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ECONOMIC IMPACTS OF IMMIGRATION: SCENARIOS USING A COMPUTABLE GENERAL EQUILIBRIUM MODEL OF THE NEW ZEALAND ECONOMY

ECONOMIC IMPACTS OF IMMIGRATION WORKING PAPER SERIES

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Background to this study

This study is part of the Department of Labour's wider Economic Impacts of Immigration research programme, which is funded by the Cross-Departmental Research Pool. It reports on the application of a Computable General Equilibrium (CGE) model of the New Zealand economy to investigate the economy-wide impacts of immigration.

Objectives

The objective of this study is to better understand the impact of immigration on the New Zealand economy overall and on different parts of the economy. This is achieved by modelling changes to the scale of the immigrant inflow and by changing the focus of immigration to target higher skilled immigrants. The model also tests the impact of additional influences that immigrants might have on productivity and trade. Finally, results from the model are compared with those from a similar study conducted in the 1980s and a more recent study undertaken for the Australian economy.

General findings

From an economy-wide perspective, the increased immigration scenarios investigated resulted in qualitatively similar impacts. In general, the results of the model scenarios found that increased immigration:

- reduces production costs
- improves the competitiveness of New Zealand goods and services, *benefiting exports*
- *benefits domestic investment and/or consumer spending*, depending on the skills composition of the immigration inflow
- results in higher revenues to government, which outweigh the impact on spending, so translate into an *improvement in the balance of the government's accounts*.

The four results listed above combine to *improve both real gross domestic product (GDP) and real GDP per capita*.

Findings from the different scenarios

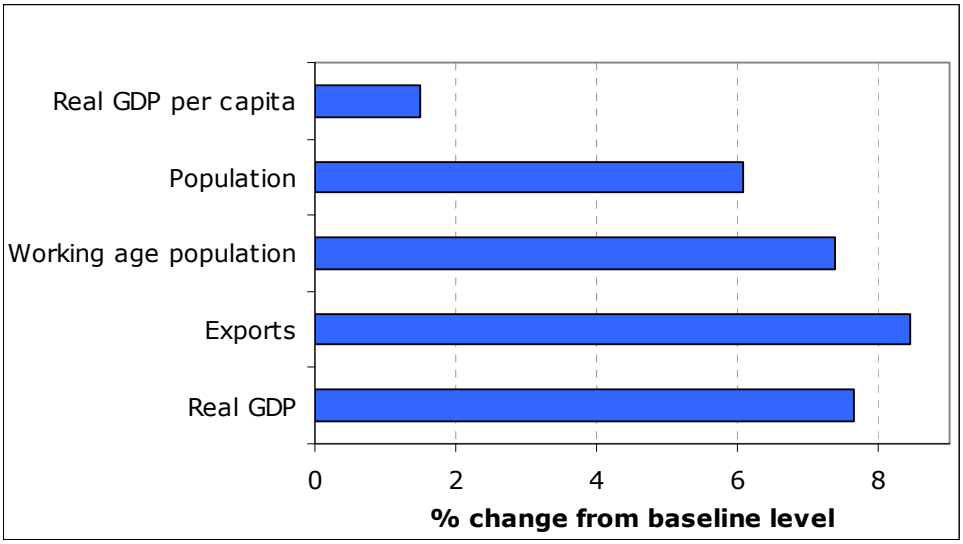
The following sections describe the major findings from the different scenarios that were modelled. The scenarios predict outcomes for 2021 compared with a baseline-level that is interpreted as a business-as-usual scenario with no major policy changes. Many core economic factors, such as productivity, export demand, terms of trade, and demographic changes, are held similar to recent historical levels.

Impact of increasing immigration flows

An average annual net permanent and long-term inflow of 40,000 non–New Zealand–born migrants, double the inflow of the recent historical average of 20,000 in the baseline, was found to add 6.1 percent to the resident population in 2021. This took the population from 4.5 million in the baseline to 4.8 million in 2021, and added 7.4 percent to the labour available to the 2021 economy compared with that in the baseline.

Real GDP would be 7.6 percent higher, taking GDP per capita up 1.5 percent or $800 above the baseline in 2021. Differences in the make-up of this larger economy are most noticed in the external sector, with export volumes 8.5 percent above baseline.[1]

Economic impact in 2021 of doubling net immigration inflow



Impact of zero immigration

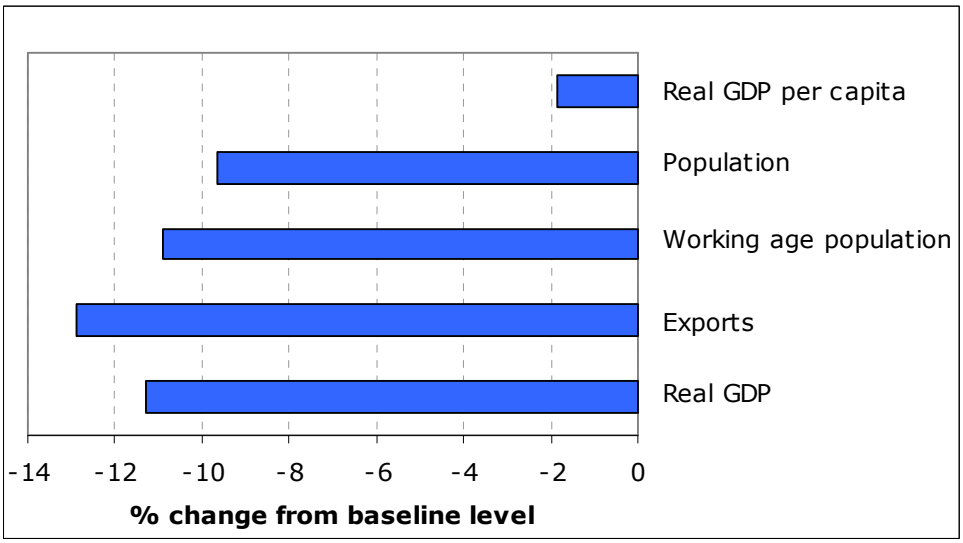
A total cessation of the current net immigrant inflow was also tested that allowed an ongoing outflow of New Zealand and overseas born at current levels. This scenario gives a New Zealand resident population of 4.1 million in 2021, 9.6 percent below the 2021 baseline population. Consequently, the labour available in 2021 is 10.9 percent below the 2021 baseline figure.

The results for this scenario record GDP in 2021 at 11.3 percent below that of the baseline. Consequently, GDP per capita is 1.8 percent or $1,000 below the baseline level.

The impact of this smaller economy is felt most by the export sector, where volumes in 2021 are 12.9 percent below the baseline. This effect arises from a higher price level, so reduced competitiveness, which results from the smaller quantity of labour available.

[1] This scenario let the model determine the skill composition of the inflow.

Economic impact in 2021 of a zero immigration inflow



Impact of current levels of immigration inflows

The difference between the baseline and the results for a zero net immigration inflow can be viewed as the value of the current level of immigration. Compared with a zero immigration inflow, net immigration at recent levels results in a significantly larger New Zealand population of 4.5 million and annual GDP of $248 billion in 2021.

Consequently, the aggregate addition to the population of 437,000[2] arising from the current inflow of immigrants over the 15-year period yields an extra $28 billion in annual GDP in 2021. That is, the inflow of immigrants at recent historical levels is estimated to be worth around $1.9 billion per year to GDP and $1,000 per capita GDP in 2021.

Impact of skill composition

Experiments were also undertaken where the composition of the additional labour was specified in favour of particular higher-skilled categories. Such a scenario can be seen as some change in policy direction or external impetus.

Overall, this scenario resulted in a slightly higher impact on GDP with GDP 0.1 percent higher than in the scenario that did not specify the skill mix of the inflow. Additionally, there were small, but noticeable, differences in the make-up of the impact on GDP. In particular, the benefit to the export sector where the additional immigration inflow was of specific skills totalled 8.3 percent above baseline. This impact is not as large as the 8.5 percent recorded in the scenario where the composition of the inflow was demand determined. An increase in domestic consumption made up the difference.

The fact the result was not a great deal higher than when the skill level was not directly specified illustrates how the export sector requires semi-skilled, as well as skilled, labour resources in order to expand its activities. For example,

[2] As explained in section 3.1, although there is a 36,000 difference in the net annual inflows between scenario B and the baseline, this difference is imposed gradually over the 15-year period. Thus, the 437,000 figure is less than 36,000 multiplied by 15.

occupations such as machine operators and clerical staff in manufacturing, drivers in the transport sector, and sales and restaurant workers in tourism-related industries are also export-related requirements.

Associated influences

A scenario was modelled that assumed productivity in 2021 is 1 percent above the baseline accompanying the increased immigration. This assumption pushes the impact on GDP to 8.7 percent above the baseline, with GDP per capita 2.5 percent higher. The productivity improvements translate into lower per unit resource costs for New Zealand producers. This, in turn, means competitiveness gains for exporters. Such gains also flow through to income gains to the household sector, thus facilitating consumption gains.

Another scenario was motivated by the argument that increased immigration might assist New Zealand producers to develop new products, contacts, and export-market opportunities. This argument, however, suggests there may also be an increased openness to importing activities. Consequently, this scenario models an increase in immigration accompanied by expanded world markets for New Zealand exports as well as an increased market share for imports. The impact on GDP is similar to the impact without these assumptions, with GDP per capita 1.5 percent higher than in the baseline. Undoubtedly, there is an additional benefit to exports, with volumes 9.1 percent above baseline compared with the 8.5 percent recorded in the absence of these assumptions. This impact, however, is countered by a similarly larger impact on the import side of the GDP equation, although the expansion of exports is greater than of imports.

Conclusion

Increased immigration inflows result in a larger economy. Further, under the assumptions adopted for the scenarios presented here, increased immigration inflows result in a positive effect on GDP per capita. The current net inflow of around 20,000 overseas born per year results in a significantly larger and more externally focused economy than if there were no inflow of immigrants.

The modelling experiments do not support arguments in favour of entirely high-skill focused or targeted immigration inflows. Such targeting does not appear to significantly increase the overall benefits to increased immigration flows. When an economy grows labour is required at all levels. This finding supports the need for a demand driven policy aimed at filling genuine shortages and not just focusing on the highly skilled. Although this result highlights the need for a range of skill levels to enable the economy to grow, it does not tell us about the appropriate policy to attract the potential immigrants (eg, different types of permits might be required to attract immigrants with varying skill levels).

Of the assumptions tested, additional benefits increase significantly only when productivity improvements accompany the increased immigration inflow. This suggests that if immigration policies or programmes were to target particular skill categories, the focus should be directed to those skills that have significant potential to improve overall productivity.

1 Introduction

This study is part of the Department of Labour's wider Economic Impacts of Immigration research programme and reports on the application of a computable general equilibrium (CGE) model of the New Zealand economy to investigate the economic impacts of immigration.

1.1 Economic Impacts of Immigration research programme

The Economic Impacts of Immigration research programme is funded from the Cross-Departmental Research Pool.[3] The overall objectives of the research programme are to:

- understand the interaction between immigration and economic performance
- capture the short-term impact of immigration, specifically the adjustment or transition effects brought about in domestic markets by the arrival of immigrants
- provide information for the development of government policy in relation to immigration
- provide perspectives on the economic impact of immigration at the regional[4] as well as the national levels
- develop a model allowing different scenarios of immigration policies to be modelled and the economy-wide impact calculated.

The Economic Impacts of Immigration research programme is in two parts. The first part is designed to increase understanding of the impacts immigration has on specific sectors of the economy. The topics that have been explored as the first part of the programme are:[5]

- measuring the economic impact of immigration[6]
- the fiscal impacts of immigration 2005/2006[7]
- the settlement patterns and geographic mobility of recent immigrants to New Zealand[8]
- immigration and housing in New Zealand 1991–2016[9]
- the impact of population movements and immigration on local housing markets[10]
- immigrants and labour market outcomes[11]

[3] Supported by the Reserve Bank, The Treasury, the Ministry of Social Development, the Ministry of Economic Development, the Department of Internal Affairs, the Ministry of Pacific Island Affairs, Local Government New Zealand, and Housing New Zealand.

[4] Within New Zealand.

[5] All publications can be found on the Economic Impacts of Immigration webpage: http://www.immigration.govt.nz/migrant/general/generalinformation/research/impacts.htm

[6] Poot and Cochrane (2004).

[7] Slack et al (2008).

[8] Morton et al (2007).

[9] Sanderson et al (2008).

[10] Maré and Stillman (2008).

- the impact of immigration on labour market outcomes of New Zealanders[12]
- the labour market adjustment of immigrants in New Zealand[13]
- the impact of immigration and local workforce characteristics on innovation and firm performance.[14]

The second part of the programme is the CGE modelling. The CGE modelling complements the first part of the analysis by giving an economy-wide perspective on the interaction between immigration and economic factors. Critical in such assessments is an understanding of the inter-relationships between other influences, immigration and the economy. This requires a general economy-wide perspective, as opposed to partial analyses of specific markets. It is also important to be able to investigate questions surrounding the sensitivity of key relationships. The CGE modelling framework is ideally suited to test and investigate the relationships between immigration and the economy in a robust economy-wide context.

While the first part of the work was undertaken independently of the CGE modelling process, its outcomes provided the CGE model with details about the economic impacts of immigration on the New Zealand economy. These work streams contained aspects that assisted in the formulation of the CGE model, as well as in the construction of the scenarios for investigation.

The outcome of this project also includes the provision of the CGE model and appropriate training to the Department of Labour, so it can undertake further experiments and simulations.

1.2 Research objective

The CGE modelling framework has been used to investigate several interrelated issues (see Figure 1.1). First, the model is used to give an understanding of how immigration interacts with the economy and estimate the value that it adds. This is achieved by simulating changes to the size (both increases and decreases) of the recent inflow of immigrants. Second, the impacts of high-skilled immigrants are tested by changing the composition of the inflow of immigrants to include many more highly skilled and fewer lower skilled. Third, increases in immigration may also have associated influences on productivity growth, and exports and imports. These are tested in individual experiments to understand individual impacts and then collated to understand their interaction. The idea is not only to focus on the impact of immigration from changes in absolute figures of the variables, but to identify relationships, influences and interactions within the economy. Additionally, understanding how immigration and influences such as the skill level of the inflow, productivity, or trade can interact will give policy-makers an idea about the factors that are most important to target.

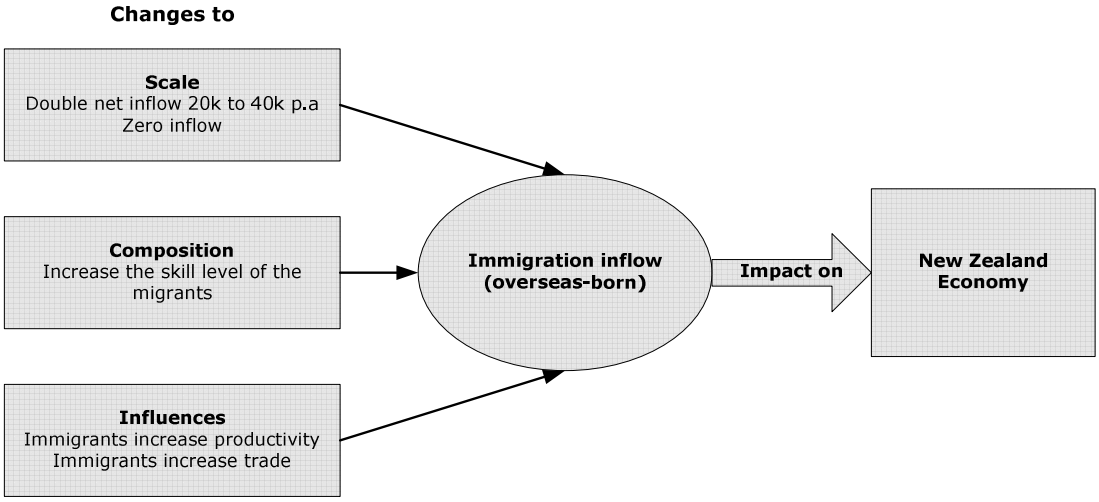
[11] Nana and Sanderson (2009).

[12] Maré and Stillman (2009a).

[13] Maré and Stillman (2009b).

[14] Maré et al (in press).

Figure 1.1 Changing different aspects of immigration to test the impact on the economy



The core results are compared with two similar studies. We first compare the results with a study on the economic impacts of immigration in New Zealand conducted in the late 1980s.[15] This is interesting because it shows how immigration has a different impact now than it did 20 years ago. Second, a comparison is made with a similar study conducted in Australia for the Australian Productivity Commission (2006) where the impacts of increasing the inflow of skilled immigrants by 50 percent was tested.[16]

1.3 Report structure

Section 2 outlines what a CGE model is, shows how to interpret the results from the model, and creates a base case for comparison. The scenarios to be tested are introduced in section 3, with the results reported and discussed in section 4 (with additional detail in the appendices). The report concludes in section 5.

[15] Poot et al (1988).

[16] Productivity Commission (2006).

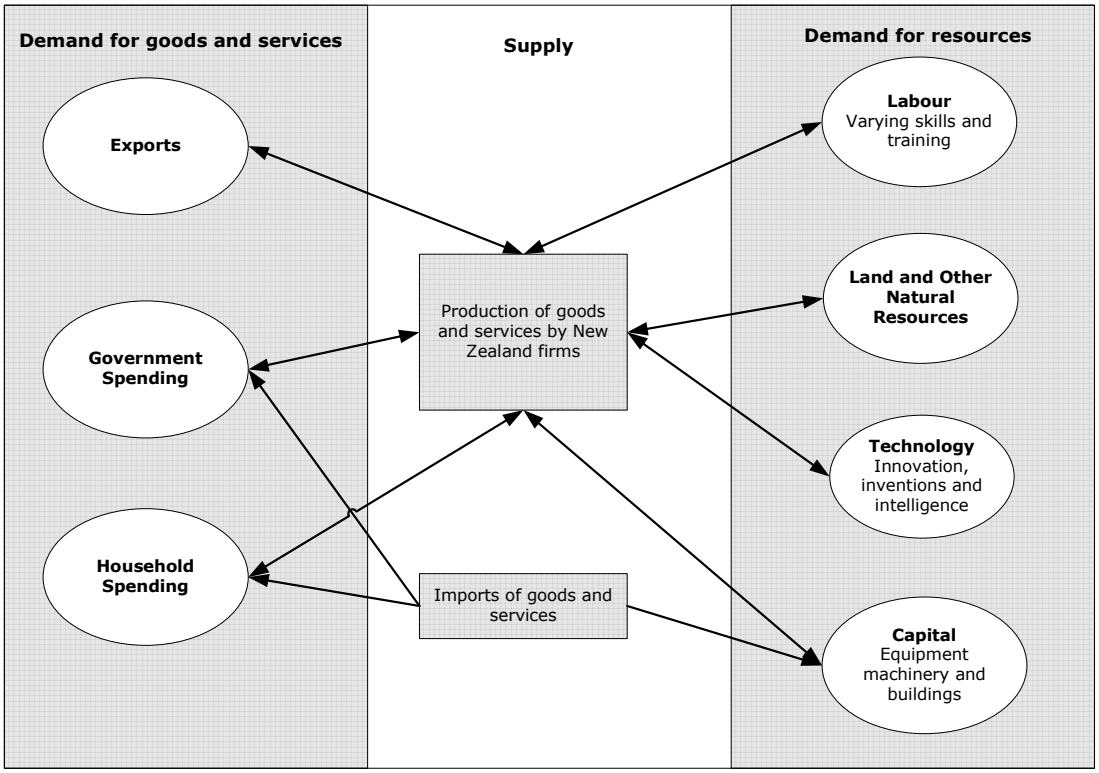
2 Computable general equilibrium model

2.1 Balancing demand and supply

Economic models are sets of equations representing the major relationships between the various sectors and participants in an economy. These equations together form a coherent, but necessarily simplified, depiction of the workings of an economy. In essence, the modelling process illustrates the outcome of a balancing act (performed by the market) between the demands for goods and services and the resources necessary to produce those goods and services to satisfy such demands.

