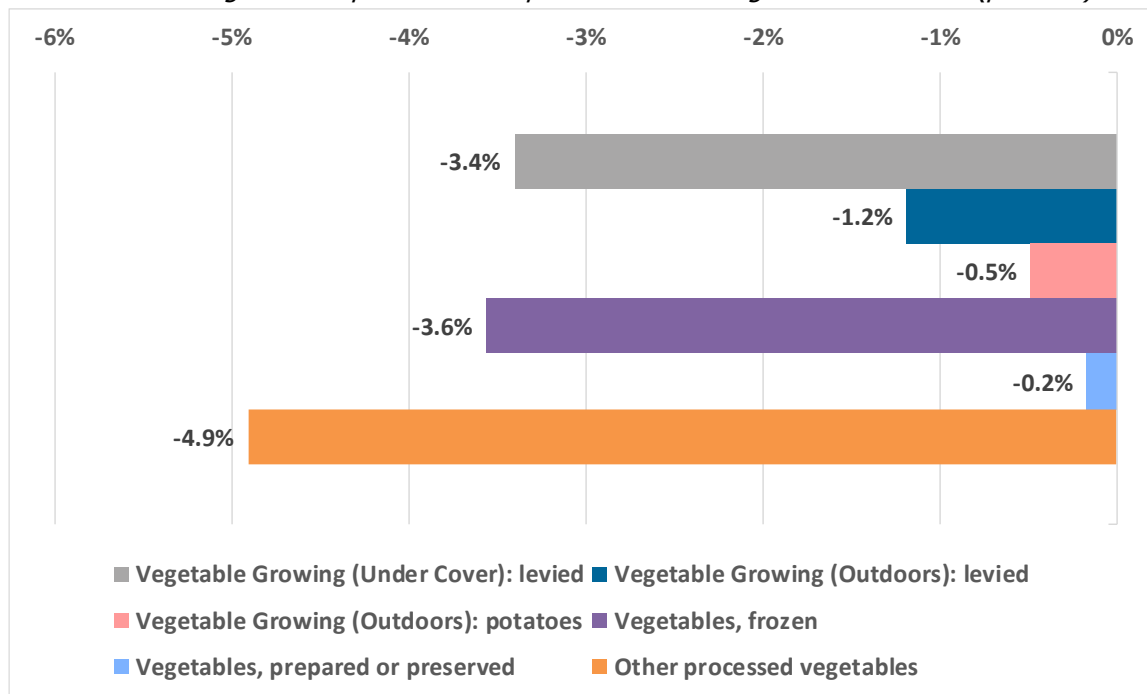
Fresh Vegetable Disease Outbreak scenario

This scenario lowers land productivity in the growing of levied vegetables by 20 per cent to simulate the effects of a prolonged disease outbreak. Lower land productivity leads to higher prices for local production of levied fresh vegetables.

Higher prices lead to a loss of 6 to 7 per cent in production of levied vegetables grown undercover. A high proportion of sales to price-sensitive consumers and substantial import competition combine to generate this production loss.

The loss in potato production is relatively small at around 1 per cent. Higher prices have a relatively low effect on local production of potatoes because import competition is relatively low, and a high share of potato production is processed and thereby potatoes account for a lower share of the final price to consumers.

The disease outbreak has generally smaller effects on production of processed vegetables. The effects of higher prices for fresh vegetables are diluted by other costs involved in producing processed vegetables. Among processed vegetables, production of vegetables prepared or preserved is most affected because of high exposure to price-sensitive export markets.

Chart H: Fresh Vegetable Disease Outbreak: Impacts on Impacts on Levied Vegetable Production (per cent)

■ Vegetable Growing (Under Cover): levied	■ Vegetable Growing (Outdoors): levied
■ Vegetable Growing (Outdoors): potatoes	■ Vegetables, frozen
■ Vegetables, prepared or preserved	■ Other processed vegetables
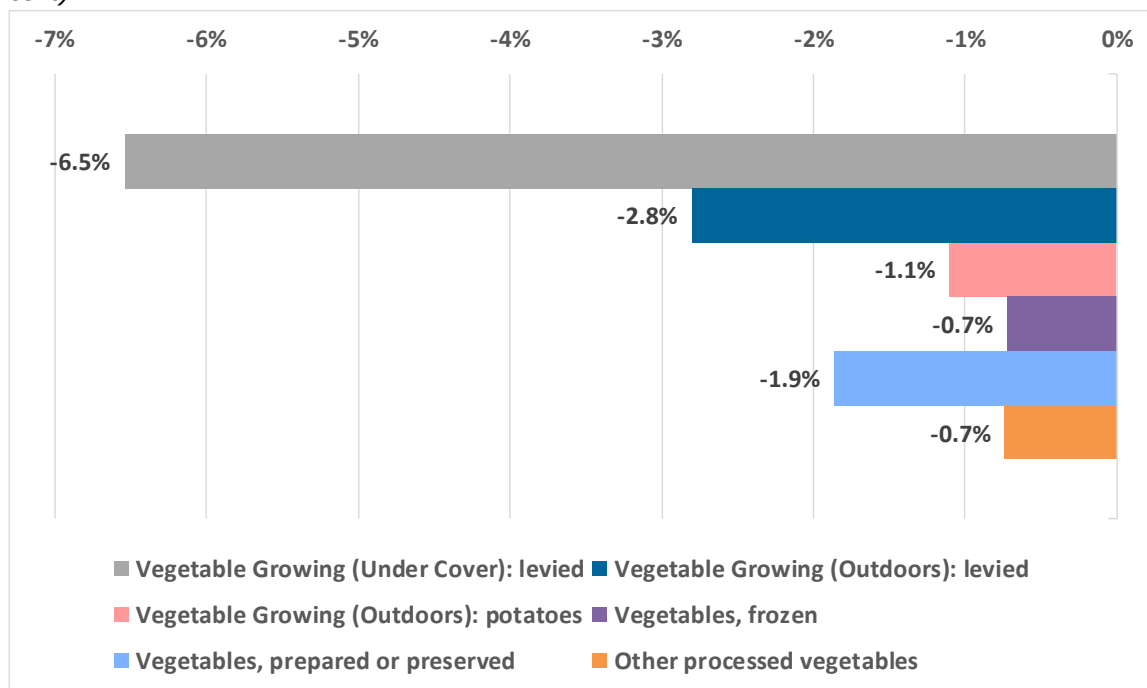
No Diesel Fuel Rebate for Agriculture scenario

Like the disease outbreak, removal of the diesel fuel rebate for Agriculture raises production costs for levied fresh vegetables. Hence, it leads to a similar pattern of production losses for levied fresh and processed vegetables. Because the increase in production costs from removal of the rebate is around one-quarter of the increase from the disease outbreak, the production losses are also around one-quarter of the size.

Chart I: No Diesel Fuel Rebate for Agriculture: Impacts on Levied Vegetable Production (per cent)
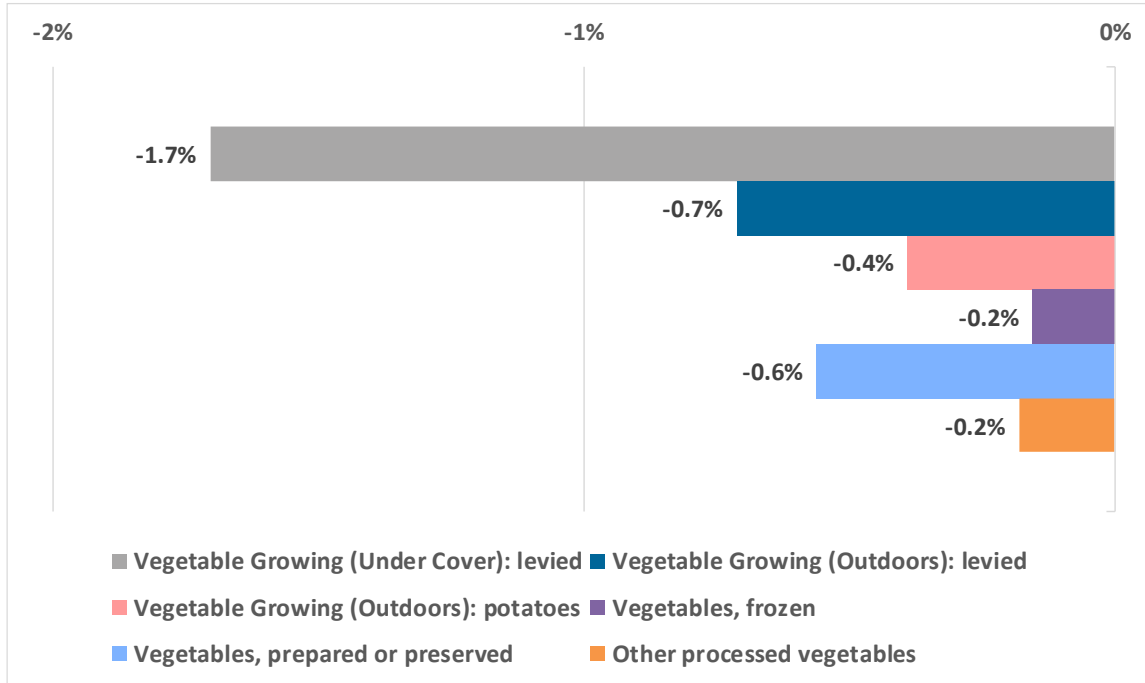
R&D Productivity Boost for Fresh Vegetables scenario

This scenario involves an increase in total factor productivity in the growing of levied vegetables of 5 per cent. This means that, for the same level of all inputs, output is 5 per cent higher. This productivity boost is assumed to come about from a boost to government R&D expenditure. However, no specific such boost has been included in the modelling given the difficulties in determining the amount of R&D expenditure that would be required to achieve this productivity gain. However, ABARES have found that the return to public R&D investment in agriculture is high.

Like the two previous scenarios, this scenario changes production costs for levied vegetables. Indeed, the percentage impacts on production shown in Chart J are close to the mirror image of those shown in Chart H for a disease outbreak. This is unsurprising in that both scenarios involve changes in productivity in the growing of levied vegetables, but in opposite directions.

Chart J: R&D Productivity Boost for Fresh Vegetables: Impacts on Levied Vegetable Production (per cent)

Regional Impacts

The economic impacts of the scenarios are far from uniform across regions. Two of the scenarios – extending the GST to basic food and withdrawing the diesel fuel rebate from all of the Agriculture, Forestry and Fishing industry – impact directly on agriculture and so have their stronger impacts on regions that are more dependent on agriculture. The remaining five scenarios impact directly on the levied vegetable industry and so have stronger impacts on regions that are more dependent on levied vegetable growing.

The regional module of the Independent Extended CGE model distinguishes 50 regions in Australia, consisting of the six greater state capital regions, and the 44 Statistical Area Level 4s (SA4s) that make up the rest of Australia. Of these 50 regions, 11 regions are significant growers of levied vegetables, with the local value of production exceeding $80 million in 2012-13. These 11 regions accounted for 68 per cent by value of the production of levied vegetables in 2012-13. They include three vegetable state capitals – Melbourne, Brisbane and Perth – and the following eight vegetable SA4s:

- VIC: Latrobe-Gippsland;
- VIC: North West
- QLD: Mackay;
- QLD: Toowoomba;
- QLD: Wide Bay;
- SA: South East;
- WA: Bunbury; and
- TAS: West and Northwest.

This includes the top two regions for growing potatoes. SA-South East accounts for one-third of production and Tasmania-West and Northwest accounts for one-tenth.

The relatively large size of three vegetable state capital economies means that levied vegetable growing makes up a smaller share of economic activity than it does in the eight vegetable SA4s. Hence, the larger percentage impacts on overall economic activity are felt in the eight vegetable SA4s.

For economic changes that are specific to levied vegetables, the most affected regions are: Toowoomba (Queensland), Wide Bay (Queensland), Latrobe-Gippsland (Victoria) and the South East (South Australia). Other regions that are significantly affected are: Bunbury (Western Australia), West and North West (Tasmania) and the North West (Victoria). While Mackay (Queensland) is also a significant grower of levied vegetables, its economy is more driven by the coal industry.

Findings on Key Economic Drivers and Linkages of the Fresh Vegetable Industry

While all seven scenarios impact significantly on levied vegetable growing, four scenarios stand out as having the more substantial impacts, each affecting levied vegetable production by between 3 and 5 per cent. These are:

- extension of GST to basic foods;
- a subsidy on local consumption of levied fresh vegetables;
- a prolonged disease outbreak in levied vegetable growing; and
- a hike in levied vegetable productivity.

Extension of the GST to basic foods has bigger implications for horticulture than for most other areas of agriculture. A large share of production of broad acre crops and livestock is for the export market and so

would remain GST free, while most horticulture production is destined for the local market and hence would become taxable. However, served vegetables and vegetables used in snack foods are already subject to GST and so would not be affected.

A 5 per cent subsidy on local consumption of levied fresh vegetables would provide a substantial boost to demand and production. Such a subsidy may be introduced in recognition of the health benefits from consuming fresh vegetables.

A prolonged disease outbreak in levied vegetable growing would have a substantial impact on levied vegetable production. Such an outbreak could last for years but would not be indefinite, unlike the other economic changes that are simulated. To take into account its temporary nature, the size of the disease outbreak that has been simulated has been discounted to a 20 per cent loss of land productivity. Even so, its impacts on vegetable production are of a similar scale to the other three scenarios.

A hike in levied vegetable growing productivity of 5 per cent would lead to lower prices, stimulating sales to consumers and increasing the international competiveness of the industry. Such a productivity boost could be generated by increased expenditure on R&D. The amount of additional R&D expenditure that would be required is difficult to quantify and has not been factored into the modelling. However, ABARES have found that the return to public R&D investment in agriculture is high.

Removal of the agriculture diesel fuel rebate would have a smaller, but still substantial impact, on production of levied vegetables. The loss in production for levied vegetables is similar to that for agriculture as a whole at around 1 per cent. On the one hand horticulture is a relatively heavy user of diesel fuel, but on the other hand production levels are less cost sensitive than for broad acre crops or livestock farming, because of the relatively low exposure of horticulture to international trade.

The remaining two scenarios have smaller, but still significant impacts, on production of levied vegetables. Greater export market access and lower import prices have smaller effects than in other areas of agriculture, because vegetable growing has lower exposure to international trade. Vegetable exports account for less than 10 per cent of the value of production. However, recently concluded free trade agreements with Japan, South Korea and China offer greater export market access for vegetables. While import competition is limited for fresh vegetables, there is significant import competition for processed vegetables, notably from New Zealand and Italy.

For economic changes that are specific to levied vegetables, the regional economies that are most affected are: Toowoomba (Queensland), Wide Bay (Queensland), Latrobe-Gippsland (Victoria) and the South East (South Australia). Other regions that are significantly affected are: Bunbury (Western Australia), West and North West (Tasmania) and the North West (Victoria). Mackay (Queensland) is also a significant grower of levied vegetables, but its economy is more driven by the coal industry.

The scenarios also highlight the economic linkages of the levied vegetable industry to other industries. Apart from the linkage to vegetable processing, which is part of the manufacturing industry, other important linkages are associated with the distribution of vegetables and involve linkages to retail trade, wholesale trade and transport.

Interestingly, a number of the scenarios also show that movements in vegetable growing or agriculture generally are at times partly offset by movements in the mining industry. This is because a gain in production in agriculture tends to strength the Australian dollar, leading to a loss in production in mining.

Keywords

Vegetables; economic modelling; CGE; economic impacts; Australia; econometrics

Introduction

This report uses economic modelling to analyse the Australian vegetable growing industry. It quantifies the key drivers of the vegetable growing industry as well as its linkages to other industries, including vegetable processing. This report, which was commissioned by Horticulture Innovation Australia Limited (HIA Ltd), places a particular emphasis on those parts of the vegetable growing industry that are subject to either the vegetable levy or the potato levy ("levied vegetables"), rather than non-levied vegetables, some of which are subject to a different levy. Levied vegetables covers most vegetables, the main exceptions being tomatoes, onions, melons and mushrooms.

The drivers and economic linkages for the levied vegetable growing industry are drawn out through the simulation of seven separate scenarios. Those scenarios are as follows:

- introduction of *GST on basic food*;
- *more export market access* for Australian fresh and processed levied vegetables;
- a *local consumer subsidy* in recognition of the health benefits of levied fresh vegetables;
- *lower vegetable import prices* affecting fresh and processed levied vegetables;
- a protracted *fresh vegetable disease outbreak* that affects the growing of levied vegetables;
- *no diesel fuel rebate for Agriculture*, but with retention of the diesel rebates for mining and transport; and
- a *productivity boost for fresh vegetables* from increased R&D investment for levied vegetables.

This study uses the Independent Extended CGE model of Australia to simulate the seven scenarios. This model goes further than previous Australian modelling in capturing the industry detail of the Australian economy, there being 288 industries compared to around 110 industries in comparable models. For this study, the industry detail for vegetable growing and vegetable processing has been further developed. Consequently, the model distinguishes six vegetable growing industries and four vegetable processing industries.

The report is organised as follows.

The methodology section sets out the modelling approach by describing the important features of the Independent Extended CGE model and how vegetable growing and processing are modelled in it.

The outputs for each of the seven scenarios are presented in separate sections as follows:
- - *GST on basic food;*
- - *more export market access;*
- – *local consumer subsidy;*
- - *lower vegetable import prices;*
- - *fresh vegetable disease outbreak;*
- - *no diesel fuel rebate for Agriculture; and*
- - *productivity boost for fresh vegetables.*

The economy-wide impacts and regional impacts are presented in separate outputs sections.

The outcomes section draws together the results from the seven scenarios to identify the key drivers and

economic linkages of the vegetable growing industry.

Appendix A provides a detailed description of the Independent Extended CGE model, which is used for the analysis in this report. Appendix B contains more detailed results for the scenarios, extending the results for the seven scenarios presented in outputs sections.

While all care, skill and consideration has been used in the preparation of this report, the findings refer to the terms of reference of HIA Ltd 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 use economic modelling to analyse the Australian vegetable growing industry, quantifying the key economic drivers of the vegetable growing industry as well as its economic linkages to other industries.

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.

Methodology

The seven scenarios are modelled using the Independent Extended Computable General Equilibrium (CGE) model, which analyses the impacts on the Australian economy of changes to its economic environment. While CGE models have a range of applications, this particular model has a special focus on industry detail. This section begins by describing the history of the model. It then describes the general features of CGE models before highlighting the special features of the Independent Extended CGE model. The approach to generating model outputs at the regional level is then discussed, with a focus on vegetable growing regions. Finally, the model's treatment of vegetable growing and processing is explained.

History

The Independent CGE model was first developed by Independent Economics in early 2012.

Later in 2012 Independent Economics further developed the modelling of business tax, with input from Treasury, to meet Treasury's needs in providing model-based advice to the Australian Government's Business Tax Working Group (BTWG). Our modelling of the economic effects of changing the rate of company tax was published as part of the BTWG's Final Report (BTWG, 2012, Appendix B). In 2014 Treasury officers (Rimmer et al., 2014) used essentially the same version of the Independent CGE model to analyse in detail the economic impacts of company tax.

Later in 2014 the model was substantially enhanced by Independent Economics. It has been updated for the latest input-output tables, the number of industries has been expanded from 120 to 288 and a 2-tier approach has been adopted to better capture consumer choice between different goods and services. The tax reform capabilities of the model have also been substantially upgraded for personal income tax, GST and selective taxes on expenditures. For this study, the industry detail for vegetable growing and vegetable processing has been further developed. Further details of these developments are provided below.

General Features

The Independent Extended CGE Model is a long run model, meaning that results refer to the ongoing effects on the economy after it has fully adjusted to economic shocks. This is appropriate for policy analysis, because government policy options should be assessed on the basis of their lasting impacts. The model has a number of general assumptions that are consistent with its long-term time horizon. Many of these features are shared with other long-run CGE models.

All markets are assumed to have reached equilibrium. This includes key markets such as the labour market, where the real wage for each type of labour adjusts so that demand from industries is equal to supply from households. In addition, the behaviour of households and government is consistent with the inter-temporal budget constraints that they face. This involves levels of household saving and net foreign capital inflow that are consistent with stocks of assets and liabilities growing at the same rate as GDP.

Industries and households in the Independent Extended CGE Model optimise, while still remaining within the constraints of production technology and budgets.

- Profit maximisation: the representative business in each industry chooses how to produce (with a mix of primary factors and intermediate inputs) and how much to produce to maximise its profit subject to the prices of its inputs and outputs.

- Utility maximisation: A representative household chooses its consumption levels of each consumer good and service and leisure, and allocates its wealth between assets in a way that maximises its well-being (or utility), subject to budget constraints.

In a sustainable equilibrium, governments and households must meet their budget constraints. For simplicity, we assume that the government budget is balanced in the long run. Given its expenditure requirement, the government chooses its level of taxation consistent with achieving this outcome. In the private sector, a sustainable outcome is one in which household saving is sufficient to generate growth in household assets in line with growth in real GDP.

Special Features

The two most distinguishing features of our CGE model are its fine level of detail in modelling both the tax system and individual industries. These two special features are now discussed in turn.

Some of the special features of the model for analysing tax reform are as follows.

- The model has a highly detailed treatment of business taxation, with a focus on important features of the current Australian system as well as tax designs that have been proposed around the world. It takes into account factors such as: the different tax treatments of debt and equity financing; the complex system of depreciation allowances and tax concessions; franking credits; and the potential for international profit shifting. This treatment of business tax was originally developed in 2012 in collaboration with the Australian Treasury, to support their work on company tax for the Business Tax Working Group.

- The model includes the option to use the tax-adjusted Capital Asset Pricing Model (CAPM) to optimally allocate wealth across asset classes. This captures the economic distortions from applying personal income tax at non-uniform effective rates across asset classes.

- The model allows for progressivity in the tax-transfer system. It does this taking into account both the payment of government cash benefits and the tax-free threshold under personal income tax. This progressivity adds to the excess burden of personal income tax.

- The model distinguishes how GST applies across 288 different products. Isolating the GST from other product taxes and taking into account how it applies at such a granular industry level provides more robust estimates of its economic impacts, including its excess burden.

- The model provides a valid measure of changes in consumer welfare based on the equivalent variation, so that policy changes can be correctly evaluated in terms of the public interest. This is particularly important for modelling tax reform, where the economic efficiency of taxes is assessed by calculating "excess burdens", which compare losses of consumer welfare to the amount of revenue raised.

Some of the special features of the model in the area of industry detail are as follows.

- Following model development work in 2014, the model has now been extended to distinguish 288 industries, compared to 114 industries for comparable models that rely on the standard ABS input-output tables. This finer level of detail in the extended model is obtained by using the ABS product details tables to disaggregate industry demand information and broad assumptions to disaggregate industry supply information.

- The model is designed to represent a normalised version of 2013/14 Australian economy, using the latest information available. It takes as its starting point the 2009/10 ABS Input-Output (IO) tables, which are the latest available. These are uprated in a simulation of the model that allows for general growth in prices, productivity and labour supply from 2009/10 to 2013/14, includes a long-run assumption for the terms-of-trade, and adjusts investment rates, the trade balance and the government budget position to sustainable levels.

- The model incorporates refined modelling of production in each industry. This includes nine types of produced capital, three fixed factors to capture economic rents, and eight occupations for labour. The model allows for different degrees of substitutability between these factors.

- The model includes refined modelling of consumer demand based on a 2-tier approach. In the top tier households allocate their spending across 19 broad categories of consumption, and in the second tier they choose their pattern of consumption within each of these categories. This 2-tier structure takes into account that there may be more scope for households to switch spending within broad categories than between broad categories.

Regional Module

The Independent Extended CGE model is designed as a national model. This is because many economic issues are national in scope and the most important data source for CGE models – the input-output tables – are only available at the national level. However, economic impacts sometimes vary markedly across regions and to take that into account it is useful to be able to disaggregate national outputs to the regional level.

Hence while the Independent Extended CGE model is a national model, a regional module was added in 2015. It uses a top down approach to extend the model outputs from the national level to the regional level. This involved selecting regions, designing the top down methodology and sourcing regional data.

Selecting Regions

In selecting regions, it is important that each region is defined broadly enough to be considered as a distinct regional economy. This is so it can be assumed, in broad terms, that people live and work within the same region. Taking that into account, the ABS recommends the Statistical Area Level 4 (SA4) as the most detailed level that is suitable for regional economic modelling. The Independent Extended CGE model distinguishes 50 regions in Australia, consisting of the six greater state capital regions, and the 44 SA4s that make up the rest of Australia. The six greater capital cities are not divided down into the SA4 level. This is because the confined geographic areas of the capital cities combined with urban transport networks mean that people in state capital cities often live and work in different SA4s within the same city.

Top down modelling

The top down methodology used in the regional module is derived rigorously from economic assumptions about regional economies. For a rigorous top down approach to be applied, regional economies are assumed to differ in a limited number of ways. In particular, it is assumed that each region has access to the same production technologies, consumers have the same tastes, labour is perfectly mobile between regions, and consumers in each region own assets from a national pool rather than a regional pool. These assumptions, taken together, mean that prices and wages can be expected to be same in each region. This in turn means that consumer spending patterns and input mixes in each industry should be the same in each region.

As is common in regional modelling, a distinction is made between industries that produce tradeables and industries that produce non-tradeables. A tradeable industry is assumed to be a price taker for its output, which it sells on national and/or international markets. A non-tradeable industry is assumed to sell its output in the market of its own region, with no competition from imports from other regions or countries.

Where regional economies are assumed to differ is in the resources available to each tradeable industry. In particular, each tradeable industry has its own fixed factor of production, which is distributed exogenously between regions. A region's share of production for a tradeable industry is then determined by its share of that industry's fixed factor. Production in each tradeable industry in turn stimulates its own pattern of demand across non-tradeable industries, including demand generated by household and government consumption, investment and exports.

Under this approach, vegetable growing and vegetable processing are both regarded as tradeable industries. Consequently, at the regional level, any expansion or contraction in vegetable growing or processing will flow through to demand for non-tradeables, generating a multiplier effect. Major examples of such non-tradeable industries include retail trade, wholesale trade, construction, health services, school education and food and beverage services.

Regional data

An advantage of the top down modelling approach is that, by assuming that regional economies differ in only limited ways, less region-specific data is needed. This is just as well because the key data needed for CGE modelling at the national level, input-output tables, are not available at the regional level. The top-down approach only requires data on each region's share of each tradeable industry.

These regional shares were calculated primarily from employment data collected in the 2011 ABS Census. This data shows, for each SA4 region, the breakdown of employment across 86 2-digit industries. One of these 2-digit industries is agriculture. Activity in each SA4 region in agriculture was broken down further to 13 sub-industries using the 2012-13 ABS data on the value of individual agricultural commodities produced in each SA4 region (ABS Cat No. 7503.0). This includes a 3-way split of vegetable growing, for each SA4 region, between potatoes, vegetables subject to the vegetable levy, and non-levied vegetables.

Vegetable Growing and Processing

The following two tables compare the level of detail of the vegetable growing and processing industries respectively in different Computable General Equilibrium (CGE) models of the Australian economy. The approach used by most other models is to rely on the standard ABS input-output tables. In those standard models, vegetable growing and vegetable processing are enclosed within the broader industries of "other

agriculture" and "fruit and vegetable product manufacturing" respectively, which account for two out of a total of around 110 industries.

The Independent Extended CGE model uses other tables published by the ABS to distinguish seven industries in place of these two broad industries. This is part of a more detailed industry representation of the economy that distinguishes 280 industries.

For this study, the model was customised so that it now distinguishes 15 industries in place of the two broad industries. This takes the total number of industries in the model from 280 to 288. Importantly, this allows the model to distinguish the specific industries that undertake the growing and processing of levied vegetables. For levied vegetable growing, three industries are distinguished: under-cover; potato growing; and other outdoor. For levied vegetable processing, again three industries are distinguished: frozen; prepared or preserved; and other processed.

Table 1.1: Vegetable Growing Industries in Different Models

Standard	Independent	Customised Independent
Other agriculture	Nursery & floriculture	Nursery & floriculture
	Mushroom & vegetable	Mushroom
		Under-cover: levied
		Under-cover: tomatoes
		Outdoors: levied
		Outdoors: potatoes
		Outdoors: tomatoes, onions
	Fruit & tree nut	Fruit & tree nut
	Other crop growing	Other crop growing

Table 1.2: Vegetable Processing Industries in Different Models

Standard	Independent	Customised Independent
Fruit & vegetable	Jams	Jams
	Other fruit processing	Other fruit processing
	Vegetable processing	Frozen
		Prepared or preserved
		Tomato pulp, puree and paste
		Other processed vegetables

For reporting on the regional economic impacts of the seven scenarios, 11 of the 50 regions in the regional module were identified as significant growers of levied vegetables. In each of these 11 regions, the local value of levied vegetable production exceeded $80 million in 2012-13. The 11 regions include three vegetable state capitals – Melbourne, Brisbane and Perth – and the following eight vegetable SA4s:

- VIC: Latrobe-Gippsland;
- VIC: North West
- QLD: Mackay;
- QLD: Toowoomba;
- QLD: Wide Bay;
- SA: South East;
- WA: Bunbury; and
- TAS: West and Northwest.

The relatively large size of three vegetable state capital economies means that levied vegetable growing makes up a smaller share of economic activity than it does in the eight vegetable SA4s.

Seven Scenarios

The model is used to draw out the key economic drivers and economic linkages for the vegetable growing industry through the simulation of seven separate scenarios. Those scenarios are as follows:

- introduction of *GST on basic food*;
- *more export market access* for Australian fresh and processed levied vegetables;
- a *local consumer subsidy for levied fresh vegetables* in recognition of the health benefits of consuming fresh vegetables;
- *lower vegetable import prices* affecting fresh and processed levied vegetables;
- a protracted *fresh vegetable disease outbreak* that affects the growing of levied vegetables;
- *no diesel fuel rebate for Agriculture*, but with retention of the diesel rebates for mining and transport; and
- a *productivity boost for fresh vegetables* from increased R&D investment for levied vegetables.

More detailed information on the model is provided at Appendix A.

Outputs: Economy-wide Impacts

Four economy-wide impacts are considered in turn covering the Government budget, economic activity in the Agriculture, Forestry and Fishing industry, GDP and consumer welfare.

Three of the seven scenarios impact directly on the Government budget. Extending the GST to cover basic food would add around $5.4 billion to the annual Budget balance (in 2013/14 terms), as seen in Chart 2.1. Ending the diesel fuel rebate for Agriculture, Forestry and Fishing would add around $1.0 billion to the Government Budget. A subsidy of 5 per cent on local consumption of levied fresh vegetables would cost around $0.3 billion. The remaining scenarios have only minor impacts on the Government Budget, which arise indirectly via the impacts of the scenarios on economic parameters that influence the Budget.

Chart 2.1: Impacts on Government Budget ($million, 2013/14 terms)

- GST on basic food
- more export market access
- consumer subsidy
- lower veg import prices
- fresh veg disease outbreak
- no diesel fuel rebate for Ag
- higher prod'y in fresh veg
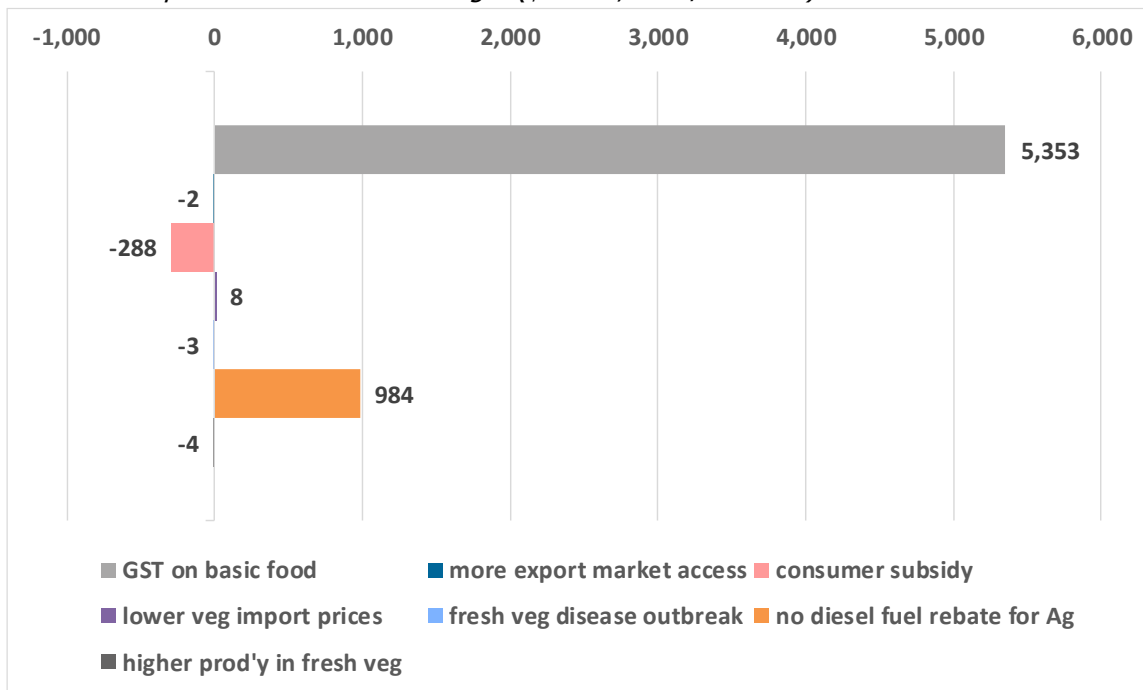
The extent to which each scenario affects the total level of economic activity in Agriculture, Forestry and Fishing depends mainly on the size of the economic change as determined by the extent of its coverage of Agriculture, Forestry and Fishing.

