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Food demand to 2050

Opportunities for Australian agriculture

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Summary

Concerns around food security have grown in recent years, with food price spikes focusing attention on rising food demand and how this will be met. Institutions such as the Food and Agriculture Organization of the United Nations (FAO) and the International Food Policy Research Institute (IFPRI) have published projections of an increase in global food demand out to 2050. The FAO projections indicate that world food demand may increase by 70 per cent by 2050, with much of the projected increase in global food demand expected to come from rising consumer incomes in regions such as Asia, Eastern Europe and Latin America.

Responses to these projections have mainly focused on the challenge of increasing world food production to meet increases in world food demand, with few implications drawn for individual food exporting countries. However, the increase in world demand is likely to create commercial opportunities for food exporters, including Australia. The objective of this report is to assess implications for Australian food exports of an increase in global food demand by 2050.

Projections of global demand and imports of agrifood products (food-based agricultural commodities and fish) are derived from a partial equilibrium model of agricultural markets that ABARES developed for this purpose. ABARES used the model to prepare projections that consistently account for the main economic forces linking demand and supply for various food commodities within a region and between regions over time.

In this paper, the real value of world agrifood demand in 2050 (in 2007 US dollars) is projected to be 77 per cent higher than in 2007. This represents an annual average increase of 1.3 per cent over the projection period. Most of the projected rise occurs in Asia, where agrifood demand is expected to double over the projection period (in 2007 US dollars). Demand in the rest of the world is projected to increase by 48 per cent over the projection period. China accounts for 43 per cent of the projected increase in global demand, while India contributes 13 per cent of this growth.

The projected increase in the real value of global agrifood demand (in 2007 US dollars) is greatest for vegetables and fruit, meats, dairy products, cereals and fish. Dairy products, meat and fish increase their share of global agrifood demand over the projection period. This is consistent with the expected change in diets towards high value products as consumer incomes rise.

Australia is in a good position to meet some of this higher demand. Australia has a comparative advantage in the production of several agricultural products and its geographical location means lower transport costs in exporting to Asia. The projected increase in global agrifood demand is expected to lead to increased production and exports of key Australian agricultural commodities. In particular, the real value (in 2007 US dollars) of Australian production of agrifood products covered in this analysis is estimated to be 77 per cent higher in 2050 than in 2007 (an annual average increase of 1.3 per cent). The largest increases in the real value of Australian production (in 2007 US dollars) are projected for beef, wheat, milk and sheep meat.

The real value (in 2007 US dollars) of Australia's agrifood exports in 2050 is projected to be 140 per cent higher than in 2007—an annual average increase of 2.1 per cent. This is driven by substantial increases in the real value of exports of beef, wheat, dairy products, sheep meat and sugar. China is driving the projected higher global import demand for beef, wheat, sheep meat and sugar, while India accounts for over 60 per cent of the projected increase in global import demand for dairy products.

Projected increases in Australian agricultural production and exports reflect the commodities where Australia has a comparative advantage. However, Australia will need to remain competitive to meet the opportunities provided by higher global agrifood demand. Australian agriculture is facing land and water constraints. It will therefore be increasingly important to maintain productivity growth through ongoing investment in research and development so that Australia is well positioned to take advantage of growth in global food demand.

The projections in this report provide an assessment of a plausible scenario for growth in global food demand and the broad potential effects of this growth in food demand. Projections are conditional on a set of assumptions regarding likely trends, particularly in the macro-economic environment and agricultural technological change, together with assumptions about parameter values in the agrifood model. This conditional baseline may serve as a starting point for scenario analysis that shows the sensitivity of the projections to assumptions and parameter values.

1 Introduction

Food security concerns have grown in recent years in response to food price spikes, their flow-on effects and rising world food demand. Institutions such as the Food and Agriculture Organization of the United Nations (FAO) and the International Food Policy Research Institute (IFPRI) have published projections of an increase in global food demand out to 2050 (FAO 2006, 2009; Nelson et al. 2010). These projections indicate that world food demand may increase by 70 per cent by 2050 (FAO 2009). Key drivers of this outward shift in aggregate food demand include: population growth (albeit slower than in the past), continuing income growth per person and urbanisation in many developing countries. Much of the projected increase in global food demand is expected to come from rising consumer incomes in fast growing developing countries, particularly in Asia, Eastern Europe and Latin America. Trade will be increasingly important to meet this higher demand.