As depicted in Figure 2.1, the demands for goods and services can be simplified as originating from households, government, and exports. The resources required to produce goods and services comprise labour, capital (machinery, equipment, and buildings), land and other natural resources, and technology. Additionally, some demands are satisfied externally – through imports.

Figure 2.1 Schematic outline of relationships



2.2 Computable general equilibrium model

A computable general equilibrium (CGE) model is a standard and widely used tool to investigate the impacts of economic shocks or events, or to measure the contribution of sectors or industries to the wider economy. The model captures the inter-relationships between industries and between exports, imports, consumption, as well as their combined resource requirements (see Appendix A for further detail on structure).

The model follows standard neoclassical assumptions of market-clearing prices,[17] profit-maximising firms,[18] and utility-maximising consumers.[19] The equilibrium of the economy is determined by market-driven adjustments to the relative prices of production factors (resources) and outputs that ensure supply equals demand in each of these markets. In addition, embedded in the production structure of firms is the standard neoclassical assumption of zero pure (economic) profits.[20]

The Business and Economic Research Limited (BERL) CGE model of the New Zealand economy (called Joanna) used in this study, separately identifies 53 industries, 25 export commodities, 8 household consumption commodities, and 40 occupation categories (see Appendix B for further details).

The model has its origins in the models the Project on Economic Planning at Victoria University of Wellington developed in the early 1980s. Early applications focused on trade policy questions, with simulations of tariff removals and General Agreement on Tariffs and Trade outcomes, contributing to the 'gains to free trade' argument prevalent at that time.

The model was originally based on a model of the Australian economy,[21] so its structural framework is similar, arising from input–output relationships. This model can simulate the effect of a policy, world price, world demand, productivity, and/or behavioural shock and solves for the equilibrium outcome in a future identified year. The model used in this study calculates the results for a user defined year, in this case 2021, but does not report the path the economy takes in preceding years.[22]

The key elements of the model's structure are summarised in the sections below.[23]

2.3 Advantage of model is in its industry detail

An important feature of CGE models is that the equations to estimate demand and supply can be constructed at a detailed industry level. Furthermore, they are based on inter-industry relationships, which show the flows of goods and services between industries. Therefore, the model's estimates of employment and output growth by industry recognise that expansion or contraction in any one industry leads to a flow-on of demand into many other industries. Thus, we can explore questions such as, 'If the production of wood products were to increase 10 percent, how much would that affect the demand for the services of the transport industry?'. In other words, industries use inputs to produce goods and services and some of these inputs are goods and services produced by other

[17] The price at which the level of demand equals the level of supply in a particular market.

[18] Profit maximisation is the process of obtaining the highest possible level of economic profit through the production and sales of goods and services.

[19] The process or goal of obtaining the highest level of satisfaction of wants and needs obtained from the use or consumption of goods and services.

[20] A firm earning zero economic profit is doing as well by investing its money in capital as it could by investing elsewhere.

[21] Dixon et al (1982).

[22] A dynamic version of the model has also been developed (Nana, 1999) that enables the path of an economy over time to be modelled. Comparing a baseline path with a path that incorporates the response to a shock or shocks enables comparative dynamic (as opposed to comparative static) analysis to be undertaken.

[23] The detailed model structure closely follows Dixon et al (1982) and is described in Poot et al (1988).

industries. The modelling process captures and mimics the relationship between these inputs and outputs.

Furthermore, the ability of certain industries to change the amount (or type) of inputs they use is incorporated in the model. This ability to change (ie, to react to demand, supply, and price shifts) is limited by technological factors. And the extent to which industries change their inputs is guided by standard economic theory, which assumes producers strive to adopt the lowest-cost method of production.

2.4 Data and aggregations

The limited availability of data as well as practical limitations mean that any model involves a degree of simplification. The model, just like all simplifications of reality, is only as good as the information available. The CGE model in particular devours information (ie, data on the aforementioned relationship between inputs and outputs), but such up-to-date and detailed information is always difficult to obtain.

As stated in section 2.3 the CGE model is based on inter-industry relationships. This information comes from input–output tables. The most recent full-scale official input–output tables for the New Zealand economy from Statistics New Zealand describes the inter-industry relations as they were in 1995/1996. A new set of input–output tables was developed for the present study, so more up-to-date, realistic and accurate estimates can be made. However, updating input–output tables is a far from trivial exercise. Information from more up-to-date supply and use tables[24] were used to derive input–output tables for 2003/2004. From this information, inter-industry transactions tables for 2005/2006 were generated using the RAS method.[25] Of course, while not ideal, a RAS update from a 2003/2004 starting point is infinitely superior to a RAS update from a 1995/1996 starting point.

Information from the 2006 Census of Population and Dwellings was used to update other data necessary for the model and allow the baseline to be as accurate as possible. As such the latest employment by industry, occupation, and household income data were incorporated using 2006 census figures.

Within the model elasticities determine the ability of industries to substitute between different types of labour occupations. Industries are assumed to undertake such substitution in response to price (wage) changes and/or constraints on the availability of different labour skill types. These elasticities were also updated for the model.

In addition, data on the physical stock of capital (machinery, equipment, land and building) in each industry was also updated. This information was obtained from the tables on supply and use, along with information from Statistics New Zealand's capital stock and productivity series.

[24] These use 2003/2004 data. The supply table shows the origin of the resources of goods and services, and the use table shows the uses of these goods and services and the cost structure of the various industries.

[25] The RAS method is a method used to update existing input–output tables to relate to a year for which intermediate input (column) sums are known but not the intermediate deliveries themselves. See Parikh (1979) for an overview of this method.

Finally, information on household consumption and government fiscal accounts was incorporated into the model. This information came from another Economic Impacts of Immigration project, namely the one on the fiscal impacts of immigration.[26]

2.5 Interpreting model simulations

The CGE model allows us to perform computer simulations to investigate the effect of particular events on the economy. For example, we could estimate the changes in major economic variables (eg, employment or real gross domestic product (GDP)) resulting from a:

- change in population growth, which affects household spending growth
- technological breakthrough that results in increased productivity in particular sectors
- world event (eg, political turmoil) that reduces the demand for our exports
- change in policy (eg, increased government spending on hospitals)
- change in the price of commodities (eg, milk solids or oil).

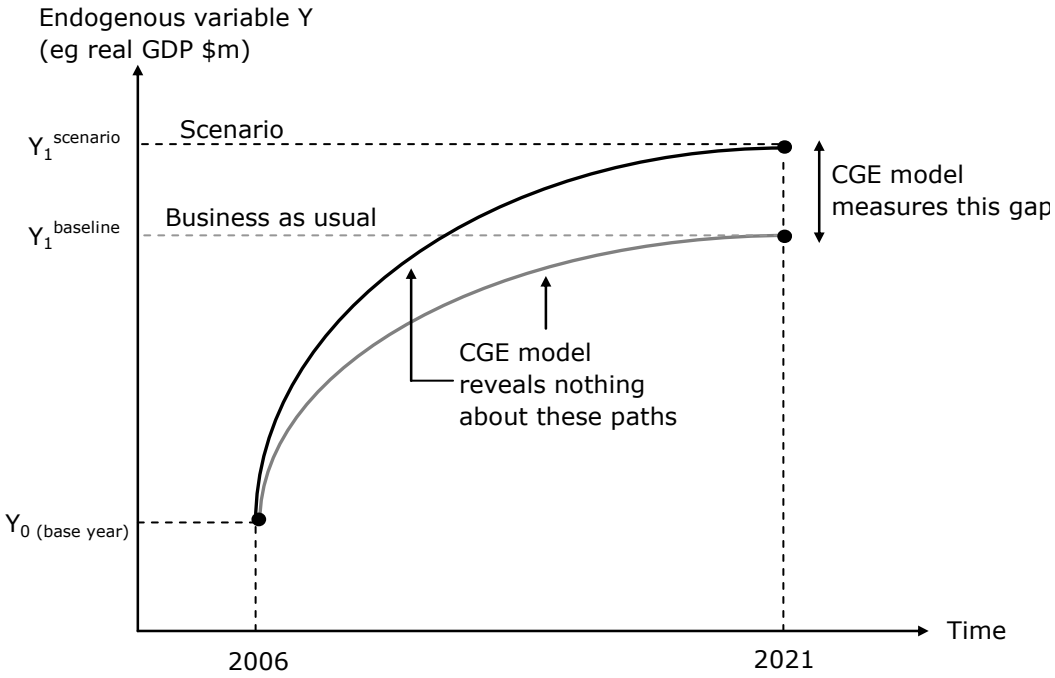
In the analysis the CGE model first needs to establish a base case to which the results of various scenarios can be compared. This means there is a constant point of analysis between various scenarios. The base case (or baseline) is sometimes referred to as a business-as-usual scenario and is essentially what would happen in the absence of any significant shock. The model also needs a 'base' year (or starting point) and a 'snapshot' year to be defined. In this study, the base year is 2006 and the snapshot year is 2021. Essentially, the study is modelling the effect of a shock, such as an increase in the inflow of immigrants, on the economy in 15 years' time (2006 to 2021).

Figure 2.2 shows how the CGE model results should be interpreted. The example of real GDP is used. First, the level of real GDP in the snapshot year (2021), noted as $Y_1^{baseline}$, consistent with a baseline scenario needs to be established.

Thereafter, the CGE model experiment proceeds by changing one (or more) of the assumptions that have been adopted to determine the baseline or control level of real GDP $Y_1^{baseline}$. It is best to change only one assumption at a time so the impact of that change can be understood. If multiple assumptions are changed, it is not possible to understand the individual impact of each change or the impact as a result of the interaction between the changed assumptions.

[26] Slack et al (2008).

Figure 2.2 Interpreting a computable general equilibrium (CGE) model experiment



If the annual flow of immigrants were changed, then this is the 'shock' that is to be modelled. For such an experiment to be modelled, a variety of variables is likely to be changed to mimic the 'shock' being introduced into the model.[27] For example, the labour supply is likely to be different in the baseline compared with in the scenario. In addition, government consumption demand may be changed to reflect different, for example, education and health spending associated with the changed flow of immigrants in the scenario.

The result of the model's simulation (experiment) of the impact of immigration would be a measure of the difference between $Y_1^{scenario}$ and $Y_1^{baseline}$; that is, the difference between real GDP with shock (changed flow of immigrants) and real GDP without shock (baseline flow of immigrants).

The model provides results for a wide range of economic measures (eg, labour employed, gross output by various sectors, exports by different commodities, and imports and consumer spending by commodity). Each of these results should be interpreted in a similar way to that depicted in Figure 2.2. An alternative way of interpreting the CGE model experiments is to view them as answering, 'what … if … ?' questions. For example, the question being answered would be, 'what is the change in real GDP and employment, if productivity in agriculture increases by x percent?'.

[27] In technical terms, a set of variables is not determined by the model – such variables are termed 'exogenous'. These variables must be set, or 'shocked', by the user, depending on the experiment or scenario being simulated. On the other hand, variables that are determined by the model are termed 'endogenous'. The outcomes for these variables are obtained as a result of solving the model's equations. This solution process occurs after the introduction of the shock, through changes to one or more exogenous variables, to the model.

2.6 Generating a baseline scenario

As noted above, the model generates a baseline scenario. Such a scenario should be interpreted carefully and, in particular, should not be confused with a forecast. Such projections are entirely contingent on the assumptions adopted for the key variables used to underpin the scenario. Key variables for which assumptions are required to generate a baseline scenario include:

- technological changes being faced by the industry or occupation (eg, which types of inputs (occupation skills or equipment) are more likely to be used than others) – the more we can find out about this, the more robust will be the model projections
- export market demand – expected global events and trends and whether these will constrain or aid the expansion in overseas sales of New Zealand goods and services
- terms of trade – movements in the relative world prices of goods and services that New Zealand producers are competing with on the global market
- demographics – growth in population, number of households, the working age population, and the labour supply available
- the relative rates of return and the savings to gross national product (GNP) ratio – assumptions on the savings to GNP ratio are required to establish the availability of the productive capital stock (physical machinery, equipment, buildings) for use by industry in the projection year.

The detailed assumptions imposed for the baseline projection are presented in Appendix C.

2.7 Baseline scenario for this study

The baseline projection should be interpreted as a business-as-usual scenario. As such, many of the variables used are similar to those observed in recent years. Productivity and export market growth are assumed to be similar to the levels experienced over recent years. The productivity[28] assumptions for the baseline vary across the different sectors and vary between capital and labour productivity. On average, labour productivity is assumed to grow at an annual rate of 1.2 percent over 2006 to 2021. This is comparable with the average for 1994 to 2006 of 1.1 percent per annum. As for capital productivity, this is assumed to grow on average 0.6 percent per annum in the baseline projection. This compares with the annual average of 0.5 percent over 1994 to 2006.

Similarly, export market growth also varies across the commodities. It is assumed that growth for primary (eg, agricultural) commodities grows at a slower rate than that for manufactured commodities. In part, this reflects market access, as well as capacity, constraints for primary products. Tourism market growth is assumed to be slightly higher than manufacturing sector growth.

The 2021 baseline terms of trade (measured as world export prices relative to world import prices) is assumed to remain relatively unchanged from the 2006 level. However, the world prices of oil and related energy products are assumed to increase at a faster rate than the prices of other goods and services.

[28] Productivity is defined as output per unit of combined labour and capital inputs used.

The baseline also assumes the average net change in the overseas-born population resident in New Zealand (annual net inflow) to be 20,000 per year. Taking into account flows of the New Zealand–born population, this assumption is equivalent to a net annual inflow of permanent and long-term (PLT)[29] migrants of 10,000. This assumption places the business-as-usual scenario in the context of the 1991 to 2006 New Zealand experience when the net inflow of overseas born averaged just under 24,000 per annum and that of PLT flows averaged just over 12,000 annually, as shown in Table 2.1. This takes the resident New Zealand population from 4 million in 2006 to 4.5 million in the 2021 baseline.

Table 2.1 Comparison of permanent and long-term and overseas-born inflows

Period	Net permanent and long-term inflow	Net migrant inflow
1991–1996	15,650	16,862
1996–2001	-1,628	18,132
2001–2006	22,996	36,568
1991–2001	7,011	17,497
1996–2006	10,684	27,350
1991–2006	12,339	23,854

The composition of this net inflow (in terms of the number of couples and singles and number of households) is assumed to be similar to that experienced over 1991 to 2006. The skill mix of this net inflow is assumed to be driven by the demands of the economy (ie, it is fully model determined). Together with the ageing profile of the population and heightened labour participation rates, this takes the labour available in 2021 to 2.2 million full-time equivalents. This represents an increase of 1.5 percent per annum in labour supply over 2006 to 2021.

The model uses broad age compositions to calculate the number of people aged under than 15 and labour market participation rates. These estimates are used to calculate the size of the labour force and the size of the population under 15 years and not in the labour force. Bearing in mind the predominant age groups for health expenditure are the very young and the very old, the 'not in the labour force' group is used as a proxy for those aged 65 and over.

In generating the baseline, it is assumed that the national savings ratio (ie, the proportion of GNP income that is not spent on consumption) remains unchanged from its 2006 level. In addition, the average tax rate on household income in the 2021 baseline is assumed to be 19.1 percent compared with 21.1 percent in 2006.

[29] PLT arrivals include people who arrive in New Zealand intending to stay for a period of 12 months or more (or permanently), plus New Zealand residents returning after an absence of 12 months or more. Included in the former group are people with New Zealand residency, as well as students and holders of work permits. PLT departures include New Zealand residents departing for an intended period of 12 months or more (or permanently), plus overseas visitors departing New Zealand after a stay of 12 months or more.

2.7.1 Baseline economy for 2021

The baseline projects GDP growth at an average 3.1 percent per annum over 2006 to 2021, with full-time equivalent employment growth of the order of 1.5 percent per annum. As part of this growth, export growth averages 4.1 percent per annum (see Table 2.2).

Table 2.2 Baseline 2021 projection

	2006	% pa	Baseline
Real GDP components (2006 $m)			
Household consumption	93,590	2.7	139,332
Investment	37,319	3.1	59,092
Government consumption	28,661	2.7	42,669
Export volumes	43,290	4.1	79,580
Imports	47,469	3.0	74,240
Real GDP	156,088	3.1	247,556
Production factors			
Capital stock (2006 $m)	469,826	2.7	699,767
Employment (000 FTEs)	1,758	1.5	2,183
Prices (2006=100)			
GDP deflator	100.0	2.2	137.9
Gross output prices	100.0	2.1	136.3
Consumer prices	100.0	2.7	149.4
Real wage rates	100.0	0.5	107.5
Balances			
Balance of trade ($m)	-4,179	551	-1,628
as % of nominal GDP	*-2.7*	n/a	*-0.5*
Core Crown ($m)	9,270	10,499	19,769
as % of nominal GDP	*5.9*	n/a	*5.7*
Net foreign liabilities ($m)	129,517	7	337,075
as % of nominal GDP	*83.0*	0.0	*97.9*
Memo: population (000s)	4,027.9	0.8	4,535.2

This growth gains some support from a slight decline in New Zealand's real exchange rate, which improves the competitiveness of the country's exports relative to other international producers. Among New Zealand's export categories, the long-term trend away from commodities towards services continues. Thus, within this expansion the shift continues to services and value-added manufacturing. These sectors are projected to grow considerably faster than commodity exports on the whole.

Growth in tourism activity remains at the forefront (at 5.3 percent per annum). Primary commodity export volumes continue to grow over the projection period, albeit at a moderate pace for most industries (eg, wool, meat, and horticulture). Moderate productivity growth allows wages to increase in real terms; that is,

average wage rates are projected to grow more quickly than consumer price inflation over the projection period.

With investment spending growing in line with overall GDP, consistent with the required expansion in capital stock, the import–to–GDP ratio reduces little in real terms. This restrains the improvement in the balance of trade over the period.

Full-time equivalent employment is projected to expand by approximately 425,000 over the 15-year period, which equates to an annual increase of approximately 28,300. Employment in primary industries, such as agriculture, is projected to remain static or decline. Growth in government investment and exports will drive ahead employment in the higher value manufacturing industries (eg, machinery and equipment manufactures) and the building and government sectors.

This model projection assumes the labour resource required is available; that is, the skill (or occupation) composition of the labour resource supplied is totally demand driven. As shown in Table 2.3, the labour required by the baseline 2021 New Zealand economy is led by a greater than average expansion in professionals, trades workers, and machine operators. Further detail of the model results indicate that the increase in the required number of professionals is concentrated in scientific, computer, engineering, and business professionals. This, along with the increase in machine operators, is consistent with the increase in the manufacturing industries noted above. Some in the trades workers category will also be required by the manufacturing sector, while the expansion in the building sector is also relevant here. At the other end of the spectrum, little employment growth in agriculture is reflected in the low number for the increase in primary sector workers.