Extending the GST to basic food impacts a large part of the Agriculture, Forestry and Fishing industry. Consequently, its real value added is lower by nearly 2 per cent, as seen in Chart 2.2. Similarly, withdrawing the diesel fuel rebate from all of the Agriculture, Forestry and Fishing industry would result in a loss in its real value added of over 1 per cent.

Chart 2.2: Impacts on real Value Added in Agriculture, Forestry and Fishing (per cent)
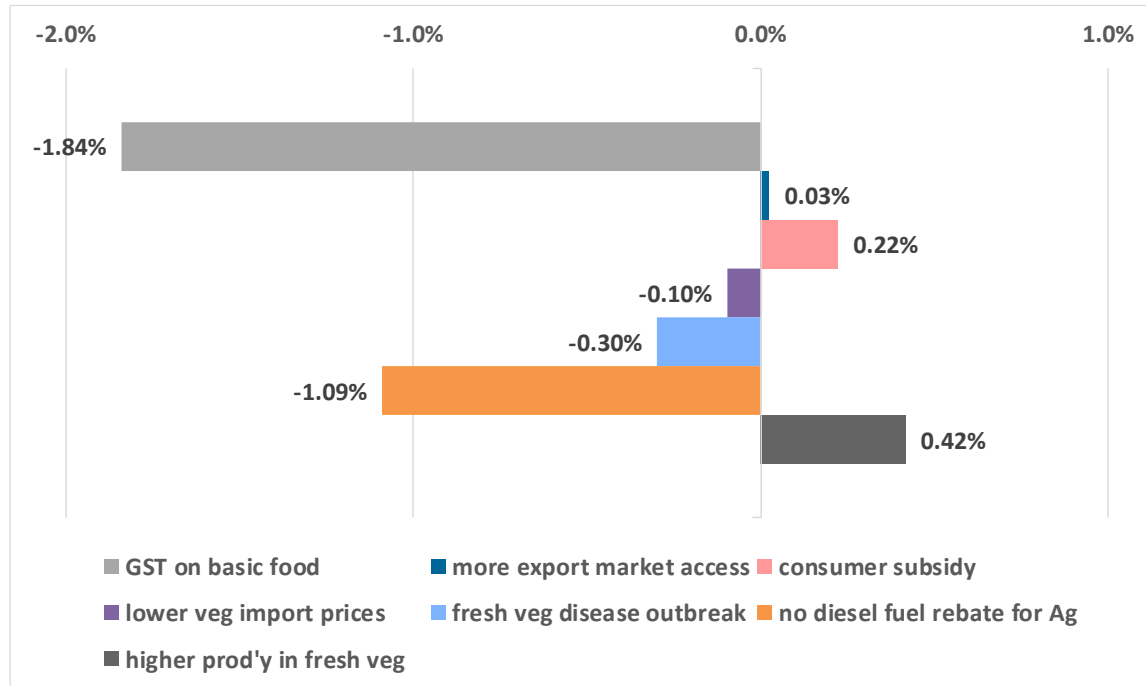
The remaining scenarios involve economic changes that are specific to vegetables and so have smaller impacts on Agriculture, Forestry and Fishing as a whole. The effects tend to be larger for economic changes affecting production than for economic changes affecting demand.

On the production side, a 5 per cent gain in total factor productivity (output relative to all inputs considered together) in the levied vegetable growing industries would add nearly one-half of one per cent to real value added in Agriculture, Forestry and Fishing. This gain in productivity is assumed to occur through increased government investment in associated R&D, although the extent of that increase is difficult to estimate and hence to take into account in the modelling. A sustained 20 per cent loss in land productivity in levied vegetable growing would subtract over one-quarter of one per cent from real value added in Agriculture, Forestry and Fishing. This loss in land productivity is a result of a prolonged disease outbreak.

The remaining three scenarios impact on the demand for vegetables and have smaller impacts on real value added in Agriculture, Forestry and Fishing. One reason these effects are smaller is that there is some scope for the effects of demand-side changes to be partly offset by resources moving from vegetable growing to other areas of Agriculture, Forestry and Fishing. A 5 per cent subsidy on local consumption of levied fresh vegetables could add around one-quarter of one per cent to real value added in Agriculture, Forestry and Fishing. Greater access to export markets for levied fresh and processed vegetables could add around 0.03 per cent to real value added in Agriculture, Forestry and Fishing. Ten per cent lower

import prices for levied fresh and processed vegetables could subtract around 0.10 per cent from real value added in Agriculture, Forestry and Fishing.

Chart 2.3 shows the percentage impacts of each scenario on total GDP. These impacts follow a similar pattern to those shown in Chart 3.2 for real value added in Agriculture, Forestry and Fishing, but are smaller, broadly in line with the weighting of that sector in the total economy.

Chart 2.3: Impacts on real GDP (per cent)
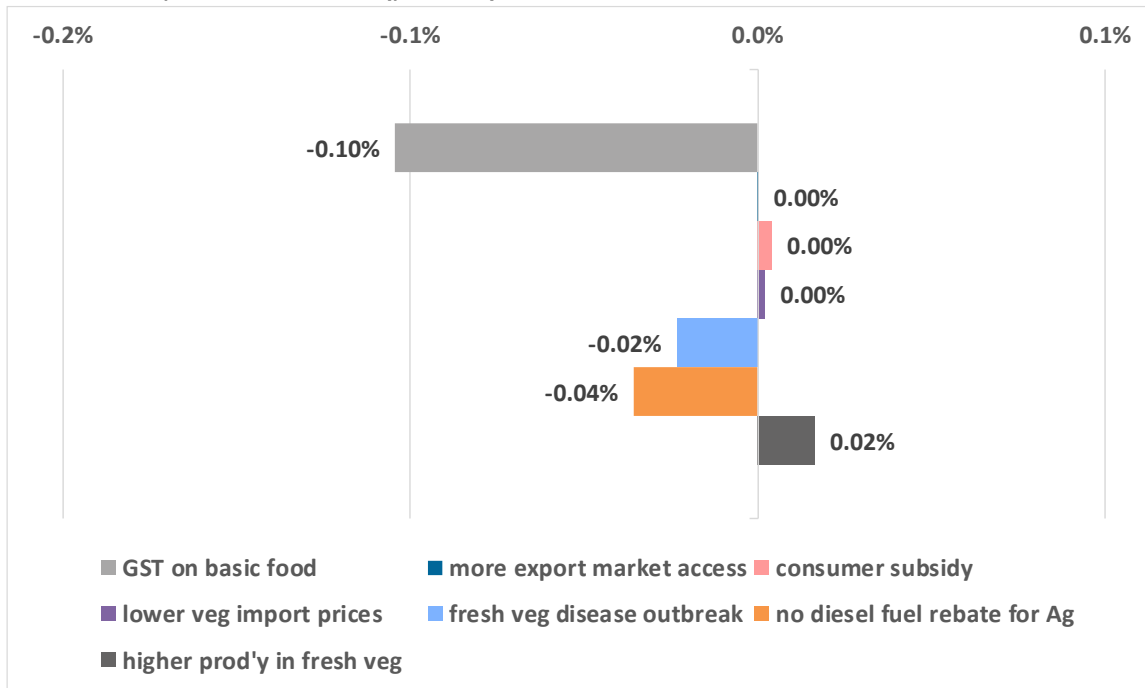
While GDP impacts are sometimes used to assess the net benefit of an economic change, consumer welfare provides a more robust estimate of net benefit. It best measures the final impact of the economic change on living standards. Chart 2.4 shows the impacts on consumer welfare of each of the seven scenarios.

The effects on consumer welfare of all scenarios are in line with expectations. This can be seen by considering the scenarios in three groups: those involving revenue-raising measures in agriculture; those involving production side changes in growing levied fresh vegetables; and those involving changes on the demand side of the market for levied vegetables.

The first scenario involving government revenue-raising is extending the GST to basic foods. This results in an annual loss in consumer welfare estimated at nearly $0.5 billion. By raising the cost of living, this policy reduces the gain in living standards from working and therefore acts as a work disincentive. However, this disincentive effect is relatively small, compared with other alternatives for government revenue raising such as raising the rate of GST or raising personal income tax. This is because broadening the base of GST to include basic food makes it a more efficient tax. Of course it would also reduce equity, but this could be addressed by other accompanying measures.

Chart 2.4: Impacts on Consumer Welfare ($million, 2013/14 terms)
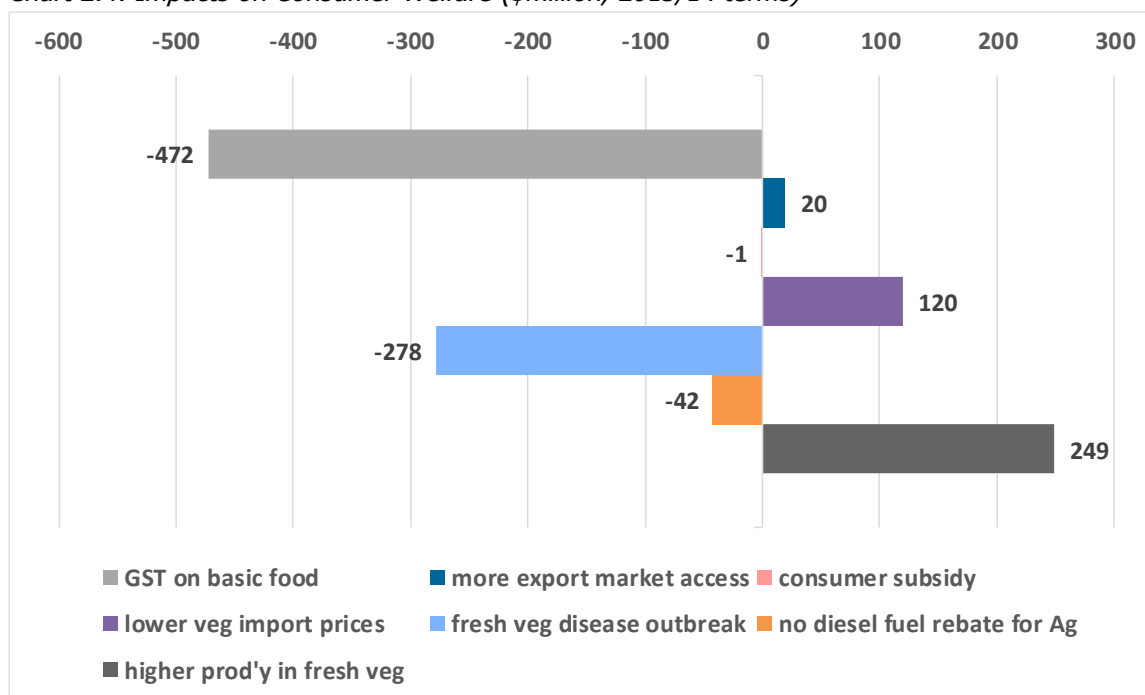
The second scenario involving government revenue-raising withdraws the diesel fuel rebate for the Agriculture, Forestry and Fishing industry. The effect of removing this rebate is to extend the application of diesel fuel excise to the Agriculture, Forestry and Fishing industry. However, that extension has no economic justification because off-road use of diesel fuel in Agriculture, Forestry and Fishing does not involve most of the costs to the public associated with on-road use of diesel fuel. The annual loss in consumer welfare is estimated at around $40 million.

The first scenario involving production side changes in growing levied vegetables is the prolonged disease outbreak. The resulting loss in land productivity leads to higher consumer prices for levied vegetables, both fresh and processed, and a resulting annual loss in consumer welfare estimated at nearly $300 million. The other scenario involving production side changes in growing levied vegetables is a gain of 5 per cent in total factor productivity (output relative to all inputs). Higher productivity leads to lower consumer prices for levied vegetables, both fresh and processed, and a resulting annual gain in consumer welfare estimated at between $200 million and $300 million.

Turning to the three scenarios involving changes on the demand side of the levied vegetable industry, the first two of these involve gains in Australia's terms-of-trade. Greater access to export markets brings higher export prices for fresh and processed levied vegetables, while the other scenario involves 10 per cent lower import prices. While these two scenarios have opposite effects on Australian production of levied vegetables, they both raise export prices relative to import prices. This means that, considering international trade as a whole, more imports can be exchanged for the same quantity of exports. The resulting annual gains in consumer welfare are around $20 million for improved export market access and $120 million for lower import prices. The final scenario involves a subsidy on local consumption of levied fresh vegetables. While the subsidy stimulates demand for levied fresh vegetables, the modelling shows a broadly neutral impact on consumer welfare. This is because the modelling does not factor in the health benefits from greater consumption of fresh vegetables.

Outputs: GST on Basic Food scenario

This scenario involves extending the GST to tax basic food, which is currently GST free.

Economy-wide

Extending the GST to cover basic food would add around $5.4 billion to the annual Budget balance (in 2013/14 terms).

It is also estimated to result in an annual loss in consumer welfare of nearly $0.5 billion. This loss occurs despite making the standard assumption that the revenue is returned to consumers. Virtually all taxes, including the GST, distort economic choices, and raising taxes makes these distortions larger. The economic distortion from the GST arises because, by raising the cost of living, it reduces the gain in living standards from working. GST therefore acts as a work disincentive.

What is more important is that the disincentive effects from extending GST to basic foods are relatively small, compared with other alternatives for government revenue raising. The loss in consumer welfare represents only 9 cents out of each additional dollar of revenue raised, the so-called marginal excess burden (MEB) from this method of revenue raising. This is well below the MEBs of 17 cents and 28 cents respectively from raising additional revenue by increasing rates of GST or personal income tax. Broadening the base of GST to include basic food makes it a more efficient tax, leading to a lower MEB than for increasing the rate of GST. Of course extending GST to basic food would reduce equity, so it might be expected to be accompanied by other measures to offset this equity effect.

Vegetables

Extending the GST to basic foods would make sales to consumers of unserved fresh and processed levied vegetables (other than snack foods) subject to GST for the first time. The resulting price rises would reduce consumer demand.

Other sales of fresh and processed vegetables would be largely unaffected. Export sales would continue to be GST free. Sales of served vegetables (e.g. in restaurants) or vegetables used in snack foods are already subject to GST and this would continue to be the case.

The impacts on production of levied vegetables will therefore be driven by the share of sales that are affected by the tax change i.e. the share of sales accounted for by sales of unserved vegetables (other than snack foods) to consumers. Overall, production losses range from about 3 to 5 per cent.

For fresh vegetables, Chart 3.1 shows that the percentage loss in production is lowest for potatoes. This is because approximately one-half of potato production is used in served meals or snack foods, and so is already subject to GST. For processed vegetables, vegetables prepared or preserved are least affected, because a high share of them are sold on export markets and so remain GST free.

Chart 3.1: GST on Basic Food: Impacts on Levied Vegetable Production (per cent)
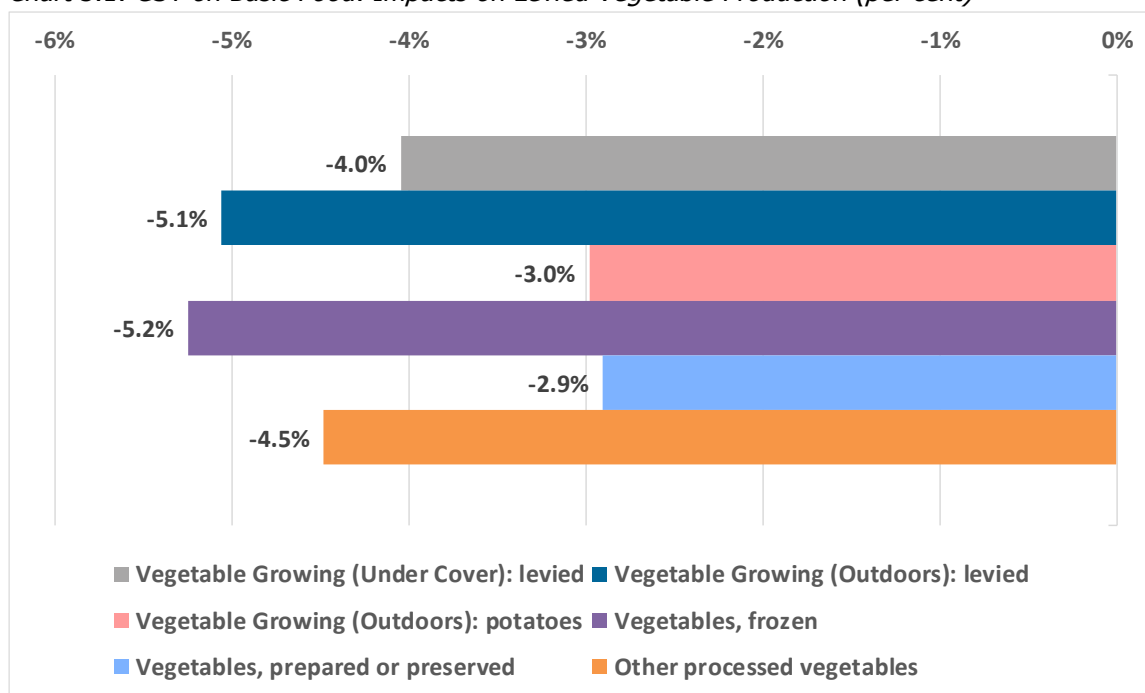
Other industries

Extending the GST to basic food impacts a large part of the Agriculture, Forestry and Fishing industry. Consequently, its real value added is lower by nearly 2 per cent, as seen in Chart 3.2. However, this impact is noticeably lower than the impacts of 3 to 5 per cent for the vegetable industry seen in Chart 3.1.

The explanation is that the extension of the GST to basic foods has bigger implications for horticulture than for most other areas of agriculture. A large share of production of broad acre crops and livestock is for the export market and so would remain GST free, while most horticulture production is destined for the local market and would become taxable.

The downstream impacts of this loss of nearly 2 per cent in Agriculture production are seen clearly in Chart 3.2. The largest downstream impact is on retail trade, but wholesale trade, manufacturing and transport are also significantly affected by the contraction in processing and distribution of agricultural produce. However, the impact on other industries is close to neutral.

Chart 3.2: GST on Basic Food: Impacts on Real GDP by Industry (per cent)

Industry	Value
A Agriculture, forestry and fishing	-1.84%
B Mining	-0.02%
C Manufacturing	-0.29%
F Wholesale trade	-0.38%
G Retail trade	-0.75%
I Transport, postal and warehousing	-0.20%
Other industries	0.03%
GDP	-0.10%
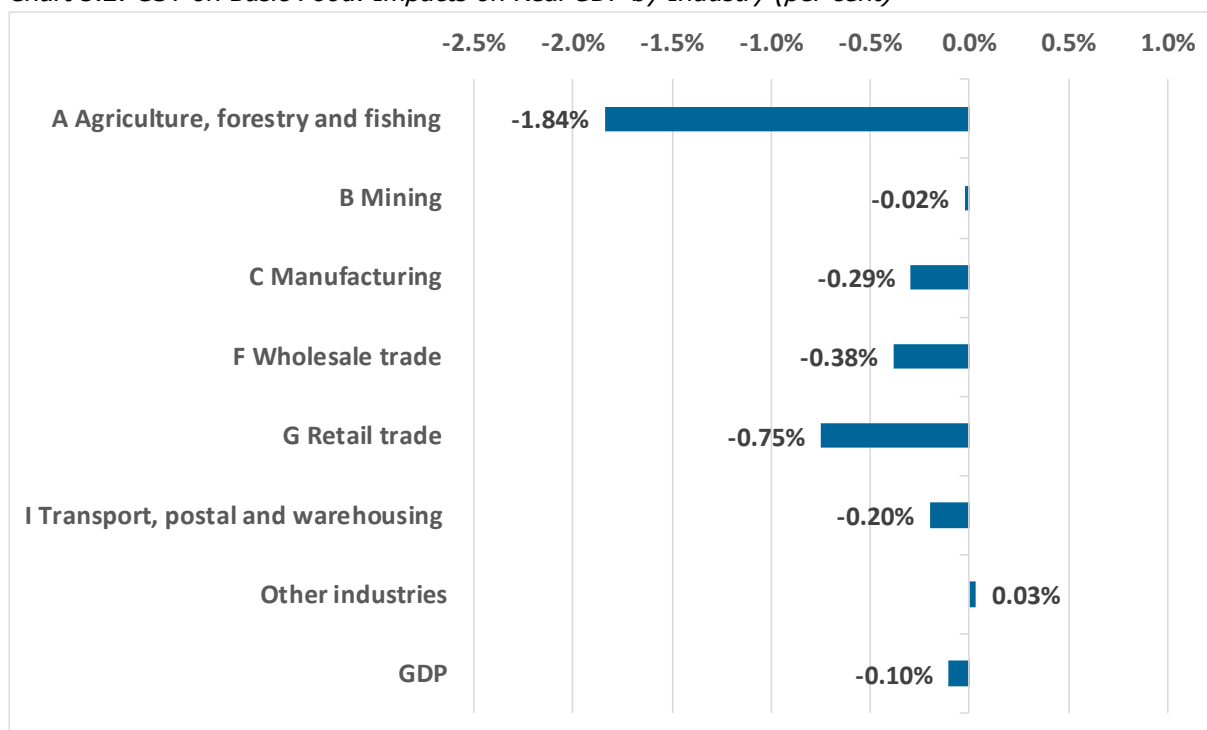
Regions

Extending the GST to basic foods results in a loss in the real output of each of the 11 levied vegetable regions, as seen in Table 3.1.

In absolute terms the losses are largest in the cities of Melbourne and Brisbane. Those cities are affected by both losses in their Agriculture output as well as losses downstream in their retail, manufacturing, wholesale and transport industries. However, Melbourne and Brisbane are large regional economies, and hence are relatively well placed to withstand such losses.

When output losses are re-expressed in percentage terms, they are largest for Latrobe-Gippsland, the North West region of Victoria, Wide Bay and the South East region of South Australia. Each of these four regions experiences a loss in annual real regional output of over $100 million.

These four regions are more affected by extending GST to basic foods than the other levied vegetable regions because they have a higher dependence on Agriculture. Besides producing levied vegetables, Latrobe-Gippsland has a dairy industry, the North-West region of Victoria produces wheat, barley, grapes and almonds, Wide Bay has a beef cattle industry and the South East region of South Australia produces wine grapes.

Table 3.1: GST on Basic Food: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	-480
Latrobe - Gippsland	-136
North West	-105
Greater Brisbane	-346
Mackay	-77
Toowoomba	-44
Wide Bay	-139
South Australia - South East	-159
Greater Perth	-145
Bunbury	-55
West and North West	-69
Rest of Australia	-2,600
Australia	**-4,356**

Outputs: More Export Market Access scenario

Recently concluded free trade agreements with Japan, South Korea and China offer greater export market access for vegetables. To illustrate the potential benefits, this scenario involves improved export market access for levied vegetables in both fresh and processed form. It was implemented by raising export demand by 20 per cent, at any given export price, for all categories of levied vegetables, including both fresh and processed.

Economy-wide

This scenario involves a gain in Australia's terms-of-trade. Greater access to export markets brings higher export prices for fresh and processed levied vegetables. Thus, export prices are raised relative to import prices. This means that, considering international trade as a whole, more imports can be exchanged for the same quantity of exports. The resulting annual gain in consumer welfare is estimated at around $20 million.

Vegetables

Levied vegetables vary greatly in the extent to which they are exported. Improved export market access provides a large boost to production of vegetables prepared or preserved, a high share of which are sold on export markets. This is the case to a lesser extent for fresh vegetables grown under cover. Other categories of fresh and processed levied vegetables have relatively low exposure to export markets and hence the impacts on their production from improved export market access are relatively small.

Chart 4.1: More Export Market Access: Impacts on Levied Vegetable production (per cent)
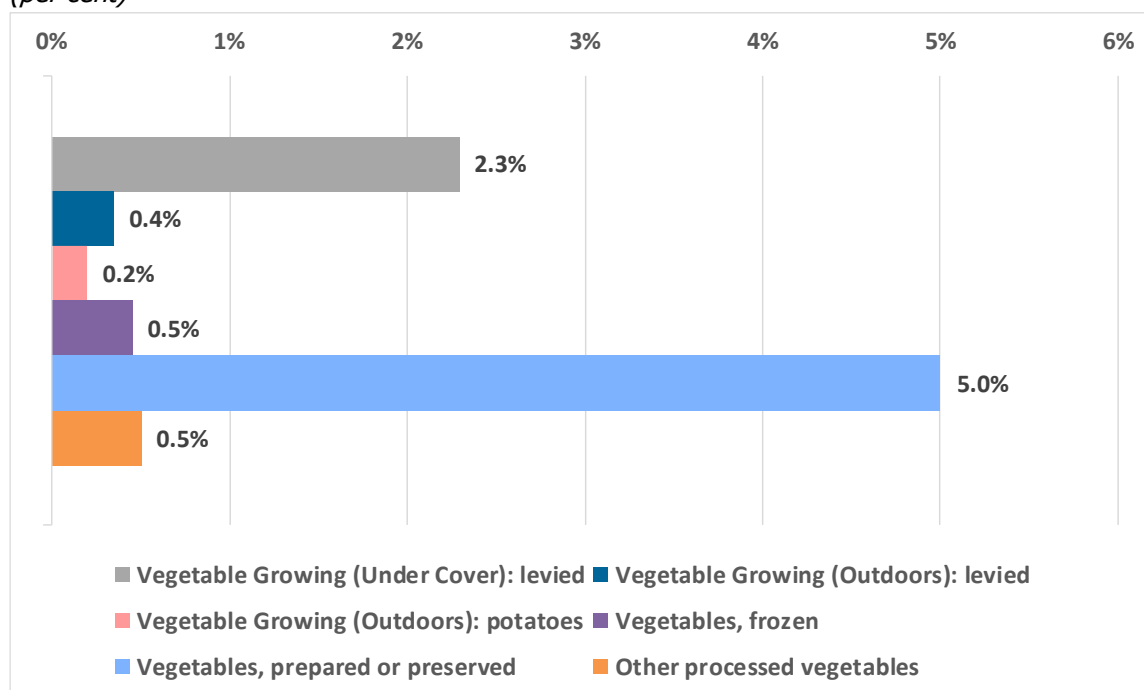
Other industries

Greater access to export markets for levied fresh and processed vegetables is an economic change that is specific to vegetables and so has smaller percentage impacts on wider Agriculture, Forestry and Fishing. Further, as a demand-side change, there is some scope for the effects to be partly offset by resources, such as land, moving to vegetable growing from other areas of Agriculture, Forestry and Fishing. This scenario is estimated to add around 0.03 per cent to real value added in Agriculture, Forestry and Fishing.

Downstream effects are also relatively small. However, higher levied vegetable exports provide some benefit to the wholesale trade industry.

One side effect of higher vegetable exports is a slight strengthening of the Australian dollar of 0.01 per cent. This leads to a small loss of output for the mining industry.

Chart 4.2: More Export Market Access: Impacts on Real GDP by Industry (per cent)
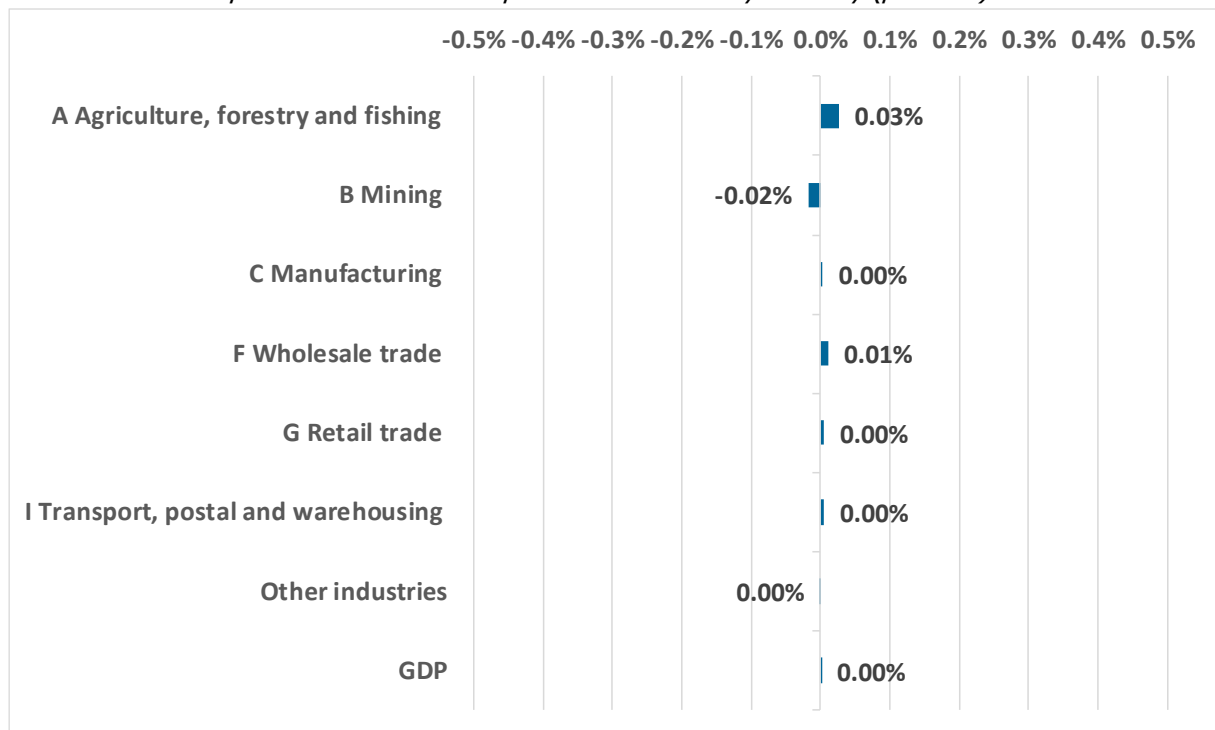
Regions

The impacts on the 11 levied vegetable regions is driven by both the gain in production of levied fresh vegetables and the small loss in production in mining.

The gain in production of levied fresh vegetables means that most of these regions gain. Greater Melbourne, as the largest producer of levied fresh vegetables, experiences the largest gain in annual real output of $13 million. On the other hand, the exposure of Mackay and Greater Perth to the mining industry means that they experience small losses in real output.

Table 4.1: More Export Market Access: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	13
Latrobe - Gippsland	3
North West	1
Greater Brisbane	6
Mackay	-4
Toowoomba	2
Wide Bay	4
South Australia - South East	3
Greater Perth	-10
Bunbury	0
West and North West	1
Rest of Australia	-9
Australia	**9**

Outputs: Consumer Subsidy scenario

This scenario involves a subsidy of 5 per cent on sales of levied fresh vegetables to local consumers. This is in recognition of the health benefits of consuming fresh vegetables.

Economy-wide

This subsidy would cost the Government Budget around $0.3 billion (in 2013/14 terms).

In the modelling, the subsidy does stimulate demand for levied fresh vegetables. The modelling shows a broadly neutral impact on consumer welfare, but this does not take into account the value of the potential health benefits.

Vegetables

The consumer subsidy lifts production of levied fresh vegetables by 2 to 4 per cent. The gain for potatoes is at the lower end of this range because a relatively high proportion of potato production is processed. On the other hand, production for other levied fresh vegetables, whether grown under cover or outdoors, gains by around 4 per cent. As the subsidy does not target processed vegetables, their production is largely unaffected.

Chart 5.1: Fresh Vegetable Consumer Subsidy: Impacts on Levied Vegetable Production (per cent)
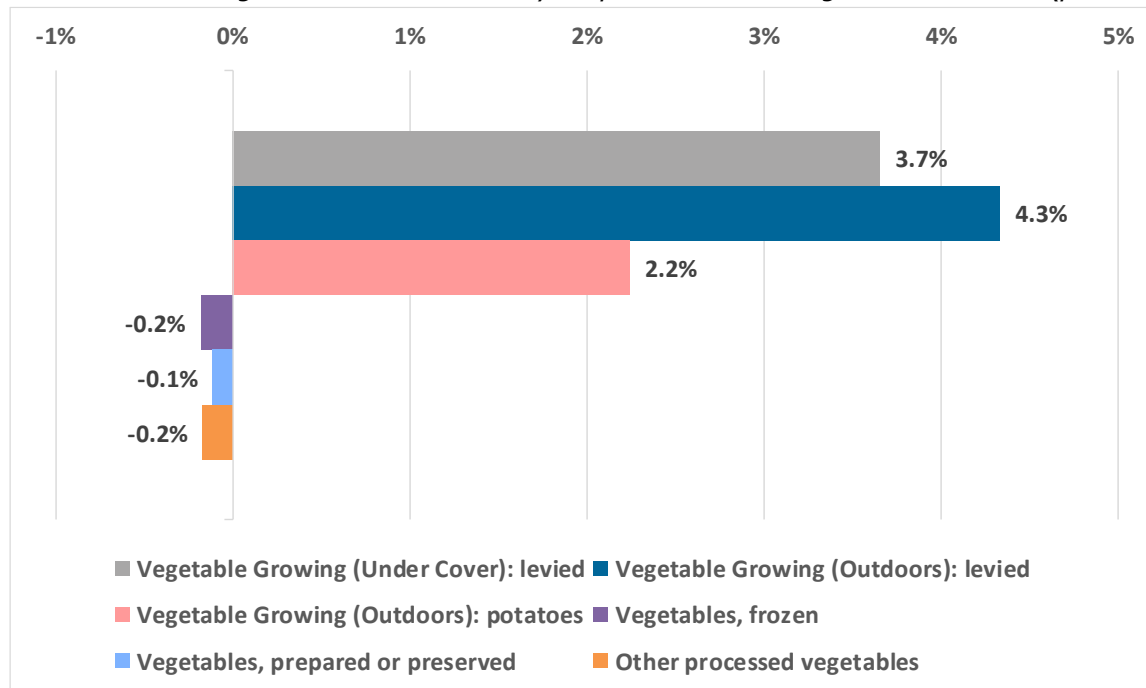
Other industries

The consumer subsidy is an economic change that is specific to vegetables and so has smaller percentage impacts on wider Agriculture, Forestry and Fishing. Further, as a demand-side change, there is some scope for the effects to be partly offset by resources, such as land, moving to vegetable growing from other areas of Agriculture, Forestry and Fishing. This scenario could add around one-quarter of one per cent to real value added in Agriculture, Forestry and Fishing, as seen in Chart 5.2.