Response to these projections has mainly focused on food security, particularly in net food importing developing countries and on the challenge of increasing global food production to meet increased world demand. However, increased demand is expected to create commercial opportunities for food exporters, including Australia.

While the focus of the FAO and IFPRI projections (FAO 2006, 2009; Nelson et al. 2010) has been on implications of global demand growth for food security, the objective of this report is to assess the implications for Australia of the projected demand growth. Significant opportunities are likely for food exporters, including Australia, to produce and export greater amounts of food over the next few decades. As noted by Sheales and Gunning-Trant (2009, p. 5):

Australian producers have the potential to benefit from increasing world demand for food and food commodities, particularly for grains, beef and semi-prepared foods where there is a comparative advantage. Australia's relatively low cost agricultural producers are well placed to take advantage of expanding high value markets, particularly in Asia.

Analysis in this report focuses on markets and commodities that are projected to experience significant rises in demand. Also examined are opportunities for Australia in response to higher demand, particularly potential effects on Australian exports of key agricultural commodities.

For this analysis ABARES developed an economic simulation model of global agricultural supply, demand and trade. The model was used to prepare annual projections between 2007 and 2050. The model's database is more up to date than the earlier FAO and IFPRI food studies. Commodity and regional coverage in the ABARES model is typically more detailed, with greater reporting of projections for Australia. In addition, the best practice mixed complementary framework (Rutherford 1995) is adopted to model various key activities in production and trade and impose key resource limits on land use and fish catch.

The model-based projections presented in this report are conditional on a set of assumptions, most notably about the macro-economic environment and changes in agricultural technology. Projections are also conditional on parameter values used to represent the sensitivities of demand and supply curves to economic forces. Changes to these assumptions and parameters will result in changes to the projections.

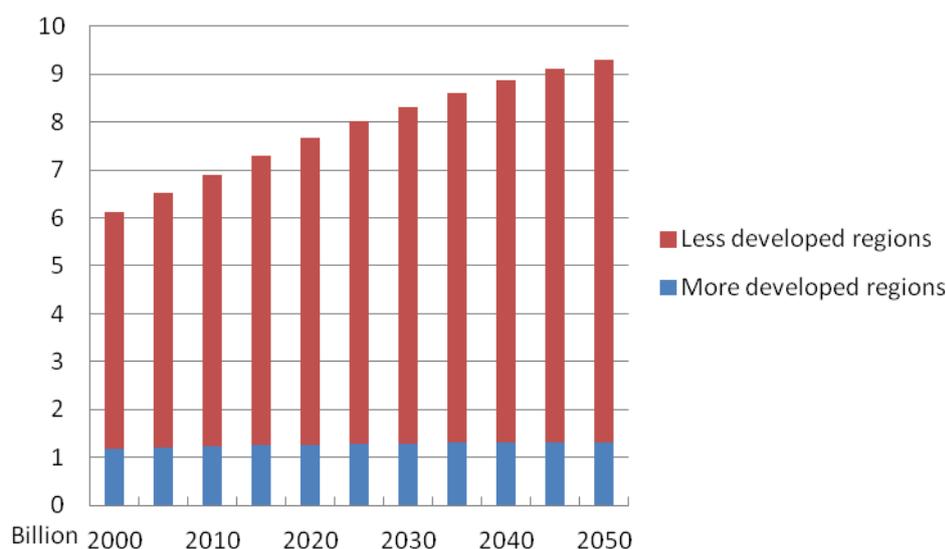
Section 2 of this report examines factors influencing food demand and supply out to 2050; Section 3 discusses global effects on food demand; and implications of these projections for future Australian production and exports are considered in Section 4.

2 Background

The Food and Agriculture Organization of the United Nations estimates that demand for food, feed and fibre will rise by 70 per cent in the first half of this century (FAO 2009). This increasing demand is being driven by higher world population, rising incomes and urbanisation. Food consumption per person is expected to expand most rapidly in Asia, Eastern Europe and Latin America where incomes are rising and population growth is slowing. Rising incomes have contributed to changes in the composition of diets for many of these countries, moving demand away from staples towards livestock and more processed foods.