Accompanying this employment growth, are capital requirements that expand an average 2.7 percent per annum over the projection period. However, the savings arising from the income over the period are insufficient to fund the increase in capital resources required. Consequently, net foreign liabilities increase to be equivalent to nearly 98 percent of nominal GDP in 2021.

Table 2.2 compares the projection for the two productive factors, labour and capital resources, and shows that capital stock expands faster than employment. This means an overall shift over 2006 to 2021 to a relatively more capital-intensive economy. This is clearly reflected in the primary sectors where output growth is achieved by an expansion of capital but little, if any, employment growth. In addition, some of the services sectors (eg, education and transport) as well as the higher-value manufacturing sectors (eg, machinery and equipment manufactures) record noticeable increases in demand for capital.

As for the government accounts, the tax revenue accruing from the 2021 income is sufficient to fund the spending in line with demographic and final demand projections. This results in the projected core Crown balance declining slightly, relative to the size of the overall economy, to be 5.7 percent of nominal GDP in 2021.

Table 2.3 Baseline projection of employment by occupation

	2006	% pa	2021 Baseline
Labour by occupations (000 FTEs)			
Managers	257	1.4	318
Professionals	298	1.9	395
Technicians	336	1.4	414
Sales and clerical	424	1.3	515
Primary sector workers	102	0.2	105
Trades workers	162	1.7	208
Machine operators and labourers	175	1.6	224
Total	1,754	1.5	2,179

3 Scenarios

The immigration scenarios presented in this paper illustrate the impact on the 2021 New Zealand economy as a result of different levels of immigration inflow, different skill compositions of the inflows and/or alternative assumptions regarding economic behaviour. The experiments can be grouped into four broad categories.

First, there are two scenarios where the size of the inflow is altered, one with an increased immigration inflow, scenario A, and one with a reduced inflow, scenario B (see Table 3.1). The composition of the change in labour in each of these scenarios is determined by the modelled calculations of labour requirements (ie, demand-driven). That is, the composition of the labour supply matches the demand for labour that arises from each scenario. In addition, scenario H is the short-run accompaniment of scenario A showing the input after five years (2011) and is summarised in Appendix D.

Secondly, an increased immigration scenario is simulated where the skill composition of the additional labour supply is directly specified to focus on skilled occupations such as managers, professionals, associate professionals, and technicians and trades workers (scenario C). This specification can be seen as mimicking some change in policy direction or external impetus.

Thirdly, in three further scenarios the increase in immigration in scenario A is accompanied by additional influences. Scenario D incorporates an assumption of increased productivity accompanying an increased immigration inflow. This scenario assumes productivity across the economy is 1 percent above the baseline. This productivity improvement can be described as the same level of output being able to be produced with a 1 percent smaller (than baseline) quantity of labour and capital resource.

Scenario E includes an assumption of increased exposure to external trade opportunities accompanying an increased immigration inflow. The increased exposure can be interpreted as a 2 percent (horizontal) shift in the demand for imports and a 1 percent shift (horizontal) in the demand for exports by consumers only (ie, the demand for capital and intermediate imports was not directly changed by this scenario).Scenario F builds on scenario E with an added assumption of flatter export and import demand curves to mimic growing external exposure. That is a change in price costs will have a larger impact on the amount sold off-shore.

Fourthly, scenario F combines the impacts of an increased immigration inflow comprising specified skill composition accompanied by selective productivity improvements and increased exposure to external trade.

As stated in section 2.5 the impacts are described as changes compared with the baseline level of a range of economic measures for 2021. The baseline, can be interpreted as a business-as-usual scenario and assumes an average annual net immigration inflow of 20,000. Productivity and export market growth in the baseline are assumed to be similar to that experienced over recent years. The baseline projects GDP growth at an average 3.1 percent per annum over 2006 to 2021, with full-time equivalent employment growth of the order of 1.5 percent per annum. Further details of the baseline scenario are in section 2.7.

Table 3.1 Scenario list

Scenario	Description
O	Assumes average annual net immigrant inflow of 20,000 (36,000 in and 16,000 out). Composition (in terms of household mix) is similar to that experienced from 1991 to 2006. Implicit migrant skill mix is totally model determined.
A	Assumes additional 20,000 average annual inflow on top of baseline (56,000 in less 16,000 out equals 40,000 inflow). Closure assumes no change (on baseline) in capital–to–labour ratio, aggregate investment–to–gross domestic product (GDP) ratio, and government consumption demand–to–GDP ratio; no change in relative wage rates (on baseline) means that the migrant skill mix is totally model determined.
B	Assumes zero immigration inflow (0 in less 16,000 out = 16,000 net outflow). Closures as for scenario A.
C	As for scenario A, but additional migrants assumed to have skill mix similar to that in 2001 to 2006. Occupation-relative wage rates are model determined.
D	As for scenario A, but with additional 1 percent positive technical change as proxy for economies of scale and productivity improvements.
E	As for scenario A, but with increased propensities to trade (exports and imports), reflecting more open trade situation.
F	As for scenario A, but with refinements incorporating selective skill mix, accompanied by selective economies of scale and trade improvements (G = A + C + D + F).
SHORT[1]	As for scenario A, but short-run model closure; that is, no change on baseline in physical capital stocks, so steep marginal costs curves (rates of return are model determined).
AUST[2]	Simulation on baseline to mirror Australian report[3] (ie, equivalent to a 50 percent increase in inflow of skilled migrants).

Notes

1 See Appendix D for results.

2 See Appendix E for results.

3 Productivity Commission (2006).

3.1 Migration assumptions

The levels of immigration and changes to populations imposed in each scenario are summarised in Table 3.2. In the increased immigration scenario A, it is assumed that the net inflow of overseas born rises to an average 40,000 per annum. All other factors constant, this implies an average net PLT inflow of 30,000 per annum.

For the zero inward immigration scenario (B), the ongoing outward flow of overseas born means an average net outflow of overseas born of 16,000 per annum. This translates to an average net PLT outflow of 26,000 per annum. An average natural increase of 25,000 per annum implies a reduction from 2006 to 2021 in the total New Zealand population in this scenario.

Note that it is assumed that the changes in the migration flows take five years to adjust to the new levels. The full change in the flow occurs in 2011. In scenario A the inflow increases by 2,500 per year from 10,000 in 2007 to 20,000 in 2011. For scenario B, the inflow falls by around 10,000 per annum.

Table 3.2 Migration 1991–2006 and assumptions in baseline and scenarios A and B[1]

		1991–2006	Baseline	Scenario A	Scenario B
NZ natural increase[2]	x	30,000	25,000	25,000	25,000
Net migration of NZ-born	y	-20,000	-10,000	-10,000	-10,000
Change in NZ-born in NZ population	x+y	10,000	15,000	15,000	15,000
Net migration of overseas born	z	36,000	20,000	**40,000**	**-16,000**
Net permanent and long-term inflow	y+z	16,000	10,000	30,000	-26,000
Total change in NZ population	x+y+z	46,000	35,000	55,000	-1,000

Notes

1 Scenario A would have an impact on the natural increase, because migrants would have children in New Zealand. However, for simplicity, the comparison between scenario A and B assumes this is not the case.

2 Births minus deaths.

3.2 Additional assumptions

The productivity and world market growth assumptions are the same as in the baseline scenario. Other assumptions are consistent with earlier studies[30] with an unchanged capital–to–labour ratio,[31] and investment and government consumption demand being fixed relative to GDP. The additional labour resources are assumed to be accompanied in the long run by extra accumulation of physical capital resources. The assumption that the aggregate long-term labour–to–capital ratio remains unchanged ensures the experiment captures the impact of the increased immigration alone. Without such an assumption, the experiment's results would reflect a mixture of impacts of increased immigration and a predetermined shift to labour-intensive activities.

In each of the scenarios government spending on health and education is related to (in real terms) changes in relevant populations. In particular, real education spending per person aged 15 years and under is assumed the same as in the baseline. Similarly, real health spending is related to the number in the population not in the labour force,[32] including those aged 15 years and under.

In addition, the scenarios assume the demand for owner-occupied dwellings is consistent with the number of households, adjusted by tenure changes, as projected in work for the Centre for Housing Research Aotearoa New Zealand and Department of Labour.[33] The report from this work found that household status (single/couple) and not birthplace (migrant/New Zealand born) was the major determinant of housing behaviour. The report found that recent migrants were more likely to rent homes than the New Zealand–born population, but that

[30] Such as Poot et al (1988).

[31] The ratio of the value of capital equipment to the total amount of employed labour.

[32] Bearing in mind the predominant age groups for health expenditure are the very young and the very old, the 'not in the labour force' group is used as a proxy for those aged 65 and over.

[33] Sanderson et al (2008).

longer term, recent migrants' rent/ownership levels were similar to those of the New Zealand–born population. It also found that the capacity of the building industry appeared to be adequate to meet the level of housing demand to 2016, even under a high immigration scenario, as long as the type of accommodation built changed to meet changed demand; that there would be a growing demand for private rental market dwellings; and that the proportion of people living in flats or apartments was likely to increase.

3.3 Summary of how immigration impacts on the economy

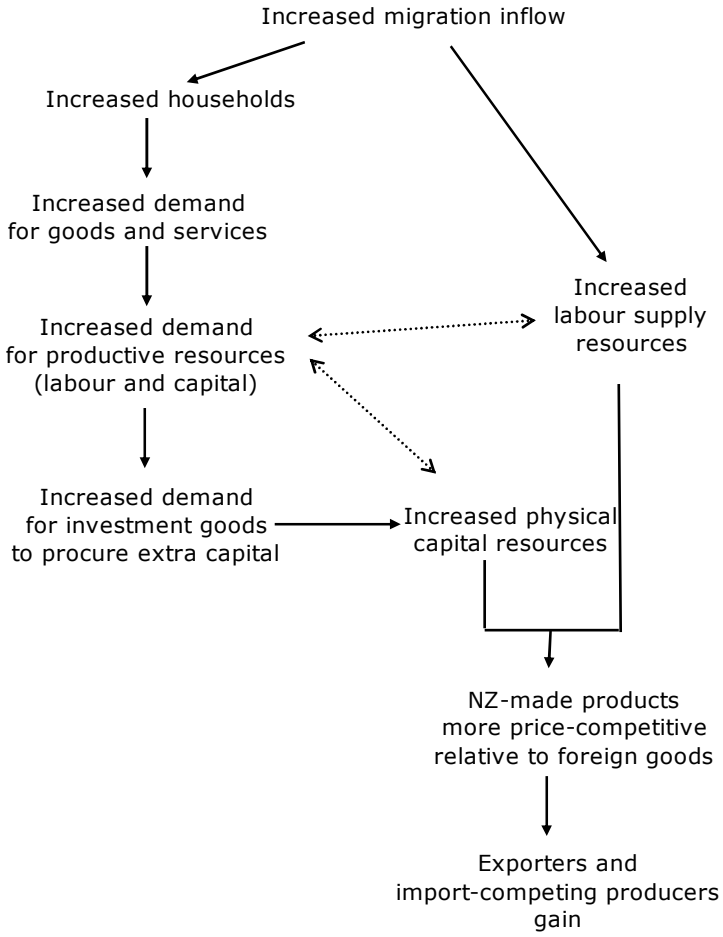
Immigration has impacts on both demand and supply sides of an economy (summarised in Figure 3.1). Thus, it is critical that investigations are undertaken using economy-wide models that capture the interaction of both sides of the economy. The investigation should also capture responses to changes in prices (including wages) prompted by different levels of immigration. In this sense, the CGE model is an ideal tool to analyse the impact of alternative immigration scenarios.

The overall economic impact of immigration comprises a balance between the impacts on the demand side and the supply side. In an increased immigration scenario, the additional demand for goods and services arises from the extra households now resident in the country. This additional demand may be modified according to the household, or family, composition of the additional residents. On the supply side, households supply additional productive resources in the form of labour. This additional labour may also be modified according to different skill types.

The combination of additional demand for goods and services and additional labour resources will require, simultaneously, additional machinery, equipment, buildings, and other productive capital. This further requirement will be reflected in increased demand for investment goods. As noted earlier, our immigration experiments are conducted under the assumption that the ratio of labour–to–physical capital remains unchanged in aggregate.

On the one hand, households and investment demand for goods and services are increased. In particular, sectors associated with the production and supply of physical capital resources (investment goods) will benefit from the increased demand for such resources. On the other hand, the additional labour and capital available will be able to supply more goods and services. The balance between these two impacts will determine changes in prices, and so set off further consequential impacts.

Figure 3.1 Schematic of economic impacts of immigration



Because of the increased resources available to New Zealand producers, the price of New Zealand commodities compared with overseas-made goods and services will decline. Consequently, New Zealand producers competing against overseas products (whether domestically or abroad) will also be advantaged.

It is the outcome of the balance between demand and supply or resources and its impact on sectors (whether export or investment oriented) that drive the overall and detailed results.

The scenarios are undertaken under the assumption that the ratio of labour to physical capital[34] available does not change in aggregate. That is, the increase in labour supply arising from an increased inward immigration scenario is accompanied by a similar increase, over the long term (year 2021), in capital stock. This ensures the model experiments are not predetermined in favour of labour-intensive industries and sectors. Note, however, that the labour–to–capital ratios for individual sectors may change depending on demand for products and the relative costs of these factors of production.

On the other hand, if the assumption of an unchanged aggregate labour–to–capital ratio is dropped, there would be a predetermined shift to labour. In such

[34] That is, non-labour productive resources such as plant, machinery, other equipment, and buildings.

a case, the results of a model experiment would capture a mixture of the predetermined factors as well as the impact of increased immigration.

4 Scenario results

4.1 Increased immigration inflow – scenario A

Given the assumptions outlined in section 3.2, scenario A investigates the impact of an annual inflow of overseas born of 20,000 per annum additional to that in the baseline. The additional labour supply consistent with this further inflow is employed across various sectors, assuming no change in relative wage rates. In other words, the skill mix of the migrant inflow and the occupations and industries in which migrants work are fully demand (model) determined.

4.1.1 Macro effect of increased immigration

The additional 20,000 per annum inflow of migrants takes the resident New Zealand population in 2021 from its baseline figure of 4.54 million to 4.81 million, an increase of 6.1 percent. This adds another 7.4 percent to the labour force in 2021 or the equivalent of nearly 170,000 full-time equivalents for the workforce. The workforce grows by more than the population as migrants are more likely than the general population to be working age.

At the overall level, the impact of these additional labour resources is an increase in the size of the New Zealand economy. In real GDP terms, the economy is 7.6 percent larger, taking the average annual growth rate over 2006 and 2021 to 3.6 percent from the 3.1 percent in the baseline scenario. The combined impacts on GDP and population, give a GDP per capita that is 1.5 percent, or just over $800, above the baseline (see Table 4.1). More detailed results are tabulated in Appendix G.

The composition of this additional activity is tilted towards exporting because the extra resources ensure an improvement in the price competitiveness of New Zealand production (relative to baseline). In other words, New Zealand prices are lower in this 2021 scenario compared with in the baseline 2021 scenario. This is reflected, for example, in the overall GDP deflator (2.2 percent lower) and the gross output price index (2.0 percent lower). This improvement in competitiveness results in export volumes in 2021 being 8.5 percent higher than the baseline. In contrast, import volumes expand by a more modest 5.4 percent. Consequently, the 2021 trade balance improves by the equivalent of 0.3 percent of GDP.

On the domestic side of the economy, the additional income from the extra resources enables household real consumption expenditure to be 6.0 percent above the baseline. The total impact on government spending is tempered by the reduced cost of resources, so, along with additional tax revenues accruing from the extra resources, there is a net improvement in the government balance equivalent to 0.2 percent of GDP.

Table 4.1 Macro results of increased immigration scenario - 2021

	% change		
	Baseline	**Scenario A on baseline**	**Scenario A**
Real GDP components (2006 $m)			
Household consumption	139,332	6.0	147,656
Investment	59,092	7.6	63,611
Government consumption	42,669	7.6	45,932
Export volumes	79,580	8.5	86,307
Imports	74,240	5.4	78,233
Real GDP	247,556	7.6	266,487
Production factors			
Capital stock (2006 $m)	699,767	7.4	751,398
Employment (000 FTEs)	2,183	7.4	2,345
Prices (2006=100)			
GDP deflator	137.9	-2.2	134.9
Gross output prices	136.3	-2.0	133.5
Consumer prices	149.4	-1.2	147.7
Real wage rates	107.5	-0.2	107.2
Balances			
Balance of trade ($m)	-1,628	806	-823
as % of nominal GDP	*-0.5*	*n/a*	*-0.2*
		0	
Core Crown ($m)	19,769	1,883	21,652
as % of nominal GDP	*5.7*	*n/a*	*5.9*
Memo: population (000s)	4,535.2	6.1	4,810.2
GDP per capita ($000s)	54.586	1.5	55.401

4.1.2 Industry effect of increased immigration[35]

The tilting of resource allocation towards export activities and relatively labour-intensive sectors is reflected in the industry composition of this scenario (see

Table 4.2). However, activity across all industries increases appreciably, indicating that all industries do benefit from the additional productive resources (both labour and capital) available in this increased immigration scenario.

[35] More detailed results are presented in Table G1 in Appendix G.

Table 4.2 Impact on industry output of increased immigration - 2021

	% change		
	Baseline	**Scenario A on baseline**	**Scenario A**
Sector output (2006 $m)			
Agriculture	26,045	5.3	27,413
Other primary	21,100	9.7	23,147
Food, beverages	43,045	5.8	45,561
Machinery and equipment manufacturing	29,300	10.5	32,363
Other manufacturing	46,140	9.9	50,730
Building and construction	44,053	8.0	47,584
Trade, rests and accommodation	74,769	7.9	80,677
Transport and communications	41,624	9.3	45,499
Finance, business services	64,428	8.4	69,829
Government, education, and health	51,244	9.0	55,855
Other services	72,919	6.4	77,576
Total	514,666	8.1	556,234

The agriculture sector has relatively limited scope to expand despite its export focus. This is because of the relatively steep export demand curve facing dairy, meat, and horticultural products; that is, price does not have a great short-term impact on demand. This reflects a combination of market access issues as well as supply-side resource limitations. In addition, this sector is relatively capital intensive, so is not the main beneficiary of the expansion in labour supply arising from the additional immigration inflow. This impact in agriculture flows into the relative food and associated processing sector.

In contrast, the manufacturing sector is more advantaged from the increased immigration scenario due to its being a relatively more labour-intensive industry. In addition, it faces relatively flat export demand curves (a small drop in the price results in a larger increase in demand), enabling the export-oriented elements of this sector to obtain the maximum gain from improvements in price competitiveness. This is particularly so for the higher-value manufacturing sectors such as machinery and equipment manufacturing, increasing by 10.5 percent above baseline. In other words when the price of New Zealand manufactured goods fall, demand for these goods increases considerably.

The services sector comprises a mixture of these effects. Undoubtedly, this sector is dominated by labour-intensive activities, but the distinguishing feature among these activities is their relationship to exports or other exporting industries. For example, the combination of trade, restaurants, and accommodation industries fares well as a result of their direct relationship with

export-oriented tourism activities. The transport and business services sectors similarly benefit because of their indirect association with export activities.