The downstream impacts of this gain in Agriculture production are seen in Chart 5.2. Retail trade and wholesale trade both benefit from additional distribution of fresh vegetables. Manufacturing does not benefit as the subsidy targets fresh vegetables rather than processed vegetables. The impact on other industries is close to neutral.

Chart 5.2: Fresh Vegetable Consumer Subsidy: Impacts on Real GDP by Industry (per cent)
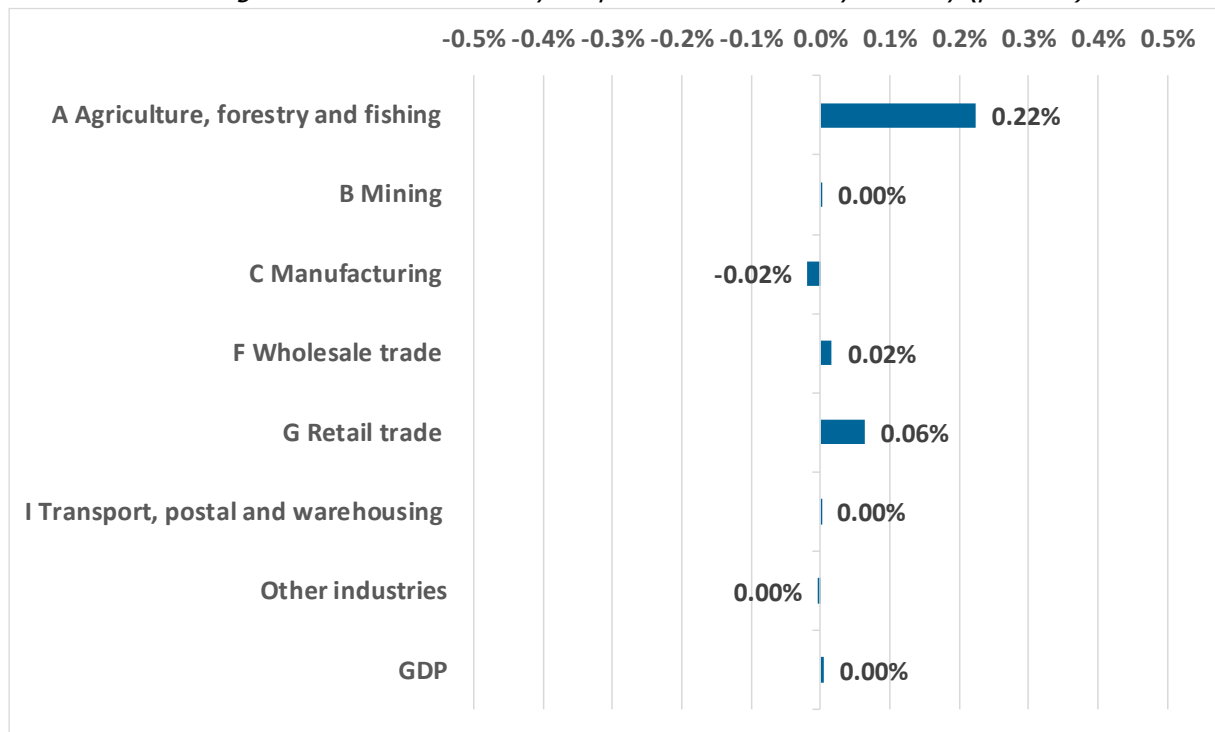
Regions

All 11 levied vegetable regions obtain a gain in gross output from the consumer subsidy, as seen in Table 5.1. The largest gains are in Toowoomba, Wide Bay and Latrobe-Gippsland, which are all large producers of levied vegetables. While Greater Melbourne is the largest producer of levied vegetables, its gain in gross output is dampened by the small increase in taxation needed to fund the subsidy.

Table 5.1: Fresh Vegetable Consumer Subsidy: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	9
Latrobe - Gippsland	13
North West	1
Greater Brisbane	2
Mackay	10
Toowoomba	16
Wide Bay	14
South Australia - South East	7
Greater Perth	11
Bunbury	7
West and North West	5
Rest of Australia	-35
Australia	**60**

Outputs: Lower Vegetable Import Prices scenario

This scenario is designed to shows the impacts of increased import competition. While import competition is limited for fresh vegetables, there is substantial and rising import competition for processed vegetables, notably from New Zealand and Italy.

This scenario illustrates the effects of increased import competition by lowering import prices for levied fresh and processed vegetables by 10 per cent. This increased import competition leads to lower local production for all categories of levied vegetables. The extent of this production loss varies with the degree of exposure to imports.

Economy-wide

This scenario involves a gain in Australia's terms-of-trade: export prices are higher relative to import prices. This means that, considering international trade as a whole, more imports can be exchanged for the same quantity of exports. The resulting annual gain in consumer welfare is estimated at around $120 million.

Vegetables

The increased competition from imports under this scenario leads to lower local production for all categories of levied vegetables. The extent of this production loss varies with the degree of exposure to imports.

Potatoes and other levied vegetables grown outdoors have relatively low exposure to imports. This is also true for vegetables prepared or preserved, which have high exposure to export markets. Thus, production losses for these three categories are relatively small.

The remaining three categories of levied vegetables have moderate exposure to import markets. For them, a ten per cent fall in prices for imports leads to local production losses estimated at around 4 per cent. This includes for levied vegetables grown under cover, frozen vegetables and other processed vegetables.

Chart 6.1: Lower Vegetable Import Prices: Impacts on Levied Vegetable Production (per cent)
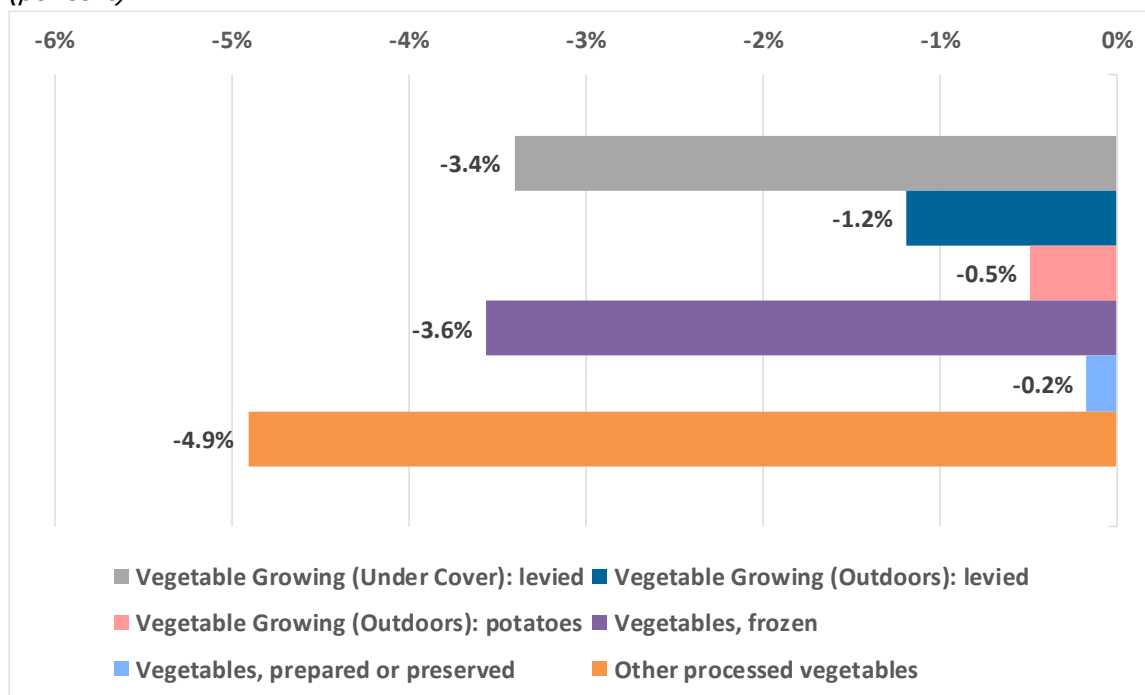
Other industries

Ten per cent lower prices for imported vegetables is an economic change that is specific to vegetables and so has smaller percentage impacts on wider Agriculture, Forestry and Fishing. Further, as a demand-side change, there is some scope for the effects to be partly offset by resources, such as land, moving from vegetable growing to other areas of Agriculture, Forestry and Fishing. Ten per cent lower import prices for levied fresh and processed vegetables could subtract around 0.10 per cent from real value added in Agriculture, Forestry and Fishing.

Because there is increased import competition for both fresh and processed vegetables, there is a small loss in output in manufacturing. However, retail trade expands slightly as it sells more imported vegetables. Mining also gains slightly: increased imports of vegetables leads to a very slight depreciation of the Australian dollar, which benefits the mining industry. The impacts of other industries are broadly neutral.

Chart 6.2: Lower Vegetable Import Prices: Impacts on Real GDP by Industry (per cent)
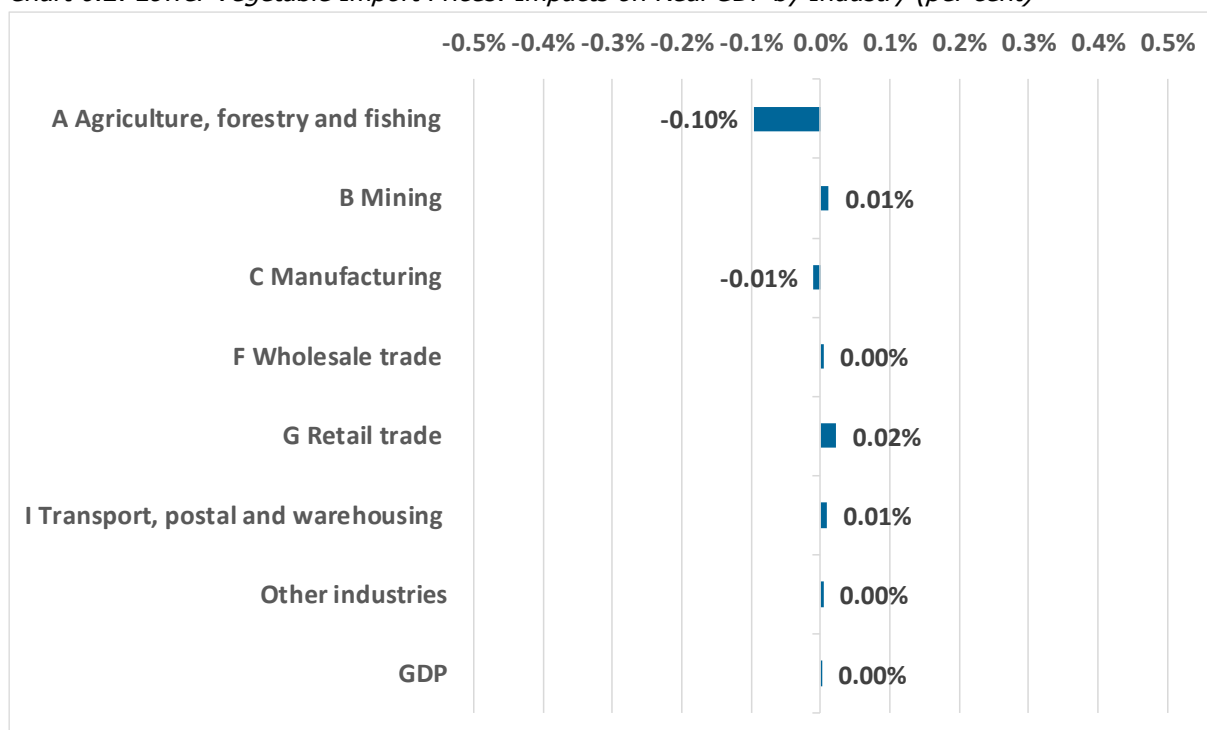
Regions

The impacts on the 11 levied vegetable regions is driven by both the loss in production of levied fresh vegetables and the small gain in production in mining.

The loss in production of levied fresh vegetables means that most of these regions lose. The largest loss in real annual output of $11 million is in Wide Bay. However, the small gain in the mining industry leaves a neutral impact for Mackay and a net gain for Greater Perth. In the rest of Australia, outside of the 11 levied vegetables regions, the impact on gross output is neutral.

Table 6.1: Lower Vegetable Import Prices: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	-9
Latrobe - Gippsland	-8
North West	-3
Greater Brisbane	-6
Mackay	0
Toowoomba	-6
Wide Bay	-11
South Australia - South East	-8
Greater Perth	13
Bunbury	-2
West and North West	-4
Rest of Australia	0
Australia	**-44**

Outputs: Fresh Vegetable Disease Outbreak scenario

This scenario lowers land productivity in the growing of levied vegetables to simulate the effects of a prolonged disease outbreak. Such an outbreak could last for years but would not be indefinite, unlike the economic changes in the other six scenarios. Thus, while such a disease outbreak could lead to a loss in land productivity of 50 per cent or more, to take into account its temporary nature the loss in land productivity has been discounted to 20 per cent.

Economy-wide

This loss in land productivity leads to higher consumer prices for levied vegetables, both fresh and processed. The resulting annual loss in consumer welfare is estimated at nearly $300 million.

Vegetables

Lower land productivity leads to higher prices for local levied fresh vegetables. Higher prices reduce demand, leading to a loss of 6 to 7 per cent in production of levied vegetables grown undercover. A high proportion of sales to price-sensitive consumers and import competition combine to generate this production loss. In addition, the higher yields for undercover production make the impacts of a disease outbreak more severe.

The loss in potato production is relatively small at around 1 per cent. Higher prices have a relatively low effect on production of potatoes because import competition is relatively low, and a high share of production is processed and so potatoes account for a lower share of the final price to consumers.

The disease outbreak has generally smaller effects on production of processed vegetables. The effects of higher prices for fresh vegetables are diluted by other costs involved in producing processed vegetables. Among processed vegetables, production of vegetables prepared or preserved is most affected because of high exposure to price-sensitive export markets.

The overall impact on vegetable growers is mixed. Taking outdoor levied vegetable growing as an example, on the one hand there is a loss in production volume of 2.8 per cent, as seen in Chart 7.1. On the other hand, the shortage resulting from the disease outbreak results in a boost to consumer prices of 2.5 per cent. In practice, this means that growers in regions affected by the disease outbreak are likely to be worse off while other growers are likely to be better off.

Chart 7.1: Fresh Vegetable Disease Outbreak: Impacts on Levied Vegetable production (per cent)

■ Vegetable Growing (Under Cover): levied	■ Vegetable Growing (Outdoors): levied
■ Vegetable Growing (Outdoors): potatoes	■ Vegetables, frozen
■ Vegetables, prepared or preserved	■ Other processed vegetables
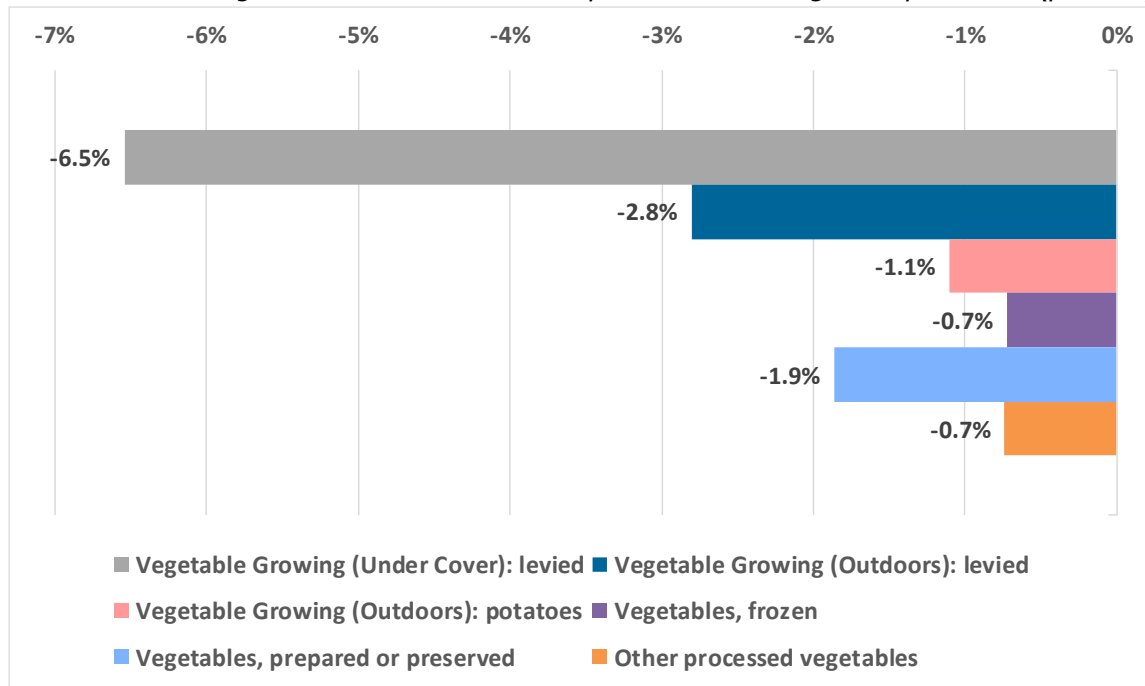
Other industries

The loss in land productivity in levied vegetable growing is estimated to subtract over one-quarter of one per cent from real value added in Agriculture, Forestry and Fishing.

The downstream impacts of this loss in Agriculture production are seen in Chart 7.2. The largest downstream impacts are on retail trade and wholesale trade, which are significantly affected by the contraction in distribution of local vegetables.

Chart 7.2: Fresh Vegetable Disease Outbreak: Impacts on Real GDP by Industry (per cent)

Regions

Higher prices for levied vegetables from the disease outbreak reduce the real incomes of consumers throughout Australia. This means that losses in gross output are spread widely, across all regions. Thus, while Table 7.1 shows that all 11 levied vegetable regions experience losses in real output, this is also true for the other 39 regions.

Table 7.1: Fresh Vegetable Disease Outbreak: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	-119
Latrobe - Gippsland	-12
North West	-8
Greater Brisbane	-63
Mackay	-6
Toowoomba	-9
Wide Bay	-13
South Australia - South East	-8
Greater Perth	-40
Bunbury	-5
West and North West	-4
Rest of Australia	-345
Australia	**-631**

Outputs: No Diesel Fuel Rebate for Agriculture scenario

This scenario ends the diesel fuel rebate for the Agriculture, Forestry and Fishing industry. Diesel fuel rebates for mining and transport are assumed to be retained.

Economy-wide

Ending the diesel fuel rebate for Agriculture, Forestry and Fishing would add around $1.0 billion to the Government Budget (in 2013/14 terms).

The effect of removing this rebate is to extend the application of diesel fuel excise to the Agriculture, Forestry and Fishing industry. However, that extension has no economic justification because off-road use of diesel fuel in Agriculture, Forestry and Fishing does not involve most of the costs to the public associated with on-road use of diesel fuel. On-road use of diesel fuel involves public costs from road construction and maintenance and urban air and noise pollution.

Accordingly, the modelling shows a loss in consumer welfare from an unjustified withdrawal of the diesel fuel rebate from Agriculture. The annual loss is estimated at around $40 million. While this represents only 4 cents in each additional dollar of revenue that is raised, the true MEB would be higher as the model does not take into account the distortion to the choice between use of diesel fuel and other intermediate inputs in Agriculture, Forestry and Fishing. This is because the model makes the common modelling assumption that such intermediate inputs are used in fixed proportions.

Vegetables

Like the disease outbreak, removal of the diesel fuel rebate for Agriculture raises production costs for levied fresh vegetables. Hence, it leads to a similar pattern of production losses for levied fresh and processed vegetables. In particular, there is a substantial loss in production of levied vegetables grown undercover, while the losses in production of potatoes and processed vegetables are relatively small.

Because the increase in production costs from removal of the rebate is around one-quarter of the increase from the disease outbreak, the production losses are also around one-quarter of the size.

Other industries

Withdrawing the diesel fuel rebate from all of the Agriculture, Forestry and Fishing industry would result in a loss in its real value added of over 1 per cent. This is broadly similar to the losses in production for levied vegetables seen above.

This similarity disguises two broadly offsetting effects. On the one hand, horticulture is a reality heavy user of diesel fuel, so levied vegetables might be expected to be more affected than Agriculture generally. On the other hand, horticulture production levels are less cost sensitive than for broad acre crops or livestock farming, because of the relatively low exposure of horticulture to international trade.

The downstream impacts of this loss in Agriculture production are seen in Chart 8.2. The largest downstream impacts are on retail trade, wholesale trade, manufacturing and transport, which are affected by the contraction in processing and distribution of agricultural produce. The loss in Agriculture production leads to a depreciation of the Australian dollar of 0.14 per cent, which benefits mining.

Chart 8.1: No Diesel Fuel Rebate for Agriculture: Impacts on Levied Vegetable production (per cent)
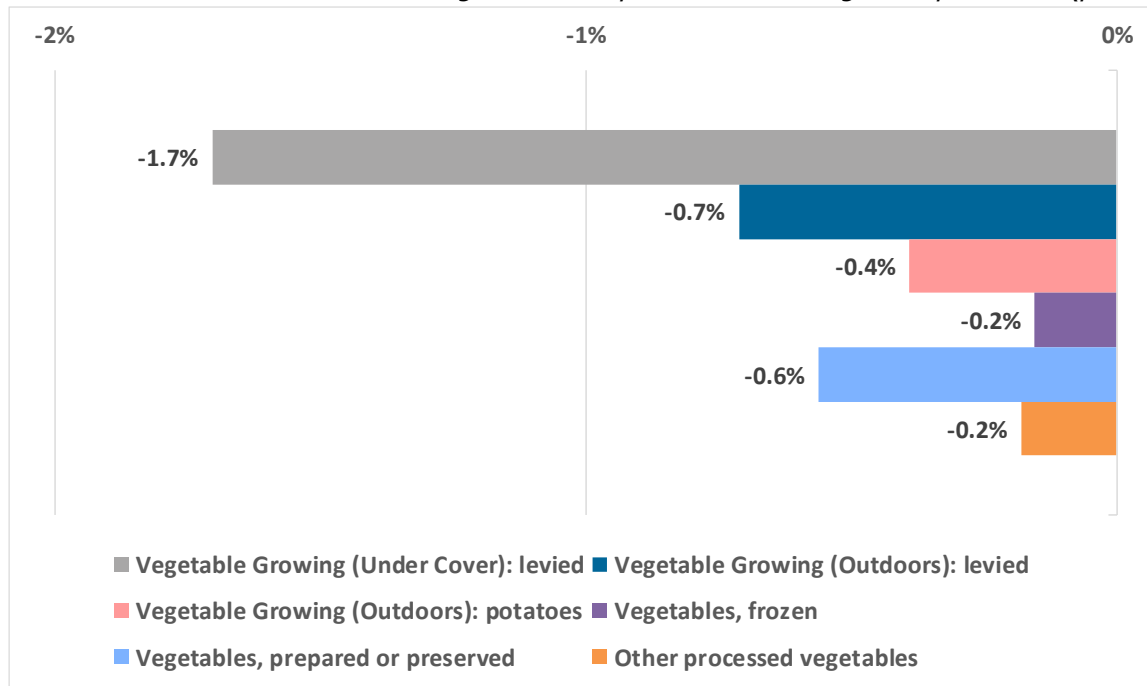
Chart 8.2: No Diesel Fuel Rebate for Agriculture: Impacts on Real GDP by Industry (per cent)
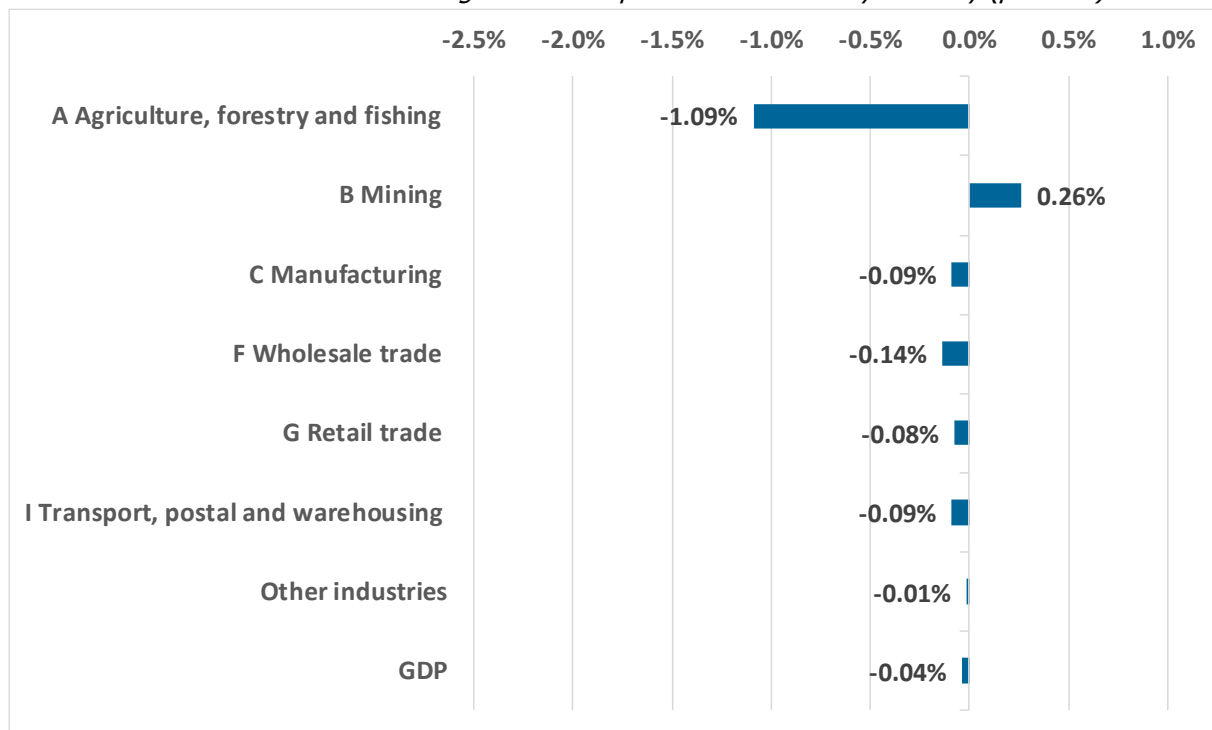
Regions

The loss in Agriculture production means that most of the 11 levied vegetable regions experience a loss of real output. On the other hand, the exposure of Mackay and Greater Perth to the mining industry means that they experience gains in real output.

Table 8.1: Fresh Vegetable Disease Outbreak: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	-274
Latrobe - Gippsland	-74
North West	-91
Greater Brisbane	-98
Mackay	59
Toowoomba	-16
Wide Bay	-75
South Australia - South East	-125
Greater Perth	113
Bunbury	-20
West and North West	-22
Rest of Australia	-1,331
Australia	**-1,952**

Outputs: Productivity Boost for Fresh Vegetables scenario

This scenario involves an increase in total factor productivity in the growing of levied vegetables of 5 per cent. This implies a gain in output of 5 per cent if all inputs were to remain unchanged. This productivity boost is assumed to come about from a boost to government R&D expenditure. No specific such boost has been included in the modelling given the difficulties in determining the amount of R&D expenditure that would be required to achieve this productivity gain. However, the available evidence, including from ABARES, indicates that the return to public R&D investment in agriculture is high.

Economy-wide

Higher productivity leads to lower consumer prices for levied vegetables, both fresh and processed. This results in an annual gain in consumer welfare estimated at between $200 million and $300 million.

Vegetables

Like the two previous scenarios, this scenario changes production costs for levied vegetables. Indeed, the percentage impacts on production shown in Chart 9.1 are close to the mirror image of those shown in Chart 7.1 for a disease outbreak: both scenarios involve changes in productivity in the growing of levied vegetables, but in opposite directions.

For example, there is a large gain in production of levied vegetables grown undercover, reflecting their sensitivity to costs, and small gains for processed vegetables.

Chart 9.1: R&D Productivity Boost for Fresh Vegetables: Impacts on Levied Vegetable production (per cent)
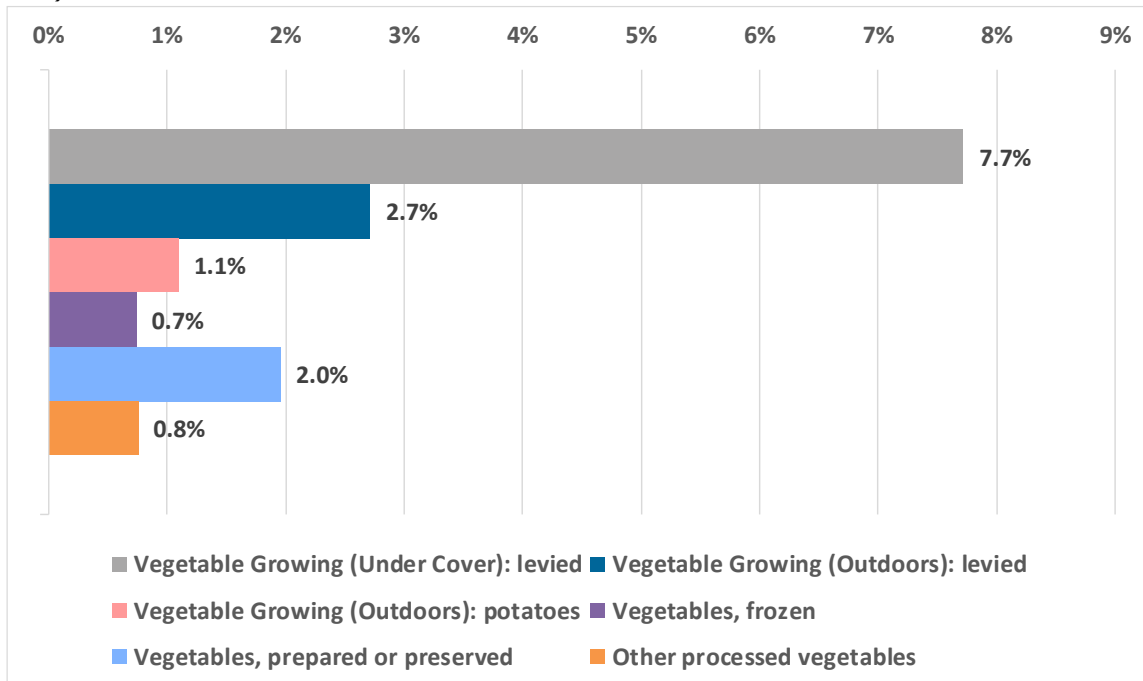
Other industries

A 5 per cent gain in total factor productivity in the levied vegetable growing industries would add nearly one-half of one per cent to real value added in Agriculture, Forestry and Fishing. This gain in output stimulates employment in agriculture, but this stimulus is offset by the labour-saving effect of higher productivity.

The downstream impacts of this gain in Agriculture production are seen in Chart 9.2. The largest downstream impacts are on retail trade and wholesale trade, which are significantly affected by the expansion in distribution of local vegetables. The expansion in local vegetable production provides a slight boost to the value of the Australian dollar of 0.02 per cent, resulting in a small loss in mining production.

Chart 9.2: R&D Productivity Boost for Fresh Vegetables: Impacts on Real GDP by Industry (per cent)

Industry	Value
A Agriculture, forestry and fishing	0.42%
B Mining	-0.02%
C Manufacturing	0.00%
F Wholesale trade	0.02%
G Retail trade	0.05%
I Transport, postal and warehousing	0.01%
Other industries	0.01%
GDP	0.02%
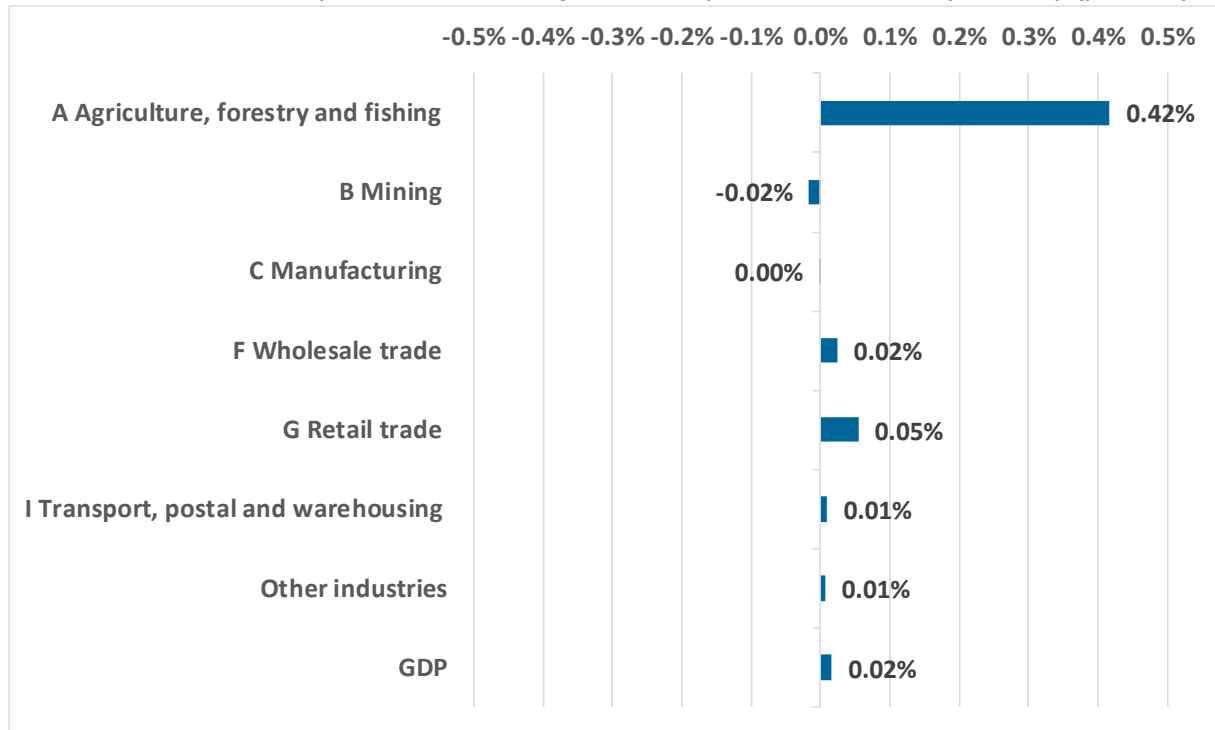
Regions

Lower prices for levied vegetables from higher productivity boost the real incomes of consumers throughout Australia. This means that gains in gross output are spread widely, across most regions. The gain in real output for most regions is around 0.01 per cent. A few regions experience small output losses, including two regions in Table 9.1, and this is due to the small loss in mining production.