The 2010 revision of the United Nations' population prospects (medium variant) projects world population will grow by 35 per cent, from 6.9 billion in 2010 to 9.3 billion in 2050 (United Nations 2011a). Compared with the previous 40 years, population growth will slow considerably. Nearly all population growth is forecast to occur in developing countries (Figure 1). World population is expected to level out after 2050, with the United Nations expecting much slower growth in the second half of the century (United Nations 2011a).

Figure 1 United Nations population estimates



Data source: United Nations (2011a)

Urbanisation is expected to continue at an accelerated pace, from 49 per cent in 2009 to 70 per cent in 2050, as measured by the proportion of the population living in urban areas (FAO 2009). Urbanisation is likely to bring with it changes in consumption patterns. In combination with income growth urbanisation may accelerate ongoing diversification of diets in developing countries (FAO 2009).

The World Bank estimates global economic growth (in 2007 US dollars) will increase at an average annual rate of 2.9 per cent between 2005 and 2050, with high income countries estimated to grow by 1.6 per cent per year and developing countries by 5.2 per cent (van der Mensbrugge et al. 2009). The World Bank analysis highlights a substantial shift in the share of global output towards developing countries, from around 20 per cent in 2005 to around 55 per cent in 2050 (van der Mensbrugge et al. 2009).

While those with higher real incomes can reduce non-food discretionary demands in times of price spikes, poor groups may be more exposed to these pressures. To the extent that the sources of price spikes are local food shortages, food trade will be an important buffer to offset this influence.

Bruinsma (2009) examines production-related implications of the 70 per cent rise in food demand by 2050 projected by the Food and Agriculture Organization of the United Nations. Bruinsma estimates that the 70 per cent increase in global agricultural production required between the base year (the average of the three years 2005 to 2007) and 2050 will occur through:

- increases in the quantities of individual product categories
- changes in the composition of product categories from low-priced staple products (cereals, pulses and starchy tubers) to higher priced products (fruit, vegetables and animal products).

Bruinsma estimates that 97 per cent of the required rise in agricultural production will occur in developing countries. Total crop production will need to rise by 66 per cent and livestock production by 76 per cent (Bruinsma 2009). Global arable land will have to increase by 5 per cent, reflecting a 12.4 per cent (120 million hectares) increase in arable land in developing countries. Average crop yields will need to increase by 42 per cent. Bruinsma (2009) calculates crop yield growth of 0.8 per cent per year will be required during the period from the base year (the average of the three years 2005 to 2007) to 2050. This is much lower than 1.7 per cent per year recorded during the period 1961 to 2007.

According to van der Mensbrugghe and colleagues (2009) agricultural production has to increase at an average rate of 0.8 per cent per year to accommodate population growth alone and by 1.8 per cent in the least developed countries out to 2050. International trade is expected to increase as many countries will depend on international trade to ensure food security (FAO 2009). The United Nations Food and Agriculture Organization estimates that developing countries will more than double their net imports of cereals by 2050 (FAO 2009).

3 Global effects

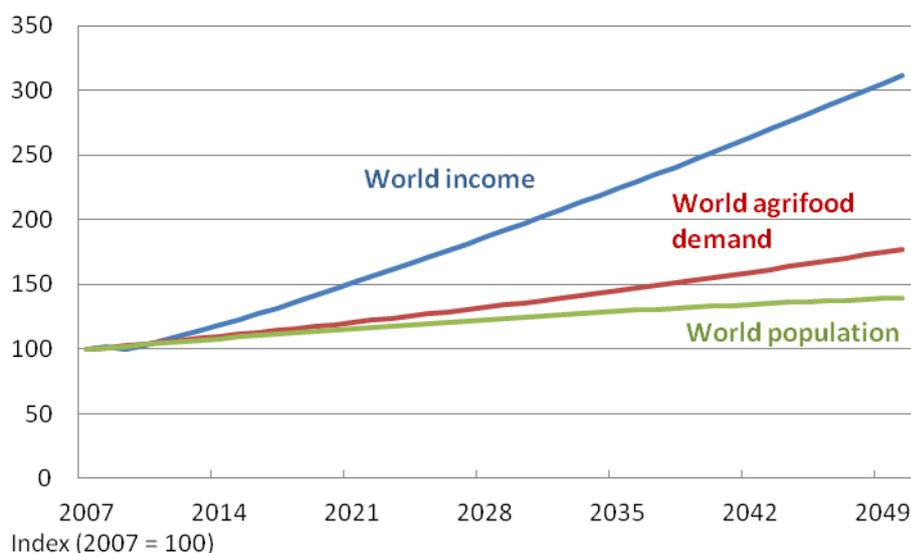
For this analysis ABARES developed an economic simulation model of global agricultural supply, demand and trade. The model was used to prepare annual projections for 2007 to 2050. In the model, annual regional demand and supply curves are specified for each agrifood product and world price, expressed in real terms, balances global demand and supply for each product.