The other services, including government services, are predominantly non-tradable sectors and grow by less than the average. While benefiting through their relatively labour-intensive structures, these sectors are less advantaged from the increased immigration because of the relatively subdued impact on the domestic economy.

4.1.3 Occupations and increased immigration[36]

The demand for the additional 7.4 percent in the workforce is divided among the occupations shown in Table 4.3. Demand for trades workers, managers, and technicians is relatively higher. In contrast, demand for professionals, primary sector workers, and machine operators expands but by less than the average.

The relationship between outcomes for occupations and industries is clear. Professionals do not benefit because of the impact on government and other services, while the result for primary sector workers is heavily dominated by the modest result for the agriculture sector.

Table 4.3 Impact on occupation employment of increased immigration - 2021

	% change		
	Baseline	**Scenario A on baseline**	**Scenario A**
Labour by occupations (000 FTEs)			
Managers	310	6.8	332
Professionals	374	8.5	406
Technicians	274	6.9	293
Sales and clerical	569	7.5	612
Primary sector workers	130	4.4	136
Trades workers	195	7.4	209
Machine operators and labourers	331	8.0	357
Total	2,183	7.4	2,345

Demand for technicians, trades workers, and managers benefits from the expansion in the manufacturing sector. The result for sales and clerical workers may seem surprising, but is due to the tourism-related sales and hospitality sectors faring well in this scenario.

[36] More detailed results are presented in Table G4 in Appendix G.

Further details of the breakdown of occupation categories show that the result for professionals masks a larger impact on computing and engineering professionals. This fits with the noticeable impact on associated technicians, in particular, scientific technicians and computer equipment controllers. The increased demand for these occupation categories is closely linked to the expansion in the manufacturing sector (in particular, the higher-value machinery and equipment manufactures) noted earlier.

In contrast, demand for other categories within the professional occupations, in particular teaching and health professionals, increases by relatively less. This is associated with the increased immigration resulting in a relatively smaller impact on the population groups that underpin demand in the education and health sectors. That is, increased immigration results in a smaller proportion of the resident population in both the younger and older age groups that are more likely to require such services.

4.1.4 Exports with increased immigration[37]

On the export front, agricultural commodities expand by relatively little due to two factors. First, the primary sector compared with other sectors uses relatively less labour. Consequently, sectors producing agricultural products do not benefit as much from the increase in the availability of labour resources. Secondly, as noted earlier, agriculture export commodities face relatively steep demand curves that limit their ability to sell additional volumes on the world market when they are able to offer a lower price. This constraint reflects a combination of market access issues as well as supply-side resource limitations.

The export of base metals also expands by very little. Again, this can be linked to the production structure of the basic metals industry. In particular, this industry does not benefit from the additional labour resource available given its relatively capital-intensive activities.

At the other end of the spectrum are tourism and other service exports. These activities tend to be very labour-intensive and so benefit greatly from the increased labour. This is illustrated in the details of the occupational make-up of the additional labour. In particular, within the sales and clerical category noted in Table 4.3, there are greater than average increases in tourism-related retail, travel, restaurant, and accommodation occupations. Similarly, while there is only a small increase in school teaching professionals, demand for tertiary and other teaching professionals does increase in this scenario by more than the average. The increase here will be related to the expansion in education exports, which is a large component of the other services export category shown in Table 4.4.

While the tourism and other services have relatively few supply-side constraints, they do require more than their share of the increase in capital resources to facilitate these expansions in activity. This is confirmed on inspection of the detail of the scenario results. Capital requirements by these sectors do eventually limit the expansions achieved by other sectors.

[37] More detailed results are presented in Table G3 in Appendix G.

Table 4.4 Impact on exports of increased immigration - 2021

	Baseline	Scenario A on baseline	Scenario A
Export volumes (2006 $m)			
Dairy products	8,259	2.2	8,439
Meat products	7,025	2.2	7,178
Wool	795	2.2	813
Horticulture	2,352	5.7	2,486
Fish products	2,231	5.3	2,349
Other food	4,910	11.1	5,457
Wood and logs	4,000	12.1	4,482
Pulp and paper	2,095	11.9	2,344
Base metals	3,922	4.7	4,108
Machinery and equipment	10,280	9.1	11,220
Other goods	9,650	9.1	10,525
Tourism	15,399	11.8	17,211
Other services	8,662	11.9	9,695
Total	79,580	8.5	86,307

4.1.5 Household consumption and income with increased immigration[38]

The additional immigration scenario A changes the structure of household income and consumption spending. Compared with the baseline, the income of the bottom quintile of households is only slightly higher as a result of the increased immigration (see Table 4.5). This result arises from the prevalence of those receiving welfare benefit and superannuation income in this group. Although the number of households receiving welfare benefits and superannuation does not increase compared with the number receiving employment income, benefits and superannuation are linked to consumer prices, which are both below their baseline levels. This limits the income growth of these groups.

Also noticeable is the proportionately greater increase in household income for those in the high and the top quintiles. This arises from the composition of the expansion in labour employment. The relatively larger expansion in the managerial, some professional, and technician categories, as noted earlier, is consistent with these higher-paying occupations being the primary determinants for incomes in the upper quintiles of the household sector.

[38] More detailed results are presented in Table G2 in Appendix G.

Table 4.5 Impact on households of increased immigration - 2021

	Baseline	% change Scenario A on baseline	Scenario A
Household consumption by quintile ($m)			
Bottom	19,079	0.8	19,230
Low	25,474	2.7	26,167
Middle	37,170	5.0	39,015
High	49,402	5.5	52,126
Top	77,050	5.8	81,534
Total	208,174	4.8	218,071
Household income by quintile ($m)			
Bottom	12,203	0.6	12,275
Low	23,235	2.6	23,846
Middle	35,394	4.8	37,096
High	46,188	5.5	48,745
Top	89,657	5.9	94,986
Total	206,679	5.0	216,949

With the exception of the top income earners, the impact on incomes is less than that on consumption spending. Because the savings ratio of the nation as a whole (ie, the savings–to–GNP ratio) is assumed unchanged compared with the baseline, the balance on government sector spending must improve compared with the baseline to compensate for this. This is indeed the case, as shown in Table 4.1. This is also consistent with the education and health components of government spending growing by less than the overall economy. In turn, this follows from the growth of the relevant population groups in scenario A compared with the baseline. Recall that education spending is linked to the population aged 15 and under. Health spending is linked to the population aged 15 and under and those not in the labour force, with the latter being a proxy for those aged 65 and over.

4.2 Zero immigration inflow – scenario B

Given the same core assumptions as in the baseline scenario, scenario B simulates the impact of a cessation of the inflow of overseas born. Taking into account an ongoing outflow of 16,000 overseas born per annum, this is 36,000 below that of the baseline. As presented in Table 3.2, when combined with a net PLT outflow of 10,000 New Zealand born this implies an average net PLT outflow of 26,000 people per annum (compared with an average net PLT inflow of 10,000 per annum in the baseline). With an average natural increase of 25,000 per annum, scenario B implies a reduction in the total New Zealand population not only compared with baseline, but also compared with 2006.

Note, as for scenario A, relative wage rates are also assumed unchanged from those in the baseline. This implies that the skill mix of the available labour resource, so the migrant outflow, is fully determined by the model. More detailed results are tabulated in Appendix H.

4.2.1 Macro effect of zero immigration

The cessation of migrant inflow takes the resident New Zealand population in 2021 from its baseline figure of 4.5 million to just under 4.1 million. This means the labour force in 2021 is close to 11 percent smaller than in the baseline (see Table 4.6). The larger impact on the labour force is due to immigrants being more likely to be working age than the New Zealand–born population.

Table 4.6 Macro impact of zero immigration inflow - 2021

			% change	
	Baseline	**Scenario B**	**Scenario B on baseline**	***Scenario A on baseline***
Real GDP components (2006 $m)				
Household consumption	139,332	127,177	-8.7	*6.0*
Investment	59,092	52,414	-11.3	*7.6*
Government consumption	42,669	37,847	-11.3	*7.6*
Export volumes	79,580	69,321	-12.9	*8.5*
Imports	74,240	68,168	-8.2	*5.4*
GDP expenditure	247,556	219,578	-11.3	*7.6*
Production factors				
Capital stock (2006 $m)	699,767	623,549	-10.9	*7.4*
Employment (000 FTEs)	2,183	1,946	-10.9	*7.4*
Price indices (2006=100)				
GDP deflator	137.9	143.0	3.7	*-2.2*
Gross output prices	136.3	141.1	3.5	*-2.0*
Consumer prices	149.4	151.8	1.6	*-1.2*
Real wage rates	107.5	108.1	0.5	*-0.2*
Balances			*% of nominal GDP*	
Balance of trade ($m)	-1,628	-3,079		
as % of nominal GDP	*-0.5*		*-1.0*	*-0.2*
Core Crown ($m)	19,769	17,120	-2,649	*1,883*
as % of nominal GDP	*5.7*	*5.4*	*5.4*	*5.9*
Memo: population (000s)	4,535.2	4,098.2	-9.6	*6.1*
GDP per capita ($000s)	54.586	53.579	-1.8	*1.5*

At the overall level, this scenario sees a much smaller New Zealand economy in 2021. In real GDP terms, the economy is 11.3 percent smaller, with the average annual growth rate between 2006 and 2021 down to 2.3 percent from the 3.1 percent in the baseline scenario. This results in GDP per capita of 1.8 percent or $1,000 below the baseline level.

Undoubtedly, the sectors disadvantaged in this scenario are those oriented towards exports. The smaller quantity of productive resources available to

producers in this scenario means the cost of these resources is higher than in the baseline. Accordingly, the price levels rise, for example, in the overall GDP deflator (3.7 percent higher) and the gross output price index (3.5 percent higher). The higher prices cause the competitiveness of New Zealand products to deteriorate, which results in a significantly lower level of exports compared with the baseline (-12.9 percent).

Despite the reduced demand for imports consistent with the smaller economy, there is a consequential worsening (compared with baseline) of the balance of trade. This is because imports fall by 4.7 percentage points less than exports.

4.2.2 Occupation impact of zero immigration inflow[39]

The reduced labour resource arising from the cessation of the migrant inflow is concentrated in the managerial, technical, and trade worker categories. This follows from the dependence of these employment groups on exporting activities. In contrast, the reduction is least in the primary sector workers category where there is less impact on the demand for education and health services consistent with the impact on the relevant groups in the population. (See Table 4.7.)

Table 4.7 Impact on occupation employment of zero immigration inflow - 2021

			% change	
	Baseline	**Scenario B**	**Scenario B on baseline**	***Scenario A on baseline***
Labour by occupations (000 FTEs)				
Managers	310	279	-10.0	*6.8*
Professionals	374	326	-12.9	*8.5*
Technicians	274	246	-10.1	*6.9*
Sales and clerical	569	507	-11.0	*7.5*
Primary sector workers	130	122	-6.4	*4.4*
Trades workers	195	174	-10.4	*7.4*
Machine operators and labourers	331	292	-11.8	*8.0*
Total	2,183	1,946	-10.9	*7.4*

However, within these broad groupings variations are noticeable. The largest declines are noted for engineering professionals, computer equipment technicians, and metal, machinery, and precision trades workers. At the other end of the spectrum, school teaching professionals register the lowest decline. Demand for tertiary and other teaching professionals, however, declines further, which is consistent with their relationship with the education export sector noted earlier.

[39] More detailed results are presented in Table H4 in Appendix H.

4.2.3 Impact of current immigration inflow

The difference between the baseline and the results for scenario B can be viewed as the impact of the current level of immigration inflow continuing over 2006 to 2021; that is, in scenario B with no further immigration inflow the New Zealand population is projected to be 4.1 million with annual GDP of approximately $220 billion.[40] However, the baseline picture, which assumes a continuation of current immigration inflows, results in a New Zealand population of 4.5 million and annual GDP of $248 billion in 2021.

Consequently, the aggregate addition to the population of 437,000[41] arising from the current inflow of immigrants over the 15-year period yields an extra $28 billion in annual GDP in 2021. That is $1.9 billion per year less than the baseline. At the margin, this equates to additional GDP per capita of the order of $64,000. This marginal GDP per capita, corresponding to the continuation of the current inflows, is higher than the average GDP per capita of $53,500 recorded in scenario B. As a result, the overall average GDP per capita in 2021 is higher in the baseline than in scenario B.

4.3 Increased immigration targeting skills – scenario C

This scenario assumes the same increase as in scenario A (a net annual inflow of 20,000 above the baseline), but further assumes the addition to the labour supply is concentrated among skilled labour categories similar to the average inflow over 2001 to 2006. These categories include managers, professionals, associate professionals, and technicians, and trades workers.

As shown in Table 4.8, the overall GDP impact of this scenario is similar to that for the earlier increased immigration scenario A. Indeed, scenario C records GDP of 7.7 percent above the 2021 baseline level, and slightly above the 7.6 percent for scenario A. In scenario C, GDP per capita is 1.5 percent above baseline.

Table 4.8 Macro impact of skilled immigration with 2001–2006 composition - 2021

			% change	
	Baseline	**Scenario C**	**Scenario C on baseline**	***Scenario A on baseline***
Real GDP components (2006 $m)				
Household consumption	139,332	147,879	6.1	*6.0*
Investment	59,092	63,645	7.7	*7.6*
Government consumption	42,669	45,957	7.7	*7.6*
Export volumes	79,580	86,208	8.3	*8.5*
Imports	74,240	78,272	5.4	*5.4*
GDP expenditure	247,556	266,629	7.7	*7.6*

[40] All GDP measures are expressed in constant 2006 dollars.

[41] Note, as explained in section 3.1, although there is a 36,000 difference in the net annual inflows between scenario B and the baseline, this difference is imposed gradually over the 15-year period. Thus, the 437,000 figure is less than 36,000 multiplied by 15.

There are noticeable differences in the make-up of economic activity in this scenario compared with in scenario A where the model allocated the labour entirely. In particular, the assumed concentration of skills in the categories listed above benefits the services sector relatively more than other sectors. In concentrating the skills inflow in these categories while holding the total increase in labour the same, we also lower the availability of other labour types compared with scenario A.

As a consequence, the results for employment in finance and other services sectors, as shown in Table 4.9, are much higher than the result for scenario A. It is also reflected in the relatively greater increases in the household and government consumption components of GDP.

Noticeably, the manufacturing and food processing sectors fare relatively worse compared with the scenario A outcome. This arises, in part, from their relatively higher need for general labour occupation categories at a range of skill levels. As a result, while export volumes are considerably higher than the baseline, the impact is below the impact estimated in scenario A. In particular, the assumed smaller expansion in primary sector workers in this increased immigration scenario penalises the agricultural sector and its export products. In contrast, activities that fare better in this scenario (compared with scenario A) are those in the other services and trade sectors.

This result illustrates how export competitiveness requires semi-skilled, as well as skilled, labour resources when export activities are expanded. For example, occupation categories such as machine operators and clerical staff in manufacturing, drivers in the transport sector, and sales and restaurant workers in tourism-related industries are also required to enable expansion of these sectors.

Table 4.9 Impact of sector employment of increased skilled immigration - 2021

			% change	
	Baseline	**Scenario C**	**Scenario C on baseline**	***Scenario A on baseline***
Sector employment (000 FTEs)				
Agriculture	124	129	3.6	*3.9*
Other primary	25	26	6.3	*8.1*
Food, beverages	61	64	4.3	*5.2*
Machinery and equipment manufacturing	93	101	8.8	*9.8*
Other manufacturing	139	150	7.9	*9.1*
Building and construction	151	160	6.3	*6.7*
Trade, rests and accommodation	494	532	7.6	*7.0*
Transport and communications	112	122	8.1	*8.3*
Finance, business services	370	400	8.0	*7.6*
Government, education, and health	431	468	8.6	*8.6*
Other services	182	193	5.8	*5.1*
Total	2,183	2,345	7.4	*7.4*

The slightly higher result for domestic consumption spending in scenario C restrains the export sector expansion. This restraint operates, in a general equilibrium sense, through the competition for labour and capital resources. The increased competition for these resources for domestic consumption (scenario C compared with scenario A) causes a higher cost of these resources to all producers. This higher cost, in turn, limits the competitiveness gains for export activities, so constrains the expansion in external markets.

Table 4.10 summarises the changes in employment by occupation resulting from scenario C. The skill composition is tilted towards the mangers, technicians, and sales and clerical categories compared with the demand-determined scenario A outcome. In contrast, the primary sector workers, trades workers, and machine operators and labourers categories are less represented in the scenario C immigration inflow. The figures for these latter categories help explain the sector employment results noted above. In particular, the agriculture, other primary, food processing, manufacturing, and building and construction sectors require these labour types for expansion.

Table 4.10 Impact on occupation employment of increased skilled immigration - 2021

			% change	
	Baseline	**Scenario C**	**Scenario C on baseline**	***Scenario A on baseline***
Labour by occupations (000 FTEs)				
Managers	310	332	7.0	*6.8*
Professionals	374	406	8.5	*8.5*
Technicians	274	297	8.4	*6.9*
Sales and clerical	569	617	8.4	*7.5*
Primary sector workers	130	136	3.9	*4.4*
Trades workers	195	207	6.5	*7.4*
Machine operators and labourers	331	350	5.9	*8.0*
Total	2,183	2,345	7.4	*7.4*

4.4 Increased immigration with accompanying elements – scenarios D and E

The next two scenarios are similar to scenario A, but test the impact of immigration and its interaction with additional influences. First, the situation where an increased immigration inflow is accompanied by improved productivity across the New Zealand economy (scenario D). Secondly, the increase in immigration inflows further encourages the openness of the New Zealand economy to external trade (scenario E).

4.4.1 Additional productivity

An increase in the absolute size of an economy accompanying an increase in immigration may also result in economies of scale. Poot et al (1988) outlined a correlation between periods of high immigration and high productivity growth.[42] Those authors were at pains to point out that it was difficult to establish causality in this regard.

Scenario D assumes the same immigration inflow as in scenario A (an annual average of 20,000 above the baseline). In addition, this scenario assumes productivity across the economy is 1 percent above the baseline. Productivity in this context means output per unit of labour input, as well as output per unit of capital input. Alternatively, this productivity improvement can be described as follows: the same level of output can be produced with a 1 percent smaller (than baseline) quantity of labour and capital resource.

Consequently, the composition of the immigration inflow in this scenario will be different from that in scenario A, as it will not only respond to the changed demand for labour from an increase in the supply of labour but also from the different level of productivity across the economy.

Table 4.11 shows that the additional immigration accompanied by improved productivity pushes GDP to 8.7 percent above the baseline, with GDP per capita 2.5 percent higher. Further, this impact is noticeably greater than that for scenario A. The results for scenario D also include larger gains for exporting activities as well as household consumption.

The productivity improvements translate into lower per unit resource costs for New Zealand producers. The lower costs are reflected in the results for gross output prices, which are 2.4 percent below baseline in scenario D. This compares with 2.0 percent below the 2021 baseline for scenario A. These lower costs, in turn, mean competitiveness gains for exporters.

Such gains flow through to income gains to the household sector, thus facilitating their consumption gains. The gains here are reflected in the result for real wage rates. In scenario D real wage rates are 0.9 percent above the baseline, while they are 0.2 percent below baseline in scenario A.

[42] In particular, the periods 1962–1967, 1971–1975, and 1983–1985 recorded average growth in total factor productivity well above the 25-year average of 0.8 percent per annum.