Table 9.1: R&D Productivity Boost for Fresh Vegetables: Impacts on real output in selected regions (per cent)

Region	$m, 2009-10 prices
Greater Melbourne	71
Latrobe - Gippsland	4
North West	2
Greater Brisbane	36
Mackay	-1
Toowoomba	4
Wide Bay	5
South Australia - South East	-2
Greater Perth	15
Bunbury	0
West and North West	-1
Rest of Australia	141
Australia	**273**

Outputs: Regional Impacts

The economic impacts of the scenarios are far from uniform across regions. Two of the scenarios – extending the GST to basic food and withdrawing the diesel fuel rebate from all of the Agriculture, Forestry and Fishing industry – impact directly on agriculture and so have their stronger impacts on regions that are more dependent on agriculture. The remaining five scenarios impact directly on the levied vegetable industry and so have stronger impacts on regions that are more dependent on levied vegetable growing. This analysis of regional economic impacts focusses on those regions that are more dependent on the growing of levied vegetables.

The regional module of the Independent Extended CGE model distinguishes 50 regions in Australia, consisting of the six greater state capital regions, and the 44 Statistical Area Level 4s (SA4s) that make up the rest of Australia. Of these 50 regions, 11 regions are significant growers of levied vegetables, with the local value of production exceeding $80 million in 2012-13. The 11 regions include three vegetable state capitals – Melbourne, Brisbane and Perth – and the following eight vegetable SA4s:

- VIC: Latrobe-Gippsland;
- VIC: North West
- QLD: Mackay;
- QLD: Toowoomba;
- QLD: Wide Bay;
- SA: South East;
- WA: Bunbury; and
- TAS: West and Northwest.

The relatively large size of three vegetable state capital economies means that levied vegetable growing makes up a smaller share of economic activity than it does in the eight vegetable SA4s. Here the focus is on the impacts on the eight vegetable SA4s, while the body of the report also discusses the impacts on the three vegetable state capitals.

The regional module of the Independent Extended CGE model distinguishes between tradeable and non-tradeable industries. Under this approach, vegetable growing and vegetable processing are both tradeable industries. This means that, at the regional level, any expansion or contraction in vegetable growing or processing will flow through to demand for non-tradeables, generating a regional multiplier effect. Major examples of such non-tradeable industries include retail trade, wholesale trade, construction, health services, school education and food and beverage services.

Each of the following charts show the impacts of each scenario on regional gross output. Each chart refers to a different region. Chart 10.1 provide a useful point of comparison by showing the impacts on the rest of Australia, which is defined as the region located outside of the eight vegetable SA4s. It is followed by Charts 10.2 to 10.9, which show the impacts on each of the eight vegetable SA4s in turn.

Rest of Australia

The rest of Australia has a lower dependency on the growing of levied vegetables than the eight vegetable SA4s. Thus, Chart 10.1 shows that the five scenarios involving only changes to the economic environment for growing and/or processing vegetables have small impacts of no more than 0.02 per cent of regional gross output. Withdrawal of the diesel fuel rebate for the agriculture, forestry and fishing industry has a broader impact, giving rise to a loss in regional gross output of 0.06 per cent. Extending GST to basic foods also has a broader impact, and its leads to a loss in regional gross output of 0.13 per cent.

Chart 10.1: Rest of Australia: Impact on real gross output (per cent)
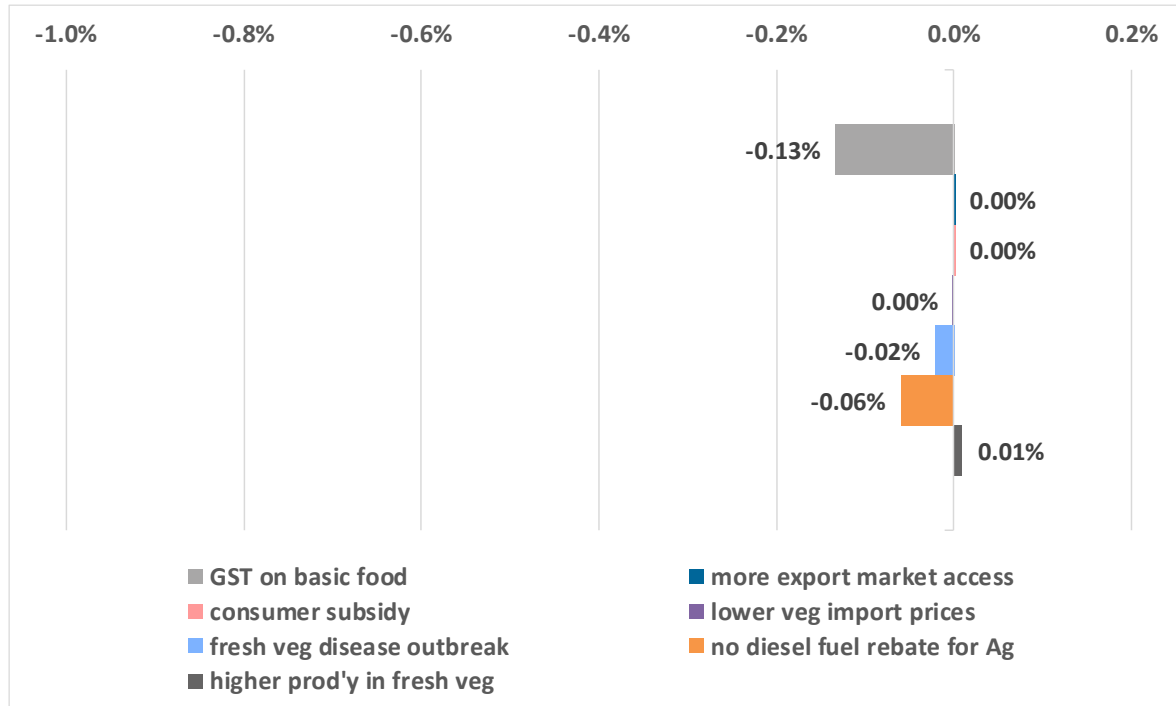
VIC: Latrobe-Gippsland

The Latrobe-Gippsland region is a very significant grower of levied vegetables. It also has a substantial dairy industry, adding to its exposure to Agriculture. This exposure to agriculture means that Latrobe-Gippsland would be significantly affected by extending the GST to basic foods or the withdrawal of the diesel fuel rebate from the Agriculture, Forestry and Fishing industry. In percentage terms, the loss in real regional gross output from these policy changes would be around four times larger than for the rest of Australia at around 0.51 per cent and 0.28 per cent respectively, as seen in Chart 10.2.

The five scenarios involving changes to the economic environment for vegetable growing also have more marked effects on the Latrobe-Gippsland region than for the rest of Australia. The region benefits from the consumer subsidy, and loses from lower prices for competing imports of vegetables and from a disease outbreak hampering the growing of levied vegetables. Better access to export markets and higher productivity for levied vegetables also generate gains in regional real gross output.

Chart 10.2: Latrobe-Gippsland region: Impact on real gross output (per cent)
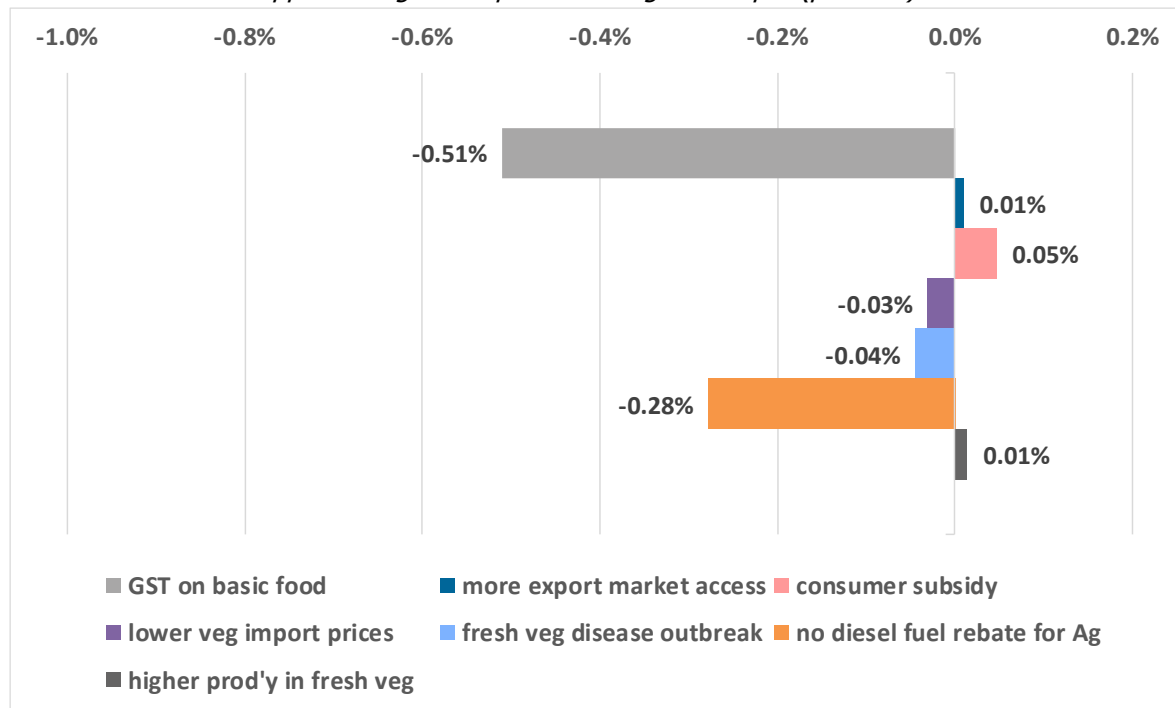
VIC: North West

The North West region of Victoria, and the neighbouring South East region of South Australia, have the largest Agriculture sectors of the eight vegetable SA4s. The North West is a significant producer of levied vegetables, as well as wheat, barley, grapes and almonds. Its large Agriculture sector means that the North West region is more affected than most of the other vegetable SA4s by extending GST to basic food and by withdrawing the diesel fuel rebate. Its losses in regional gross output are estimated at 0.65 per cent and 0.57 per cent respectively, as seen in Chart 10.3.

The five scenarios involving changes to the economic environment for levied vegetables also have significant effects on the North West region. For example, the disease outbreak in levied vegetables reduces regional gross output by an estimated 0.05 per cent.

Chart 10.3: North West region: Impact on real gross output (per cent)
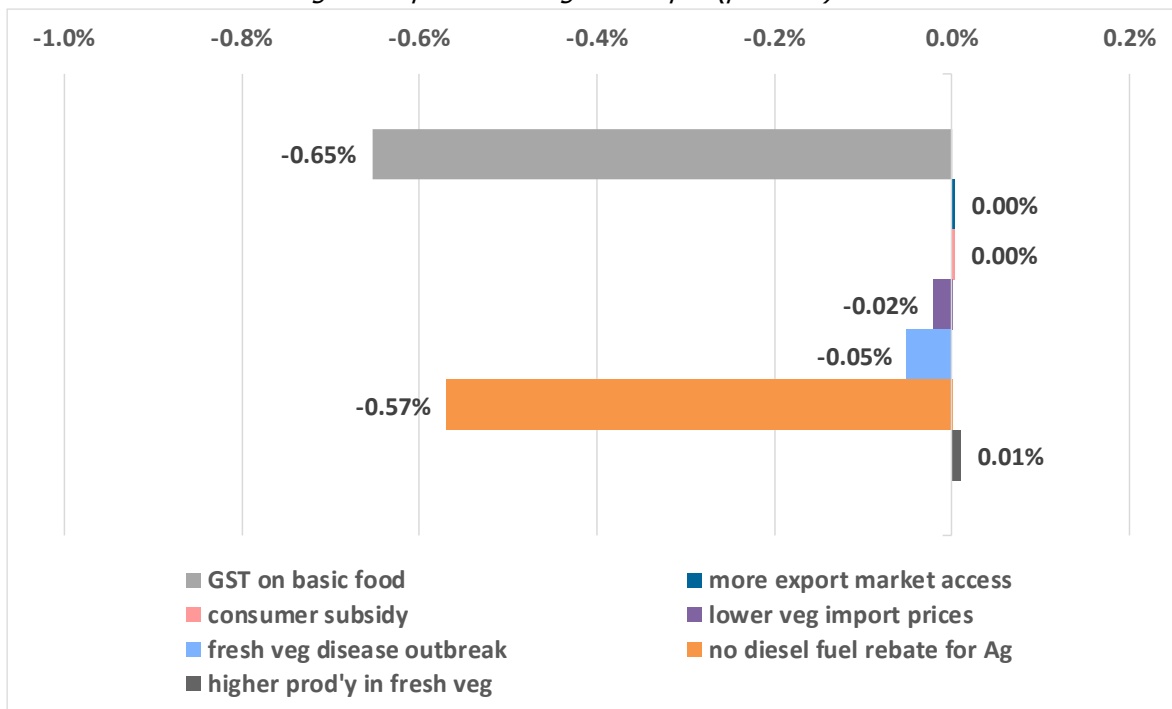
QLD: Mackay

The Mackay region is a significant grower of levied vegetables. Its exposure to Agriculture is further increased by unlevied vegetables and beef cattle. The Mackay regional economy has a large coal industry, which employs around four times more people than Agriculture. This large coal industry exerts an offsetting influence on the modelling that is not seen in the results for other vegetable SA4s.

This offset arises because, to the extent that the scenarios weaken (strengthen) the trade performance of agriculture, they lead to a weaker (stronger) Australian dollar, which benefits (hurts) the coal industry. This effect is seen most starkly in the case of the withdrawal of the diesel fuel rebate from Agriculture.

Withdrawal of the Agriculture diesel fuel rebate reduce the international competitiveness of Agriculture, resulting in a loss in Agriculture production and a weakening of the Australian dollar by 0.14 per cent. But the weaker Australian dollar stimulates coal industry production. In the Mackay region, the gain in coal production outweighs the loss in agriculture production, sending regional gross output higher, as seen in Chart 10.4.

For the five scenarios involving changes to the economic environment for the vegetable industry, the offset effect from coal production is less strong. It tends to cancel out rather than dominate the potential effects on regional output from changes in vegetable production. Thus, Chart 10.4 shows that these five scenarios have close to a zero effect on the gross output of the Mackay region.

Chart 10.4: Mackay region: Impact on real gross output (per cent)
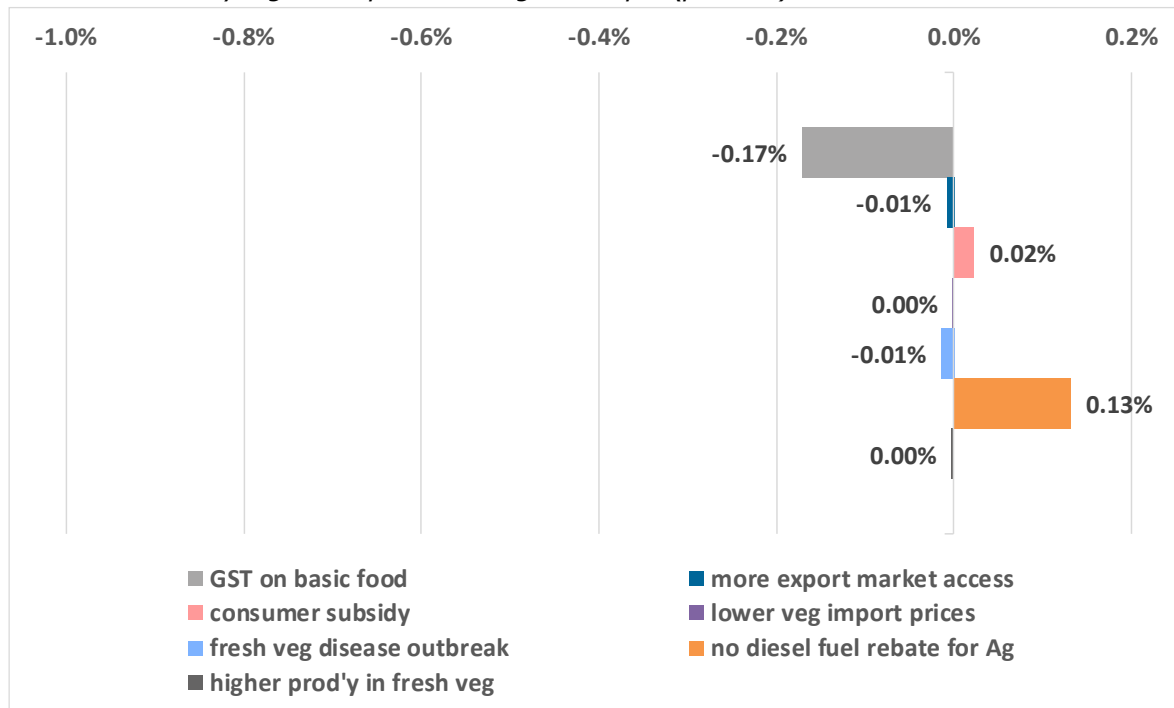
QLD: Toowoomba

The Toowoomba regional economy is more straightforward. It has a sizeable levied vegetable growing industry, which dominates its Agriculture sector. Extending the GST to include basic food and withdrawing the diesel fuel rebate from Agriculture both lead to significant losses in regional gross output. In percentage terms, these losses are around twice as large as for the rest of Australia, because of the importance of levied vegetable growing to the Toowoomba region economy.

The five scenarios involving changes to the economic environment for levied vegetables also have significant effects on the Toowoomba region. Indeed, as shown in Chart 10.5, the percentage gain in regional gross output of 0.11 per cent from the consumer subsidy and percentage loss of 0.06 per cent from the levied vegetable disease outbreak are the largest for any region. This reflects the high level of importance of levied vegetable growing in Toowoomba compared to other regions.

Chart 10.5: Toowoomba region: Impact on real gross output (per cent)
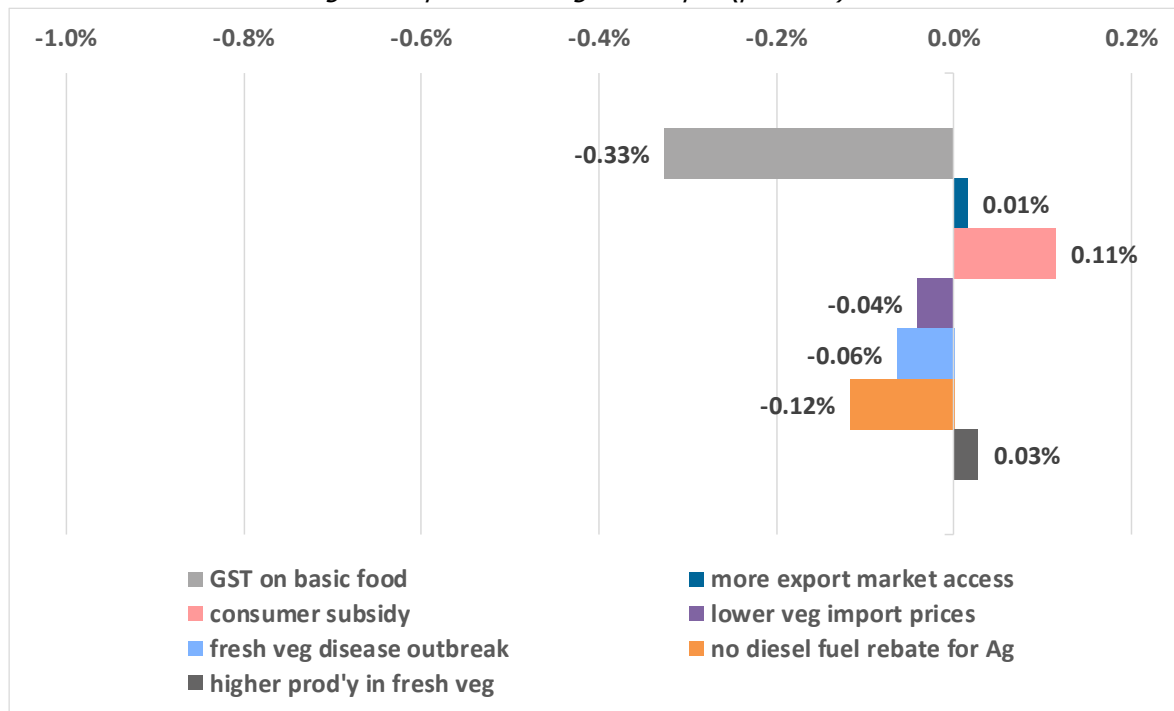
QLD: Wide Bay

Like Toowoomba, Wide Bay region has a significant levied vegetable growing industry. However, it differs in having a broader Agriculture industry in which non-levied vegetables and beef cattle are also important. The broader extent of its Agriculture industry increases its exposure to extending the GST to include basic food and withdrawing the diesel fuel rebate from Agriculture. In percentage terms, these policy changes lead to losses in regional gross output that are around five times larger than for the rest of Australia, compared to around twice as large for Toowoomba.

The five scenarios involving changes to the economic environment for levied vegetables also have significant effects that are comparable in size to the relatively large effects for the Toowoomba region. Indeed, the percentage gain in regional gross output of 0.02 per cent from improved access to export markets for levied vegetables, and the loss of 0.05 per cent from lower prices for competing levied vegetable imports, as seen in Chart 10.6, are the largest for any region. This reflects the importance of levied vegetables to the Wide Bay economy.

Chart 10.6: Wide Bay region: Impact on real gross output (per cent)
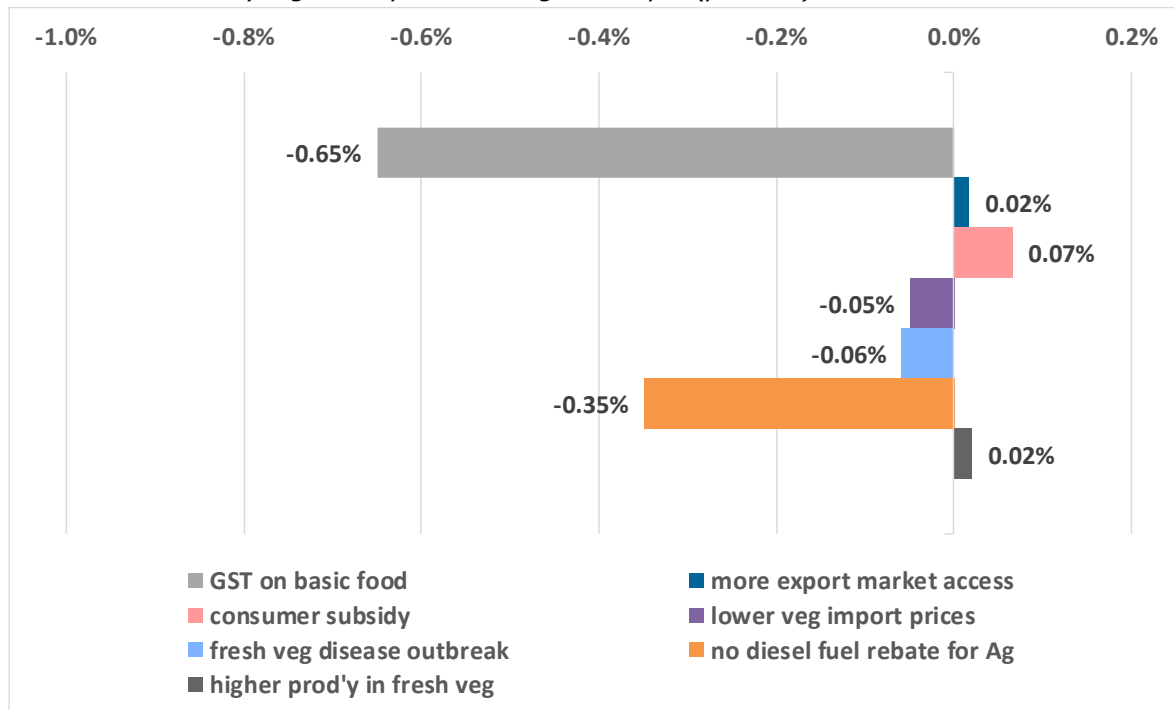
SA: South East

The South East region of South Australia, and the neighbouring North West region of Victoria, have the largest Agriculture sectors of the eight vegetable SA4s. The South East is the most important region in Australia for potato growing and is also a significant producer of non-levied vegetables, wine grapes and wheat. This large Agriculture sector means that the South East region is more affected than all of the other vegetable SA4s by extending GST to basic food and by withdrawing the diesel fuel rebate. Its losses in regional gross output are estimated at 0.84 per cent and 0.65 per cent respectively, as seen in Chart 10.7.

The five scenarios involving changes to the economic environment for levied vegetables also have significant effects on the South East region, although not as large as in Toowoomba or Wide Bay. This is because vegetable growing in the South East region is dominated by potatoes, sales of which are less sensitive to changes in growing costs than is the case for other vegetables. This is because a high share of potatoes are processed before sale, diluting the share of the final consumer price accounted for by the unprocessed product.

Chart 10.7: SA South East region: Impact on real gross output (per cent)
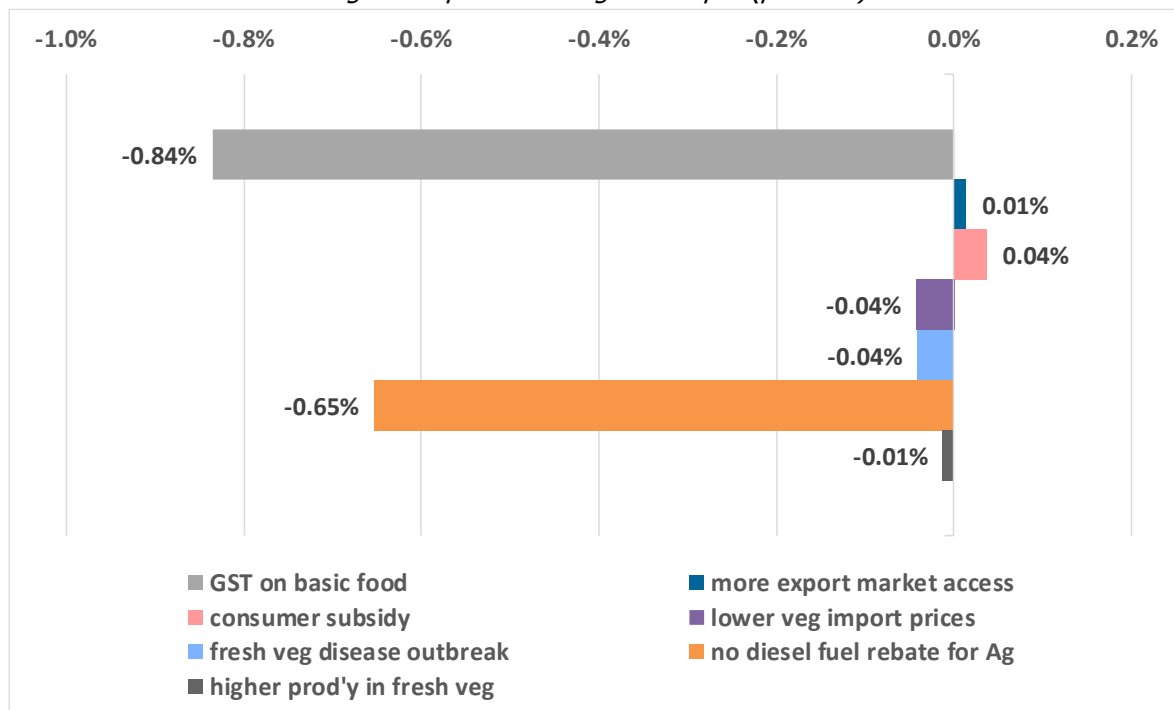
WA: Bunbury

Bunbury is significant for vegetable growing. Dairy cattle also contributes to its Agriculture sector. The size of the Agriculture sector means that Bunbury is more affected than the rest of Australia region from extending GST to basic food and from withdrawing the diesel fuel rebate.

The five scenarios involving changes to the economic environment for levied vegetables also have significant effects on the Bunbury region, as seen in Chart 10.8. However, these effects are smaller than in Toowoomba and Wide Bay, which are more dependent on vegetable growing.

Chart 10.8: WA Bunbury region: Impact on real gross output (per cent)
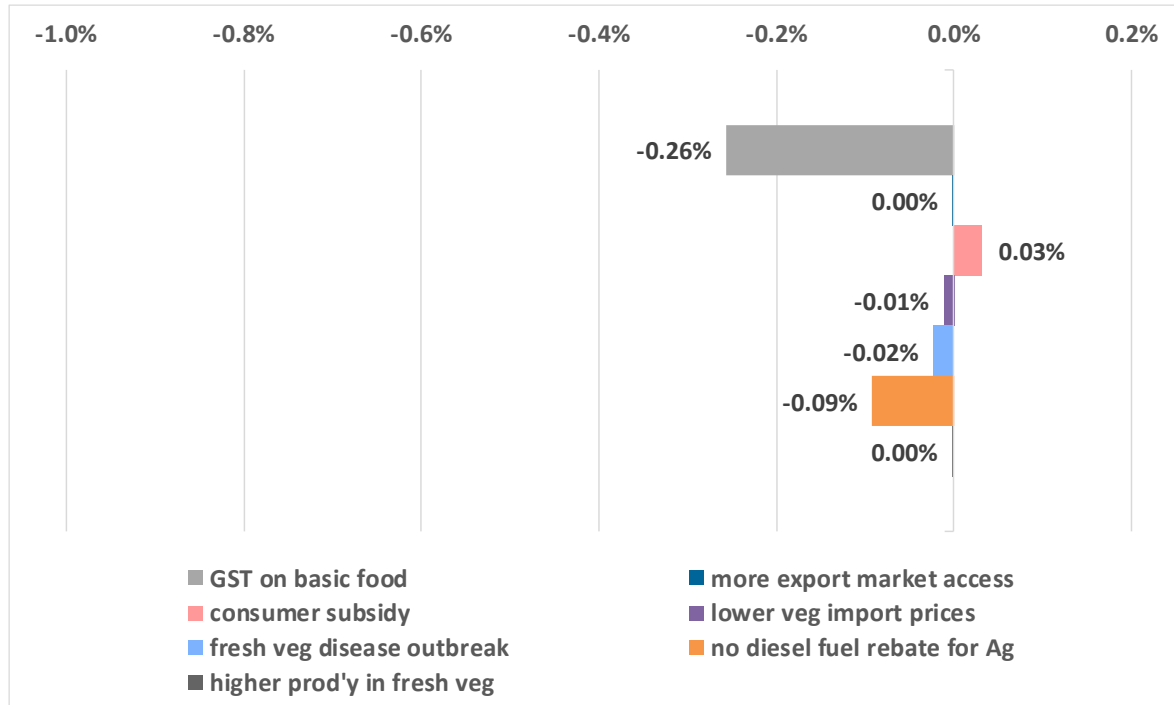
TAS: West and Northwest

The West and Northwest region of Tasmania is a significant producer of potatoes. Dairy cattle also contribute to its Agriculture sector. This combination of vegetable growing and dairy cattle is also seem in the Gippsland-Latrobe region on the other side of Bass Strait. Not surprisingly, the seven scenarios have similar effects on both neighbours of Bass Strait.

This exposure to agriculture means that the West and Northwest region would be significantly affected by extending the GST to basic foods or the withdrawal of the diesel fuel rebate from the Agriculture, Forestry and Fishing industry. In percentage terms, the loss in real regional gross output from these policy changes would be around three times larger than for the rest of Australia, as seen in Chart 10.9.

The five scenarios involving changes to the economic environment for vegetable growing also have more marked effects on the West and North West region than for the rest of Australia. The region benefits from the consumer subsidy on levied fresh vegetables, and loses from lower prices for competing imports of vegetables and from a disease outbreak hampering the growing of levied vegetables.