In the model, consumer demand for each good increases over time with such factors as per person real income and population growth assumptions. Consumer markets are linked through substitution responses to relative price changes that are derived in the model. Producer supply increases with assumed rates of technical advance. Crop market supplies are linked through competing land use. Livestock product supplies compete for food as feed and for land suitable for pasture, including crop land. Land supply is price responsive within a feasible expansion limit. Low and high-valued fish products are incorporated to account for food substitution and feed linkages. Details of model coverage are provided in the Appendix.

Global demand

In this analysis the real value of world agrifood demand (in 2007 US dollars) in 2050 is projected to be 77 per cent higher than 2007, increasing by 1.3 per cent annually. This rise is driven by higher world population and per person incomes. The medium variant forecast from the United Nations is for population to rise by 40 per cent between 2007 and 2050, increasing by 0.8 per cent annually (United Nations 2011a). Over the same period total world real income is projected to increase by 211 per cent (2.7 per cent annually) (Figure 2). Growth in global agrifood demand is projected to be greater than the growth in global population. This reflects the effect of higher real per person incomes leading to increased food consumption per person.

Figure 2 World agrifood demand, population and income

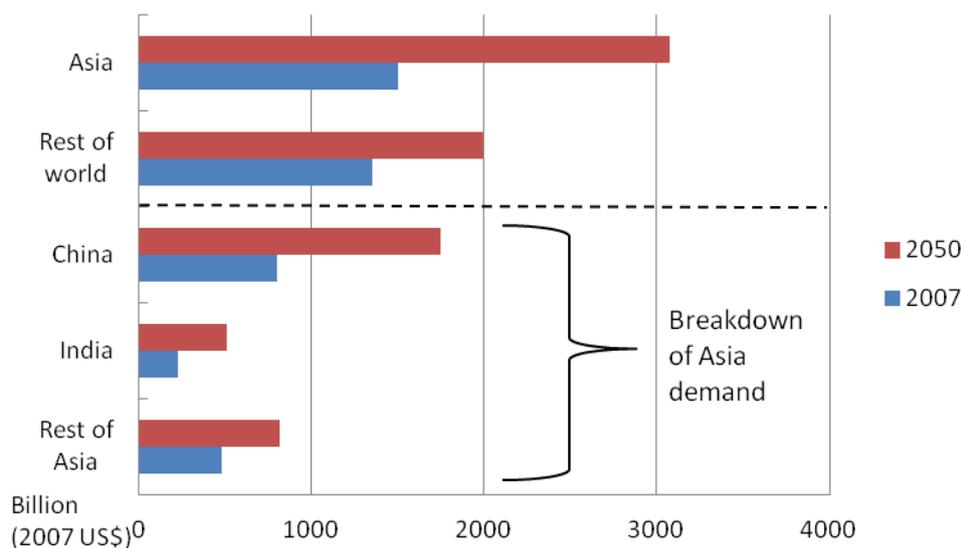


Data source: United Nations (2011a), ABARES model output

Asia is driving the rise in the real value of agrifood demand (Figure 3), accounting for 71 per cent of the projected increase between 2007 and 2050. The real value of agrifood demand in Asia (in 2007 US dollars) is projected to double between 2007 and 2050, while the real value of agrifood demand from the rest of the world is projected to increase by 48 per cent over this

period. China accounts for 43 per cent of the projected increase in global agrifood demand (or around 60 per cent of the increase in Asian demand). China's demand for all commodity groups is projected to increase over this period. India accounts for 13 per cent of the projected increase in global agrifood demand, while the rest of Asia accounts for a further 15 per cent. In annual average growth rates, India's food demand records the largest projected increase (1.9 per cent per year), followed by China (1.8 per cent per year).