Table 4.11 Macro impact of increased immigration and improved productivity - 2021

	Baseline	Scenario D	% change	
			Scenario D on baseline	*Scenario A on baseline*
Real GDP components (2006 $m)				
Household consumption	139,332	148,921	6.9	*6.0*
Investment	59,092	64,246	8.7	*7.6*
Government consumption	42,669	46,390	8.7	*7.6*
Export volumes	79,580	87,180	9.5	*8.5*
Imports	74,240	78,818	6.2	*5.4*
GDP expenditure	247,556	269,145	8.7	*7.6*
Production factors				
Capital stock (2006 $m)	699,767	751,398	7.4	*7.4*
Employment (000 FTEs)	2,183	2,345	7.4	*7.4*
Price indices (2006=100)				
Gross output prices	136.3	133.1	-2.4	*-2.0*
Real wage rates	107.5	108.5	0.9	*-0.2*

At the sector level, the productivity improvement assists the export-oriented sections of manufacturing to expand further. This is seen in the employment results shown in Table 4.12. In particular, the machinery and equipment manufacturing sector demands even more labour, compared with scenario A, as its productivity improvement enables it to compete better in export markets. This in turn causes employment in transport and communication to increase.

It is noticeable that this additional labour demand is met through a lower impact (compared with scenario A) on the agriculture sector and on government, education, health, and other services. The lower result for agriculture can be explained by the effect of the steeper export demand curves facing traditional agricultural products. Mimicking supply and market access constraints, such demand curves do limit expansion in this sector. In scenario D, this constraint becomes more relevant as other sectors (eg, machinery and equipment manufacturing) can take advantage of improved productivity. These other sectors are now able to attract (or demand) more labour resources to their industries.

Table 4.12 Sector employment impact of with improved productivity - 2021

			% change	
	Baseline	**Scenario D**	**Scenario D on baseline**	***Scenario A on baseline***
Sector employment (000 FTEs)				
Agriculture	124	129	3.6	*3.9*
Other primary	25	27	8.2	*8.1*
Food, beverages	61	64	4.9	*5.2*
Machinery and equipment manufacturing	93	103	10.2	*9.8*
Other manufacturing	139	153	9.4	*9.1*
Building and construction	151	161	6.5	*6.7*
Trade, rests and accommodation	494	529	7.1	*7.0*
Transport and communications	112	122	8.5	*8.3*
Finance, business services	370	399	7.7	*7.6*
Government, education, and health	431	468	8.6	*8.6*
Other services	182	191	5.1	*5.1*
Total	2,183	2,345	7.4	*7.4*

4.4.2 Improved external trade environment

The scenario E experiment reflects another feature that could accompany increased immigration. This feature focuses on the openness of the economy to external trade opportunities. This is motivated by the argument that increased immigration may assist New Zealand producers in developing new products, contacts, and export-market opportunities. On the other side of this argument, however, when migrants come to a new country they tend to demand goods from their country of origin. This is especially strong if the two countries are culturally quite different. The impact of this is an increased openness to importing activities. Law et al (2009) found that migration increases trade. They found that for New Zealand the impact was greater for imports than exports. For example, a 10 percent increase in the number of migrants from a specific country increases merchandise imports from that country by 1.9 percent and merchandise exports to that country by 0.6 percent. They then found the impact of migrants demanding 'ethnic' goods outweighed the effect of using migrant networks to gain market access. It should be noted that the methodology used logs, so numerically small increases of migrants from countries that New Zealand has little contact with have a much larger impact on the results than countries where New Zealand has an established relationship.

This scenario models an increase in immigration accompanied by expanded world markets for New Zealand exports as well as an increased market share for imports. As found in Law et al (2009) the impact on imports is assumed to be larger than that on exports. The increased exposure can be interpreted as a 2 percent (horizontal) shift in the demand for imports and a 1 percent shift

(horizontal) in the demand for exports by consumers only (ie, the demand for capital and intermediate imports was not directly subjected by this scenario).

The impact on GDP in scenario E is similar to that for scenario A, as shown in Table 4.13. GDP per capita in this scenario is 1.3 percent higher than in the baseline. The added focus on the external sector in scenario E results in the domestic sector being slightly more subdued compared with the scenario A outcome. This is reflected in the result for household consumption, which registers a gain smaller than that recorded in scenario A.

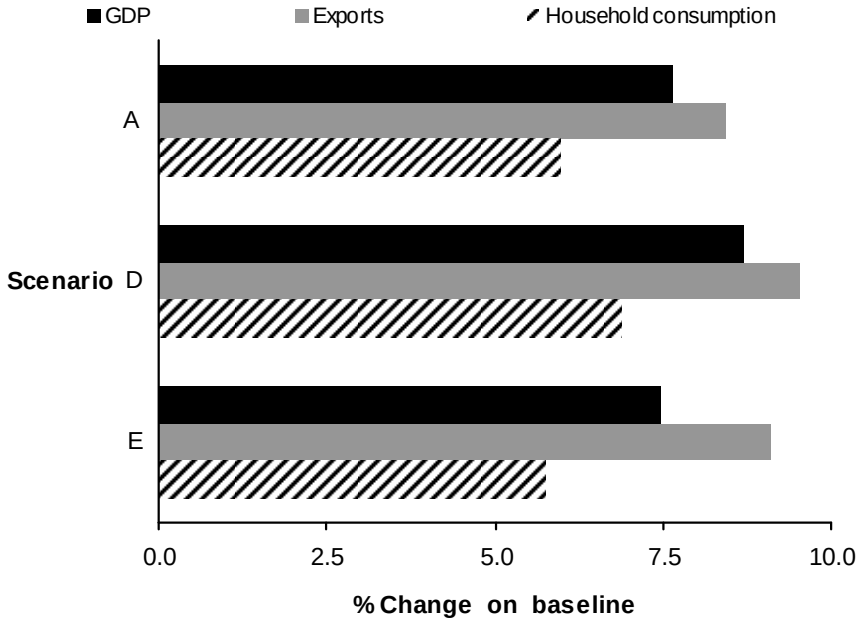
Table 4.13 Macro impact of increased immigration and external trade links - 2021

			% change	
	Baseline	**Scenario E**	**Scenario E on baseline**	***Scenario A on baseline***
Real GDP components (2006 $m)				
Household consumption	139,332	147,324	5.7	*6.0*
Investment	59,092	63,501	7.5	*7.6*
Government consumption	42,669	45,853	7.5	*7.6*
Export volumes	79,580	86,825	9.1	*8.5*
Imports	74,240	78,690	6.0	*5.4*
GDP expenditure	247,556	266,026	7.5	*7.6*

4.4.3 Comparing the accompanying influences

Comparing the results for the scenarios with accompanying influences shows that the major benefits additional to an increased inflow of migrants would come from increases in productivity. While exports are higher for the increased trade scenario so are imports, resulting in slightly less growth in GDP (see Figure 4.1). Productivity, on the other hand, results in much lower production costs, which increase exports by much more than the increased trade scenario. In turn, this results in a much higher (1.2 percent) GDP.

Figure 4.1 Impact of increased immigration with additional features - 2021



4.5 Immigration scenario with refinements – scenario F

As noted earlier, in all increased immigration scenarios the relative shifts are in favour of export and labour-intensive activities. A further exploration of this finding is undertaken in scenario F. This scenario mimics the impact of the combined influences of the various features discussed in some of the individual scenarios above. In particular, this refined scenario assumes:

- the composition of the labour supply increase from immigration is concentrated in selected professional and trade occupations[43]
- a boost to productivity in selected sectors[44]
- an improvement in export market opportunities for New Zealand producers
- an increase in the market share of imports into New Zealand.

[43] The occupations included in this immigration scenario are physicists, chemists, mathematicians and related professionals; life science professionals; computing professionals; architects, engineers, and related professionals; Health professionals, nursing and midwifery; other teaching professionals; physical science and engineering technicians; life science and related technicians; computer equipment controllers; optical and electronic equipment controllers; health associate professionals; building trades workers; and metal and machinery trades workers.

[44] Sectors assumed to have improved productivity in this scenario are paper; printing, publishing and recorded media; non-metallic mineral products; fabricated metal product manufacturing; machinery and other equipment manufacturing; furniture and other manufacturing; residential construction; other construction; communication services; and scientific research and computer services.

The outcome of scenario F is summarised in Table 4.14 and results in a lower level of GDP than scenario A and a 0.9 percent increase in GDP per capita compared with baseline. Within this impact, is a more export-oriented economy. The 7.1 percent addition, above baseline, to real GDP in scenario F includes a 9.3 percent increase in export volumes in 2021. The improved competitiveness of New Zealand products also helps hold the expansion in imports to 4.4 percent despite its assumed increased market share. This helps improve the external trade balance further (compared with both the baseline and scenario A) by 0.6 percent of GDP.

In addition, the impact on the domestic sector sees a restrained impact on consumption spending and a slightly greater impact on investment. This facet ties in with building trades workers being specifically included in the set of skilled occupations targeted by the immigration inflow. Consequently, the construction sector gains directly from this inflow, which makes investment, as opposed to consumer, spending more attractive.

Table 4.14 Macro impact of increased immigration with refinements - 2021

			% change	
	Baseline	**Scenario F**	**Scenario F on baseline**	***Scenario A on baseline***
Real GDP components (2006 $m)				
Household consumption	139,332	145,385	4.3	*6.0*
Investment	59,092	63,260	7.1	*7.6*
Export volumes	79,580	86,979	9.3	*8.5*
Imports	74,240	77,495	4.4	*5.4*
GDP expenditure	247,556	265,017	7.1	*7.6*
Production factors				
Capital stock (2006 $m)	699,767	751,398	7.4	*7.4*
Employment (000 FTEs)	2,183	2,345	7.4	*7.4*
Price indices (2006=100)				
Consumer prices	149.4	147.1	-1.5	*-1.2*
Real wage rates	107.5	105.9	-1.5	*-0.2*
			% of nominal GDP	
Balance of trade ($m)	-1,628	1,267		
as % of nominal GDP	*-0.5*		*0.4*	*-0.2*
Memo: population (000s)	4,535.2	4,810.2	6.1	*6.1*
GDP per capita ($000s)	54.586	55.095	0.9	*1.5*

The sector and occupation mix of employment in the refined scenario are shown in Table 4.15 and Table 4.16. It is clear that the sectors to enjoy the greatest gains in this scenario are those requiring professional, technical, or trade-related skills. In particular, the building and construction sector and the higher-value machinery and equipment manufacturing sector stand most to gain from such a scenario.

Table 4.15 Sector employment in refined scenario - 2021

			% change	
	Baseline	**Scenario F**	**Scenario F on baseline**	***Scenario A on baseline***
Sector employment (000 FTEs)				
Agriculture	124	124	0.2	*3.9*
Other primary	25	26	6.7	*8.1*
Food, beverages	61	61	0.1	*5.2*
Machinery and equipment manufacturing	93	115	23.9	*9.8*
Other manufacturing	139	147	5.8	*9.1*
Building and construction	151	184	22.1	*6.7*
Trade, rests and accommodation	494	513	3.8	*7.0*
Transport and communications	112	116	3.5	*8.3*
Finance, business services	370	397	7.2	*7.6*
Government, education, and health	431	472	9.5	*8.6*
Other services	182	188	3.1	*5.1*
Total	2,183	2,345	7.4	*7.4*

It is informative to note that most other sectors also gain noticeably from the increase in this mix of occupations. The exceptions to this observation are the agriculture and related food processing sectors, which are heavily penalised by the assumed absence of primary sector workers from the increase in immigration.

Table 4.16 Occupation mix of refined scenario - 2021

			% change	
	Baseline	**Scenario F**	**Scenario F on baseline**	***Scenario A on baseline***
Labour by occupations (000 FTEs)				
Managers	310	310	0.0	*6.8*
Professionals	374	426	13.9	*8.5*
Technicians	274	310	13.4	*6.9*
Sales and clerical	569	569	0.0	*7.5*
Primary sector workers	130	130	0.0	*4.4*
Trades workers	195	267	37.2	*7.4*
Machine operators and labourers	331	331	0.0	*8.0*
Total	2,183	2,345	7.4	*7.4*

4.6 Comparison with 1988 simulations

Poot et al's (1988) study into international migration and the New Zealand economy used a 22-sector CGE model to explore the long-run impacts of various immigration scenarios. The framework of the static CGE model used in that study was similar to that used in this study. In addition, the macroeconomic assumptions for the baseline were similar, allowing comparison.[45] The main difference in model structure was the lack of disaggregation in the household sector in the 1988 study, and a more detailed sectoral breakdown of industry in the current model.

Table 4.17 compares the macroeconomic impact findings from this study with those of the 1988 study (Poot et al, 1988). The scenario A results are compared with the results for the simulation labelled VW in the 1988 study, as that simulation had a comparable labour market closure.

This study records higher gains to immigration compared with those in the 1988 study. These higher gains are in terms of real GDP, household consumption, and, importantly, export volumes. Two factors can be highlighted to explain these higher gains.

First, the increased labour available relative to the similar change in population provides the later study with a head start. This, in turn, arises from the differing composition of the assumed immigration inflow, along with higher labour force participation rates.

Secondly, the sectoral structure of the New Zealand economy has changed since the mid 1980s. The economy is much more diverse and the increased importance of non-agricultural commodities in overall exports (eg, tourism and forestry) ensures exports record a greater gain. This arises because of the relatively steep demand curve facing agricultural commodity exports (eg, dairy and meat) and the relatively flatter curves facing other exports. In other words,

[45] With an unchanged (compared with baseline) aggregate labour–to–capital ratio, fixed investment–to GDP ratio and government consumption spending–to–GDP ratio.

supply and demand of non-agricultural commodities are more price responsive than agricultural commodities. This allows these sectors to gain much more when per unit production costs fall. It should also be noted that the impact on imports is similar to that found in the 1988 work. This means the balance of trade is better in the latest findings.

Interestingly, the impact on per capita consumption is similar between the two studies (slightly higher in the later study). This implies immigration is not a shock that increases the amount of consumption per person. The only way to increase per capita consumption is to increase productivity, such as in scenario D.

Table 4.17 Comparison of results from scenario A and 1988 study

	Scenario A	**1988 study**[1]
Population	6.1	6.15
Capital stock	7.4	6.04
Employment	7.4	6.04
Household consumption	6.0	5.28
Export volumes	8.5	4.66
Imports	5.4	5.56
GDP expenditure	7.6	6.24
Consumer prices	-1.2	-1.49
Real wage rates	-0.2	-0.26
Change in trade balance (% of GDP)	-0.2	-0.78

Note

1 See Poot et al (1988).

5 Conclusion

The objective of this study was to better understand the impact of immigration on the New Zealand economy overall and on different parts of the economy. To achieve this, different combinations of the scale and composition of the immigrant inflow was tested. Impacts on productivity and trade were also explored.

From an economy-wide perspective, the increased immigration scenarios investigated resulted in similar impacts. However, there were considerable differences in detail, depending on the assumptions about market responses. In general, the results of the modelled scenarios found that increased immigration:

- reduces production costs
- improves the competitiveness of New Zealand producers, *benefiting exports*
- *benefits domestic investment and/or consumer spending*, depending on the skills composition of the immigration inflow
- results in higher revenues to government, which outweigh the impact on spending, so translate into an *improvement in the balance of the government's accounts*.

The four results listed above combine to *improve both real GDP and real GDP per capita.*

The scenarios predict outcomes for 2021 and are compared with a baseline level that is interpreted as a business-as-usual scenario with no major policy changes. Many core economic factors, such as productivity, export demand, terms of trade, and demographic changes, are similar to recent historical levels.

An average annual net PLT inflow of 40,000 non–New Zealand–born migrants, double that of 20,000 in the baseline, was found to add 6.1 percent to the resident population in 2021. This took the 2021 population from 4.5 million in the baseline to 4.8 million, and added 7.4 percent to the labour available to the 2021 economy compared with that in the baseline.

Real GDP was 7.6 percent higher, taking GDP per capita to 1.5 percent or $1,000 above the baseline in 2021. Differences in the make-up of this larger economy are most noticeable in the external sector, with export volumes recorded as 8.5 percent above baseline.[46]

A total cessation of the current net immigrant inflow was also tested that allowed an ongoing outflow of New Zealand and overseas born at current levels. This scenario gives a New Zealand resident population of 4.1 million in 2021, 9.6 percent below that in the 2021 baseline. Consequently, the labour available in 2021 is 10.9 percent below the 2021 baseline figure.

The results for this experiment record a GDP in 2021 of 11.3 percent below that of the baseline. Consequently, GDP per capita is 1.8 percent below the baseline level.

[46] This scenario let the model determine the skill composition of the inflow.

The impact of this smaller economy is felt most by the export sector, where volumes in 2021 are more than 12.9 percent below the baseline. This effect arises from a higher price level, so reduced competitiveness, which results from the smaller quantity of labour available.

The difference between the baseline and the results for a zero net immigration inflow can be viewed as the impact of the current level of immigration inflow continuing over 2006 to 2021. With no further net immigration inflow between 2006 and 2021, the New Zealand population is projected to be 4.1 million with an annual GDP figure of about $220 billion.[47] However, the baseline picture, which assumes a continuation of current immigration inflows, results in a significantly larger New Zealand population of 4.5 million and annual GDP of $248 billion in 2021.

Consequently, the aggregate addition to the population of 437,000[48] arising from the current inflow of immigrants over the 15-year period yields an extra $28 billion in annual GDP in 2021. That is $1.9 billion per year less than the baseline and a $1,000 lower per capita GDP.

Experiments were also undertaken where the composition of the additional labour was specified in favour of particular higher-skilled categories. Such a scenario can be seen as mimicking some change in policy direction or external impetus.

Overall, this scenario resulted in a slightly higher impact on overall GDP with GDP 0.1 percent higher than in the scenario that did not specify the skill mix of the inflow. Additionally, there were small, but noticeable, differences in the make-up of the impact on GDP. In particular, the benefit to the export sector where the additional immigration inflow was of specific skills totalled 8.3 percent above baseline. This impact is not as large as the 8.5 percent recorded in the scenario where the composition of the inflow was demand determined. An increase in domestic consumption made up the difference.

The reason for this distinction lies in the make-up of the selected skill group; namely, the managerial, professional, associate professional, technician and trades workers occupations. An increase in labour resources concentrated in these skill categories benefits, in relative terms, the services sector more than the manufacturing sector. The fact the result was not a great deal higher than when the skill level was not specified illustrates how the export sector requires semi-skilled, as well as skilled, labour resources in order to expand its activities. For example, occupations such as machine operators and clerical staff in manufacturing, drivers in the transport sector, and sales and restaurant workers in tourism-related industries are also export-related requirements.

A scenario experiment was undertaken assuming productivity in 2021 is 1 percent above the baseline and accompanying the increased immigration. This assumption pushes the impact on GDP to 8.7 percent above the baseline, with GDP per capita 2.5 percent higher. The productivity improvements translate into lower per unit resource costs for New Zealand producers. This, in turn, means competitiveness gains for exporters. Such gains also flow through to income gains to the household sector, thus facilitating consumption gains.

[47] All GDP measures are expressed in constant 2006 dollars.

[48] Note, as explained in section 3.1 while there is a 36,000 difference in the net annual inflows between scenario B and the baseline, this difference is imposed gradually over the 15-year period. Thus, the 437,000 figure is less than 36,000 multiplied by 15.