Chart 10.9: Tasmania West and Northwest region: Impact on real gross output (per cent)
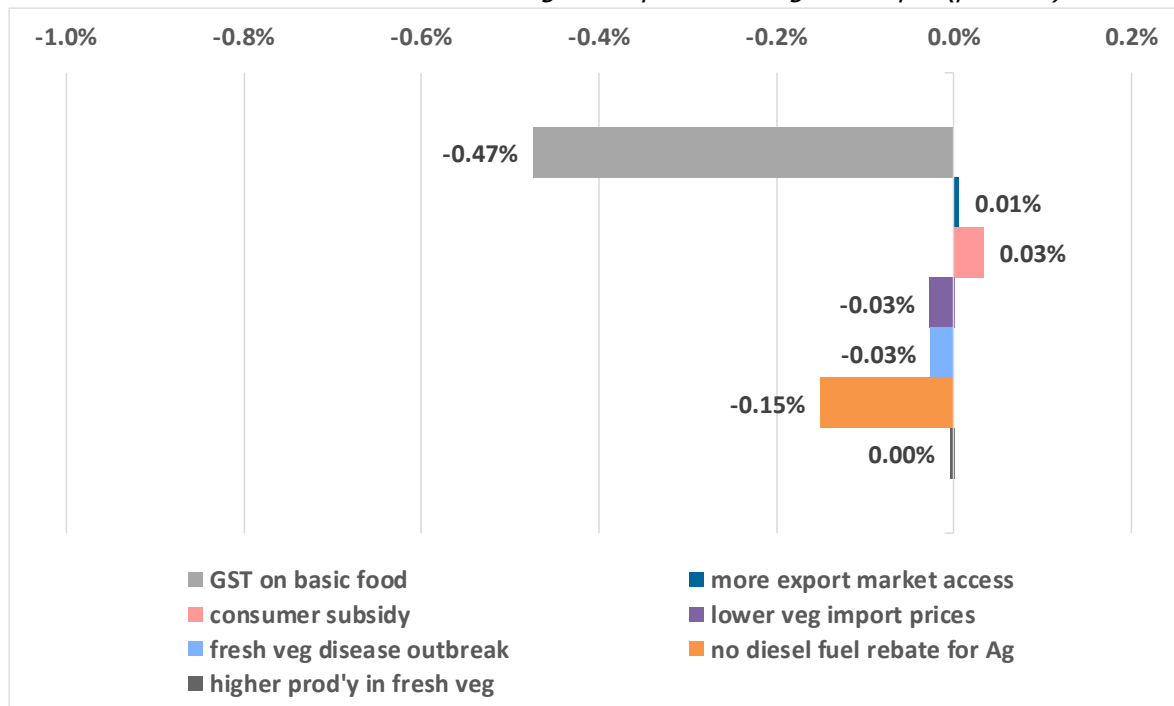
Outcomes

While all seven scenarios impact significantly on levied vegetable growing, four scenarios stand out as having the more substantial impacts, each affecting levied vegetable production by between 3 and 5 per cent. These are:

- extension of GST to basic foods;
- a local consumer subsidy in recognition of the health benefits of fresh vegetables;
- a prolonged disease outbreak in levied vegetable growing; and
- a hike in levied vegetable productivity.

Extension of the GST to basic foods has bigger implications for horticulture than for most other areas of agriculture. A large share of production of broad acre crops and livestock is for the export market and so would remain GST free, while most horticulture production is destined for the local market and hence would become taxable. However, served vegetables and vegetables used in snack foods are already subject to GST and so would not be affected.

A local consumer subsidy in recognition of the health benefits of fresh vegetables would also have a substantial impact.

A prolonged disease outbreak in levied vegetable growing would have a substantial impact on levied vegetable production. Such an outbreak could last for years but would not be indefinite, unlike the other economic changes that are simulated. To take into account its temporary nature, the size of the disease outbreak that has been simulated has been discounted to a 20 per cent loss of land productivity. Even so, its impacts on vegetable production are of a similar scale to the other three scenarios.

A hike in levied vegetable growing productivity of 5 per cent would lead to lower prices, stimulating sales to consumers and increasing the international competiveness of the industry. Such a productivity boost could be generated by increased expenditure on R&D. The amount of additional R&D expenditure that would be required is difficult to quantify and has not been factored into the modelling, but ABARES have found that the return to public R&D investment in agriculture is high.

Removal of the agriculture diesel fuel rebate would have a smaller, but still substantial impact, on production of levied vegetables. The loss in production for levied vegetables is similar to that for agriculture as a whole at around 1 per cent. On the one hand horticulture is a relatively heavy user of diesel fuel, but on the other hand production levels are less cost sensitive than for broad acre crops or livestock farming, because of the relatively low exposure of horticulture to international trade.

The remaining two scenarios have smaller, but still significant impacts, on production of levied vegetables. Greater export market access and lower import prices have smaller effects than in other areas of agriculture, because vegetable growing has lower exposure to international trade.

For economic changes that are specific to levied vegetables, the regional economies that are most affected are: Toowoomba (Queensland), Wide Bay (Queensland), Latrobe-Gippsland (Victoria) and the South East (South Australia). Other regions that are significantly affected are: Bunbury (Western Australia), West and North West (Tasmania) and the North West (Victoria). Mackay (Queensland) is also a significant grower of levied vegetables, but its economy is more driven by the coal industry.

The scenarios also highlight the economic linkages of the levied vegetable industry to other industries. Apart from the linkage to vegetable processing, which is part of the manufacturing industry, other important linkages are associated with the distribution of vegetables and involve linkages to retail trade, wholesale trade and transport.

Interestingly, a number of the scenarios also show that movements in vegetable growing or agriculture generally are at times partly offset by movements in the mining industry. This is because a gain in production in agriculture tends to strength the Australian dollar, leading to a loss in production in mining.

Scientific Refereed Publications

None to report.

>

Intellectual Property/Commercialisation

No commercial IP generated.

Acknowledgements

Appendices

Appendix A: The Independent Extended CGE Model

Appendix B: Detailed Results

Economic Modelling of the Vegetable Industry

Appendix A: The Independent Extended CGE Model

A.1   Introduction

The Independent Extended CGE Model is Independent Economics' Computable General Equilibrium (CGE) model of the Australian economy, as recently extended. Some notable features which set the Independent CGE model apart from other models of the Australian economy are as follows.

- Following model development work in 2014, the model has now been extended to distinguish 288 industries, compared to 114 industries for comparable models that rely on the standard ABS input-output tables. This finer level of detail in the extended model is obtained by using the ABS product details tables to disaggregate industry demand information and broad assumptions to disaggregate industry supply information.

- The model is designed to represent a normalised version of 2013/14 Australian economy, using the latest information available. It takes as its starting point the 2009/10 ABS Input-Output (IO) tables, which are the latest available. These are uprated in a simulation of the model that allows for general growth in prices, productivity and labour supply from 2009/10 to 2013/14, includes a long-run assumption for the terms-of-trade, and adjusts investment rates, the trade balance and the government budget position to sustainable levels.

- The model incorporates refined modelling of production in each industry. This includes nine types of produced capital, three fixed factors to capture economic rents, and eight occupations for labour. The model allows for different degrees of substitutability between these factors.

- The model provides a valid measure of changes in consumer welfare based on the equivalent variation, so that policy changes can be correctly evaluated in terms of the public interest.

- The model includes the option to use the tax-adjusted Capital Asset Pricing Model to optimally allocate wealth across asset classes. This captures the economic distortions from applying personal income tax at non-uniform effective rates across asset classes.

- The model includes refined modelling of consumer demand based on a 2-tier approach. In the top tier households allocate their spending across 19 broad categories of consumption, and in the second tier they choose their pattern of consumption within each of these categories. This 2-tier structure takes into account that there may be more scope for households to switch spending within broad categories than between broad categories.

- The model has a highly detailed treatment of business taxation, with a focus on important features of the current Australian system as well as tax designs that have been proposed around the world. It takes into account factors such as: the different tax treatments of debt and equity financing; the complex system of depreciation allowances and tax concessions; franking credits; and the potential for international profit shifting.

This Appendix provides an overview of the model. More detailed documentation is available at www.independenteconomics.com.au

A.2   General features

The Independent Extended CGE Model makes a number of general assumptions that are consistent with its long-term time horizon. Many of these features are shared with other long-run CGE models.

Long-term model

The Independent Extended CGE Model is a long-term model, meaning that results refer to the ongoing effects on the economy after it has fully adjusted to economic shocks. In keeping with this, all markets are assumed to have reached equilibrium. This includes key markets such as the labour market, where the real wage for each type of labour adjusts so that demand from industries is equal to supply from households. In addition, the behaviour of households and government is consistent with the inter-temporal budget constraints that they face. This involves levels of household saving and foreign capital inflow that are consistent with stocks of assets and liabilities growing at the same rate as GDP.

The long-term time horizon is fitting because economic policies should be judged against their lasting effects on the economy, not just their effects in the first one or two years.

Optimising behaviour

Industries and households in the Independent CGE Model optimise, while still remaining within the constraints of production technology and budgets.

- Profit maximisation: the representative business in each industry chooses how to produce (with a mix of primary factors and intermediate inputs) and how much to produce to maximise its profit subject to the prices of its inputs and outputs.

- Utility maximisation: A representative household chooses its consumption levels of each consumer good and service and leisure, and allocates its wealth between assets in a way that maximises its well-being (or utility), subject to budget and wealth constraints.

Budget and wealth constraints

In a sustainable equilibrium, governments and households must meet their budget constraints. For simplicity, we assume that the government budget is balanced in the long run. Given its expenditure requirement, the government chooses its level of taxation consistent with achieving this outcome. In the private sector, a sustainable outcome is one in which household saving is sufficient to generate growth in household assets in line with growth in real GDP. The household sector has an initial endowment of a bundle of assets that determines its wealth, which it then re-allocates between assets by maximising its expected utility in line with the Capital Asset Pricing Model (CAPM).

A.3   Decision makers

This section discusses the interactions between the different decision makers, or 'economic agents' in the Independent CGE model – industries, households, government and the foreign sector.

A.3.1 Trade and demand

The overall structure of each industry in the Independent Extended CGE Model is summarised in Diagram 3.1.

Diagram 3.1 Trade and demand for each product
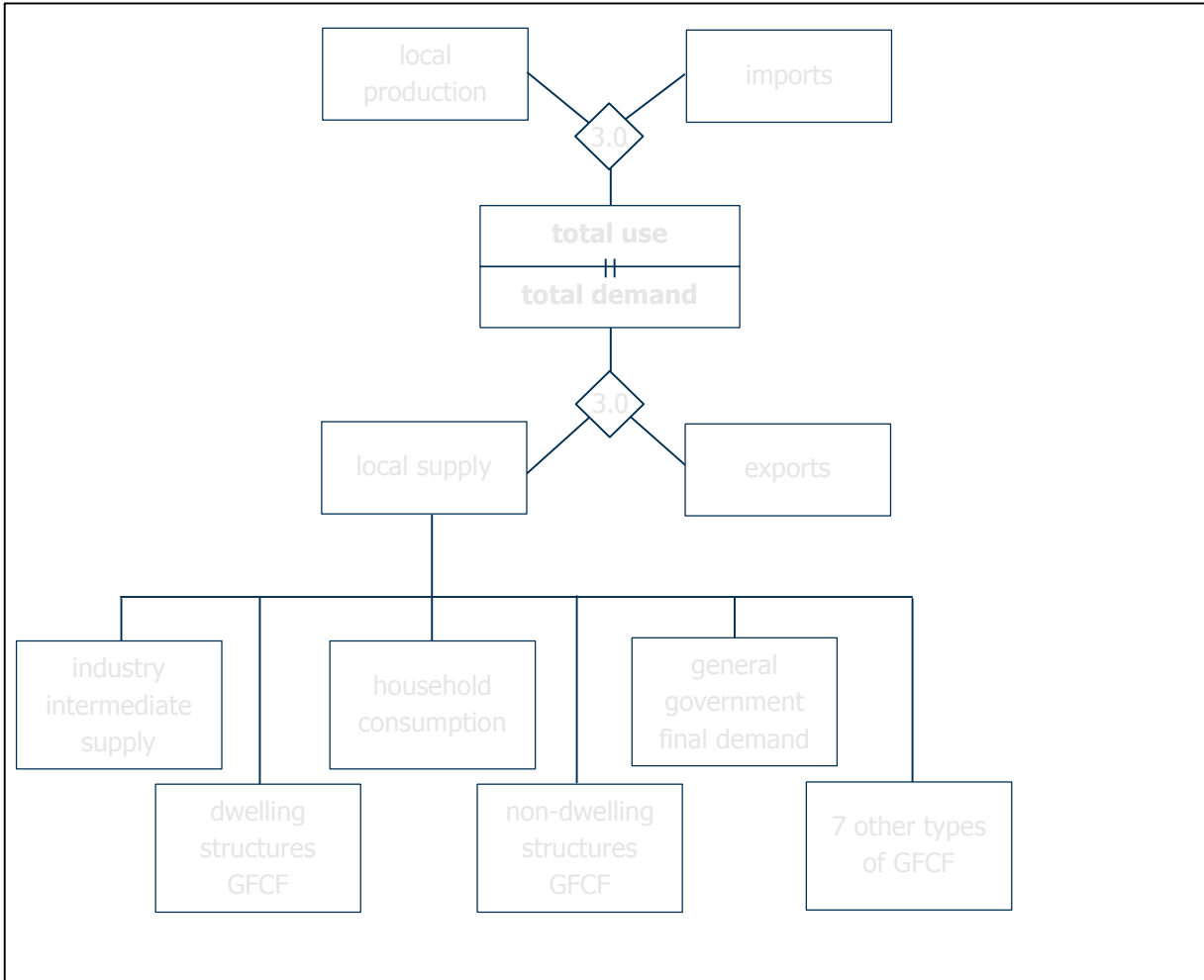
Note: GFCF is Gross Fixed Capital Formation, or investment.

As shown in Diagram 3.1, total supply in the Independent CGE Model is made up of locally produced and imported varieties of each good. Local production competes with imports, and the elasticity of substitution has been set at 3.0 in most industries.

In each industry, the representative firm chooses the amount to supply to the export market and the amount to supply to the domestic market. It does this using a constant elasticity of transformation (CET) function, with an elasticity of 3.0.

Total supply equals total demand in long-run equilibrium. In the model, local production and imports supply the 13 different categories of demand that are shown in Diagram 3.1.

Local production in each of the 288 industries in the Independent CGE Model is modelled in a sophisticated way that identifies a large set of inputs used by industries. It distinguishes 9 types of capital and 9 types of labour according to occupation. It also identifies land and two industry-specific fixed factors, one of which is fixed in supply in Australia (location-specific) and the other which is fixed in supply globally (or firm-specific). These primary factors are combined with intermediate inputs purchased from other industries. The structure of the production decisions is shown in Diagram 3.2.

Each industry can change the mix of inputs that it uses as relative prices change. Some types of primary factors are more substitutable with other factors, and other types of primary factors are less substitutable. To reflect this, the nesting structure of production decisions in the Independent CGE Model is set up in a way that provides for a high degree of flexibility.

Diagram 3.2 below shows an overview of the production technology used by firms in each industry in the Independent CGE model. Further details for non-structure capital, labour and structure services are provided in Diagrams 3.3, 3.4 and 3.5 respectively.

Diagram 3.2 Production in each industry
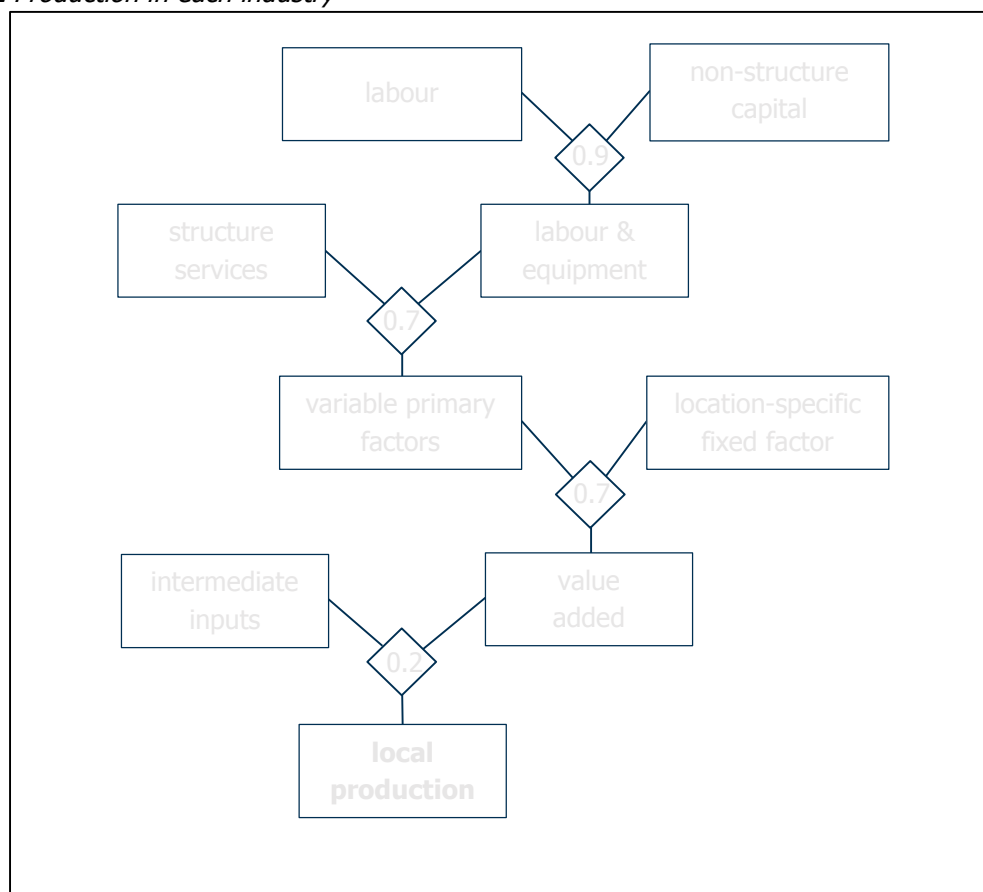
Diagram 3.3 Non-structure capital in each industry
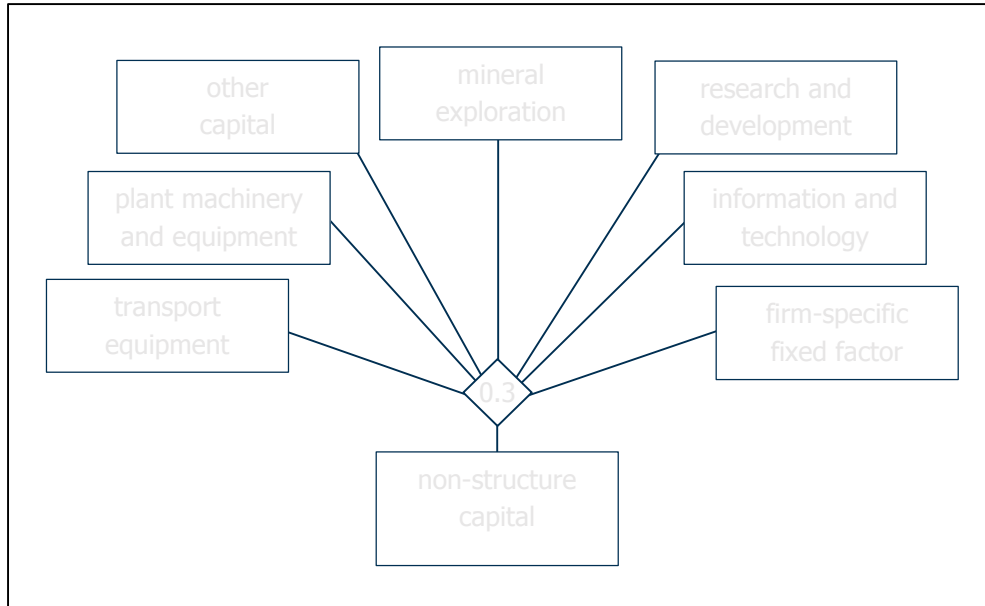
As shown in Diagram 3.4, the modelling of industry demand for each occupation employs a 2-tier structure covering eight occupations. However, the same elasticity of substitution of 1.5 is used at both tiers. This makes it equivalent to arranging the occupations on a single tier with the one elasticity of substitution of 1.5. However, the 2-tier approach allows for greater flexibility in the future.

Diagram 3.4: Industry demand for labour
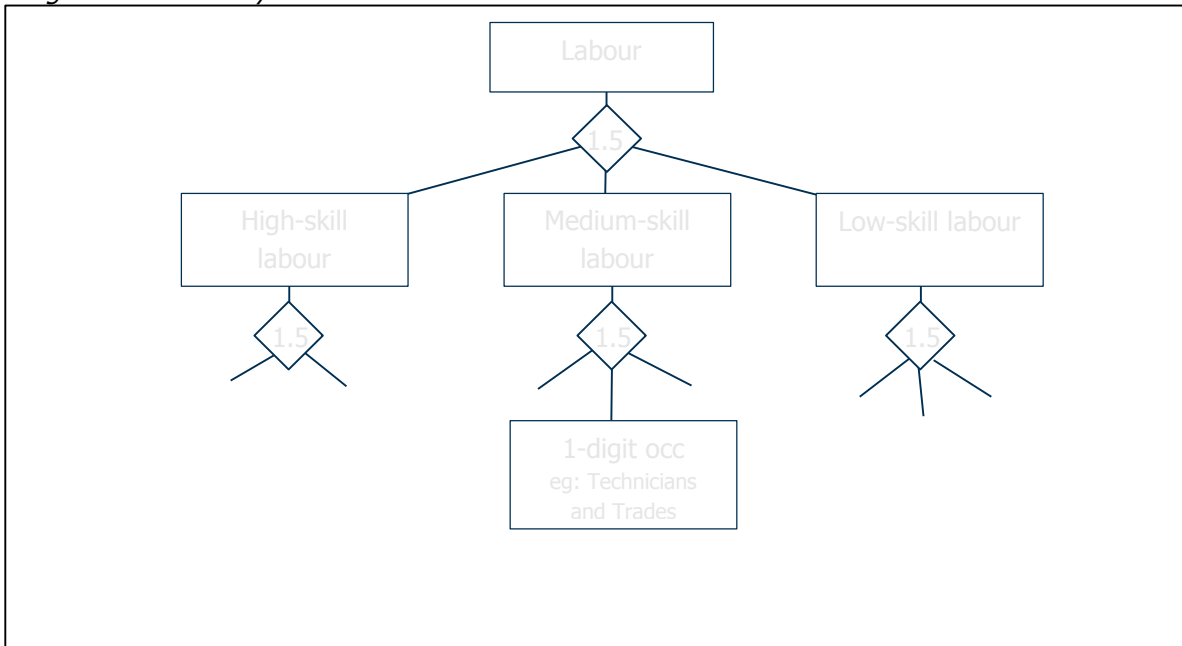
Diagram 3.5 shows that the structure services are produced using non-dwelling structures (which includes commercial buildings and engineering structures such as roads and bridges), non-dwelling land and ownership transfer costs. The need for non-dwelling structures and non-dwelling land to produce structure services is relatively obvious. Ownership transfer costs are incurred as businesses change premises as their needs changes in terms of location or building size or type.

Diagram 3.5 Structure Services in each industry (except Dwellings Services)
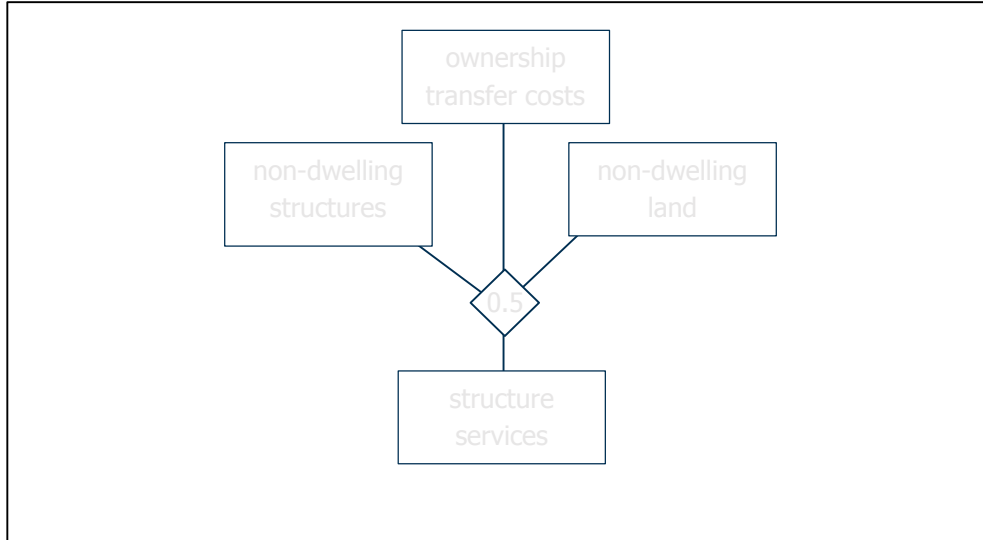
Dwelling services are produced in a broadly comparable way to structure services. The primary factors involved are dwelling structures, dwelling land and ownership transfer costs. This production technology for dwellings services is shown in Diagram 3.6 below. In the Independent Extended CGE model, there are two industries that produce dwelling services, namely, the owner-occupied sector and the rented sector. This is a useful distinction, partly because of differences in tax regimes.

Diagram 3.6 Production of Dwelling Services

7
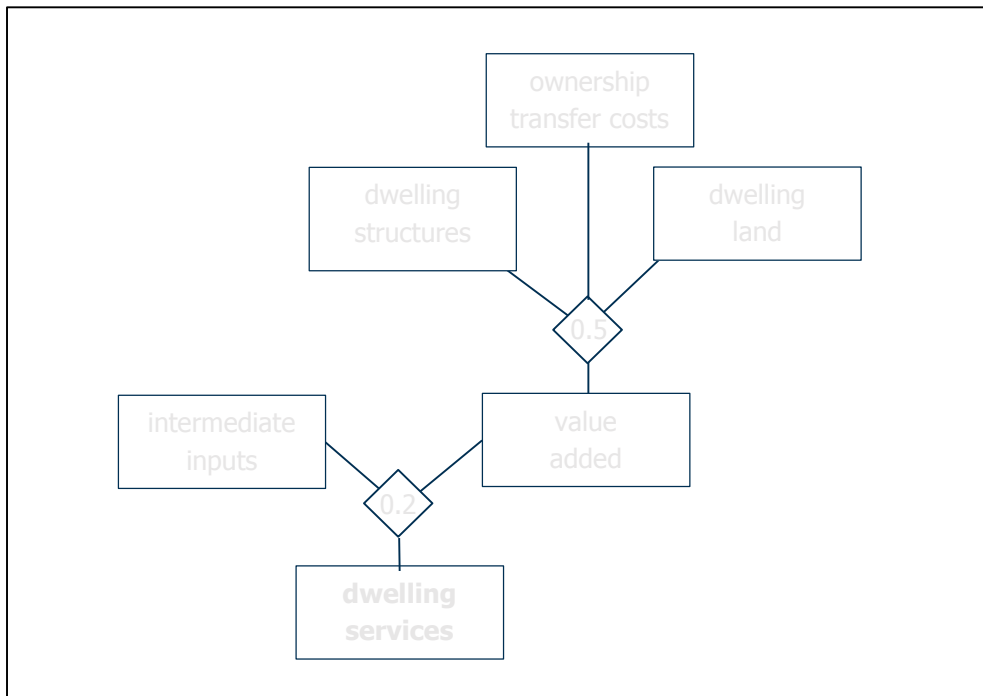
The model separates household decision making into two stages. In the first stage, households allocate their wealth across asset classes. In the second stage, households make choices between work and leisure and between different consumer goods and services. These two stages are now discussed in turn.

In the first stage, the model provides two options for allocating wealth across four broad asset classes: housing, domestic business capital, direct equity investment abroad and portfolio equity investment abroad. The first and simpler option is to use a fixed allocation.

The second option is to model an optimal asset allocation using the tax-adjusted using the Capital Asset Pricing Model (CAPM). This allows the model to capture the economic distortions from applying personal income tax at non-uniform effective rates across asset classes.

The version of the CAPM used here was adjusted for taxes by Brennan (1970), framed in an open economy setting by Bond et al. (2007) and used to model the impacts of changes to taxation of foreign dividends by Desai et al. (2011a).

In the CAPM, none of the four assets are assumed to be "riskless". Households have an initial endowment of each asset that determines the value of their wealth, W. They then allocate this wealth across the four asset classes, W(i), to maximise expected utility, V, which is given by the following.

$$V = W + \Sigma(1\text{-}t(i)).r(i).W(i) + \Sigma a(i).W(i) - \gamma.\sigma^2(W)/(2.W)$$

In the above, the expected pre-tax return from an asset is represented by r(i), the tax rate applied to that return is t(i), a(i) refers to the "amenity" of an asset, which may be positive or negative. The extent of risk aversion is captured in the parameter, γ, and the variance of the return associated with uncertain capital gains is $\sigma^2(W)$ and which depends on the chosen portfolio,. The optimal asset allocation depends on:

- the expected after-tax returns for each asset;
- the variances of returns for each asset;
- the covariances of returns between assets; and
- the amenity of each asset.

After-tax returns are modelled as follows. For the three equity-related asset classes, personal income tax on the component of profits paid out as dividends is taken into account. Dividend payout ratios are assumed to be 2/3 for local-sourced income and 1/2 for foreign-sourced income, based on historical data presented in Shaw Stockbroking (2013). Effective personal income tax rates on dividends are calculated using the formula:

(tp-tc)/(1-tc)

where "tp" is the rate of personal income tax applied to dividends and "tc" is the rate of tax credit. For dividends paid from local-sourced income the rate of tax credit is 30%, reflecting franking credits, while it is zero for dividends paid from foreign-sourced income. The remaining asset class, housing, is assumed to be free of personal income tax. This is on the basis that owner-occupied housing is free of personal

income tax, while for investor housing, debt-related and other deductions mean that the net impact on personal income payment is slightly negative.

The variances and covariances of asset returns are derived from the pre-GFC estimates in the Australian empirical study of Peat et al. (2012). Importantly, as seen in Table 3.1, the returns from the three business capital-based asset classes are strongly positively correlated, suggesting these assets are substitutable, but these returns are largely uncorrelated with the returns from housing.

Table 3.1 Correlation matrix of investment returns

	domestic business capital	housing	direct equity abroad	portfolio equity abroad
domestic business capital	1.00			
housing	-0.13	1.00		
direct equity abroad	0.64	0.06	1.00	
portfolio equity abroad	0.64	0.06	0.70	1.00

Source: Peat et al. (2012) and Independent Economics calculations.

The amenity of each asset is determined in calibrating the model to actual asset holdings at the end of the 2013-14 financial year. The risk aversion parameter was set equal to 10, giving the model's asset allocation similar sensitivity to tax changes to that seen in earlier similar studies by Desai et al. (2011b) and Devereux (2008).

Irrespective of whether asset allocation is based on the first option (fixed allocation) or the second option (CAPM), this asset allocation has a number of functions in the model. It determines the level of asset income, which feeds into the second stage of the household decision making process. It also determines personal income tax collections from asset income. Finally, under the CAPM option, it determines the amenity and riskiness of household portfolios, which both influence household welfare, as discussed below in section 3.4.

Turning to the second stage of the household decision making process, households in the Independent Extended CGE model, after saving at a sustainable rate, choose between leisure and consumption, and then divide their consumption between the 288 goods and services. They do so in a way that maximises their utility. This behaviour is illustrated in Diagram 3.7.

Household full income is the amount of income that households would earn if they maximised their time working and consumed no leisure. Full income is made up of full labour income net of tax, after-tax income from owning assets, and transfers from government.

Household saving out of full income is set at a sustainable rate, namely the rate at which the assets owned by households grow in line with GDP. After saving at this rate, the remainder of full income is available for 'full consumption' – which includes the consumption of leisure and of goods and services.

As illustrated in Diagram 3.7, a 3-tier CES utility function is used in modelling the price-sensitive choices that households make concerning their labour supply and the level and pattern of their consumer demand. The first tier describes household choice between leisure and consumption, the second tier describes their

choices between 19 broad categories of consumption, and the third tier their choices within each of these broad categories. These three tiers are now discussed in turn.

After meeting their savings target, in the first tier households decide how much of their time to spend in leisure, and how much to spend working. The cost of taking leisure is the amount that would have been earned if the time were instead spent working – which is the real after-tax wage.

Having made their saving and leisure decisions, households are left with a budget for actual consumption expenditure. This budget is allocated across the 288 goods and services distinguished in the model in the second and third tiers of decision making.

Diagram 3.7 Household choices and utility
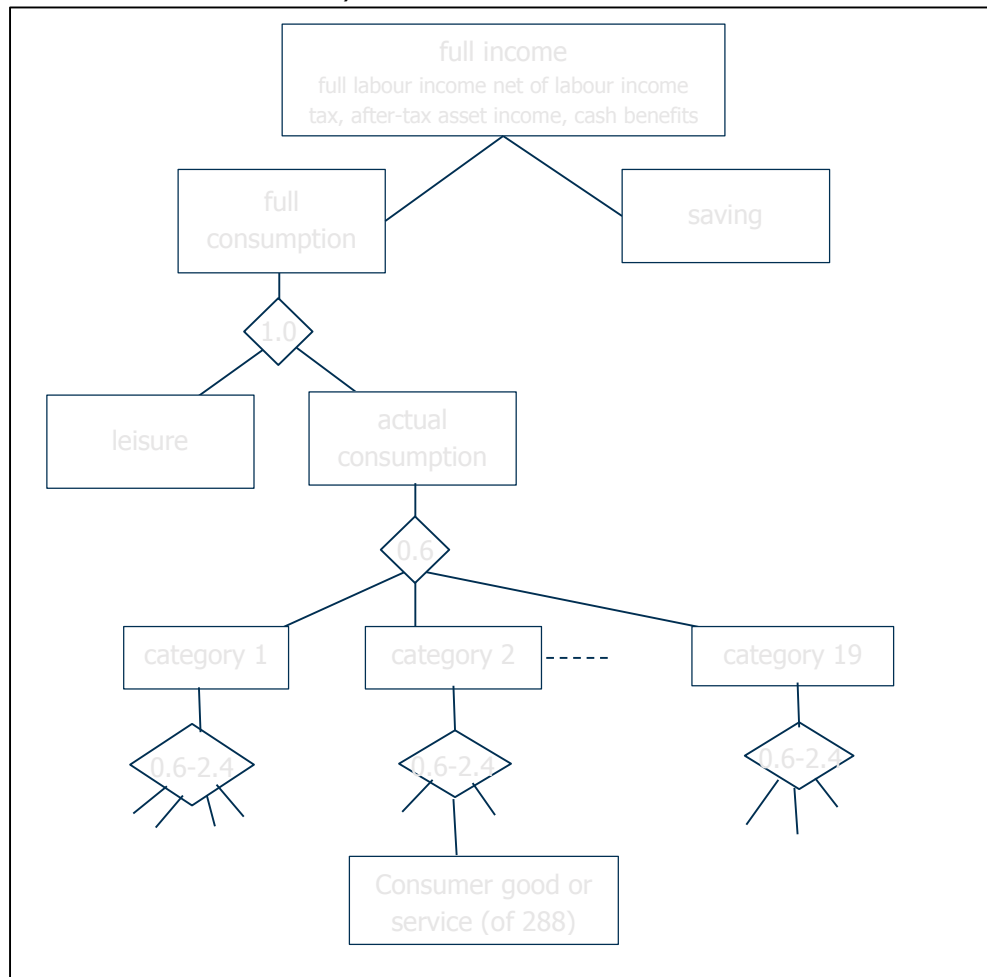
In the second tier, households allocate their spending across 19 broad categories of consumption. Those broad categories are listed in Table 3.1.