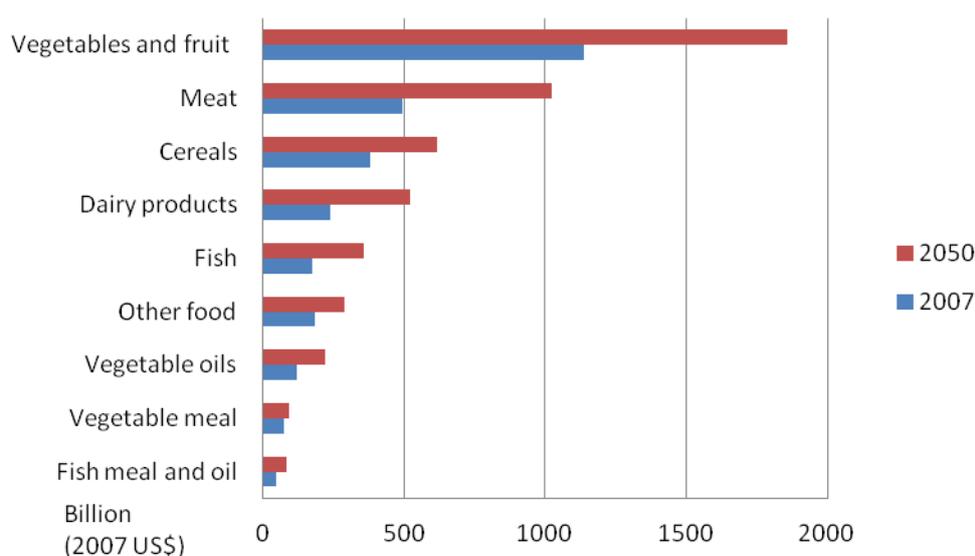
Figure 3 World agrifood demand by region



Data source: ABARES model output

For commodity groupings, the largest increases in real value of total agrifood demand are for vegetables and fruit and meat (Figure 4). The category of vegetables and fruit accounts for 33 per cent of the projected rise in agrifood demand, while meat accounts for 24 per cent. Dairy products, meat and fish are expected to grow fastest in annual average growth terms between 2007 and 2050 at 1.8 per cent, 1.7 per cent and 1.7 per cent respectively. Stronger demand results in higher relative world prices for these commodities. On the other hand, demand for cereals is projected to grow at 1.1 per cent per year. Differences in these growth rates are consistent with expected change in diets towards high value products.

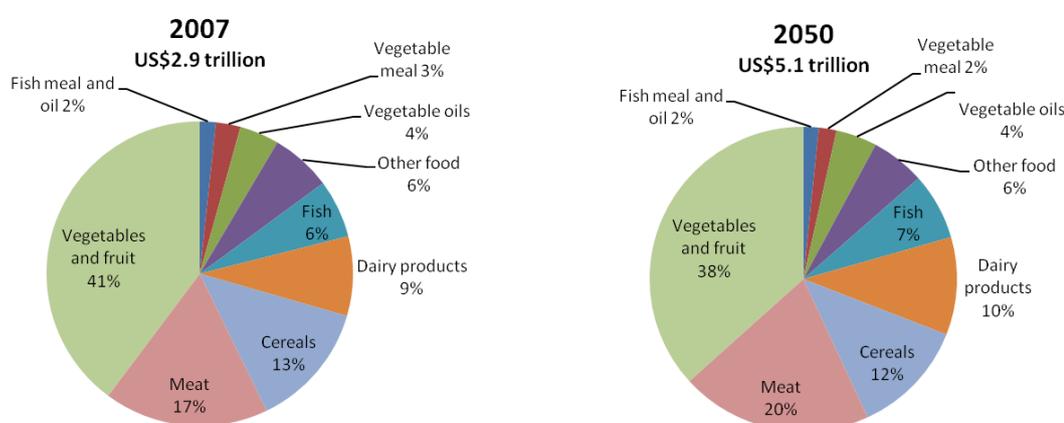
Figure 4 World agrifood demand by commodity grouping



Data source: ABARES model output

Meat, dairy products and fish are projected to increase their share of agrifood demand between 2007 and 2050, while vegetables and fruit and cereals are expected to account for a smaller share (Figure 5).