Another scenario was motivated by the argument that increased immigration might assist New Zealand producers to develop new products, contacts, and export-market opportunities. This argument, however, suggests there may also be an increased openness to importing activities. Consequently, this scenario models an increase in immigration accompanied by expanded world markets for New Zealand exports as well as an increased market share for imports. The impact on GDP is similar to the impact without these assumptions, with GDP per capita 1.5 percent higher than in the baseline. Undoubtedly, there is an additional benefit to exports, with volumes 8.9 percent above baseline compared with the 8.5 percent recorded in the absence of these assumptions. This impact, however, is countered by a similarly larger impact on the import side of the GDP equation.

Increased immigration inflows result in a larger economy. Further, under the assumptions adopted for the experiments presented here, increased immigration inflows result in a positive effect on GDP per capita. The current net inflow of around 20,000 overseas born per year results in a significantly larger and more externally focused economy than if there were no inflow of immigrants.

The modelling experiments do not support arguments in favour of entirely high-skill focused or targeted immigration inflows. Such targeting does not appear to significantly increase the overall benefits to increased immigration flows. When an economy grows labour is required at all levels. However, this result highlights the need for a range of skill levels to enable the economy to grow, it does not tell us anything about appropriate policy to offer potential immigrants (eg, different types of permits might be required to attract immigrants with varying skill levels).

Of the assumptions tested, additional benefits increase significantly only when productivity improvements accompany the increased immigration inflow. This suggests that if immigration policies or programmes were to target particular skill categories, the focus should be directed to those skills that have significant potential to improve overall productivity.

The CGE model used has been made available to the Department of Labour so the Department can explore other topics and different impacts of immigration. Such a model allows the impacts of various changes in policy or the impacts of external shocks to be modelled and the economy-wide, as well as sectoral, impacts to be better understood within a robust and widely recognised framework.

Appendix A: Model structure

The model separately identifies 53 industries, 25 export commodities, 8 household commodities, and 40 occupation categories. The separately identified industries in the model are listed in Table B1 in Appendix B, along with their relevant Australia and New Zealand Standard Industrial Classification code (1996, revision 2).

Each industry produces a single output by way of a production function requiring a fixed combination of intermediate and primary factor inputs. At the secondary level, each intermediate input is a mixture of a domestically produced item and its imported equivalent. Producers can substitute between these two sources for each intermediate input in response to shifts in the relative price of each according to a constant elasticity of substitution (CES) mixing function. Substitution elasticities are less than infinite to reflect, in part, the degree of aggregation as well as technological limits to such substitution. Similarly, the primary factor input comprises a constant ratio of elasticity of substitution homothetic (CRESH) function, mixing 40 different types of labour and 1 physical capital resource.

Each industry's output is either sold to other industries for use as intermediate inputs or sold to meet final demand agents. The classification of imports is such that the output of each domestic industry competes against one imported equivalent item, subject to the substitution elasticity noted above.

These substitution decisions are underpinned by the neoclassical framework of profit-maximising and cost-minimising producers.

Final demand agents comprise other industries for the production of investment goods, domestic households for consumption, foreign demand for export, and government.

Investment in good production involves a similar CES mix of imported and domestic inputs. Aggregate investment is exogenous to the model, either as a fixed amount or as a set ratio to gross domestic product. However, investment activity is allocated across industries endogenously to equate expected rates of return.

Households allocate their income according to a linear expenditure system function across a consumption basket containing eight consumer categories. Within each of these categories, consumers can shift between domestically made items and their imported equivalents in response to relative price changes given the constraints of a CES function. Aggregate consumption is linked to household income, which is predominantly determined by employment income.

Government consumption demand is exogenous to the model, either at a set figure or at a specified ratio of gross domestic product.

Exports are modelled as facing a less than perfectly elastic demand curve. As such, foreigners demand more (or less) from New Zealand sources depending on the relative price competitiveness of New Zealand–made products compared with products from elsewhere. Differing elasticities among the commodities reflect, in part, aggregation as well as non-market barriers to the expansion of export sales. In general, New Zealand exporters of primary commodities such as dairy and meat face steeper demand curves than manufactures and service exporters.

The Business and Economic Research Limited computable general equilibrium model is maintained, updated, and solved using GEMPACK[49] modelling software.

[49] Pearson (1988).

Appendix B: Model classifications and base data

Table B1 to Table B4 list the industry, labour, export, and consumption commodity groupings included in the Business and Economic Research Limited (BERL) computable general equilibrium model used for this study.

Table B1 Industry classifications in BERL computable general equilibrium model

#	Code	Australian and New Zealand Standard Industrial Classification	Industry	2006 gross output $m
1	HFRG	A011	Horticulture and fruit growing	2,656
2	SBLC	A012; A01591	Livestock and cropping farming	6,591
3	DAIF	A013	Dairy and cattle farming	4,720
4	OTHF	A014; A0151; A0152; A0153; A01593; A01599	Other farming	1,072
5	SAHF	A02	Services to agric, hunting and trapping	1,845
6	FOLO	A03	Forestry and logging	2,978
7	FISH	A04	Fishing	852
8	MINE	B11; B13; B14; B1514; B1520	Mining and quarrying	1,197
9	OGPE	B12; B1511; B1512; C251; C252; D362	Oil & gas	6,162
10	MEDA	C211; C212	Meat and dairy manufacturing	16,356
11	OFOD	C213; C214; C215; C216; C217	Other food manufacturing	6,816
12	BEVT	C218; C219	Beverage, malt & tobacco manufacturing	4,510
13	TCFL	C22	Textiles and apparel manufacturing	2,113
14	WOOD	C231; C232	Wood product manufacturing	4,203
15	PAPR	C233	Paper & paper product manufacturing	2,918
16	PPRM	C24	Printing, publishing and recorded media	3,823
17	CHEM	C253	Fertiliser and other industrial chemical manufacturing	2,675
18	RBPL	C254; C255; C256	Rubber, plastic and other chemical product manufacturing	4,092
19	NMMP	C26	Non-metallic mineral product manufacturing	2,311
20	BASM	C271; C272; C273	Basic metal manufacturing	3,257
21	FABM	C274; C275; C276	Structural, sheet & fabricated metal product manufacturing	4,848
22	TREQ	C281; C282	Transport equipment manufacturing	2,512
23	MAEQ	C283; C284; C285; C286	Machinery and other equipment manufacturing	6,192
24	OMFG	C29	Furniture and other manufacturing	1,929
25	ELEC	D361	Electricity generation and transmission	11,178
26	WATS	D3701	Water supply	803
27	WAST	D3702; Q9634	Sewerage, drainage & waste disposal services	628
28	RCON	E4111; E4112	Residential construction	7,800
29	OCON	E4113; E412; E42	Other construction	21,506
30	WHIN	F45; F46	Industrial goods wholesaling	11,812
31	WHOT	F47	Other wholesale trade	8,675
32	RETT	G	Retail trade	17,998
33	ACCR	H	Accommodation, restaurants and bars	6,454
34	RDFR	I611	Road freight transport	4,998
35	RDPS	I612	Road passenger transport	804

#	Code	Australian and New Zealand Standard Industrial Classification	Industry	2006 gross output $m
36	RWAS	I62; I63; I64; I65; I66; I67	Rail, water, air transport & transport services	9,670
37	COMM	J	Communication services	7,911
38	FINE	K73	Finance	9,433
39	INSU	K74	Insurance	3,483
40	SFIN	K75	Services to finance and services	3,199
41	REES	L7711; L7719 (part); L772	Real estate	11,021
42	EHOP	L773; L774	Equipment hire & investors in other property	2,637
43	OWND	L7719 (part)	Ownership of owner-occupied dwellings	12,472
44	SRCS	L781; L782; L783	Scientific research and computer services	8,331
45	OBUS	L784; L785; L786	Other business services	16,200
46	GOVC	M8111; M812; M813; M82; Q963	Central govt administration and defence	9,424
47	GOVL	M8223	Local govt administration	4,036
48	SCHL	N841; N842	Pre-school, primary and secondary education	3,968
49	OEDU	N843; N844	Other education	4,262
50	HOSP	O861	Hospitals and nursing homes	5,622
51	OHCS	O862; O863; 0864; O87	Other health and community services	6,930
52	CULT	P	Cultural and recreational services	7,827
53	PERS	Q95; Q961; Q962; Q97	Personal and other community services	3,937
			Total	**319,646**

Table B2 Consumption commodity categories in BERL computable general equilibrium model

#	Code	Consumption category	Base year 2006 spending $m
1	FD	Food	17,844
2	HG	Housing	17,741
3	HO	Household operation	10,393
4	AP	Apparel	2,983
5	TN	Transportation	14,471
6	TA	Tobacco & alcohol	6,176
7	OG	Other goods	5,189
8	OS	Other services	18,793
		Total	**93,590**

Table B3 Export commodity categories in BERL computable general equilibrium model

#	Code	Export commodity	Base year 2006 exports $m
1	LA	Live animals	111
2	DR	Dairy	5,444
3	ME	Meat	4,730
4	WO	Wool	631
5	HO	Horticulture	1,399
6	FI	Fish	1,473
7	FB	Other food, beverages and tobacco	2,447
8	TC	Textiles and clothing	1,826
9	LG	Logs	675
10	WD	Wood	1,604
11	PP	Pulp & paper	1,176
12	PR	Printing & recorded media	266
13	BU	Oil bunkering	619
14	CH	Chemicals	2,283
15	CO	Coal	152
16	MN	Mining	40
17	CR	Ceramics	182
18	BS	Basic metals	2,148
19	FM	Fabricated metals	475
20	ME	Machinery & equipment	3,476
21	OM	Other manufacturing	339
22	TR	Tourism	7,097
23	FR	Freight	741
24	ED	Education	903
25	OS	Other services	3,051
		Total	**43,290**

Table B4 Labour occupation types in BERL computable general equilibrium model

#	Code	New Zealand Standard Classification of Occupations, 1999	Occupation	Base year 2006 employment full-time equivalents (000s)
1	LEGA	11	Legislators and administrators	4.24
2	CORP	12	Corporate managers	247.70
3	SCIP	211, 212, 221	Physicists, chemists, mathematicians & related professionals, life science professionals	9.09
4	COMP	213	Computing professionals	28.13
5	AREN	214	Architects, engineers and related professionals	27.97
6	HLTP	222, 223	Health professionals, nursing & midwifery	49.55
7	TETP	231	Tertiary teaching professionals	15.25
8	OTEP	232-235	Other teaching professionals	67.08
9	BUSP	241	Business professionals	52.89
10	LEGP	242	Legal professionals	11.44
11	OTHP	243-245	Other professionals	19.58
12	SCIT	311, 321	Physical science & engineering technicians, life science technicians & related	26.13
13	CMEC	312	Computer equipment controllers	7.88

#	Code	New Zealand Standard Classification of Occupations, 1999	Occupation	Base year 2006 employment full-time equivalents (000s)
14	OPEC	313	Optical and electronic equipment controllers	8.02
15	OCTS	314	Ship and aircraft controllers and technicians	4.54
16	HLAP	322, 323	Health associate professionals	11.87
17	FSAP	331, 332	Finance, sales and administrative associate professionals	99.49
18	GVAP	333, 334, 335	Govt & social work assoc professionals, careers & employment advisors	26.48
19	OTAP	315, 337, 338	Safety & health inspectors, environmental protection & other assoc professionals	7.48
20	WAES	336	Writers, artists, entertainment and sports associate professionals	33.07
21	OFCK	41	Office clerks	137.08
22	CSCK	42	Customer services clerks	55.52
23	TRAV	511	Travel attendants and guides	5.31
24	REST	512	Housekeeping and restaurant services workers	57.98
25	POCW	513, 514	Personal care and other personal service workers	50.56
26	PRSW	515	Protective services workers	26.21
27	SALE	52	Salespersons, demonstrators and models	115.44
28	FARM	611-612	Farmers, growers and animal producers	113.29
29	FRST	613	Forestry and related workers	4.91
30	FISH	614	Fishery workers, hunters and trappers	4.39
31	BDTW	71	Building trades workers	92.35
32	MMTW	72	Metal and machinery trades workers	49.64
33	PRTW	73	Precision trades workers	11.28
34	OCTW	74	Other craft and related trades workers	18.33
35	IPMO	81, 82	Industrial plant operators, stationary machine operators	83.02
36	RAIL	831, 834	Railway engine drivers, ships deck crews and related workers	1.89
37	MOVD	832	Motor vehicle drivers	39.04
38	AGEO	833	Agricultural, earthmoving & other materials handling equipment operators	16.82
39	BLRW	84	Building and related workers	9.55
40	LBSW	91	Labourers and related elementary service workers	107.90
			Total	**1,758.40**

Appendix C: Model input for baseline

Table C1 to Table C5 list the baseline assumptions for the model. Details for the base year 2006 and the out-year 2021 are detailed below.

Table C1 Baseline assumptions for resources

	History		**Baseline**		
	1994–2004	***1994–2006***	**2006**		**2021**
Resources and productivity	*% pa*			% pa	
Population (000s)	*1.2*	*1.2*	4,027.9	0.8	4,535.2
Population aged 65+ (000s)	*1.5*	*1.7*	495.6	2.5	717.8
Households	*1.5*	*1.5*	1,453.2	0.8	1,649.4
	average pa (1991–1906)			average pa	
Net PLT inflow (average per annum)	*12,339*			10,000	
Net migrant (OB) inflow (average per annum)	*23,854*			20,000	
	%				
Unemployment (% of labour supply)	*6.3*	*5.9*	4.6		4.6
	% pa			% pa	
Labour supply (000 FTEs)	*1.7*	*1.9*	1,843.4	1.5	2,289.0
Labour productivity (varies by industry)	*1.4*	*1.1*	100.0	1.2	120.3
Capital productivity (varies by industry)	*0.7*	*0.5*	100.0	0.6	109.3

Table C2 Baseline assumptions for final demand

	History			Baseline
	1994–2004	***1994–2006***	**2006**	**2021**
Composition of final demand	***%***	***%***	***%***	***%***
Savings ratio (nominal savings as % of GNP)			15.7	15.7
Real investment (% of real GDP)	*22.3*	*23.1*	23.9	23.9
Average tax rate (% of nominal household income)	*19.9*	*20.1*	21.1	19.1
bottom			4.1	3.6
low			12.5	11.2
middle			13.0	11.7
high			24.4	22.0
top			26.1	23.5

Table C3 Baseline assumptions for world markets

	History				Baseline
	1994–2004	***1994–2006***	**2006**		**2021**
World markets		*% pa*		% pa	
Trading partner GDP growth	*3.4*	*3.4*			
World export demand (varies by commodity)			100.0	1.9	133.4
OECD GDP deflator	*3.4*	*3.2*			
IMF advanced economies median inflation	*2.1*	*2.1*			
IMF emerging and developing median inflation	*5.9*	*5.9*			
OECD other primary commodities $ index	*0.0*	*1.0*			
World export prices (varies by commodity)			100.0	2.5	144.1
World import prices (varies by commodity)			100.0	2.4	143.5

Table C4 Industry productivity and import price assumptions for baseline

	Productivity		World import prices
	Labour	Capital	
Industry	**% pa**	**% pa**	**% pa**
Horticulture and fruit growing	1.88	0.63	2.13
Livestock and cropping farming	1.93	0.53	2.13
Dairy and cattle farming	1.97	0.80	2.13
Other farming	1.90	0.63	2.13
Services to agriculture, hunting & trapping	1.88	0.63	2.13
Forestry and logging	-0.50	-1.34	2.13
Fishing	2.20	-1.34	2.13
Mining and quarrying	0.70	0.00	2.13
Oil & gas	0.70	0.00	5.66
Meat and dairy manufacturing	1.90	0.30	2.13
Other food manufacturing	1.87	0.00	2.13
Beverages, malt and tobacco manufacturing	1.77	0.00	2.13
Textiles & apparel manufacturing	1.03	0.40	2.13
Wood product manufacturing	2.23	-0.27	2.13
Paper & paper product mfg	2.23	-0.27	2.13
Printing, publishing & recorded media	0.00	-0.30	2.13
Fertiliser & other industrial chemical manufacturing	0.40	0.60	2.13
Rubber, plastic & other chemical manufacturing	0.40	0.60	2.13
Non-metallic mineral mfg	2.33	1.40	2.13
Basic metal manufacturing	1.60	2.03	2.13
Structural, sheet & fabrication metal manufacturing	2.43	3.03	2.13
Transport equipment manufacturing	2.33	0.80	2.13
Machinery and other equipment manufacturing	2.33	1.20	2.13
Furniture and other manufacturing	0.70	0.00	2.13
Electricity generation & transmission	1.23	-0.50	2.13
Water supply	1.23	-0.50	2.13
Sewer, drain & waste disposal services	1.23	-0.50	2.13
Residential construction	1.80	1.53	2.13
Other construction	1.80	1.53	2.13
Industrial goods wholesaling	2.00	2.50	2.13
Other wholesale trade	2.00	2.50	2.13

Industry	Productivity		World import prices
	Labour	Capital	
	% pa	% pa	% pa
Retail trade	1.87	0.70	2.13
Accommodation, restaurants and bars	-0.30	-0.60	2.13
Road freight transport	2.03	1.30	2.13
Road passenger transport	2.03	1.30	2.13
Rail, water, air transport & services	2.03	1.30	2.13
Communication services	3.50	3.40	2.13
Finance	1.27	1.80	2.13
Insurance	1.27	1.80	2.13
Services to finance & insurance	1.27	1.80	2.13
Real estate	-0.33	-0.13	2.13
Equipment hire & investments in other property	-0.33	-0.13	2.13
Ownership of own-occupied dwellings	0.00	-0.74	2.13
Science research & computer services	-0.27	-1.07	2.13
Other business services	-0.27	-1.07	2.13
Central govt admin & defence	1.50	-0.50	2.13
Local govt administration	1.50	-1.00	2.13
Pre-school, prim and sec education	1.33	-0.27	2.13
Other education	1.33	-0.27	2.13
Hospitals and nursing homes	0.50	0.70	2.13
Other health & community services	0.50	0.70	2.13
Cultural & recreational services	0.83	0.20	2.13
Personal & other community services	1.60	-0.50	2.13

Table C5 Commodity export market baseline assumptions

Commodity	World demand % pa	World price % pa
Live animals	1.00	2.13
Dairy	2.00	2.50
Meat	1.90	2.43
Wool	1.00	2.23
Horticulture	1.53	2.43
Fish	1.40	2.43
Other FBT	1.30	2.50
Textiles & Clothing	1.70	2.20
Logs	1.90	2.53
Wood	1.77	2.53
Pulp & paper	1.80	2.47
Printing & recording	1.80	2.33
Oil bunkering	1.37	4.83
Chemicals	1.37	2.50
Coal	1.33	2.23
Mining	1.17	2.20
Ceramics	1.33	2.13
Basic metals	1.80	2.53
Fabricating metals	1.50	2.40
Machinery & equipment	1.97	2.40
Other manufacturing	1.83	2.20
Tourism	2.70	2.50
Freight	1.50	2.20
Education	2.50	2.20
Other services	2.13	2.20

Appendix D: Short-run impacts of increased immigration scenario

This appendix summarises the results from a short-run simulation of the increased immigration scenario A presented in section 4.1. Scenario A assumed an annual inflow of overseas born of 20,000 per annum additional to that in the baseline. Further, the additional labour supply is fully demand (model) determined. That is, the skill mix of the migrant inflow is consistent with the employment requirements across various sectors, assuming no change in relative wage rates.