Table 3.1 Broad Categories of Consumption

Food	Transport services
Alcoholic beverages	Communication
Cigarettes and tobacco	Goods for recreation and culture
Clothing and footwear	Recreational and cultural services
Housing services	Education services
Water and sewerage services	Catering
Electricity, gas and other fuel	Accommodation services
Furnishings and household equipment	Other goods and services
Health	Financial services
Vehicle purchase and operation	

In the final tier, households choose their pattern of consumption within each of the broad categories, which gives consumer demand for each of the model's 288 goods and services. There is likely to be more scope for households to vary consumption patterns within broad categories than between broad categories. This is taken into account by using a higher default elasticity of substitution of 1.2 in the final tier, compared to 0.6 in the preceding tier. With the final tier, the elasticity of substitution varies between the broad categories, reflecting differing degrees of substitutability.

A.3.4 Measuring household living standards

Measuring household welfare or living standards needs to take into account both stages of the household decision making process.

In the second stage, the assumed homothetic nature of household preferences means that the indirect utility function, V, takes the following simple form.

$$V = CF\$/PFC$$

In the above, CF refers to full consumption, including leisure and actual consumption. CF\$ is total nominal expenditure on full consumption, while PFC is the associated constant utility price index.

Regarding the first stage, no further adjustment to the indirect function is required under the first option of fixed asset allocation. However, under the second option of CAPM allocation, expected utility depends on the three factors, as set out in section 3.3. This first factor was the expected value of asset income. However, its contribution to utility has already been taken into account in the second stage via the inclusion of asset income in full income, as seen in Diagram 3.7. This ensures that changes in asset income flow through dollar-for-dollar to utility via CF\$.

Under CAPM asset allocation, as seen in section 3.3, expected utility also depends on two other factors, the variance of asset income and the amenity of each asset. This can be taken into account by extending the concept of nominal full consumption used in defining indirect utility as follows.

$$CFE\$ = CF\$ + \Sigma a(i).W(i) - \gamma.\sigma^2(W)/(2.W)$$

$$V = CFE\$/PFC$$

In the above, W refers to total wealth and W(i) to a component of wealth. The parameters represented by Greek letters are $\sigma^2(W)$, which is the variance in asset income and wealth associated with uncertainty in capital gains, and γ, which reflects the degree of risk aversion. Taking into account that the variance in asset income depends on the variances and covariances of asset returns, $\sigma(i,j)$, the expression for extended nominal full consumption becomes the following.

$$CFE\$ = CF\$ + \Sigma a(i).W(i) - \gamma. \Sigma\Sigma W(i).W(j).\sigma(i,j)/(2.W)$$

In practice, the covariances in asset returns are calculated using the data in Peat et al. (2012) on standard deviations and correlations of returns.

$$\sigma(i,j) = \rho(i,j,).\sigma(i).\sigma(j)$$

Having constructed an indirect utility function, welfare losses can now be measured. In comparing a policy scenario ("p") with a baseline scenario ("b"), the loss in consumer welfare from the policy scenario can be measured using either the compensating variation, CV, or the equivalent variation, EV.

$$CV = \{PFC(p)/PFC(b)\}.CFE\$(b) - CFE\$(p)$$

$$EV = CFE\$(b) - \{PFC(b)/PFC(p)\}.CFE\$(p)$$

In practice, the model calculates the EV. Formally, this is defined as the amount of income that households could forego under the baseline scenario while still enjoying the same level of utility as they would under the policy scenario.

For ease of interpretation, the model reverses the sign of the EV so that it measures welfare gains as positive and welfare losses as negative.

One application of the EV is in determining the excess burden of taxes, which is a measure of the welfare loss per dollar of tax revenue raised. Excess burdens can be calculated for each tax and compared across taxes to assist policy makers in designing a tax system which minimises the adverse impact of raising revenue on household welfare.

A.3.5 Government

On the expenditure side of the government budget, it is assumed that real government final demand for the 288 goods and services is determined exogenously by government spending policies. Because government expenditures are exogenous in real terms, if prices change, then nominal government expenditures change accordingly. Cash benefits paid to households are modelled as lump sum transfers.

On the revenue side of the government budget, the model distinguishes indirect taxes on production and components of final demand, as well as direct taxes such as company income tax, personal income tax, and mining taxes. To ensure that the government budget position is sustainable, the model user designates a swing tax policy that adjusts automatically to keep the budget in balance in long run equilibrium. In the Independent CGE Model, either the tax rate on labour income or cash benefits or GST can be used for this purpose.

The modelling of Australia's relationship with the foreign sector recognises Australia's position as a small, open economy. This is the case for both trade and capital flows.

Australia is a price taker for imports, meaning that changes in the Australian economy do not influence the foreign-currency price of imports. Likewise, Australia is also close to being a price taker for exports, with a standard value for the export price elasticity of demand of -12. For some industries, where Australia has some market power or product differentiation (e.g. tourism services) a lower value of -6 is used.

Under the small country assumption, Australia can access the world market for funds, so long as the post-corporate tax rate of return that is achieved matches the given rate required on the world capital market. That is, the after-tax required rate of return on capital is determined overseas and is not influenced by changes in the domestic economy.

Australian wealth is allocated across four asset classes using a CAPM, as outlined in section 3.3. With levels of Australian-owned assets determined in this way, any change in the capital stock is funded by a change in foreign-owned capital.

Foreign ownership of the capital stock must also be in a sustainable long-run equilibrium. The annual inflow of investment funds, recorded on the capital account in the balance of payments, is an amount that ensures that the foreign-owned capital stock grows at a sustainable rate – the long-run rate of GDP growth. The payments to service this borrowing, an outflow on the current account, reflects the required after-tax return on the foreign-owned assets.

Together, the inflow on the capital account and the outflow on the current account imply a certain trade balance if external balance is to be achieved. Exchange rate adjustments ensure that this balance is achieved.

A.4   Industry detail

The original Independent CGE model, which was developed in 2012, followed comparable models in basing its industry detail on the standard ABS input-output tables. Those tables distinguish around 110 industries, the precise number depending on the year of the tables.

The Independent Extended CGE model was developed in 2014. Among its enhancements to the original model, it now extends its detail to distinguish 288 industries. The 288 industries are listed in Table 4.1. The two main aspects of this development work were to devise a method for disaggregating the original 114 industries and to choose the specific disaggregation.

To split the original industries, a disaggregation is needed for both the demand and supply sides.

On the demand side, a disaggregation is available from the ABS product details tables. The 2009/10 edition of these tables provide the demand side information for as many as 1,231 products. These were aggregated to obtain the demand side information for the 288 industries used in the extended model.

On the supply side, there is no disaggregation available from the ABS. In disaggregating from 114 to 288 industries, on the supply side inevitably an initial, simplifying assumption was made that the cost structure of each sub-industry was the same as for its parent industry. This assumption will be refined over time. In particular, in undertaking model applications that may be sensitive to this assumption, the sub-industries that are important for the application will be identified and investigated and, where appropriate, adjustments will be made to the allocation of costs between sub-industries.

In principle, using the 2009/10 product details tables allows a model developer to distinguish anything between 114 and 1,231 industries. Choosing 288 industries involved a trade-off between model richness and model maintenance costs. The trade-off was resolved by distinguishing industries that are more likely to be useful in model applications.

A complication in using the product details tables is that there are a significant number of entries that are suppressed by the ABS to protect the confidentiality of individual businesses. However, the information that is provided, together with reasonable assumptions, were used to obtain estimates for these entries that are considered to be reasonable. This was a time-intensive process.

Table 4.1 List of Industries in the Independent Extended CGE model

0101A	Sheep Farming
0101B	Beef Cattle Farming
0101C	Grain Growing
0101D	Dairy Cattle Farming
0102A	Poultry Farming
0102B	Deer Farming
0102C	Other Livestock Farming
0103A	Nursery and Floriculture Production
0103B	Mushroom Growing
0103C	Vegetable Growing (Under Cover)
0103D	Potatoes
0103E	Other Vegetables
0103F	Fruit and Tree Nut Growing

0103G	Other Crop Growing
0201Z	Aquaculture
0301Z	Forestry and Logging
0401A	Fishing
0401B	Hunting and Trapping
0501A	Forestry Support Services
0501B	Agriculture and Fishing Support Services
0601Z	Coal mining
0701A	Crude oil (incl. condensate)
0701B	Gas Extraction
0801Z	Iron Ore Mining
0802A	Gold Ore Mining
0802B	Other Metal Ore Mining
0901A	Construction Material Mining
0901B	Other Non-Metallic Mineral Mining and Quarrying
1001A	Exploration
1001B	Other Mining Support Services
1101A	Meat Processing
1101B	Poultry Processing
1101C	Bacon and Ham
1101D	Other Smallgoods
1102Z	Processed Seafood Manufacturing
1103A	Milk
1103B	Cheese
1103C	Ice cream and other dairy products
1104A	Jams
1104B	Other Fruit Processing
1104C	Vegetables, frozen
1104D	Vegetables, prepared or preserved
1104E	Tomato pulp, puree and paste
1104F	Other processed vegetables
1105Z	Oils and Fats Manufacturing
1106A	Grain Mill Product Manufacturing
1106B	Cereal, Pasta and Baking Mix Manufacturing
1107A	Bread Manufacturing
1107B	Other Bakery Product Manufacturing
1108A	Sugar Manufacturing
1108B	Confectionery Manufacturing
1109A	Potato, Corn and Other Crisp Manufacturing
1109B	Prepared Animal and Bird Feed Manufacturing
1109C	Coffee and tea, including substitutes
1109D	Other Food Product Manufacturing n.e.c.
1201Z	Soft Drinks, Cordials and Syrup Manufacturing
1202A	Beer: packaged
1202B	Beer: draught
1205A	Spirits: full-strength
1205B	Spirits: RTDs

1205C	Wine: bottled
1205D	Wine: cask
1205E	Cider
1205F	Cigarette and Tobacco Product Manufacturing
1301Z	Textile Manufacturing
1302Z	Tanned Leather, Dressed Fur and Leather Product Manufacturing
1303A	Textile Floor Covering Manufacturing
1303B	Rope, Cordage and Twine Manufacturing
1303C	Cut and Sewn Textile Product Manufacturing
1303D	Textile Finishing and Other Textile Product Manufacturing
1304Z	Knitted Product Manufacturing
1305Z	Clothing Manufacturing
1306Z	Footwear Manufacturing
1401Z	Sawmill Product Manufacturing
1402Z	Other Wood Product Manufacturing
1501Z	Pulp, Paper and Paperboard Manufacturing
1502A	Paper Stationery Manufacturing
1502B	Sanitary Paper Product Manufacturing
1502C	Other Converted Paper Product Manufacturing
1601A	Printing and Printing Support Services
1601B	Reproduction of Recorded Media
1701A	Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)
1701B	Kerosene (incl kerosene type jet fuel)
1701C	Petrodiesel
1701D	Other Petroleum Refining and Petroleum Fuel Manufacturing
1701E	Other Petroleum and Coal Product Manufacturing
1801Z	Human Pharmaceutical and Medicinal Product Manufacturing
1802Z	Veterinary Pharmaceutical and Medicinal Product Manufacturing
1803A	Basic Chemical Manufacturing
1803B	Basic Polymer Manufacturing
1803C	Fertiliser and Pesticide Manufacturing
1803D	Other Basic Chemical Product Manufacturing
1804A	Soap and Toothpaste Manufacturing
1804B	Other Cleaning Compound Manufacturing
1804C	Cosmetic and Toiletry Preparation Manufacturing
1901A	Tyre Manufacturing
1901B	Other Polymer Product Manufacturing
1902Z	Natural Rubber Product Manufacturing
2001Z	Glass and Glass Product Manufacturing
2002Z	Ceramic Product Manufacturing
2003Z	Cement, Lime and Ready-Mixed Concrete Manufacturing
2004Z	Plaster and Concrete Product Manufacturing
2005Z	Other Non-Metallic Mineral Product Manufacturing
2101A	Basic Ferrous Metal Manufacturing
2101B	Basic Ferrous Metal Product Manufacturing
2102A	Alumina Production
2102B	Aluminium Smelting

2102C	Copper, Silver, Lead and Zinc Smelting and Refining
2102D	Gold - primary and secondary (excl from purchased scrap)
2102E	Other Basic Non-Ferrous Metal Manufacturing
2102F	Basic Non-Ferrous Metal Product Manufacturing
2201Z	Forged Iron and Steel Product Manufacturing
2202Z	Structural Metal Product Manufacturing
2203A	Metal Container Manufacturing
2203B	Sheet Metal Product Manufacturing (except Metal Structural and Container Products)
2204Z	Other Fabricated Metal Product manufacturing
2301A	Motor Vehicle Manufacturing
2301B	Motor Vehicle Body and Trailer Manufacturing
2301C	Automotive Electrical Component Manufacturing
2301D	Other Motor Vehicle Parts Manufacturing
2301E	Other Transport Equipment Manufacturing n.e.c.
2302A	Shipbuilding and Repair Services
2302B	Boatbuilding and Repair Services
2303Z	Railway Rolling Stock Manufacturing and Repair Services
2304Z	Aircraft Manufacturing and Repair Services
2401A	Photographic, Optical and Ophthalmic Equipment Manufacturing
2401B	Medical and Surgical Equipment Manufacturing
2401C	Other Professional and Scientific Equipment Manufacturing
2401D	Computer and Electronic Office Equipment Manufacturing
2401E	Communication Equipment Manufacturing
2401F	Other Electronic Equipment Manufacturing
2403Z	Electrical Equipment Manufacturing
2404Z	Domestic Appliance Manufacturing
2405A	Pump, Compressor, Heating and Ventilation Equipment Manufacturing
2405B	Specialised Machinery and Equipment Manufacturing
2405C	Other Machinery and Equipment Manufacturing
2501Z	Furniture Manufacturing
2502A	Jewellery and Silverware Manufacturing
2502B	Toy Manufacturing
2502C	Sporting Product Manufacturing
2502D	Other Manufacturing n.e.c.
2601A	Fossil Fuel Electricity Generation
2601B	Hydro-Electricity Generation
2601C	Other Electricity Generation
2605A	Other electricity service income
2605M	Margin - Electricity transmission, distribution and on selling (2620-2640)
2701A	Other gas service income
2701M	Margin - gas distribution
2801Z	Water Supply, Sewerage and Drainage Services
2901Z	Waste Collection, Treatment and Disposal Services
3001Z	Residential Building Construction
3002Z	Non-Residential Building Construction
3101A	Road and Bridge Construction
3101B	Other Heavy and Civil Engineering Construction

3201Z	Construction Services
3301A	Non-margin - wholesaling services
3301B	Commission-Based Wholesaling
3301M	Margin - wholesaling services
3901A	Non-margin - retailing services
3901B	Retail commission on sales
3901M	Margin - retailing services
4401Z	Accommodation
4501A	Meal preparation and presentation
4501B	Beverage serving service
4501C	Takeaway food
4501D	Catering services
4501E	Net losses from gambling - Clubs, pubs, taverns and bars (Hospitality)
4501M	Margin - food and beverage services (4511-4530)
4601A	Non-margin - Road Freight Transport
4601B	Road Passenger Transport
4601M	Margin - Road Freight Transport
4701A	Non-margin - Rail Freight Transport
4701B	Rail Passenger Transport
4701M	Margin - Rail Freight Transport
4801A	Non-margin - Water Freight Transport
4801B	Water Passenger Transport
4801M	Margin - Water Freight Transport
4901A	Non-margin - Air and Space Freight Transport
4901B	Air and Space Passenger Transport
4901M	Margin - Air and Space Freight Transport
4801C	Scenic and Sightseeing Transport
4801D	Non-margin - Pipeline and Other Transport
4801N	Margin - Pipeline and Other Transport
5101Z	Postal and Courier Pick-up and Delivery Service
5201A	Water Transport Support Services
5201B	Airport Operations and Other Air Transport Support Services
5201C	Other Transport Support Services
5201D	Warehousing and Storage Services
5201M	Margin - Water Transport Support Services
5401A	Newspaper and Magazine publishing
5401B	Book publishing
5401C	Other Publishing
5401D	Software Publishing
5501A	Motion Picture and Video Activities
5501B	Sound Recording and Music Publishing
5601A	Radio Broadcasting
5601B	Television Broadcasting
5701A	Internet Publishing and Broadcasting
5701B	Internet Service Providers and Web Search Portals
5701C	Data Processing, Web Hosting and Electronic Information Storage Services
5801A	Wired Telecommunications Network Operation

5801B	Other Telecommunications Network Operation
5801C	Other Telecommunications Services
6001A	Libraries and Archives
6001B	Other Information Services
6201A	Banks, building societies, credit unions
6201B	Other Depository Financial Intermediation
6201C	Non-Depository Financing
6201D	Financial Asset Investing
6301A	Life Insurance
6301B	Health Insurance
6301C	General Insurance
6301D	Superannuation Funds
6301M	Marine insurance provision (Margin)
6401A	Financial Asset Broking Services
6401B	Other Auxiliary Finance and Investment Services
6401C	Auxiliary Insurance Services
6601A	Goods and Equipment Rental and Hiring
6601B	Non-Financial Intangible Assets (Except Copyrights) Leasing
6701A	Residential Property Operators: owner-occupied
6701B	Residential Property Operators: rented
6702A	Non-Residential Property Operators
6702B	Real Estate Services
6901A	Scientific Research Services
6901B	Architectural Services
6901C	Surveying and Mapping Services
6901D	Engineering Design and Engineering Consulting Services
6901E	Other Specialised Design Services
6901F	Scientific Testing and Analysis Services
6901G	Legal Services
6901H	Accounting Services
6901I	Advertising Services
6901J	Market Research and Statistical Services
6901K	Corporate Head Office Management Services
6901L	Management Advice and Related Consulting Services
6901O	Veterinary Services
6901P	Professional Photographic Services
6901Q	Other Professional, Scientific and Technical Services n.e.c.
7001Z	Computer Systems Design and Related Services
7210A	Employment Placement and Recruitment Services
7210B	Labour Supply Services
7210C	Travel Agency and Tour Arrangement Services
7210D	Other Administrative Services
7310A	Building Cleaning, Pest Control and Gardening Services
7310B	Packaging Services
7501Z	Public Administration and Regulatory Services
7601Z	Defence
7701Z	Public Order and Safety

8010A	Preschool Education
8010B	Primary Education
8010C	Secondary Education
8010D	Special School Education
8110A	Technical and Vocational Education and Training
8110B	Higher Education
8210A	Adult, Community and Other Education
8210B	Educational Support Services
8401A	Hospitals
8401B	Medical Services
8401C	Pathology and Diagnostic Imaging Services
8401D	Dental Services
8401E	Optometry and optical dispensing
8401F	Other Allied Health Services
8401G	Other Health Care Services
8601A	Aged Care Residential Services
8601B	Other Residential Care Services
8601C	Child Care Services
8601D	Other Social Assistance Services
8901A	Museum Operation
8901B	Parks and Gardens Operations
8901C	Creative and Performing Arts Activities
9101A	Sports and Physical Recreation Activities
9101B	Horse and Dog Racing Activities
9101C	Amusement and Other Recreation Activities
9201A	Casino Operation
9201B	Lottery Operation
9201C	Other Gambling Activities
9401Z	Automotive Repair and Maintenance
9402A	Machinery and Equipment Repair and Maintenance
9402B	Other Repair and Maintenance
9501A	Personal Care Services
9501B	Funeral, Crematorium and Cemetery Services
9501C	Laundry and Dry-Cleaning Services
9501D	Photographic Film Processing
9501E	Parking Services
9501F	Other Personal Services n.e.c.
9501G	Private Households Employing Staff and Undifferentiated Goods- and Service-Producing Activities of Households for Own Use
9502A	Religious Services
9502B	Civic, Professional and Other Interest Group Services

A.5   Regional module

The Independent Extended CGE model is designed as a national model. This is because many economic issues are national in scope and the most important data source for CGE models – the input-output tables – are only available at the national level. However, economic impacts sometimes vary markedly across regions and to take that into account it is useful to be able to disaggregate national outputs to the regional level.

A regional module was added in 2015. It uses a top down approach to extend the model outputs from the national level to the regional level. This involved selecting regions, designing the top down methodology and sourcing regional data.

In selecting regions, it is important that each region is defined broadly enough to be considered as a distinct regional economy. This is so it can be assumed, in broad terms, that people live and work within the same region. Taking that into account, the ABS recommends the Statistical Area Level 4 (SA4) as the most detailed level that is suitable for regional economic modelling. The Independent Extended CGE model distinguishes 50 regions in Australia, consisting of the six greater state capital regions, and the 44 SA4s that make up the rest of Australia. The six greater capital cities are not divided down into the SA4 level. This is because the confined geographic areas of the capital cities combined with urban transport networks mean that people in state capital cities often live and work in different SA4s within the same city.

The top down methodology used in the regional module is derived rigorously starting from economic assumptions about regional economies. For a rigorous top down approach to be applied, regional economies are assumed to differ in a limited number of ways. In particular, it is assumed that each region has access to the same production technologies, consumers have the same tastes, labour is perfectly mobile between regions, and consumers in each region own assets from a national pool rather than a regional pool. As will be demonstrated below, these assumptions, taken together, mean that prices and wages can be expected to be same in each region. This in turn means that consumer spending patterns and input mixes in each industry are the same in each region.

As is common in regional modelling, a distinction is made between industries that produce tradeables and industries that produce non-tradeables. A tradeable industry is assumed to be a price taker for its output, which it sells on national and/or international markets. A non-tradeable industry is assumed to sell its output in the market of its own region, with no competition from imports from other regions or countries.

Where regional economies are assumed to differ is in the resources available to each tradeable industry. In particular, each tradeable industry has its own fixed factor of production, which is distributed exogenously between regions. A region's share of production for a tradeable industry is then determined by its share of that industry's fixed factor. Production in each tradeable industry in turn stimulates its own pattern of local demand across non-tradeable industries, including demand generated by household and government consumption, investment and exports.

The high degree of sameness between regions under this approach provides the conditions for top down modelling, where regional outcomes can be derived starting from national outcomes. Indeed, given national outcomes, regional outcomes can be generated using the simple technique of input-output analysis. This can be seen by considering each regional economy under the above assumptions.

Perfect mobility of labour means that utility of a household will be equalised across regions at some level, V. This is expressed below in terms of the indirect utility function, V(.), which takes the same form in each region because of the assumption that tastes are the same. The price of tradeables is determined at the national level and so is the same in each region.

$V = V(P_t, P_{nr}, M_r/N_r)$ for all r

P_t and P_{nr} are the vectors of prices for traded and non-traded goods in region r, M_r is income in region r, and N_r is employment in region r.

Income in region r is made up of labour income, plus the region share of national income from productive assets, includes variable capital K and fixed capital F. Assuming a national capital market, rates of return will not vary between regions for any particular asset.

$$M_r = W_r.N_r + (N_r/N).\sum_r (rk_n.PK_{nr}.K_{nr} + rk_t.PK_{tr}K_{tr} + rf_t.PF_{tr}.F_{tr})$$

Dividing by employment to obtain income per employed person and substituting this into the indirect utility function gives equation (1).

$$V = V(P_t, P_{nr}, W_r + (1/N).\sum_r (rk_n.PK_{nr}.K_{nr} + rk_t.PK_{tr}K_{tr} + rf_t.PF_{tr}.F_{tr}))$$ for all r   (1)

Under constant returns to scale, profit maximisation leads to a zero pure profits condition for each non-tradeable industry. These zero pure profit conditions take the same form in each region, under the assumption that the available technology is the same in each region. They are expressed after eliminating the price for capital goods used by the non-tradeables industries, PK_{nr}.

$P_{nr} = g(P_t, P_{nr}, W_{r,}, rk_n)$ (2)

Because the price of tradeables and the required rate of return on capital are determined at the national level, equation (2) is a set of n equations, which are the same for each region, and involve the (n+1) unknowns of P_{nr} and W_r. This means that the prices for non-tradeables will be the same in each region if wages are also the same. However, the perfect labour mobility assumption of equation (1) provides a further equation, which is also the same in each region and involves the same set of endogenous variables. Effectively it requires the real wage to be the same in each region. Thus, each region will have the same wage and the same prices for all non-traded goods.

With relative prices the same in each region, Hicks composite commodity theorem applies. In this case it is regions, rather than commodities, which may be aggregated for analysis. In this case the theorem is not been used to aggregate from regions to the national level but rather to do the reverse – to disaggregate from the national level to regions.

For tradeable industries, the key assumption is that each such industry has a fixed factor that is distributed exogenously between regions. With prices the same in each region, each region will combine other inputs in the same proportions with the fixed factor. This means that each region's share of national production of a given tradeable will equal its given share of the fixed factor for that tradeable. Further, each region will also face the same import prices, leading to the same import propensities. Thus, each region's share

of total use of a tradeable will also equal its given share of the fixed factor for that tradeable.

This makes it straightforward to apply the top down methodology to estimate use of tradeables in each region. The first step is to simulate the national model, to obtain national use of each tradeable. Each region's historical share of activity for each tradeable industry is then used to estimate use of tradeables, u_T, in any given region.

To determine the use of non-tradeables, the key observation is that relative prices and the associated optimal consumption and input mixes have already been determined at the national level. Under the assumptions made above, the same mixes are also optimal at the regional level. This means that the technique of input-output analysis can be adapted to solve for the use of non-tradeables.

It is important that the various coefficient matrices are re-calculated for each simulation of the national model. This is because relative prices and associated optimal mixes are likely to vary between simulations of the national model.

To obtain the solution for total use of non-tradeables in a region, the regional model is written in the following form, which is similar to the form of an input-output model.

$$x = A.x + D.i + e - m + n \tag{3}$$

$$f = L.x \tag{4}$$

In the above, x is the vector of industry production, A is the usual matrix of input-output coefficients determining intermediate use, D is the matrix of domestic demands, i is a column vector of ones, e is foreign exports, m is foreign imports and n is inter-regional net exports. Note that in solving the regional module A is fixed, because any sensitivity of intermediate demands to relative prices has already been taken into account in constructing A from the outputs of the national model. The same principle applies for factor demands so L is also fixed when solving the regional module.

Equation (4) determines a region's demand for primary factors, f, by aggregating over the demand from all industries. This involves applying the matrix of primary factor demand intensities, L, to the industry production vector, x. The matrix L, like the matrix A, is constructed from the outputs of the national model.

Under the assumptions made earlier, the following relationships will hold in the regional model.

$$e = \overset{\wedge}{\theta} \cdot x \tag{5}$$

$$m = \overset{\wedge}{\alpha} \cdot x \tag{6}$$

$$D.i = D_n \cdot \overset{\wedge}{f_n}^{-1} \cdot f \tag{7}$$

Exports and imports are determined from production using the national-level propensities.

A region's share of each column of the national matrix of domestic demands, D_n, is determined by its share of use of the associated primary factor. For example, under the assumptions made above, its share

of the consumption vector will be determined by its share of national employment. Further, its share of each category of investment will be determined by its share of use of the corresponding category of capital.

$\hat{f}_n$ is a diagonal matrix showing the total use of each primary factor at the national level. The ordering of the rows of fn and f is based on the ordering of primary factors in driving each column of final demands. If the same primary factor drives more than one category of final demand (employment drives both household consumption and government consumption) it appears more than once and if it does not drive any categories of final demand (as is the case for fixed factors) it does not appear at all.

Using equations (4), (5), (6) and (7) in equation (3) and re-arranging gives the following.

$$Q.x = n \tag{8}$$

where:

$$Q = I - A - D_n . \hat{f}_n^{-1} . L - \hat{\theta} + \hat{\alpha}$$

Without loss of generality, the industries can be ordered so that the tradeable industries appear first, followed by the non-tradeable industries. The matrices in equation (8) can then be partitioned as follows.

$$Q = \begin{bmatrix} Q_{TT} & Q_{TN} \\ Q_{NT} & Q^{NN} \end{bmatrix}$$

$$x = \begin{bmatrix} x_T \\ x^N \end{bmatrix}$$

$$n = \begin{bmatrix} n_T \\ 0 \end{bmatrix}$$

Equation (8) can now be divided into separate sets of equations for tradeables and non-tradeables.

$$Q_{TT}.x_T + Q_{TN}.x_N = n_T \tag{9}$$

$$Q_{NT}.x_T + Q_{NN}.x_N = 0 \tag{10}$$

Using equation (10), the solution for production non-tradeables is given be equation (11).

$$x_N = -Q_{NN}^{-1} \cdot Q_{NT} .x_T \tag{11}$$

Net inter-regional exports of tradeables can then be determined recursively from equation (9), which can be written more simply as equation (12), where Q_T represents the rows of Q for tradeable industries.

$$n_T = Q_T .x \tag{12}$$

It is computationally straightforward to use equations (11) and (12) to solve the system. Having obtained x_T in the simple manner described above, solving the system for each region only requires the matrix Q, which is constructed entirely from outputs of the national model. Q is transformed according to equations (10) and (11), stored, and used repeatedly to solve for each region. Thus, only one matrix inversion is required using national data, and no further matrix inversions or manipulations are required in solving for all of the regions.

Once x has been determined, regional-level results for other variables are readily generated as required using equations (4), (5), (6) and (7).

As is clear from equation (11), under this approach, any expansion or contraction in a tradeable industry in a region will flow through to demand for non-tradeables, generating a regional multiplier effect. Major examples of such non-tradeable industries in the regional module include retail trade, construction, health services, school education and food and beverage services.

An advantage of the top down modelling approach is that, by assuming that regional economies differ in only limited ways, less region-specific data is needed. This is just as well because the key data needed for CGE modelling at the national level, input-output tables, are not available at the regional level. The top-down approach only requires data on each region's share of each tradeable industry.

These regional shares were calculated primarily from employment data collected in the 2011 ABS Census. This data shows, for each SA4 region, the breakdown of employment across 86 2-digit industries. One of these 2-digit industries is agriculture. Activity in each SA4 region in agriculture was broken down further to 13 sub-industries using the 2012-13 ABS data on the value of individual agricultural commodities produced in each SA4 region (ABS Cat No. 7503.0).

After matching industries in this regional database to industries in the national model, the final outcome was a regional module with 89 industries. This is fewer than the 288 industries in the national model. The regional module provides results only for quantities. However, prices are not required, because they are the same as at the national level.

A.6   Baseline scenario and validation

The model uses a variety of recent data, but the main source is the detailed Input-Output (IO) tables from the ABS, giving the model a detailed picture of the Australian economy. The latest available tables are used, specifically the 2009/10 IO tables released in late 2013. This also means that the model uses the contemporary ABS industry classification, ANZSIC 2006. The model is calibrated so that it exactly reproduces this 2009/10 data.

The next step is to simulate a baseline scenario for use as a point of reference. This involves two aspects, uprating the economy from 2009/10 to 2013/14 and normalising the economy to a sustainable position. That is, the baseline scenario provides a normalised, or sustainable, version of the 2013/14 economy.

Uprating the economy from 2009/10 to 2013/14 involves simulating the model after adjusting the model's inputs for the effects of economic developments from 2009/10 to 2013/14. This includes allowing for growth in wages, import prices, productivity and employment from 2009/10 to 2013/14.

Normalising the economy involves taking into account the differences between the structure of the economy in 2009/10, compared to an economy in a long-run sustainable equilibrium. This involves normalising the trade balance, the government budget balance, rates of business investment, and the level of the terms-of-trade.

The model has been tested to ensure that it observes a number of widely-accepted balance and neutrality properties for CGE models.

- GDP by expenditure always equals GDP by income. This is true for both nominal and real GDP in all simulations, which is a useful check on the consistency of the model's coding.

- Walras' Law states that if all but one market is in equilibrium, then the last market must also be in equilibrium. In the Independent Extended CGE Model, equilibrium is not imposed in one of the 8 labour markets, but is nevertheless always achieved in that market in model simulations as a consequence of Walras' Law.

- The Independent CGE Model observes price neutrality. When the average nominal wage or numeraire is increased by two per cent, all prices in the model increase by exactly two per cent, and all real variables are unaffected, in accordance with the expected price neutrality property.

- The Independent CGE Model also observes real neutrality. This means that when all of the exogenous real variables are two per cent higher, all of the endogenous real variables are also two per cent higher. The exogenous real variables in the Independent CGE Model are: full labour supply; real general government final demand by industry; the supplies of industry-specific fixed factors; the supplies of land; the initial holdings of the four real assets owned by the household sector; and the size of the world economy.

A.7   Business tax

Analysis of the business tax system is important. High or poorly designed business taxes have the potential to cause major economic distortions because of the open economy assumption that the after-tax required rate of return on capital is determined overseas. This assumption implies that an increase in taxation of foreign investment into Australia may need to be offset by higher pre-tax returns on capital to maintain the after-tax returns received by foreign investors. Higher pre-tax returns are achieved by reducing investment and capital, which leads to lower labour productivity.

In light of this, the model has a highly detailed treatment of business taxation, with a focus on important features of the current Australian system as well as tax designs that have been proposed around the world. This takes into account factors such as: the different tax treatments of debt and equity financing; the complex system of depreciation allowances and tax concessions; franking credits; and the potential for international profit shifting.

Treatment of debt and equity financing

Four alternative business income tax systems that have been proposed around the world are provided for in the Independent CGE model. These systems differ in the deductions available for the costs of debt and equity financing, and are modelled as follows.

- Standard corporate income tax (CIT), such as the current Australian system, allows deductions for the interest costs of debt financing, but no deduction with respect to equity financing costs.

- Comprehensive business income tax (CBIT), allows no deductions for financing costs, giving the widest possible tax base.

- Allowance for corporate equity tax (ACE), gives deductions for the interest costs of debt financing, along with an imputed cost for equity financing.

- Allowance for corporate capital tax (ACC), allows a single deduction for an imputed cost for the full capital base, so both equity and debt financing costs are covered by the one deduction.

Both ACE and ACC aim to provide deductions that cover all capital financing costs. With the full cost of capital deductible, the tax base is intended to only include economic rents. In principle, this means that a business tax system based on ACE or ACC would be more efficient than the existing CIT system.

In modelling deductions for the cost of debt financing (under the CIT and ACE), the debt-to-equity ratio of each industry has been estimated using ATO Taxation Statistics data. This allows the model to take into account that the current company income tax system provides higher tax deductions for industries which tend to have higher debt-to-equity ratios.

Depreciation allowances and tax concessions

Company income tax in Australia allows for a number of depreciation allowances and tax concessions, which differ by asset type. The model takes into account the following aspects of the system of depreciation allowances.

- The tax system allows for depreciation at historic cost which is less generous than economic depreciation which would be calculated at replacement cost.

- Tax and economic depreciation rates differ for each of the nine types of produced assets in the model. Where tax depreciation rates are more concessional for some types of capital than for others, the choice of the mix of capital may be distorted.

- Immediate expensing is allowed for investment in some assets, sometimes with a loading. This includes certain R&D expenditure, which can be immediately expensed, with loadings that differ by industry.

Franking credits

Some corporate tax revenue is refunded when franking credits are used, reducing the overall contribution to the budget from company tax. However, some franking credits are "lost" because companies may choose to retain profits rather than distribute them as franked dividends, or because the franking credits accrue to overseas investors who are not able to use them. The use of franking credits is explicitly modelled as part of the CAPM that was discussed in section 3.4. In the CAPM, the availability of franking credits creates a tax bias in favour of Australian wealth being allocated to Australian-based capital.

Choice of firm location

Multinational firms can generate rents through access to intangible assets such as brand names, patents and market power. Company income tax can have an important effect on the locational choice of multinational firms and their rents, which is taken into account in the model. It assumes that multinational firms have access to a firm-specific fixed factor that represents their intangible assets. They allocate the factor between countries to maximise their profit.

The response of firm-specific capital to an increase in the Australian company tax rate is not dissimilar to the response of variable capital. In both cases, capital is likely to be withdrawn, until pre-tax returns rise sufficiently to restore after-tax returns to the levels available in other jurisdictions.

Profit shifting

The model takes into account that multinational companies may seek to reduce their business tax liability by shifting profits from Australia to countries with lower rates of business tax. Profit shifting may occur through transfer pricing, the method of internal charging for company know-how and the way debt is allocated between countries.

Following de Mooij and Devereux (2011), profit shifting, which is assumed to involve costs, is modelled as a shifting of part of the company tax base from Australia to tax havens. The extent of profit shifting

depends on the extent of the gap between the Australian company tax rate and the tax haven tax rate. The model takes into account the overall effect that this behaviour has on both revenue collections and the user cost of capital.

A.8 References

Bond, Stephen R.; Devereux, Michael P.; and Klemm, Alexander (2007), "The Effects of Dividend Taxes on Equity Prices: A Re-examination of the 1997 U.K. Tax Reform", *IMF Working Paper*, WP/07/204, International Monetary Fund.

Brennan, M.J. (1970), "Taxes, Market Valuation and Corporate Financial Policy", *National Tax Journal*, XXIII(4): 417-27.

Desai, Mihir A. and Dharmapala, Dhammika (2011), "Dividend Taxes and International Portfolio Choice", *The Review of Economics and Statistics*, February 2011, 93(1): 266–284.

Fraser, Iain; and Waschik, Robert (2010), 'The Double Dividend Hypothesis in a CGE Model: Specific Factors and Variable Labour Supply', LaTrobe University, mimeo.

Gunning, Timothy; Diamond, J.; Zodrow, G; (2007), 'Selecting Parameter Values for General Equilibrium Model Simulations', National Tax Association Proceedings from the 100th Annual Conference in Columbus, Ohio, 2007.

Hertel, Thomas; Rose, Steven; and Tol, Richard (2008), 'Land Use in Computable General Equilibrium Models: An Overview', GTAP Working Paper No. 39.

Krusell, Per; Ohanian, Lee; Rios-Rull, Jose-Victor; and Violante, Giovanni (1997), 'Capital-Skill Complementarity and Inequality: a Macroeconomic Analysis', Federal Reserve Bank of Minneapolis Research Department Staff Report 239, 1997.

de Mooij, R.A. and Devereux, M.P. (2011), "An applied analysis of ACE and CBIT reforms in the EU", *International Tax and Public Finance*, pp 93-120.

Zhang, Xiao-guang; and Verikios, G; 'Armington Parameter Estimation for a Computable General Equilibrium Model: a database consistent approach',
http://www.animals.uwa.edu.au/__data/assets/pdf_file/0005/99257/06_10_Verikios.pdf

Zhao, Xingshuo, 'Market Forces and Urban Spatial Structure: Evidence from Beijing, China', PhD dissertation, University of Maryland, 2010.

Economic Modelling of the Vegetable Industry

Appendix B: Detailed Results

This appendix provides additional detail on the modelling results for the seven scenarios presented in the main report.

Table B.1 Effects of each scenario on sources of household income (nominal)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Labour income	-0.19%	0.00%	0.01%	0.00%	0.00%	-0.04%	0.00%
business capital	-0.18%	0.00%	0.02%	0.00%	0.06%	0.01%	-0.02%
housing capital	0.15%	0.00%	-0.01%	0.00%	0.00%	0.09%	0.00%
direct offshore	-0.12%	-0.01%	0.01%	0.00%	0.04%	0.14%	-0.02%
portfolio offshore	-0.12%	-0.01%	0.01%	0.00%	0.04%	0.14%	-0.02%
total local capital income	-0.10%	0.00%	0.01%	0.00%	0.04%	0.05%	-0.02%
less personal income tax before dividend credits	-0.19%	0.00%	0.01%	0.00%	0.01%	-0.03%	0.00%
Dividend tax credits use	-0.18%	0.00%	0.02%	0.00%	0.06%	0.02%	-0.02%
Cash benefits	4.42%	0.00%	-0.24%	0.00%	0.00%	0.81%	0.00%
Total household income	**0.40%**	**0.00%**	**-0.02%**	**0.00%**	**0.01%**	**0.09%**	**0.00%**

Table B.2 Effects of each scenario on household living standards

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Real wage	-0.62%	0.00%	0.03%	0.01%	-0.04%	-0.11%	0.03%
Real after-tax wage	-0.62%	0.00%	0.03%	0.01%	-0.04%	-0.11%	0.03%
Real consumption (national accounts)	-0.15%	0.00%	0.01%	0.01%	-0.03%	-0.03%	0.03%
consumption	-0.17%	0.00%	0.01%	0.01%	-0.03%	-0.03%	0.03%
leisure	0.39%	0.00%	-0.02%	0.00%	0.01%	0.08%	0.00%
full consumption	-0.04%	0.00%	0.00%	0.00%	-0.02%	0.00%	0.02%
full nominal consumption	0.44%	0.00%	-0.02%	0.00%	0.01%	0.08%	0.00%
Household welfare $m 2013/14 terms	-472	20	-1	56	-278	-42	249
Budget cost $m 2013/14 terms	-5,353	2	288	-4	3	-984	4

Table B.3 Effects of each scenario on the external account (nominal)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Exports	-0.27%	0.01%	0.01%	0.02%	0.02%	0.04%	-0.02%
Imports	-0.22%	0.01%	0.00%	0.03%	0.02%	0.07%	-0.02%
net income outflow	-0.49%	0.00%	0.04%	0.00%	0.01%	-0.20%	-0.01%
net capital inflow	-0.19%	0.00%	0.02%	0.00%	-0.03%	-0.33%	0.01%
exchange rate	0.12%	0.01%	-0.01%	0.00%	-0.04%	-0.14%	0.02%
terms-of-trade	0.01%	0.01%	0.00%	0.02%	0.00%	0.00%	0.00%

Table B.4 Effects of each scenario on Government budget

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
General Government Final Demand	38	5	-10	4	-50	-163	22
Cash benefits	-5,353	2	288	-4	3	-984	4
WET: wine	1	0	0	0	0	1	0
WET: cider	0	0	0	0	0	0	0
Luxury car tax	0	0	0	0	0	0	0
GST	5,971	-1	-7	0	5	47	-2
Import Duties	-4	0	0	1	0	3	0
Stamp duties on conveyances	5	0	0	0	0	7	0
Excises (incl customs equivalent): petroleum products	-50	0	4	0	0	0	-4
Excises (incl customs equivalent): tobacco	13	0	-1	0	0	9	0
Excises (incl customs equivalent): beer	3	0	0	0	1	4	0
Excises (incl customs equivalent): spirits	4	0	0	0	0	4	0
Taxes on gambling	11	0	0	0	0	5	0
Taxes on insurance	2	0	0	0	0	2	0
Other product taxes	-19	0	1	0	1	1	-1
petroleum subsidies	34	0	-3	0	0	1,090	3
other product subsidies	3	1	-317	0	-2	-12	1
Payroll tax	-53	0	3	0	1	7	-1
Land tax	-5	0	0	0	0	3	0
Municipal rates	-6	0	0	0	1	10	-1
Other taxes on production	-18	0	1	0	-1	-2	0
Other subsidies on production	16	0	-1	0	-1	-4	1
Royalties	-21	-3	2	1	5	46	-5
Business income tax	-204	-3	21	-2	39	-11	-18
Dividend tax credits use	49	1	-6	1	-17	-4	6
PIT before div credits	-417	-1	25	-1	12	-59	-6
Total	0	0	0	0	0	0	0

Table B.5 Effects of each scenario on real GDP by expenditure

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Households Final Consumption Expenditure	-0.15%	0.00%	0.01%	0.01%	-0.03%	-0.03%	0.03%
General Government Final Demand	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Investment	-0.04%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
Other GFCF	-0.14%	0.00%	0.01%	0.00%	-0.02%	-0.08%	0.00%
Non-dwelling Construction	-0.13%	0.00%	0.00%	0.00%	-0.03%	-0.01%	0.00%
Dwelling Construction	0.24%	0.00%	-0.02%	0.00%	-0.02%	-0.01%	0.01%
Exports	-0.16%	0.01%	0.00%	0.03%	-0.02%	-0.10%	0.00%
less Imports	-0.10%	0.02%	-0.01%	0.05%	-0.02%	-0.06%	0.00%
GDPE	**-0.10%**	**0.00%**	**0.00%**	**0.00%**	**-0.02%**	**-0.04%**	**0.02%**

Table B.6 Effects of each scenario on real GDP by industry

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
A Agriculture, forestry and fishing	-1.84%	0.03%	0.22%	-0.04%	-0.30%	-1.09%	0.42%
B Mining	-0.02%	-0.02%	0.00%	0.01%	0.00%	0.26%	-0.02%
C Manufacturing	-0.29%	0.00%	-0.02%	0.00%	-0.01%	-0.09%	0.00%
D Electricity, gas, water and waste services	-0.16%	0.00%	0.01%	0.00%	-0.03%	-0.05%	0.01%
E Construction	0.01%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.01%
F Wholesale trade	-0.38%	0.01%	0.02%	0.00%	-0.04%	-0.14%	0.02%
G Retail trade	-0.75%	0.00%	0.06%	0.01%	-0.06%	-0.08%	0.05%
H Accommodation and food services	0.13%	0.00%	-0.01%	0.01%	-0.04%	-0.02%	0.03%
I Transport, postal and warehousing	-0.20%	0.00%	0.00%	0.00%	-0.02%	-0.09%	0.01%
J Information media and telecommunications	-0.01%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
K Financial and insurance services	0.03%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.00%
L Rental, hiring and real estate services	-0.09%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
M Professional, scientific and technical services	-0.12%	0.00%	0.00%	0.00%	-0.01%	-0.03%	0.00%
N Administrative and support services	-0.10%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
O Public administration and safety	-0.01%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
P Education and training	0.04%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Q Health care and social assistance	0.06%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
R Arts and recreation services	0.14%	0.00%	-0.01%	0.00%	-0.01%	0.02%	0.00%
S Other services	0.03%	0.00%	-0.01%	0.00%	-0.02%	-0.03%	0.01%
T Ownership of dwellings	0.18%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
Other taxes less subsidies on production	0.11%	0.00%	-0.01%	0.00%	-0.02%	-0.02%	0.01%
GDPP	**-0.10%**	**0.00%**	**0.00%**	**0.00%**	**-0.02%**	**-0.04%**	**0.02%**

Table B.7A Effects of each scenario on employment by industry (per cent)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
A Agriculture, forestry and fishing	-1.93%	0.02%	0.19%	-0.04%	0.14%	-1.12%	-0.17%
B Mining	-0.13%	-0.02%	0.01%	0.01%	0.03%	0.33%	-0.03%
C Manufacturing	-0.35%	0.00%	-0.02%	-0.01%	0.00%	-0.08%	-0.01%
D Electricity, gas, water and waste services	-0.22%	0.00%	0.02%	0.00%	-0.01%	-0.03%	0.01%
E Construction	-0.03%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%
F Wholesale trade	-0.40%	0.01%	0.02%	0.00%	-0.03%	-0.12%	0.02%
G Retail trade	-0.76%	0.00%	0.06%	0.01%	-0.05%	-0.06%	0.05%
H Accommodation and food services	0.10%	0.00%	0.00%	0.01%	-0.03%	-0.02%	0.03%
I Transport, postal and warehousing	-0.23%	0.00%	0.00%	0.00%	-0.01%	-0.07%	0.01%
J Information media and telecommunications	-0.10%	0.00%	0.01%	0.00%	0.01%	0.02%	0.00%
K Financial and insurance services	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.03%	0.00%
L Rental, hiring and real estate services	-0.13%	0.00%	0.01%	0.00%	0.00%	-0.03%	0.00%
M Professional, scientific and technical services	-0.16%	0.00%	0.01%	0.00%	-0.01%	-0.01%	0.00%
N Administrative and support services	-0.14%	0.00%	0.01%	0.00%	0.00%	-0.01%	0.00%
O Public administration and safety	-0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
P Education and training	0.01%	0.00%	0.00%	0.00%	0.01%	0.04%	0.00%
Q Health care and social assistance	0.03%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
R Arts and recreation services	0.07%	0.00%	0.00%	0.00%	0.01%	0.01%	0.00%
S Other services	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.02%	0.00%
T Ownership of dwellings	NA	NA	NA	NA	NA	NA	NA
Total Employment	**-0.19%**	**0.00%**	**0.01%**	**0.00%**	**0.00%**	**-0.04%**	**0.00%**

Table B.7B Effects of each scenario on employment by industry (jobs)

	GST on basic food	more export market access	consumer subsidy	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
A Agriculture, forestry and fishing	-4,353	42	422	-202	327	-2,535	-392
B Mining	-461	-82	53	39	126	1,178	-115
C Manufacturing	-4,496	15	-198	-301	62	-1,018	-91
D Electricity, gas, water and waste services	-417	-2	31	7	-18	-60	10
E Construction	-302	-17	20	37	-78	-14	11
F Wholesale trade	-2,802	65	131	25	-198	-810	139
G Retail trade	-5,597	26	478	162	-377	-437	371
H Accommodation and food services	386	-8	-15	69	-115	-70	115
I Transport, postal and warehousing	-1,628	29	28	53	-71	-498	40
J Information media and telecommunications	-258	-4	19	0	24	59	-13
K Financial and insurance services	-18	-3	8	13	-64	-166	9
L Rental, hiring and real estate services	-335	-4	18	0	3	-81	-10
M Professional, scientific and technical services	-1,611	-20	70	10	-63	-152	-8
N Administrative and support services	-437	1	16	-12	-8	-28	5
O Public administration and safety	-317	-4	22	-3	35	-14	-15
P Education and training	126	-16	7	18	50	314	-14
Q Health care and social assistance	366	1	-13	26	4	138	23
R Arts and recreation services	91	-2	-3	0	7	19	-2
S Other services	-6	3	-4	6	-22	-68	13
T Ownership of dwellings	0	0	0	0	0	0	0
Total Employment	**-22,068**	**23**	**1,089**	**-53**	**-377**	**-4,245**	**74**

Table B.8A Effects of each scenario on real output in Other Agriculture

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
0103A Nursery and Floriculture Production	-0.25%	0.00%	0.03%	-0.01%	0.00%	-0.43%	-0.02%
0103B Mushroom Growing	-4.53%	0.03%	-0.17%	-0.05%	-0.01%	-0.39%	-0.02%
0103C Vegetable Growing (Under Cover): levied	-4.05%	2.29%	3.65%	-1.61%	-6.54%	-1.70%	7.72%
0103D Vegetable Growing (Under Cover): tomatoes	-5.30%	-0.01%	-0.20%	-0.01%	0.02%	-0.58%	-0.06%
0103E Vegetable Growing (Outdoors): levied	-5.06%	0.35%	4.33%	-0.56%	-2.80%	-0.71%	2.72%
0103F Vegetable Growing (Outdoors): potatoes	-2.98%	0.20%	2.24%	-0.23%	-1.11%	-0.39%	1.10%
0103G Vegetable Growing (Outdoors): tomatoes, onion	-4.30%	0.59%	-0.16%	-0.66%	-0.41%	-0.42%	0.40%
0103H Fruit and Tree Nut Growing	-3.50%	-0.01%	-0.16%	-0.01%	-0.03%	-0.86%	-0.03%
0103I Other Crop Growing	-0.78%	0.00%	-0.05%	-0.01%	-0.10%	-1.50%	0.00%

Table B.8B Effects of each scenario on real output in Fruit and Vegetable Product Manufacturing

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1104A Jams	-4.98%	-0.01%	-0.20%	-0.01%	0.02%	-0.49%	-0.06%
1104B Other Fruit Processing	-5.03%	-0.01%	-0.19%	-0.01%	0.03%	-0.41%	-0.06%
1104C Vegetables, frozen	-5.25%	0.45%	-0.19%	-1.67%	-0.73%	-0.15%	0.74%
1104D Vegetables, prepared or preserved	-2.90%	5.00%	-0.12%	-0.21%	-1.86%	-0.56%	1.96%
1104E Tomato pulp, puree and paste	-5.39%	-0.01%	-0.19%	-0.01%	0.05%	-0.16%	-0.07%
1104F Other processed vegetables	-4.48%	0.50%	-0.17%	-2.33%	-0.74%	-0.18%	0.75%

Table B.9A Effects of each scenario on consumer prices in Other Agriculture

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
0103A Nursery and Floriculture Production	-0.23%	0.00%	0.03%	0.00%	0.07%	0.61%	-0.02%
0103B Mushroom Growing	9.29%	0.00%	0.02%	0.00%	0.06%	0.56%	-0.02%
0103C Vegetable Growing (Under Cover): levied	9.17%	-0.28%	-4.89%	-0.47%	2.24%	0.68%	-2.33%
0103D Vegetable Growing (Under Cover): tomatoes	9.25%	0.00%	0.03%	0.00%	0.07%	0.66%	-0.03%
0103E Vegetable Growing (Outdoors): levied	9.23%	-0.03%	-4.96%	-0.08%	2.50%	0.74%	-2.52%
0103F Vegetable Growing (Outdoors): potatoes	9.27%	0.00%	-4.96%	-0.01%	2.03%	0.62%	-2.04%
0103G Vegetable Growing (Outdoors): tomatoes, onior	9.30%	0.00%	0.02%	0.00%	0.05%	0.49%	-0.02%
0103H Fruit and Tree Nut Growing	9.28%	0.00%	0.02%	0.00%	0.06%	0.55%	-0.02%
0103I Other Crop Growing	4.78%	0.00%	0.04%	-0.01%	0.09%	0.95%	-0.03%

Table B.9B Effects of each scenario on consumer prices in Fruit and Vegetable Product Manufacturing

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1104A Jams	9.29%	0.00%	0.02%	0.00%	0.05%	0.35%	-0.02%
1104B Other Fruit Processing	9.32%	0.00%	0.02%	0.00%	0.05%	0.32%	-0.02%
1104C Vegetables, frozen	9.35%	-0.08%	0.01%	-0.55%	0.42%	0.24%	-0.42%
1104D Vegetables, prepared or preserved	9.24%	-0.61%	0.01%	-1.13%	0.37%	0.21%	-0.37%
1104E Tomato pulp, puree and paste	9.36%	0.00%	0.01%	0.00%	0.04%	0.21%	-0.02%
1104F Other processed vegetables	8.98%	-0.09%	0.01%	-0.67%	0.36%	0.22%	-0.35%

Table B.10A Effects of each scenario on real household consumption in Other Agriculture

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
0103A Nursery and Floriculture Production	0.42%	0.00%	-0.03%	0.01%	-0.07%	-0.62%	0.03%
0103B Mushroom Growing	-6.46%	-0.01%	-0.23%	-0.02%	0.05%	-0.39%	-0.09%
0103C Vegetable Growing (Under Cover): levied	-6.34%	0.34%	5.99%	0.54%	-2.50%	-0.53%	2.76%
0103D Vegetable Growing (Under Cover): tomatoes	-6.42%	-0.01%	-0.23%	-0.02%	0.04%	-0.50%	-0.08%
0103E Vegetable Growing (Outdoors): levied	-6.40%	0.03%	6.07%	0.07%	-2.80%	-0.59%	2.99%
0103F Vegetable Growing (Outdoors): potatoes	-6.44%	0.00%	6.08%	-0.01%	-2.26%	-0.45%	2.39%
0103G Vegetable Growing (Outdoors): tomatoes, onion	-6.47%	-0.01%	-0.23%	-0.02%	0.06%	-0.30%	-0.09%
0103H Fruit and Tree Nut Growing	-6.45%	-0.01%	-0.23%	-0.02%	0.05%	-0.37%	-0.09%
0103I Other Crop Growing	-1.60%	-0.01%	-0.25%	-0.02%	0.02%	-0.84%	-0.08%

Table B.10B Effects of each scenario on real household consumption in Fruit and Vegetable Product Manufacturing

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1104A Jams	-6.46%	-0.01%	-0.22%	-0.02%	0.07%	-0.13%	-0.09%
1104B Other Fruit Processing	-6.49%	0.00%	-0.22%	-0.02%	0.07%	-0.10%	-0.09%
1104C Vegetables, frozen	-6.52%	0.10%	-0.22%	0.64%	-0.38%	0.00%	0.39%
1104D Vegetables, prepared or preserved	-6.41%	0.73%	-0.21%	1.34%	-0.32%	0.04%	0.33%
1104E Tomato pulp, puree and paste	-6.54%	0.00%	-0.22%	-0.02%	0.08%	0.03%	-0.09%
1104F Other processed vegetables	-6.14%	0.10%	-0.22%	0.78%	-0.31%	0.03%	0.31%

Table B.11A Effects of each scenario on real output in selected regions (per cent)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Latrobe - Gippsland	-0.51%	0.01%	0.05%	-0.03%	-0.04%	-0.28%	0.01%
North West	-0.65%	0.00%	0.00%	-0.02%	-0.05%	-0.57%	0.01%
Mackay	-0.17%	-0.01%	0.02%	0.00%	-0.01%	0.13%	0.00%
Toowoomba	-0.33%	0.01%	0.11%	-0.04%	-0.06%	-0.12%	0.03%
Wide Bay	-0.65%	0.02%	0.07%	-0.05%	-0.06%	-0.35%	0.02%
South Australia - South East	-0.84%	0.01%	0.04%	-0.04%	-0.04%	-0.65%	-0.01%
Bunbury	-0.26%	0.00%	0.03%	-0.01%	-0.02%	-0.09%	0.00%
West and North West	-0.47%	0.01%	0.03%	-0.03%	-0.03%	-0.15%	0.00%
Rest of Australia	-0.13%	0.00%	0.00%	0.00%	-0.02%	-0.06%	0.01%
Australia	**-0.16%**	**0.00%**	**0.00%**	**0.00%**	**-0.02%**	**-0.07%**	**0.01%**

Table B.11B Effects of each scenario on real output in selected regions ($m, 2009-10 prices)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Greater Melbourne	-480	13	9	-9	-119	-274	71
Latrobe - Gippsland	-136	3	13	-8	-12	-74	4
North West	-105	1	1	-3	-8	-91	2
Greater Brisbane	-346	6	2	-6	-63	-98	36
Mackay	-77	-4	10	0	-6	59	-1
Toowoomba	-44	2	16	-6	-9	-16	4
Wide Bay	-139	4	14	-11	-13	-75	5
South Australia - South East	-159	3	7	-8	-8	-125	-2
Greater Perth	-145	-10	11	13	-40	113	15
Bunbury	-55	0	7	-2	-5	-20	0
West and North West	-69	1	5	-4	-4	-22	-1
Rest of Australia	-2,600	-9	-35	0	-345	-1,331	141
Australia	**-4,356**	**9**	**60**	**-44**	**-631**	**-1,952**	**273**

Table B.12 Effects of each scenario on real output by region (per cent)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Greater Sydney	-0.06%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
Capital Region	-0.48%	0.00%	-0.02%	-0.01%	-0.04%	-0.44%	0.01%
Central West	-0.32%	0.00%	0.01%	-0.01%	-0.03%	-0.20%	0.01%
Coffs Harbour - Grafton	-0.41%	0.00%	-0.01%	-0.01%	-0.03%	-0.31%	0.01%
Far West and Orana	-0.37%	-0.01%	-0.01%	0.00%	-0.03%	-0.36%	0.00%
Hunter Valley exc Newcastle	-0.12%	-0.01%	0.00%	0.01%	0.00%	0.10%	-0.01%
Illawarra	-0.03%	-0.01%	0.00%	0.01%	-0.01%	0.09%	0.00%
Mid North Coast	-0.40%	0.00%	0.00%	-0.01%	-0.03%	-0.22%	0.01%
Murray	-0.47%	0.00%	-0.01%	-0.01%	-0.04%	-0.45%	0.01%
New England and North West	-0.59%	0.00%	-0.02%	-0.02%	-0.05%	-0.60%	0.01%
Newcastle and Lake Macquarie	-0.10%	0.00%	0.00%	0.00%	-0.02%	0.01%	0.01%
Richmond - Tweed	-0.58%	0.01%	0.02%	-0.04%	-0.05%	-0.29%	0.02%
Riverina	-0.53%	0.01%	0.01%	-0.03%	-0.05%	-0.50%	0.02%
Southern Highlands and Shoalhaven	-0.22%	0.00%	-0.01%	0.00%	-0.02%	-0.12%	0.01%
Greater Melbourne	-0.09%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
Ballarat	-0.34%	0.01%	0.01%	-0.02%	-0.03%	-0.25%	0.01%
Bendigo	-0.43%	0.01%	-0.03%	-0.02%	-0.03%	-0.23%	0.02%
Geelong	-0.12%	0.00%	0.00%	0.00%	-0.02%	-0.09%	0.01%
Hume	-0.48%	0.01%	-0.01%	-0.02%	-0.04%	-0.36%	0.02%
Latrobe - Gippsland	-0.51%	0.01%	0.05%	-0.03%	-0.04%	-0.28%	0.01%
North West	-0.65%	0.00%	0.00%	-0.02%	-0.05%	-0.57%	0.01%
Shepparton	-0.96%	0.02%	-0.04%	-0.07%	-0.05%	-0.45%	0.02%
Warrnambool and South West	-0.76%	0.01%	-0.03%	-0.02%	-0.03%	-0.50%	0.00%
Greater Brisbane	-0.12%	0.00%	0.00%	0.00%	-0.02%	-0.04%	0.01%
Cairns	-0.38%	0.00%	0.01%	-0.01%	-0.03%	-0.16%	0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Darling Downs - Maranoa	-0.61%	0.00%	0.00%	-0.02%	-0.04%	-0.46%	0.01%
Fitzroy	-0.19%	-0.01%	0.00%	0.01%	-0.01%	0.05%	0.00%
Gold Coast	-0.07%	0.00%	-0.01%	0.00%	-0.02%	-0.06%	0.01%
Mackay	-0.17%	-0.01%	0.02%	0.00%	-0.01%	0.13%	0.00%
Queensland - Outback	-0.27%	-0.02%	0.00%	0.01%	-0.01%	0.05%	-0.01%
Sunshine Coast	-0.22%	0.00%	0.00%	-0.01%	-0.03%	-0.14%	0.01%
Toowoomba	-0.33%	0.01%	0.11%	-0.04%	-0.06%	-0.12%	0.03%
Townsville	-0.23%	0.00%	0.01%	-0.01%	-0.03%	-0.09%	0.01%
Wide Bay	-0.65%	0.02%	0.07%	-0.05%	-0.06%	-0.35%	0.02%
Greater Adelaide	-0.11%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
Barossa - Yorke - Mid North	-0.32%	0.00%	-0.03%	-0.01%	-0.04%	-0.58%	0.01%
South Australia - Outback	-0.20%	-0.01%	-0.01%	0.01%	-0.01%	-0.02%	-0.01%
South Australia - South East	-0.84%	0.01%	0.04%	-0.04%	-0.04%	-0.65%	-0.01%
Greater Perth	-0.06%	0.00%	0.00%	0.01%	-0.02%	0.05%	0.01%
Bunbury	-0.26%	0.00%	0.03%	-0.01%	-0.02%	-0.09%	0.00%
Western Australia - Outback	-0.04%	-0.02%	0.00%	0.02%	0.00%	0.22%	-0.01%
Western Australia - Wheat Belt	-0.42%	-0.01%	-0.01%	0.00%	-0.04%	-0.54%	0.00%
Greater Hobart	-0.15%	0.00%	0.00%	0.00%	-0.02%	-0.12%	0.02%
Launceston and North East	-0.29%	0.00%	0.02%	-0.01%	-0.02%	-0.22%	0.00%
South East	-1.09%	0.00%	-0.01%	-0.01%	-0.04%	-0.86%	0.01%
West and North West	-0.47%	0.01%	0.03%	-0.03%	-0.03%	-0.15%	0.00%
Darwin	-0.05%	0.00%	0.00%	0.01%	-0.02%	-0.01%	0.01%
Northern Territory - Outback	-0.12%	-0.01%	0.02%	0.01%	-0.02%	0.09%	0.00%
Australian Capital Territory	0.04%	0.00%	0.00%	0.01%	-0.02%	-0.01%	0.02%
Other Territories	0.02%	0.00%	0.00%	0.01%	-0.02%	0.02%	0.01%
NSW	-0.14%	0.00%	0.00%	0.00%	-0.02%	-0.09%	0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
VIC	-0.18%	0.00%	0.00%	-0.01%	-0.03%	-0.11%	0.01%
QLD	-0.20%	0.00%	0.01%	0.00%	-0.02%	-0.05%	0.01%
SA	-0.21%	0.00%	0.00%	-0.01%	-0.02%	-0.14%	0.01%
WA	-0.09%	-0.01%	0.00%	0.01%	-0.01%	0.05%	0.00%
TAS	-0.31%	0.00%	0.01%	-0.01%	-0.02%	-0.19%	0.01%
NT	-0.08%	0.00%	0.01%	0.01%	-0.02%	0.03%	0.01%
ACT	0.04%	0.00%	0.00%	0.01%	-0.02%	-0.01%	0.02%
Other	0.02%	0.00%	0.00%	0.01%	-0.02%	0.02%	0.01%
Australia	**-0.16%**	**0.00%**	**0.00%**	**0.00%**	**-0.02%**	**-0.07%**	**0.01%**

Table B.13 Effects of each scenario on real output by industry (per cent)