The short run assumes a five-year period over which the increased immigration inflow gradually builds. The short run assumes a first year in which the net inflow is 10,000 above baseline, building up to 20,000 above baseline in the fifth year.

The additional inflow of migrants takes the resident New Zealand population in 2011 from its baseline figure of 4.19 million to 4.26 million. This adds another 2.2 percent to the labour force in 2011 or the equivalent of nearly 43,400 full-time equivalent workers for the workforce.

In addition to the reduced magnitude of the immigration 'shock', the short run also imposes the inability of sectors to access additional physical capital stock for production above the baseline level.[50] Consequently, production can expand only through the application of additional labour to the same quantity of capital that was available in the baseline economy.

With such a constraint on the response of the production side of the economy, the impact of the immigration shock in the short run is muted. At the overall level, the short-run impact of the additional labour resources is a 1.1 percent increase in gross domestic product (GDP). With the severely restricted ability to reallocate resources across the sectors in the short run, the composition of above-baseline GDP is similar to that in the baseline. The only noticeable difference among the headline GDP components is the slightly smaller expansion in imports. This difference arises as the additional labour resources marginally reduce production costs across the board, making New Zealand products marginally more competitive than those from overseas.

The short-run impact of the increased immigration scenario is to accentuate the heightened labour intensity of the new economy (Table D1). This is reflected in the employment figure of 2.2 percent above baseline, compared with GDP being only 1.2 percent above baseline.

[50] The 0.3 percent result for capital stock for scenario H listed in Table D1 arises from the increase in capital in the owner-occupied dwellings sector. As for all scenarios, this is assumed to change in line with the number of households adjusted for changes in household tenure.

Table D1 Short-run macro results of increased immigration scenario

	2011	% change	
	Baseline	Short-run scenario H on baseline	Short run
Real GDP components (2006 $m)			
Household consumption	106,494	0.6	107,102
Investment	43,992	2.4	45,028
Government consumption	32,613	0.8	32,885
Export volumes	54,281	0.2	54,365
Imports	55,307	0.9	55,788
GDP expenditure	182,895	0.8	184,424
Production factors			
Capital stock (2006 $m)	541,816	0.0	541,816
Employment (000 FTEs)	1,884	2.2	1,925
Price indices (2006=100)			
GDP deflator	112.5	0.3	112.8
Gross output prices	111.6	0.3	111.9
Consumer prices	116.4	0.4	116.8
Real wage rates	101.0	-1.8	99.1
Balances			
Balance of trade ($m)	-3,222	-500	-3,722
as % of nominal GDP	*-1.6*	na	*-1.8*
Core Crown ($m)	10,353	386	10,739
as % of nominal GDP	*5.0*	na	*5.1*
Memo: population (000s)	4,188.3	1.8	4,263.3
GDP per capita ($000s)	43.7	-0.9	43.3

At the sector level, the relatively labour-intensive machinery and equipment manufacturing sector benefits more than the agriculture and food processing sectors (Table D2). This results in the neutral impact for total export volumes in that the above-baseline figure is the same as that for overall GDP.

Table D2 Short-run impact on industry output of increased immigration

	2011	% change	
	Baseline	**Short-run scenario H on baseline**	**Short run**
Sector output (2006 $m)			
Agriculture	19,827	0.5	19,916
Other primary	14,076	0.5	14,141
Food, beverages	32,504	0.4	32,641
Machinery and equipment manufacturing	17,854	0.9	18,016
Other manufacturing	33,039	0.9	33,344
Building and construction	33,872	3.3	34,979
Trade, rests and accommodation	53,670	0.7	54,068
Transport and communications	28,758	0.7	28,958
Finance, business services	47,552	0.9	47,962
Government, education, and health	39,090	1.2	39,575
Other services	56,913	0.6	57,279
Total	**377,156**	**1.0**	**380,879**

As to the occupation breakdown, the increased technical and trades workers fits with the machinery and equipment manufacturing results (Table D3). The results for the other occupation categories also mirror those for the longer-term scenario (see Table 4.3).

Table D3 Short-run impact on occupation employment of increased immigration

	2011	% change	
	Baseline	**Short run scenario H on baseline**	**Short run**
Labour by occupations (000 FTEs)			
Managers	270	2.5	276
Professionals	309	1.5	313
Technicians	239	2.5	245
Sales and clerical	483	1.6	491
Primary sector workers	125	1.3	127
Trades workers	178	6.0	189
Machine operators and labourers	280	1.4	284
Total	**1,884**	**2.2**	**1,925**

One noticeable difference, though, is the result for managers. In this short-run scenario the demand for managers increases by less than that for technicians,

whereas this relativity is reversed in the longer run. This difference can be traced to the constraint on capital stock, as capital and managerial labour, to a degree, are complements in the production process. Thus, the inability to access more capital in the short run constrains the increase in demand for managerial skills in response to the increase in immigration. In the longer run, however, the increased availability of capital brings forth an increased demand for managerial skills.

Appendix E: Comparison with Australian Productivity Commission experiment

A scenario was undertaken assuming a 4.6 percent above-baseline increase in labour supply (scenario I). Scenario I was generated to enable broad comparisons with results reported by the Productivity Commission (2006), which investigated the impact of immigration on the Australian economy using the MONASH model. Table E1 lists the macro results of the two simulations.

Table E1 Comparison of increased immigration scenarios

	% change on baseline	
	Australia	**Productivity Commission experiment**
Household consumption	3.3	4.1
Investment	2.4	8.0
Government consumption	3.3	4.1
Export volumes	4.8	3.5
Imports	2.2	4.8
GDP expenditure	3.9	4.6
Capital stock (2006 $m)	2.4	4.2
Employment (000 FTEs)	4.6	4.6
Real wage rates	-0.6	-1.7

In broad gross domestic product terms, it can be argued that the two simulations are comparable. However, there are noticeable differences in composition. The Australian impact is dominated by the investment and capital responses. In comparison, the investment and capital responses in the New Zealand simulation are more muted.

This difference could be related to differences in the modelling routines; the MONASH model incorporates dynamic effects. In contrast, the Business and Economic Research Limited computable general equilibrium model provides a static 'snapshot' picture of impacts associated with a shock. In turn, the increased import ratio found in the Australian simulation could be related to the import requirements of the increased investment demand.

Appendix F: Detailed sector results for 2021 baseline

Table F1 to Table F4 provide detailed results by sector for the base case. See Appendix B for the abbreviations used in the tables.

Table F1 Sector results for 2021 baseline

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	2006	% change pa	2021	2006	% change pa	2021	2006	% change pa	2021
HFRG	2,656	3.24	4,287	22.2	0.68	24.6	1,989	3.80	3,480
SBLC	6,591	2.90	10,113	41.6	-0.01	41.6	6,686	3.34	10,943
DAIF	4,720	2.80	7,138	31.6	-0.05	31.4	4,032	3.11	6,388
OTHF	1,072	2.92	1,651	5.9	0.43	6.3	536	3.45	891
SAHF	1,845	2.96	2,855	18.2	0.72	20.2	1,131	3.47	1,885
FOLO	2,978	2.96	4,610	8.0	2.72	11.9	1,351	5.05	2,829
FISH	852	3.06	1,338	2.8	-0.11	2.7	962	5.12	2,035
MINE	1,197	3.26	1,937	3.6	2.19	5.0	878	3.46	1,463
OGPE	6,162	5.22	13,215	2.2	5.74	5.0	4,905	5.09	10,329
MEDA	16,356	2.78	24,683	29.3	0.62	32.2	3,518	3.10	5,562
OFOD	6,816	3.09	10,755	21.0	0.72	23.4	4,659	3.67	7,994
BEVT	4,510	3.55	7,607	4.7	0.90	5.4	3,314	4.03	5,993
TCFL	2,113	3.98	3,795	17.3	2.62	25.5	874	4.35	1,655
WOOD	4,203	3.36	6,904	18.7	0.66	20.6	2,565	4.30	4,826
PAPR	2,918	3.53	4,910	4.6	0.65	5.1	2,545	4.22	4,728
PPRM	3,823	2.95	5,913	21.4	2.39	30.6	2,069	4.15	3,808
CHEM	2,675	3.29	4,348	2.6	2.04	3.6	1,980	3.11	3,132
RBPL	4,092	3.31	6,669	14.6	2.43	20.9	1,949	3.45	3,243
NMMP	2,311	3.48	3,861	6.9	0.50	7.4	1,030	2.68	1,531
BASM	3,257	4.78	6,559	4.8	2.38	6.8	2,140	3.02	3,344
FABM	4,848	4.62	9,550	22.2	1.72	28.7	1,272	2.30	1,789
TREQ	2,512	5.05	5,262	12.1	2.22	16.8	3,109	5.16	6,611
MAEQ	6,192	5.83	14,488	30.8	2.94	47.6	646	5.30	1,402
OMFG	1,929	3.39	3,181	14.0	2.06	19.0	2,137	4.26	3,997
ELEC	11,178	3.57	18,908	3.8	1.43	4.7	19,425	4.22	36,103
WATS	803	2.16	1,106	1.1	-0.23	1.1	2,375	2.89	3,643
WAST	628	2.93	969	4.2	0.97	4.8	1,251	3.96	2,238
RCON	7,800	1.39	9,599	47.3	-1.59	37.2	1,185	0.46	1,270
OCON	21,506	3.19	34,453	102.1	0.71	113.6	4,393	2.48	6,346
WHIN	11,812	3.60	20,085	63.7	1.11	75.3	4,559	2.08	6,205
WHOT	8,675	3.09	13,691	41.9	0.56	45.6	3,721	1.51	4,662
RETT	17,998	3.49	30,105	208.7	1.02	243.1	7,265	3.51	12,195
ACCR	6,454	3.55	10,888	80.3	3.30	130.6	5,251	5.20	11,226
RDFR	4,998	3.35	8,197	22.7	0.92	26.1	4,817	2.61	7,087
RDPS	804	3.83	1,413	10.3	1.47	12.8	1,168	2.99	1,818
RWAS	9,670	4.39	18,417	41.1	1.73	53.2	8,007	4.02	14,461
COMM	7,911	3.68	13,597	22.8	-0.75	20.4	8,498	0.66	9,380
FINE	9,433	3.15	15,014	37.3	1.09	43.9	5,097	1.87	6,726
INSU	3,483	2.75	5,233	9.0	1.78	11.7	639	0.59	698
SFIN	3,199	3.10	5,056	16.0	1.01	18.6	887	2.58	1,301
REES	11,021	2.17	15,201	39.1	0.95	45.1	71,885	2.48	103,808
EHOP	2,637	3.75	4,581	9.9	3.09	15.7	11,738	4.22	21,807
OWND	12,472	0.81	14,081	0.0	na	0.0	163,680	0.85	185,780

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	2006	% change pa	2021	2006	% change pa	2021	2006	% change pa	2021
SRCS	8,331	3.23	13,430	59.8	3.11	94.7	1,986	5.18	4,240
OBUS	16,200	3.12	25,694	130.8	2.92	201.4	4,390	4.86	8,948
GOVC	9,424	2.73	14,124	69.4	1.07	81.4	19,240	4.33	36,335
GOVL	4,036	2.76	6,072	13.4	0.56	14.5	24,060	4.75	48,291
SCHL	3,968	2.73	5,941	81.3	1.27	98.2	8,123	4.05	14,725
OEDU	4,262	2.88	6,520	42.1	1.38	51.7	7,977	4.29	14,980
HOSP	5,622	2.68	8,364	42.2	2.10	57.7	1,663	2.93	2,563
OHCS	6,930	2.63	10,223	100.6	1.60	127.6	9,184	2.75	13,802
CULT	7,827	3.01	12,215	46.3	1.22	55.5	8,061	3.57	13,644
PERS	3,937	2.69	5,858	50.1	0.67	55.4	3,025	4.23	5,628
Total	**319,646**	**3.23**	**514,665**	**1,758.4**	**1.45**	**2,183.5**	**469,826**	**2.69**	**699,766**

Table F2 Household consumption spending for 2021 baseline

	2006	% change pa	2021
Consumption 2006 $m			
Food	17,844	2.03	24,126
Housing	17,741	0.81	20,029
Household operation	10,393	3.65	17,782
Apparel	2,983	4.72	5,956
Transportation	14,471	4.14	26,604
Tobacco & alcohol	6,176	3.14	9,824
Other goods	5,189	2.92	7,993
Other services	18,793	2.45	27,018
Total	**93,590**	**2.69**	**139,332**
Consumption by quintile $m			
Bottom	8,630	5.43	19,079
Low	11,836	5.24	25,474
Middle	16,927	5.38	37,170
High	22,007	5.54	49,402
Top	34,190	5.57	77,050
Total	**93,590**	**5.47**	**208,174**

Table F3 Export volumes for 2021 baseline

Exports	Exports 2006 $m		
	2006	% change pa	2021
Live animals	111	1.48	139
Dairy	5,444	2.82	8,259
Meat	4,730	2.67	7,025
Wool	631	1.56	795
Horticulture	1,399	3.52	2,352
Fish	1,473	2.81	2,231
Other food	2,447	4.75	4,910
Textiles & clothing	1,826	3.90	3,242
Logs	675	1.78	880
Wood	1,604	4.53	3,120
Pulp & paper	1,176	3.92	2,095
Printing & recording	266	1.43	329
Oil bunkering	619	3.62	1,054
Chemicals	2,283	3.53	3,842
Coal	152	0.81	171
Mining	40	-0.01	40
Ceramics	182	3.78	318
Basic metals	2,148	4.09	3,922
Fabricated metal products	475	5.30	1,030
Machinery & equipment	3,476	6.74	9,250
Other manufacturing	339	2.82	514
Tourism	7,097	5.30	15,399
Freight	741	4.16	1,367
Education	903	3.74	1,566
Other services	3,051	4.29	5,730
Total	**43,290**	**4.14**	**79,580**

Table F4 Labour by occupation type for 2021 baseline

Occupation	Occupation employment 000s		
	2006	% change pa	2021
Administrators	4.24	1.03	4.94
Corporate managers	247.70	1.41	305.40
Science professionals	9.09	2.23	12.65
Computing professionals	28.13	2.35	39.88
Architects, engineers	27.97	2.36	39.67
Health professionals	49.55	1.91	65.80
Tertiary teaching professionals	15.25	1.61	19.37
Other teaching professionals	67.08	1.39	82.49
Business professionals	52.89	2.18	73.09
Legal professionals	11.44	2.60	16.80
Other professionals	19.58	1.55	24.65
Science technicians	26.13	1.57	33.03
Computer equipment controllers	7.88	1.81	10.32
Electronic equipment controllers	8.02	1.28	9.72
Ship and aircraft technicians	4.54	1.41	5.60
Health associate professionals	11.87	1.49	14.81
Finance associate professionals	99.49	1.18	118.61
Govt associate professionals	26.48	1.18	31.59
Safety & health inspectors	7.48	1.11	8.83
Writers, artists	33.07	1.49	41.30
Office clerks	137.08	1.58	173.37
Customer services clerks	55.52	1.57	70.11
Travel attendants and guides	5.31	1.74	6.89
Restaurant services workers	57.98	2.70	86.47
Personal service workers	50.56	1.50	63.18
Protective services workers	26.21	1.41	32.34
Salespersons	115.44	1.15	137.07
Farmers	113.29	0.32	118.86
Forestry and related workers	4.91	2.12	6.74
Fishery workers	4.39	0.55	4.77
Building trades workers	92.35	0.06	93.19
Metal and machinery trades	49.64	1.74	64.26
Precision trades workers	11.28	1.95	15.07
Other trades workers	18.33	1.23	22.01
Industrial plant operators	83.02	1.70	106.96
Train, ships crews	1.89	1.86	2.49
Motor vehicle drivers	39.04	1.43	48.31
Earthmoving equipment operators	16.82	1.40	20.73

Occupation	Occupation employment 000s		
	2006	% change pa	2021
Building and related workers	9.55	1.40	11.76
Labourers	107.90	1.77	140.36
Total	**1,758.40**	**1.45**	**2,183.48**

Appendix G: Detailed sector results for Scenario A

Table G1 to Table G4 give detailed results for scenario A.

Table G1 Sector results for 2021 increased immigration scenario A

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	Baseline	% change	Scenario	Baseline	% change	Scenario	Baseline	% change	Scenario
HFRG	4,287	6.48	4,565	24.6	5.20	25.9	3,480	8.56	3,777
SBLC	10,113	5.00	10,618	41.6	3.12	42.9	10,943	6.68	11,674
DAIF	7,138	4.19	7,438	31.4	2.49	32.2	6,388	6.15	6,781
OTHF	1,651	5.99	1,750	6.3	4.98	6.6	891	7.79	960
SAHF	2,855	6.55	3,042	20.2	5.95	21.4	1,885	8.39	2,044
FOLO	4,610	10.34	5,087	11.9	8.75	12.9	2,829	11.69	3,160
FISH	1,338	7.88	1,443	2.7	6.11	2.9	2,035	8.78	2,214
MINE	1,937	8.57	2,103	5.0	7.51	5.4	1,463	9.14	1,597
OGPE	13,215	9.83	14,514	5.0	7.99	5.4	10,329	10.00	11,362
MEDA	24,683	4.08	25,691	32.2	3.71	33.3	5,562	4.94	5,837
OFOD	10,755	7.69	11,582	23.4	6.79	25.0	7,994	8.63	8,684
BEVT	7,607	8.95	8,288	5.4	7.26	5.8	5,993	9.77	6,578
TCFL	3,795	10.78	4,205	25.5	10.23	28.1	1,655	12.17	1,856
WOOD	6,904	10.48	7,627	20.6	9.52	22.6	4,826	11.65	5,389
PAPR	4,910	11.24	5,461	5.1	10.21	5.6	4,728	11.79	5,286
PPRM	5,913	9.60	6,481	30.6	8.55	33.2	3,808	11.21	4,234
CHEM	4,348	9.03	4,741	3.6	7.60	3.9	3,132	9.78	3,439
RBPL	6,669	9.36	7,293	20.9	8.61	22.7	3,243	10.62	3,588
NMMP	3,861	9.44	4,225	7.4	8.39	8.0	1,531	10.43	1,691
BASM	6,559	9.42	7,177	6.8	8.22	7.4	3,344	9.99	3,678
FABM	9,550	9.81	10,486	28.7	9.09	31.3	1,789	11.19	1,989
TREQ	5,262	11.74	5,879	16.8	10.86	18.6	6,611	13.39	7,496
MAEQ	14,488	10.42	15,998	47.6	9.84	52.3	1,402	11.21	1,559
OMFG	3,181	10.66	3,520	19.0	9.49	20.8	3,997	12.22	4,485
ELEC	18,908	7.63	20,350	4.7	4.74	4.9	36,103	8.00	38,991
WATS	1,106	5.15	1,163	1.1	2.28	1.1	3,643	5.63	3,848
WAST	969	7.95	1,046	4.8	6.58	5.1	2,238	8.79	2,435
RCON	9,599	9.73	10,533	37.2	7.46	40.0	1,270	10.81	1,407
OCON	34,453	7.54	37,051	113.6	6.50	121.0	6,346	8.85	6,908
WHIN	20,085	8.05	21,701	75.3	7.20	80.7	6,205	9.93	6,821
WHOT	13,691	7.04	14,655	45.6	6.09	48.4	4,662	8.87	5,075
RETT	30,105	7.99	32,511	243.1	6.97	260.0	12,195	9.20	13,317
ACCR	10,888	8.47	11,811	130.6	7.44	140.3	11,226	10.27	12,378
RDFR	8,197	8.14	8,864	26.1	7.48	28.0	7,087	9.13	7,734
RDPS	1,413	8.77	1,537	12.8	8.25	13.8	1,818	9.63	1,993
RWAS	18,417	10.46	20,343	53.2	9.31	58.2	14,461	12.26	16,234
COMM	13,597	8.51	14,754	20.4	6.89	21.8	9,380	9.20	10,243
FINE	15,014	8.11	16,232	43.9	6.78	46.9	6,726	9.09	7,338
INSU	5,233	7.07	5,603	11.7	7.72	12.6	698	6.30	742
SFIN	5,056	7.60	5,441	18.6	5.82	19.7	1,301	10.59	1,438
REES	15,201	6.21	16,144	45.1	2.55	46.2	103,808	6.62	110,680
EHOP	4,581	10.10	5,044	15.7	8.09	16.9	21,807	10.76	24,153
OWND	14,081	2.68	14,458	0.0	na	0.0	185,780	2.68	190,756