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
0101A Sheep Farming	-1.26%	-0.02%	-0.08%	0.02%	-0.09%	-1.87%	0.02%
0101B Beef Cattle Farming	-2.24%	-0.01%	-0.08%	-0.01%	-0.05%	-1.31%	-0.01%
0101C Grain Growing	-0.90%	-0.02%	-0.09%	0.01%	-0.10%	-2.14%	0.02%
0101D Dairy Cattle Farming	-1.90%	-0.01%	-0.10%	-0.02%	0.02%	-0.66%	-0.04%
0102A Poultry Farming	-2.66%	-0.01%	-0.12%	-0.01%	-0.05%	-1.01%	0.00%
0102B Other Livestock Farming	-1.32%	-0.01%	-0.06%	-0.01%	-0.09%	-1.06%	0.00%
0103A Nursery and Floriculture Production	-0.25%	0.00%	0.03%	-0.01%	0.00%	-0.43%	-0.02%
0103B Mushroom Growing	-4.53%	0.03%	-0.17%	-0.10%	-0.01%	-0.39%	-0.02%
0103C Vegetable Growing (Under Cover): levied	-4.05%	2.29%	3.65%	-3.40%	-6.54%	-1.70%	7.72%
0103D Vegetable Growing (Under Cover): tomatoes	-5.30%	-0.01%	-0.20%	-0.03%	0.02%	-0.58%	-0.06%
0103E Vegetable Growing (Outdoors): levied	-5.06%	0.35%	4.33%	-1.19%	-2.80%	-0.71%	2.72%
0103F Vegetable Growing (Outdoors): potatoes	-2.98%	0.20%	2.24%	-0.49%	-1.11%	-0.39%	1.10%
0103G Vegetable Growing (Outdoors): tomatoes, onions	-4.30%	0.59%	-0.16%	-1.38%	-0.41%	-0.42%	0.40%
0103H Fruit and Tree Nut Growing	-3.50%	-0.01%	-0.16%	-0.01%	-0.03%	-0.86%	-0.03%
0103I Other Crop Growing	-0.78%	0.00%	-0.05%	-0.02%	-0.10%	-1.50%	0.00%
0201Z Aquaculture	-2.66%	-0.01%	-0.10%	0.00%	-0.01%	-1.37%	-0.01%
0301Z Forestry and Logging	-0.02%	-0.01%	0.00%	0.01%	-0.03%	-3.06%	0.00%
0401Z Fishing, hunting and trapping	-3.71%	-0.01%	-0.14%	-0.01%	0.01%	-3.06%	-0.03%
0501A Forestry Support Services	-0.83%	0.00%	0.09%	-0.04%	-0.09%	-2.04%	-0.08%
0501B Agriculture and Fishing Support Services	-1.71%	0.02%	0.18%	-0.09%	-0.17%	-1.95%	-0.16%
0601Z Coal mining	-0.06%	-0.02%	0.01%	0.01%	0.01%	0.32%	-0.02%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
0701A Crude oil (incl. condensate)	0.00%	-0.01%	0.00%	0.01%	-0.01%	0.11%	-0.01%
0701B Gas Extraction	-0.02%	-0.01%	0.00%	0.01%	-0.01%	0.07%	0.00%
0801Z Iron Ore Mining	0.01%	-0.03%	0.00%	0.02%	-0.01%	0.39%	-0.02%
0802A Gold Ore Mining	-0.06%	-0.02%	0.01%	0.01%	0.02%	0.29%	-0.02%
0802B Other Metal Ore Mining	-0.06%	-0.02%	0.01%	0.01%	0.01%	0.25%	-0.02%
0901A Construction Material Mining	-0.01%	0.00%	0.00%	0.00%	-0.01%	0.03%	0.00%
0901B Other Non-Metallic Mineral Mining and Quarrying	-0.25%	-0.01%	0.00%	-0.01%	-0.01%	0.03%	-0.01%
1001A Exploration	-0.07%	-0.02%	0.01%	0.01%	0.01%	0.31%	-0.02%
1001B Other Mining Support Services	-0.04%	-0.02%	0.00%	0.01%	0.01%	0.31%	-0.02%
1101A Meat Processing	-2.39%	-0.02%	-0.14%	0.01%	-0.07%	-1.61%	0.00%
1101B Poultry Processing	-2.49%	0.01%	-0.08%	-0.03%	-0.02%	-0.21%	0.01%
1101C Bacon and Ham	-3.14%	0.01%	-0.11%	-0.05%	-0.01%	-0.21%	-0.01%
1101D Other Smallgoods	-3.44%	0.02%	-0.12%	-0.07%	-0.02%	-0.37%	-0.01%
1102Z Processed Seafood Manufacturing	-4.36%	-0.01%	-0.15%	-0.01%	0.03%	-1.62%	-0.04%
1103A Milk	-2.39%	-0.01%	-0.14%	-0.02%	0.03%	-0.23%	-0.04%
1103B Cheese	-3.34%	-0.01%	-0.13%	-0.01%	0.02%	-0.52%	-0.04%
1103C Ice cream and other dairy products	-1.33%	-0.01%	-0.13%	-0.02%	0.00%	-0.53%	-0.02%
1104A Jams	-4.98%	-0.01%	-0.20%	-0.03%	0.02%	-0.49%	-0.06%
1104B Other Fruit Processing	-5.03%	-0.01%	-0.19%	-0.03%	0.03%	-0.41%	-0.06%
1104C Vegetables, frozen	-5.25%	0.45%	-0.19%	-3.56%	-0.73%	-0.15%	0.74%
1104D Vegetables, prepared or preserved	-2.90%	5.00%	-0.12%	-0.17%	-1.86%	-0.56%	1.96%
1104E Tomato pulp, puree and paste	-5.39%	-0.01%	-0.19%	-0.03%	0.05%	-0.16%	-0.07%
1104F Other processed vegetables	-4.48%	0.50%	-0.17%	-4.91%	-0.74%	-0.18%	0.75%
1105Z Oils and Fats Manufacturing	-2.63%	0.00%	-0.11%	-0.03%	-0.01%	-0.64%	-0.02%
1106A Grain Mill Product Manufacturing	-1.53%	0.00%	-0.11%	-0.01%	-0.04%	-0.78%	0.01%

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	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1106B Cereal, Pasta and Baking Mix Manufacturing	-3.60%	0.01%	-0.14%	-0.05%	-0.01%	-0.53%	-0.02%
1107A Bread Manufacturing	-4.68%	0.00%	-0.16%	0.00%	0.03%	-0.09%	-0.04%
1107B Other Bakery Product Manufacturing	2.66%	0.00%	-0.16%	0.00%	0.02%	-0.16%	-0.04%
1108A Sugar Manufacturing	-0.77%	-0.02%	-0.09%	0.00%	-0.08%	-0.74%	0.04%
1108B Confectionery Manufacturing	2.06%	-0.01%	-0.14%	-0.01%	-0.02%	-0.32%	-0.01%
1109A Potato, Corn and Other Crisp Manufacturing	3.05%	-0.01%	-0.16%	-0.02%	-0.11%	-0.23%	0.09%
1109B Prepared Animal and Bird Feed Manufacturing	-0.47%	-0.01%	-0.03%	0.01%	-0.15%	-0.85%	0.11%
1109C Coffee and tea, including substitutes	-4.18%	-0.01%	-0.15%	-0.01%	-0.12%	-0.25%	0.10%
1109D Other Food Product Manufacturing n.e.c.	-0.48%	0.06%	-0.13%	-0.16%	-0.18%	-0.41%	0.16%
1201Z Soft Drinks, Cordials and Syrup Manufacturing	1.90%	0.00%	-0.11%	-0.02%	0.03%	0.03%	-0.03%
1202A Beer: packaged	0.17%	0.00%	-0.01%	0.01%	-0.03%	-0.12%	0.02%
1202B Beer: draught	0.16%	0.00%	-0.01%	0.02%	-0.04%	-0.12%	0.03%
1205A Spirits: full-strength	0.14%	-0.01%	-0.01%	0.02%	-0.03%	-0.31%	0.01%
1205B Spirits: RTDs	0.14%	-0.01%	-0.01%	0.02%	-0.03%	-0.30%	0.01%
1205C Wine: premium	0.15%	-0.01%	-0.01%	0.01%	-0.02%	-0.30%	0.01%
1205D Wine: cask	0.13%	-0.01%	-0.01%	0.01%	-0.02%	-0.30%	0.01%
1205E Cider	0.19%	0.00%	-0.01%	0.01%	-0.03%	-0.20%	0.02%
1205F Cigarette and Tobacco Product Manufacturing	0.17%	-0.01%	-0.01%	0.02%	-0.02%	-0.31%	0.01%
1301Z Textile Manufacturing	0.29%	-0.02%	-0.02%	0.03%	-0.05%	-1.00%	0.01%
1302Z Tanned Leather, Dressed Fur and Leather Product Manufacturing	0.47%	-0.02%	-0.02%	0.03%	-0.06%	-1.10%	0.01%
1303A Textile Floor Covering Manufacturing	0.08%	-0.01%	0.00%	0.01%	-0.01%	-0.12%	0.00%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1303B Rope, Cordage and Twine Manufacturing	-0.33%	-0.01%	0.00%	0.01%	-0.02%	-0.35%	0.00%
1301Z Textile Manufacturing	0.02%	-0.01%	-0.01%	0.01%	-0.02%	-0.22%	0.00%
1303D Textile Finishing and Other Textile Product Manufacturing	0.06%	-0.01%	-0.01%	0.01%	-0.02%	-0.16%	0.00%
1304Z Knitted Product Manufacturing	0.13%	-0.02%	0.00%	0.01%	0.02%	0.16%	-0.01%
1305Z Clothing Manufacturing	0.10%	-0.01%	0.00%	0.01%	0.00%	0.09%	-0.01%
1306Z Footwear Manufacturing	0.14%	-0.01%	-0.01%	0.01%	-0.01%	0.01%	0.00%
1401Z Sawmill Product Manufacturing	0.06%	-0.01%	-0.01%	0.01%	-0.01%	-1.65%	0.00%
1402Z Other Wood Product Manufacturing	0.03%	0.00%	0.00%	0.01%	-0.01%	-0.26%	0.00%
1501Z Pulp, Paper and Paperboard Manufacturing	-0.16%	-0.01%	0.00%	0.00%	-0.01%	-0.94%	0.00%
1502A Paper Stationery Manufacturing	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.03%	0.00%
1502B Sanitary Paper Product Manufacturing	0.14%	0.00%	-0.01%	0.01%	-0.01%	-0.02%	0.01%
1502C Other Converted Paper Product Manufacturing	-0.36%	0.02%	-0.03%	-0.05%	-0.03%	-0.22%	0.02%
1601A Printing and Printing Support Services	-0.12%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
1601B Reproduction of Recorded Media	-0.04%	0.00%	0.01%	0.00%	0.00%	-0.04%	-0.01%
1701A Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)	0.10%	0.00%	-0.01%	0.00%	-0.02%	-0.03%	0.01%
1701B Kerosene (incl kerosene type jet fuel)	0.02%	-0.01%	0.00%	0.01%	0.01%	0.13%	-0.01%
1701C Petrodiesel	-0.34%	0.00%	0.02%	0.00%	-0.03%	-0.25%	-0.02%
1701D Other Petroleum Refining and Petroleum Fuel Manufacturing	-0.08%	-0.01%	0.00%	0.01%	-0.01%	0.02%	-0.01%
1701E Other Petroleum and Coal Product Manufacturing	-0.13%	0.00%	0.01%	0.00%	-0.02%	-0.07%	0.00%
1801Z Human Pharmaceutical and Medicinal Product Manufacturing	0.06%	-0.01%	0.00%	0.01%	0.00%	0.04%	0.00%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
1802Z Veterinary Pharmaceutical and Medicinal Product Manufacturing	-0.37%	-0.02%	-0.02%	0.01%	-0.03%	-0.69%	-0.01%
1803A Basic Chemical Manufacturing	-0.12%	-0.01%	0.00%	0.00%	0.00%	-0.17%	-0.01%
1803B Basic Polymer Manufacturing	-0.09%	-0.01%	0.00%	0.00%	0.00%	-0.10%	-0.01%
1803C Fertiliser and Pesticide Manufacturing	-0.63%	0.00%	0.05%	-0.02%	-0.06%	-0.71%	-0.05%
1803D Other Basic Chemical Product Manufacturing	-0.05%	-0.01%	0.00%	0.01%	0.00%	-0.08%	-0.01%
1804A Soap and Toothpaste Manufacturing	0.04%	0.00%	-0.01%	0.01%	-0.02%	-0.18%	0.01%
1804B Other Cleaning Compound Manufacturing	0.04%	0.00%	-0.01%	0.00%	-0.02%	-0.18%	0.01%
1804C Cosmetic and Toiletry Preparation Manufacturing	0.19%	-0.01%	-0.01%	0.01%	-0.01%	-0.16%	0.00%
1901A Tyre Manufacturing	-0.16%	-0.01%	0.01%	0.01%	0.02%	0.05%	-0.02%
1901B Other Polymer Product Manufacturing	-0.10%	0.00%	-0.01%	-0.01%	-0.01%	-0.06%	0.00%
1902Z Natural Rubber Product Manufacturing	-0.14%	-0.01%	0.01%	0.01%	0.01%	-0.03%	-0.01%
2001Z Glass and Glass Product Manufacturing	-0.11%	0.02%	-0.01%	-0.05%	-0.02%	0.00%	0.02%
2002Z Ceramic Product Manufacturing	0.05%	-0.01%	0.00%	0.01%	0.00%	0.08%	0.00%
2003Z Cement, Lime and Ready-Mixed Concrete Manufacturing	0.02%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.00%
2004Z Plaster and Concrete Product Manufacturing	0.05%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.01%
2005Z Other Non-Metallic Mineral Product Manufacturing	-0.06%	-0.01%	0.01%	0.01%	0.00%	0.07%	-0.01%
2101A Basic Ferrous Metal Manufacturing	-0.08%	-0.01%	0.01%	0.01%	0.00%	0.13%	-0.01%
2101B Basic Ferrous Metal Product Manufacturing	-0.10%	-0.01%	0.01%	0.01%	0.00%	0.15%	-0.02%
2102A Alumina Production	-0.09%	-0.02%	0.01%	0.01%	0.02%	0.32%	-0.03%
2102B Aluminium Smelting	-0.08%	-0.02%	0.01%	0.01%	0.01%	0.22%	-0.02%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
2102C Copper, Silver, Lead and Zinc Smelting and Refining	-0.07%	-0.02%	0.01%	0.01%	0.02%	0.29%	-0.03%
2102D Gold - primary and secondary (excl from purchased scrap)	-0.05%	-0.03%	0.01%	0.01%	0.03%	0.37%	-0.03%
2102E Other Basic Non-Ferrous Metal Manufacturing	-0.11%	-0.02%	0.01%	0.01%	0.02%	0.27%	-0.02%
2102F Basic Non-Ferrous Metal Product Manufacturing	-0.08%	-0.01%	0.00%	0.01%	0.01%	0.12%	-0.01%
2201Z Forged Iron and Steel Product Manufacturing	-0.11%	-0.01%	0.01%	0.01%	0.00%	0.09%	-0.01%
2202Z Structural Metal Product Manufacturing	-0.03%	0.00%	0.00%	0.01%	-0.01%	0.02%	0.00%
2203A Metal Container Manufacturing	-0.16%	0.00%	0.00%	-0.01%	-0.01%	-0.03%	0.00%
2203B Sheet Metal Product Manufacturing (except Metal Structural and Container Products)	0.07%	-0.01%	0.00%	0.01%	-0.01%	0.05%	0.00%
2204Z Other Fabricated Metal Product manufacturing	-0.09%	-0.01%	0.01%	0.01%	0.00%	0.06%	-0.01%
2301A Motor Vehicle Manufacturing	-0.05%	-0.01%	0.01%	0.01%	0.00%	0.09%	-0.01%
2301B Motor Vehicle Body and Trailer Manufacturing	-0.05%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
2301C Automotive Electrical Component Manufacturing	-0.21%	-0.01%	0.01%	0.00%	0.00%	0.00%	-0.01%
2301D Other Motor Vehicle Parts Manufacturing	-0.20%	-0.01%	0.01%	0.01%	0.01%	0.07%	-0.01%
2301E Other Transport Equipment Manufacturing n.e.c.	0.01%	-0.01%	0.00%	0.01%	0.00%	0.09%	0.00%
2302A Shipbuilding and Repair Services	-0.07%	-0.01%	0.01%	0.00%	0.01%	0.04%	-0.01%
2302B Boatbuilding and Repair Services	-0.14%	0.00%	0.00%	0.01%	-0.01%	-0.09%	0.00%
2303Z Railway Rolling Stock Manufacturing and Repair Services	-0.16%	0.00%	0.01%	0.03%	-0.01%	-0.02%	0.00%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
2304Z Aircraft Manufacturing and Repair Services	-0.17%	-0.01%	0.02%	0.01%	0.02%	0.13%	-0.02%
2401A Photographic, Optical and Ophthalmic Equipment Manufacturing	-0.05%	-0.01%	0.01%	0.01%	0.02%	0.17%	-0.01%
2401B Medical and Surgical Equipment Manufacturing	-0.08%	-0.01%	0.01%	0.01%	0.01%	0.12%	-0.01%
2401C Other Professional and Scientific Equipment Manufacturing	-0.13%	-0.01%	0.01%	0.01%	0.02%	0.14%	-0.01%
2401D Computer and Electronic Office Equipment Manufacturing	-0.14%	-0.01%	0.01%	0.01%	0.01%	0.10%	-0.01%
2401E Communication Equipment Manufacturing	-0.17%	-0.01%	0.01%	0.01%	0.01%	0.13%	-0.01%
2401F Other Electronic Equipment Manufacturing	-0.08%	-0.01%	0.01%	0.01%	0.02%	0.16%	-0.01%
2403Z Electrical Equipment Manufacturing	-0.17%	-0.01%	0.01%	0.01%	0.01%	0.11%	-0.01%
2404Z Domestic Appliance Manufacturing	0.09%	-0.01%	0.00%	0.01%	-0.01%	0.12%	0.00%
2405A Pump, Compressor, Heating and Ventilation Equipment Manufacturing	-0.25%	-0.01%	0.01%	0.00%	0.01%	0.07%	-0.02%
2405B Specialised Machinery and Equipment Manufacturing	-0.25%	-0.01%	0.01%	0.00%	0.01%	0.09%	-0.02%
2405C Other Machinery and Equipment Manufacturing	-0.26%	-0.02%	0.01%	0.01%	0.02%	0.15%	-0.03%
2501Z Furniture Manufacturing	0.04%	-0.01%	0.00%	0.01%	0.00%	-0.31%	0.00%
2502A Jewellery and Silverware Manufacturing	0.10%	-0.01%	0.00%	0.01%	0.01%	0.03%	-0.01%
2502B Toy Manufacturing	0.18%	-0.01%	-0.01%	0.01%	0.01%	-0.04%	-0.01%
2502C Sporting Product Manufacturing	0.21%	-0.01%	-0.01%	0.01%	0.00%	-0.01%	0.00%
2502D Other Manufacturing n.e.c.	-0.07%	-0.01%	0.01%	0.01%	0.00%	-0.05%	-0.01%
2601A Fossil Fuel Electricity Generation	-0.06%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
2601B Hydro-Electricity Generation	-0.05%	0.00%	0.00%	0.01%	-0.02%	-0.02%	0.01%
2601C Other Electricity Generation	0.08%	0.00%	-0.01%	0.00%	-0.03%	-0.09%	0.01%
2605A Other electricity service income	-0.29%	0.00%	0.02%	0.01%	-0.03%	-0.05%	0.02%
2605M Margin - Electricity transmission, distribution and on selling (2620-2640)	-0.42%	0.00%	0.03%	0.01%	-0.04%	-0.06%	0.02%
2701A Other gas service income	-0.25%	-0.01%	0.02%	0.01%	-0.02%	-0.03%	0.00%
2701M Margin - gas distribution	-0.25%	-0.01%	0.01%	0.01%	-0.02%	-0.03%	0.00%
2801Z Water Supply, Sewerage and Drainage Services	-0.01%	0.00%	0.00%	0.00%	-0.03%	-0.09%	0.00%
2901Z Waste Collection, Treatment and Disposal Services	0.04%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.01%
3001Z Residential Building Construction	0.24%	0.00%	-0.01%	0.01%	-0.02%	-0.01%	0.01%
3002Z Non-Residential Building Construction	-0.08%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.00%
3101A Road and Bridge Construction	-0.04%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
3101B Other Heavy and Civil Engineering Construction	-0.11%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.00%
3201Z Construction Services	0.00%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
3301A Non-margin - wholesaling services	-0.34%	0.00%	0.00%	0.00%	-0.02%	-0.14%	0.00%
3301B Commission-Based Wholesaling	-0.40%	0.00%	0.01%	-0.01%	-0.03%	-0.27%	-0.01%
3301M Margin - wholesaling services	-0.38%	0.01%	0.02%	0.00%	-0.04%	-0.14%	0.03%
3901A Non-margin - retailing services	-0.15%	0.00%	0.01%	0.00%	-0.01%	-0.02%	0.00%
3901B Retail commission on sales	-0.45%	0.01%	0.03%	0.01%	-0.05%	-0.13%	0.04%
3901M Margin - retailing services	-0.75%	0.00%	0.06%	0.02%	-0.06%	-0.09%	0.06%
4401Z Accommodation	0.11%	-0.01%	-0.01%	0.02%	-0.04%	0.05%	0.02%
4501A Meal preparation and presentation	0.16%	0.00%	-0.01%	0.02%	-0.06%	-0.08%	0.05%
4501B Beverage serving	0.17%	0.00%	-0.01%	0.02%	-0.04%	-0.08%	0.03%
4501C Takeaway food	0.24%	0.00%	-0.01%	0.03%	-0.07%	-0.08%	0.06%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
4501D Catering services	0.00%	0.00%	0.00%	0.02%	-0.05%	-0.09%	0.04%
4501E Net losses from gambling - Clubs, pubs, taverns and bars (Hospitality)	0.27%	0.01%	-0.02%	0.04%	-0.08%	-0.12%	0.07%
4501M Margin - food and beverage services (4511-4530)	-0.83%	0.00%	0.07%	0.03%	-0.07%	-0.08%	0.06%
4601A Non-margin - Road Freight Transport	-0.27%	0.01%	-0.01%	0.00%	-0.03%	-0.15%	0.01%
4601B Road Passenger Transport	0.07%	0.00%	0.00%	0.01%	0.00%	0.08%	0.00%
4601M Margin - Road Freight Transport	-0.49%	0.02%	0.00%	0.00%	-0.05%	-0.28%	0.03%
4701A Non-margin - Rail Freight Transport	-0.11%	-0.01%	0.00%	-0.01%	-0.01%	0.04%	0.00%
4701B Rail Passenger Transport	0.13%	-0.01%	0.00%	0.01%	0.00%	0.11%	0.00%
4701M Margin - Rail Freight Transport	-0.23%	0.04%	-0.01%	0.09%	-0.05%	-0.29%	0.03%
4801A Non-margin - Water Freight Transport	-0.23%	-0.04%	0.03%	0.04%	0.03%	0.44%	0.00%
4801B Water Passenger Transport	-0.02%	-0.01%	0.00%	0.02%	-0.01%	0.16%	0.00%
4801M Margin - Water Freight Transport	-0.18%	0.02%	0.00%	0.06%	-0.04%	-0.19%	0.02%
4901A Non-margin - Air and Space Freight Transport	-0.17%	-0.01%	0.01%	0.01%	0.01%	0.10%	-0.01%
4901B Air and Space Passenger Transport	0.06%	-0.01%	0.00%	0.01%	0.00%	0.10%	0.00%
4901M Margin - Air and Space Freight Transport	-0.50%	0.01%	0.02%	-0.01%	-0.04%	-0.15%	0.03%
4801C Scenic and Sightseeing Transport	0.09%	-0.01%	0.00%	0.02%	-0.01%	0.11%	0.01%
4801D Non-margin - Pipeline and Other Transport	0.03%	0.00%	0.00%	0.00%	-0.01%	0.02%	0.01%
4801N Margin - Pipeline and Other Transport	-0.25%	-0.01%	0.02%	0.01%	-0.02%	-0.03%	0.00%
5101Z Postal and Courier Pick-up and Delivery Service	-0.11%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
5201A Water Transport Support Services	-0.23%	-0.01%	0.00%	0.00%	0.00%	0.03%	0.00%
5201B Airport Operations and Other Air Transport Support Services	-0.15%	-0.01%	0.01%	0.01%	0.01%	0.11%	-0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
5201C Other Transport Support Services	-0.09%	0.00%	0.00%	0.00%	-0.01%	-0.08%	0.00%
5201D Warehousing and Storage Services	-0.35%	0.00%	0.00%	0.00%	-0.03%	-0.21%	0.01%
5201M Margin - Water Transport Support Services	-0.35%	0.02%	0.00%	0.04%	-0.04%	-0.20%	0.02%
5401A Newspaper and Magazine publishing	-0.08%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
5401B Book publishing	0.17%	0.00%	-0.01%	0.01%	-0.01%	0.06%	0.00%
5401C Other Publishing	-0.11%	0.00%	0.00%	0.01%	-0.02%	-0.03%	0.01%
5401D Software Publishing	-0.02%	0.00%	0.00%	0.01%	-0.01%	0.03%	0.00%
5501A Motion Picture and Video Activities	-0.04%	0.00%	0.01%	0.00%	0.00%	-0.05%	-0.01%
5501B Sound Recording and Music Publishing	-0.19%	-0.02%	0.02%	0.00%	0.04%	0.09%	-0.03%
5601A Radio Broadcasting	-0.15%	0.00%	0.01%	0.00%	-0.01%	-0.03%	0.00%
5601B Television Broadcasting	-0.09%	0.00%	0.01%	0.00%	-0.01%	-0.08%	-0.01%
5701A Internet Publishing and Broadcasting	0.02%	0.00%	-0.01%	0.00%	-0.02%	-0.02%	0.01%
5701B Internet Service Providers and Web Search Portals	0.10%	0.00%	-0.01%	0.00%	-0.03%	-0.02%	0.02%
5701C Data Processing, Web Hosting and Electronic Information Storage Services	-0.12%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.00%
5801A Wired Telecommunications Network Operation	0.01%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
5801B Other Telecommunications Network Operation	0.01%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.01%
5801C Other Telecommunications Services	-0.03%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
6001A Libraries and Archives	0.11%	0.00%	-0.01%	0.00%	-0.01%	0.02%	0.00%
6001B Other Information Services	-0.01%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
6201A Banks, building societies, credit unions	0.03%	0.00%	0.00%	0.00%	-0.01%	-0.02%	0.00%
6201B Other Depository Financial Intermediation	0.02%	0.00%	0.00%	0.00%	-0.02%	-0.02%	0.00%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
6201C Non-Depository Financing	0.06%	0.00%	0.00%	0.00%	-0.01%	0.02%	0.00%
6201D Financial Asset Investing	0.13%	0.00%	-0.01%	0.00%	-0.02%	0.01%	0.01%
6301A Life Insurance	0.21%	0.00%	-0.01%	0.01%	-0.02%	0.03%	0.01%
6301B Health Insurance	0.21%	0.00%	-0.01%	0.01%	-0.02%	0.03%	0.01%
6301C General Insurance	0.00%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
6301D Superannuation Funds	0.20%	0.00%	-0.01%	0.01%	-0.02%	0.03%	0.01%
6301M Marine insurance provision (Margin)	-0.53%	0.02%	-0.01%	0.07%	-0.05%	-0.38%	0.03%
6401A Financial Asset Broking Services	0.03%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%
6401B Other Auxiliary Finance and Investment Services	-0.04%	0.00%	0.00%	0.00%	-0.02%	-0.07%	0.00%
6401C Auxiliary Insurance Services	0.07%	0.00%	-0.01%	0.00%	-0.01%	0.02%	0.01%
6601A Goods and Equipment Rental and Hiring	-0.09%	0.00%	0.00%	0.00%	-0.02%	-0.04%	0.00%
6601B Non-Financial Intangible Assets (Except Copyrights) Leasing	-0.11%	0.00%	0.00%	0.00%	-0.01%	-0.02%	0.00%
6701A Residential Property Operators: owner-occupied	0.19%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
6701B Residential Property Operators: rented	0.19%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
6702A Non-Residential Property Operators	-0.11%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
6702B Real Estate Services	-0.09%	0.00%	0.01%	0.00%	-0.03%	-0.10%	0.00%
6901A Scientific Research Services	-0.10%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%
6901B Architectural Services	-0.05%	0.00%	0.00%	0.00%	-0.02%	-0.03%	0.01%
6901C Surveying and Mapping Services	-0.06%	-0.01%	0.01%	0.00%	-0.01%	0.06%	-0.01%
6901D Engineering Design and Engineering Consulting Services	-0.10%	0.00%	0.00%	0.00%	-0.01%	0.01%	0.00%
6901E Other Specialised Design Services	-0.20%	0.00%	0.00%	0.00%	-0.03%	-0.09%	0.02%
6901F Scientific Testing and Analysis Services	-0.16%	-0.01%	0.01%	0.00%	-0.01%	0.03%	-0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
6901G Legal Services	-0.13%	0.00%	0.00%	0.00%	-0.02%	-0.04%	0.00%
6901H Accounting Services	-0.11%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
6901I Advertising Services	-0.15%	0.00%	0.00%	0.00%	-0.02%	-0.06%	0.01%
6901J Market Research and Statistical Services	-0.10%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
6901K Corporate Head Office Management Services	-0.25%	-0.01%	0.02%	0.00%	0.01%	0.06%	-0.01%
6901L Management Advice and Related Consulting Services	-0.15%	0.00%	0.00%	0.00%	-0.02%	-0.06%	0.01%
6901O Veterinary Services	-0.28%	0.00%	-0.01%	0.00%	-0.01%	-0.29%	-0.01%
6901P Professional Photographic Services	0.04%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
6901Q Other Professional, Scientific and Technical Services n.e.c.	-0.23%	0.00%	0.02%	-0.01%	-0.03%	-0.11%	-0.02%
7001Z Computer Systems Design and Related Services	-0.08%	0.00%	0.00%	0.00%	-0.02%	-0.05%	0.01%
7210A Employment Placement and Recruitment Services	-0.09%	0.00%	0.00%	-0.01%	-0.02%	-0.04%	0.01%
7210B Labour Supply Services	-0.15%	0.00%	0.00%	-0.01%	-0.02%	-0.06%	0.01%
7210C Travel Agency and Tour Arrangement Services	-0.03%	0.00%	0.00%	0.01%	-0.01%	0.02%	0.01%
7210D Other Administrative Services	-0.07%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
7310A Building Cleaning, Pest Control and Gardening Services	-0.03%	0.00%	0.00%	0.00%	-0.02%	-0.04%	0.01%
7310B Packaging Services	-0.33%	0.01%	0.00%	-0.01%	-0.03%	-0.16%	0.01%
7501Z Public Administration and Regulatory Services	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
7601Z Defence	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7701Z Public Order and Safety	-0.01%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
8010A Preschool Education	0.11%	0.00%	-0.01%	0.00%	-0.01%	0.02%	0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
8010B Primary Education	0.06%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
8010C Secondary Education	0.08%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
8010D Special School Education	0.02%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
8110A Technical and Vocational Education and Training	-0.05%	0.00%	0.00%	0.00%	0.01%	0.06%	-0.01%
8110B Higher Education	0.00%	0.00%	0.00%	0.00%	0.01%	0.06%	0.00%
8210A Adult, Community and Other Education	0.13%	0.00%	-0.01%	0.00%	0.00%	0.05%	0.00%
8210B Educational Support Services	0.01%	0.00%	0.00%	0.00%	-0.02%	-0.01%	0.01%
8401A Hospitals	0.06%	0.00%	0.00%	0.00%	-0.01%	0.01%	0.00%
8401B Medical Services	0.07%	0.00%	0.00%	0.00%	-0.01%	0.01%	0.01%
8401C Pathology and Diagnostic Imaging Services	0.08%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.01%
8401D Dental Services	0.13%	0.00%	-0.01%	0.01%	-0.01%	0.02%	0.01%
8401E Optometry and optical dispensing	0.15%	0.00%	-0.01%	0.01%	-0.01%	0.01%	0.01%
8401F Other Allied Health Services	0.13%	0.00%	-0.01%	0.01%	-0.01%	0.01%	0.01%
8401G Other Health Care Services	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8601A Aged Care Residential Services	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8601B Other Residential Care Services	0.09%	0.00%	0.00%	0.01%	-0.01%	0.00%	0.01%
8601C Child Care Services	0.09%	0.00%	0.00%	0.01%	-0.01%	0.02%	0.01%
8601D Other Social Assistance Services	0.05%	0.00%	0.00%	0.01%	-0.01%	0.01%	0.01%
8901A Museum Operation	0.05%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%
8901B Parks and Gardens Operations	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8901C Creative and Performing Arts Activities	0.01%	0.00%	0.00%	0.00%	-0.01%	-0.03%	0.00%
9101A Sports and Physical Recreation Activities	0.14%	0.00%	-0.01%	0.00%	-0.01%	-0.02%	0.01%
9101B Horse and Dog Racing Activities	0.20%	0.00%	-0.01%	0.00%	-0.02%	-0.02%	0.01%
9101C Amusement and Other Recreation	0.17%	0.00%	-0.01%	0.00%	-0.01%	0.01%	0.01%

	GST on basic food	more export market access	fresh veg campaign	lower veg import prices	fresh veg disease outbreak	no diesel fuel rebate for Ag	higher prod'y in fresh veg
Activities							
9201A Casino Operation	0.24%	0.00%	-0.02%	0.01%	-0.02%	0.06%	0.00%
9201B Lottery Operation	0.21%	-0.01%	-0.01%	0.01%	-0.01%	0.10%	0.00%
9201C Other Gambling Activities	0.24%	0.00%	-0.02%	0.00%	-0.02%	0.04%	0.01%
9401Z Automotive Repair and Maintenance	-0.12%	0.00%	0.00%	0.00%	-0.03%	-0.12%	0.01%
9402A Machinery and Equipment Repair and Maintenance	-0.16%	0.00%	0.00%	0.00%	-0.02%	-0.08%	0.00%
9402B Other Repair and Maintenance	0.02%	0.00%	0.00%	0.01%	-0.02%	-0.01%	0.01%
9501A Personal Care Services	0.18%	0.00%	-0.01%	0.00%	-0.01%	0.04%	0.01%
9501B Funeral, Crematorium and Cemetery Services	0.13%	0.00%	-0.01%	0.00%	-0.01%	0.02%	0.01%
9501C Laundry and Dry-Cleaning Services	0.12%	0.00%	-0.01%	0.00%	-0.01%	0.01%	0.01%
9501D Photographic Film Processing	-0.04%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.01%
9501E Parking Services	0.11%	0.00%	-0.01%	0.01%	-0.02%	-0.01%	0.01%
9501F Other Personal Services n.e.c.	0.15%	0.00%	-0.01%	0.00%	-0.01%	0.04%	0.01%
9501G Private Households Employing Staff and Undifferentiated Goods- and Service- Producing Activities of Households for Own Use	0.21%	0.00%	-0.01%	0.01%	-0.01%	0.04%	0.01%
9502A Religious Services	0.23%	0.00%	-0.01%	0.01%	-0.02%	0.03%	0.01%
9502B Civic, Professional and Other Interest Group Services	0.26%	0.00%	-0.02%	0.01%	-0.03%	0.00%	0.02%
Total	**-0.16%**	**0.00%**	**0.00%**	**0.00%**	**-0.02%**	**-0.07%**	**0.01%**