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	Baseline	% change	Scenario	Baseline	% change	Scenario	Baseline	% change	Scenario
SRCS	13,430	8.56	14,579	94.7	7.87	102.1	4,240	9.89	4,659
OBUS	25,694	8.87	27,974	201.4	7.85	217.2	8,948	10.11	9,853
GOVC	14,124	7.70	15,212	81.4	7.30	87.4	36,335	10.19	40,037
GOVL	6,072	7.70	6,539	14.5	6.14	15.4	48,291	9.45	52,855
SCHL	5,941	8.80	6,464	98.2	8.55	106.6	14,725	10.94	16,336
OEDU	6,520	8.27	7,059	51.7	7.92	55.8	14,980	10.65	16,575
HOSP	8,364	11.95	9,364	57.7	11.81	64.5	2,563	13.78	2,916
OHCS	10,223	9.72	11,217	127.6	8.69	138.7	13,802	11.45	15,382
CULT	12,215	7.48	13,128	55.5	5.73	58.7	13,644	8.79	14,844
PERS	5,858	6.57	6,243	55.4	5.79	58.6	5,628	8.24	6,092
Total	**514,665**	**8.08**	**556,233**	**2,183.5**	**7.38**	**2,344.6**	**699,766**	**7.38**	**751,397**

Table G2 Household consumption spending for increased immigration scenario A

	Baseline	% change	Scenario
Consumption 2006 $m			
Food	24,126	4.86	25,299
Housing	20,029	2.68	20,565
Household operation	17,782	7.28	19,076
Apparel	5,956	8.25	6,448
Transportation	26,604	7.99	28,730
Tobacco & alcohol	9,824	6.95	10,507
Other goods	7,993	5.96	8,470
Other services	27,018	5.71	28,562
Total	**139,332**	**5.97**	**147,656**
Consumption by quintile $m			
Bottom	19,079	0.79	19,230
Low	25,474	2.72	26,167
Middle	37,170	4.96	39,015
High	49,402	5.51	52,126
Top	77,050	5.82	81,534
Total	**208,174**	**4.75**	**218,071**

Table G3 Export volumes for increased immigration scenario A

	Exports 2006 $m		
	Baseline	**% change**	**Scenario**
Exports			
Live animals	139	4.69	145
Dairy	8,259	2.18	8,439
Meat	7,025	2.18	7,178
Wool	795	2.24	813
Horticulture	2,352	5.69	2,486
Fish	2,231	5.29	2,349
Other food	4,910	11.14	5,457
Textiles & clothing	3,242	10.19	3,572
Logs	880	12.33	988
Wood	3,120	11.98	3,494
Pulp & paper	2,095	11.91	2,344
Printing & recording	329	10.62	364
Oil bunkering	1,054	4.31	1,100
Chemicals	3,842	9.22	4,197
Coal	171	4.95	180
Mining	40	12.82	45
Ceramics	318	10.66	352
Basic metals	3,922	4.74	4,108
Fabricated metal products	1,030	6.86	1,101
Machinery & equipment	9,250	9.39	10,119
Other manufacturing	514	10.90	571
Tourism	15,399	11.77	17,211
Freight	1,367	11.35	1,522
Education	1,566	10.27	1,727
Other services	5,730	12.50	6,446
Total	**79,580**	**8.45**	**86,307**

Table G4 Labour by occupation type for increased immigration scenario A

Occupation type	Occupation employment 000s		
	Baseline	% change	Scenario
Administrators	4.94	6.49	5.26
Corporate managers	305.40	6.85	326.33
Science professionals	12.65	8.06	13.67
Computing professionals	39.88	7.99	43.07
Architects, engineers	39.67	8.25	42.94
Health professionals	65.80	10.04	72.41
Tertiary teaching professionals	19.37	8.01	20.92
Other teaching professionals	82.49	8.52	89.52
Business professionals	73.09	7.86	78.84
Legal professionals	16.80	8.01	18.14
Other professionals	24.65	7.71	26.55
Science technicians	33.03	7.27	35.43
Computer equipment controllers	10.32	7.19	11.06
Electronic equipment controllers	9.72	7.50	10.44
Ship and aircraft technicians	5.60	8.25	6.06
Health associate professionals	14.81	8.67	16.09
Finance associate professionals	118.61	6.36	126.15
Govt associate professionals	31.59	7.63	34.00
Safety & health inspectors	8.83	6.70	9.42
Writers, artists	41.30	6.73	44.08
Office clerks	173.37	7.57	186.50
Customer services clerks	70.11	7.43	75.32
Travel attendants and guides	6.89	8.40	7.47
Restaurant services workers	86.47	7.52	92.97
Personal service workers	63.18	8.17	68.35
Protective services workers	32.34	7.39	34.73
Salespersons	137.07	7.05	146.73
Farmers	118.86	4.12	123.76
Forestry and related workers	6.74	7.91	7.27
Fishery workers	4.77	5.91	5.05
Building trades workers	93.19	6.74	99.47
Metal and machinery trades	64.26	8.28	69.59
Precision trades workers	15.07	8.20	16.30
Other trades workers	22.01	7.48	23.65
Industrial plant operators	106.96	8.00	115.52
Train, ships crews	2.49	9.01	2.71
Motor vehicle drivers	48.31	7.99	52.16

Occupation type	Occupation employment 000s		
	Baseline	**% change**	**Scenario**
Earthmoving equipment operators	20.73	7.46	22.28
Building and related workers	11.76	7.80	12.68
Labourers	140.36	8.06	151.67
Total	**2,183.48**	**7.38**	**2,344.58**

Appendix H: Detailed sector results for scenario B

Table H1 to H4 give detailed results for scenario B.

Table H1 Sector results for 2021 zero inward immigration scenario

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	Baseline	% change	Scenario	Baseline	% change	Scenario	baseline	% change	Scenario
HFRG	4,287	-10.02	3,858	24.6	-7.91	22.7	3,480	-13.30	3,017
SBLC	10,113	-7.71	9,333	41.6	-4.48	39.7	10,943	-10.49	9,796
DAIF	7,138	-6.52	6,673	31.4	-3.54	30.3	6,388	-9.82	5,761
OTHF	1,651	-9.17	1,500	6.3	-7.48	5.8	891	-12.09	783
SAHF	2,855	-9.86	2,574	20.2	-8.88	18.4	1,885	-12.82	1,644
FOLO	4,610	-15.06	3,916	11.9	-12.65	10.4	2,829	-17.03	2,347
FISH	1,338	-12.02	1,177	2.7	-9.15	2.5	2,035	-13.42	1,762
MINE	1,937	-12.91	1,687	5.0	-11.24	4.4	1,463	-13.79	1,262
OGPE	13,215	-14.60	11,286	5.0	-11.70	4.4	10,329	-14.87	8,793
MEDA	24,683	-6.36	23,113	32.2	-5.70	30.3	5,562	-7.84	5,126
OFOD	10,755	-11.66	9,502	23.4	-10.20	21.0	7,994	-13.13	6,944
BEVT	7,607	-13.28	6,597	5.4	-10.62	4.8	5,993	-14.53	5,122
TCFL	3,795	-15.94	3,191	25.5	-15.12	21.6	1,655	-17.94	1,358
WOOD	6,904	-14.86	5,877	20.6	-13.42	17.8	4,826	-16.58	4,026
PAPR	4,910	-16.67	4,091	5.1	-15.14	4.3	4,728	-17.49	3,901
PPRM	5,913	-14.23	5,072	30.6	-12.61	26.7	3,808	-16.65	3,174
CHEM	4,348	-13.66	3,754	3.6	-11.40	3.2	3,132	-14.81	2,668
RBPL	6,669	-13.88	5,743	20.9	-12.71	18.2	3,243	-15.79	2,731
NMMP	3,861	-13.57	3,337	7.4	-11.93	6.5	1,531	-15.06	1,300
BASM	6,559	-14.11	5,634	6.8	-12.24	6.0	3,344	-14.97	2,844
FABM	9,550	-14.44	8,171	28.7	-13.34	24.9	1,789	-16.49	1,494
TREQ	5,262	-17.25	4,354	16.8	-15.98	14.1	6,611	-19.57	5,317
MAEQ	14,488	-15.66	12,220	47.6	-14.77	40.6	1,402	-16.86	1,165
OMFG	3,181	-15.77	2,679	19.0	-14.03	16.3	3,997	-18.03	3,276
ELEC	18,908	-11.46	16,742	4.7	-6.71	4.4	36,103	-12.04	31,756
WATS	1,106	-7.53	1,023	1.1	-2.52	1.0	3,643	-8.33	3,340
WAST	969	-11.78	855	4.8	-9.56	4.3	2,238	-13.09	1,945
RCON	9,599	-10.65	8,577	37.2	-6.99	34.6	1,270	-12.35	1,113
OCON	34,453	-11.16	30,607	113.6	-9.47	102.8	6,346	-13.24	5,506
WHIN	20,085	-12.17	17,641	75.3	-10.83	67.1	6,205	-15.07	5,269
WHOT	13,691	-10.49	12,255	45.6	-8.93	41.5	4,662	-13.38	4,038
RETT	30,105	-11.86	26,534	243.1	-10.22	218.2	12,195	-13.75	10,518
ACCR	10,888	-12.59	9,517	130.6	-10.97	116.3	11,226	-15.33	9,505
RDFR	8,197	-12.11	7,204	26.1	-11.06	23.2	7,087	-13.64	6,120
RDPS	1,413	-13.08	1,228	12.8	-12.27	11.2	1,818	-14.38	1,557
RWAS	18,417	-15.58	15,548	53.2	-13.87	45.8	14,461	-18.17	11,834
COMM	13,597	-12.66	11,875	20.4	-10.07	18.3	9,380	-13.73	8,092
FINE	15,014	-12.01	13,210	43.9	-9.86	39.6	6,726	-13.55	5,815
INSU	5,233	-10.41	4,689	11.7	-11.36	10.4	698	-9.28	634
SFIN	5,056	-11.30	4,485	18.6	-8.53	17.0	1,301	-15.68	1,097
REES	15,201	-8.91	13,846	45.1	-2.65	43.9	103,808	-9.59	93,855
EHOP	4,581	-14.99	3,894	15.7	-11.90	13.8	21,807	-15.98	18,323
OWND	14,081	-3.50	13,588	0.0	na	0.0	185,780	-3.50	179,283
SRCS	13,430	-12.78	11,713	94.7	-11.69	83.6	4,240	-14.85	3,610

	Gross output 2006 $m			Employment 000 FTEs			Capital stock 2006 $m		
	Baseline	% change	Scenario	Baseline	% change	Scenario	baseline	% change	Scenario
OBUS	25,694	-13.12	22,323	201.4	-11.52	178.2	8,948	-14.99	7,607
GOVC	14,124	-11.39	12,515	81.4	-10.75	72.7	36,335	-15.17	30,822
GOVL	6,072	-11.40	5,379	14.5	-8.91	13.2	48,291	-14.06	41,500
SCHL	5,941	-15.30	5,033	98.2	-14.92	83.5	14,725	-18.37	12,019
OEDU	6,520	-13.23	5,657	51.7	-12.70	45.1	14,980	-16.75	12,470
HOSP	8,364	-17.57	6,895	57.7	-17.37	47.6	2,563	-20.11	2,048
OHCS	10,223	-14.28	8,763	127.6	-12.72	111.4	13,802	-16.82	11,480
CULT	12,215	-11.08	10,862	55.5	-8.22	51.0	13,644	-13.16	11,849
PERS	5,858	-9.69	5,290	55.4	-8.39	50.7	5,628	-12.37	4,932
Total	**514,665**	**-11.96**	**453,086**	**2,183.5**	**-10.89**	**1,945.7**	**699,766**	**-10.89**	**623,549**

Table H2 Household consumption spending for zero inward immigration scenario B

Consumption 2006 $m	Baseline	% change	Scenario
Food	24,126	-7.13	22,406
Housing	20,029	-3.50	19,329
Household operation	17,782	-10.73	15,874
Apparel	5,956	-12.23	5,227
Transportation	26,604	-11.78	23,469
Tobacco & alcohol	9,824	-10.20	8,822
Other goods	7,993	-8.81	7,289
Other services	27,018	-8.36	24,760
Total	**139,332**	**-8.72**	**127,177**
Consumption by quintile $m			
Bottom	19,079	-1.19	18,852
Low	25,474	-4.11	24,426
Middle	37,170	-7.74	34,292
High	49,402	-8.39	45,256
Top	77,050	-8.81	70,265
Total	**208,174**	**-7.25**	**193,091**

Table H3 Export volumes for zero inward immigration scenario B

Exports	Exports 2006 $m		
	Baseline	% change	Scenario
Live animals	139	-7.70	128
Dairy	8,259	-3.68	7,955
Meat	7,025	-3.68	6,766
Wool	795	-3.79	765
Horticulture	2,352	-9.15	2,137
Fish	2,231	-8.60	2,039
Other food	4,910	-16.78	4,086
Textiles & clothing	3,242	-15.44	2,741
Logs	880	-18.35	718
Wood	3,120	-17.90	2,562
Pulp & paper	2,095	-17.95	1,719
Printing & recording	329	-16.06	276
Oil bunkering	1,054	-7.20	978
Chemicals	3,842	-14.31	3,292
Coal	171	-8.14	157
Mining	40	-19.11	32
Ceramics	318	-16.19	267
Basic metals	3,922	-7.79	3,617
Fabricated metal products	1,030	-10.84	918
Machinery & equipment	9,250	-14.37	7,921
Other manufacturing	514	-16.43	430
Tourism	15,399	-17.59	12,690
Freight	1,367	-17.07	1,133
Education	1,566	-15.28	1,327
Other services	5,730	-18.59	4,665
Total	**79,580**	**-12.89**	**69,321**

Table H4 Labour by occupation type for zero inward immigration scenario B

Occupation type	Occupation employment 000s		
	Baseline	% change	Scenario
Administrators	4.94	-9.60	4.47
Corporate managers	305.40	-10.02	274.79
Science professionals	12.65	-11.94	11.14
Computing professionals	39.88	-11.89	35.14
Architects, engineers	39.67	-12.22	34.82
Health professionals	65.80	-14.77	56.08
Tertiary teaching professionals	19.37	-12.59	16.93
Other teaching professionals	82.49	-14.42	70.59
Business professionals	73.09	-11.62	64.60
Legal professionals	16.80	-11.81	14.81
Other professionals	24.65	-11.57	21.80
Science technicians	33.03	-10.65	29.51
Computer equipment controllers	10.32	-10.61	9.22
Electronic equipment controllers	9.72	-10.92	8.65
Ship and aircraft technicians	5.60	-12.23	4.91
Health associate professionals	14.81	-12.74	12.92
Finance associate professionals	118.61	-9.16	107.75
Govt associate professionals	31.59	-11.76	27.88
Safety & health inspectors	8.83	-9.76	7.96
Writers, artists	41.30	-9.87	37.22
Office clerks	173.37	-11.21	153.94
Customer services clerks	70.11	-10.92	62.45
Travel attendants and guides	6.89	-12.46	6.03
Restaurant services workers	86.47	-11.10	76.87
Personal service workers	63.18	-12.03	55.58
Protective services workers	32.34	-10.89	28.82
Salespersons	137.07	-10.36	122.87
Farmers	118.86	-5.98	111.76
Forestry and related workers	6.74	-11.42	5.97
Fishery workers	4.77	-8.66	4.35
Building trades workers	93.19	-8.78	85.01
Metal and machinery trades	64.26	-12.25	56.39
Precision trades workers	15.07	-12.07	13.25
Other trades workers	22.01	-10.95	19.60
Industrial plant operators	106.96	-11.85	94.29
Train, ships crews	2.49	-13.40	2.15
Motor vehicle drivers	48.31	-11.86	42.58

Occupation type	Occupation employment 000s		
	Baseline	% change	Scenario
Earthmoving equipment operators	20.73	-11.02	18.44
Building and related workers	11.76	-11.42	10.42
Labourers	140.36	-11.89	123.67
Total	**2,183.48**	**-10.89**	**1,945.66**

Appendix I Comparison of results

Table I1 Comparison of scenario results

	Baseline			% change on baseline					
	2006	**% pa**	**2021**	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario D**	**Scenario E**	**Scenario F**
Real GDP components (2006 $m)									
Household consumption	93,590	2.7	139,332	6.0	-8.7	6.1	6.9	5.7	4.3
Investment	37,319	3.1	59,092	7.6	-11.3	7.7	8.7	7.5	7.1
Government consumption	28,661	2.7	42,669	7.6	-11.3	7.7	8.7	7.5	7.1
Export volumes	43,290	4.1	79,580	8.5	-12.9	8.3	9.5	9.1	9.3
Imports	47,469	3.0	74,240	5.4	-8.2	5.4	6.2	6.0	4.4
Real GDP	156,088	3.1	247,556	7.6	-11.3	7.7	8.7	7.5	7.1
Production factors									
Capital stock (2006 $m)	469,826	2.7	699,767	7.4	-10.9	7.4	7.4	7.4	7.4
Employment (000 FTEs)	1,758	1.5	2,183	7.4	-10.9	7.4	7.4	7.4	7.4
Prices (2006=100)									
GDP deflator	100.0	2.2	137.9	-2.2	3.7	-2.3	-2.6	-2.1	-4.1
Gross output prices	100.0	2.1	136.3	-2.0	3.5	-2.1	-2.4	-1.9	-3.1
Consumer prices	100.0	2.7	149.4	-1.2	1.6	-1.3	-1.6	-0.7	-1.5
Real wage rates	100.0	0.5	107.5	-0.2	0.5	0.1	0.9	-0.5	-1.5
Balances									
Balance of trade ($m)	-4,179	2,551	-1,628	806	-1,451	734	796	946	2,895
as % of nominal GDP	*-2.7*		*-0.5*	*-0.2*	*-1.0*	*-0.2*	*-0.2*	*-0.2*	*0.4*
Population (000s)	4,027.9	0.8	4,535	6.1	-9.6	6.1	6.1	6.1	6.1
GDP per capita ($000s)	38.751	2.3	54.586	1.5	-1.8	1.5	2.5	1.3	0.9

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