Figure 5 Share of world agrifood demand, the global diet



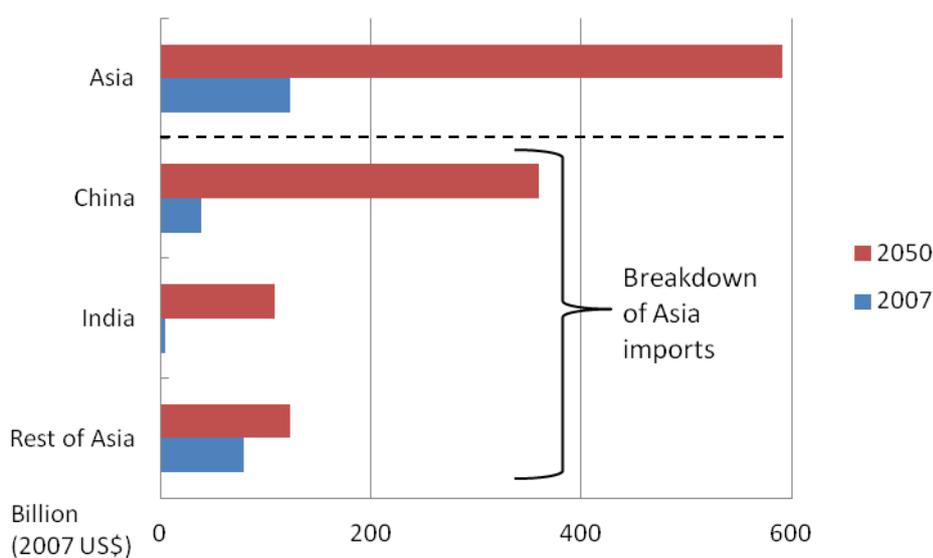
Note: The total value of world agrifood demand in the model is expressed in 2007 US dollars. See Appendix for model coverage.

Data source: ABARES model output

Global imports

The real value of world agrifood imports is projected to increase from US\$278 billion in 2007 to US\$764 billion in 2050 (in 2007 US dollars), a rise of 174 per cent (or 2.3 per cent annually). Asia accounts for the bulk of the growth in agrifood imports, with the real value of Asia’s agrifood imports rising from around US\$120 billion in 2007 to around US\$590 billion (in 2007 US dollars) in 2050. China accounts for most of the rise in Asian imports (Figure 6).

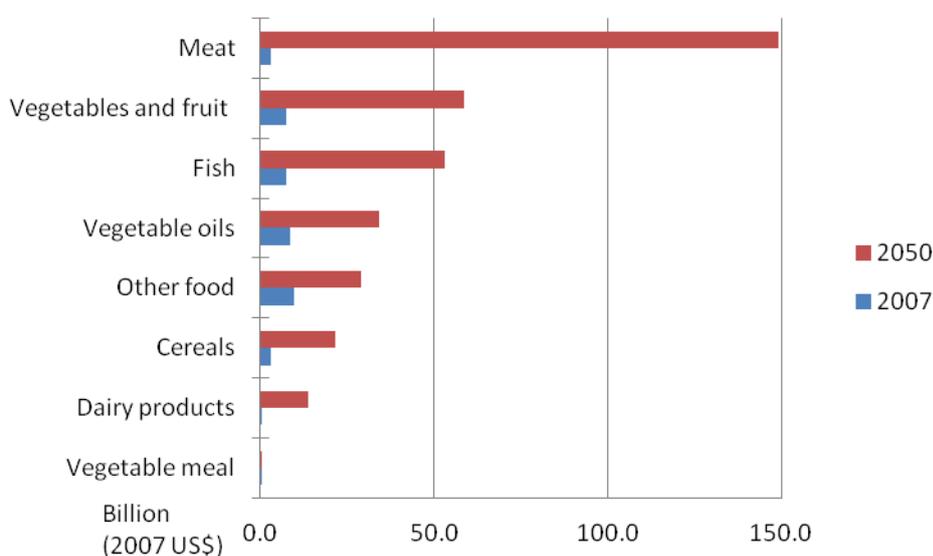
Figure 6 Asian agrifood imports by region



Data source: ABARES model output

China’s import position is driven by a substantial increase in imports of meat, from US\$2.9 billion in 2007 to US\$149 billion in 2050 (Figure 7). The real value of Chinese imports also rises substantially for vegetables and fruit and fish.

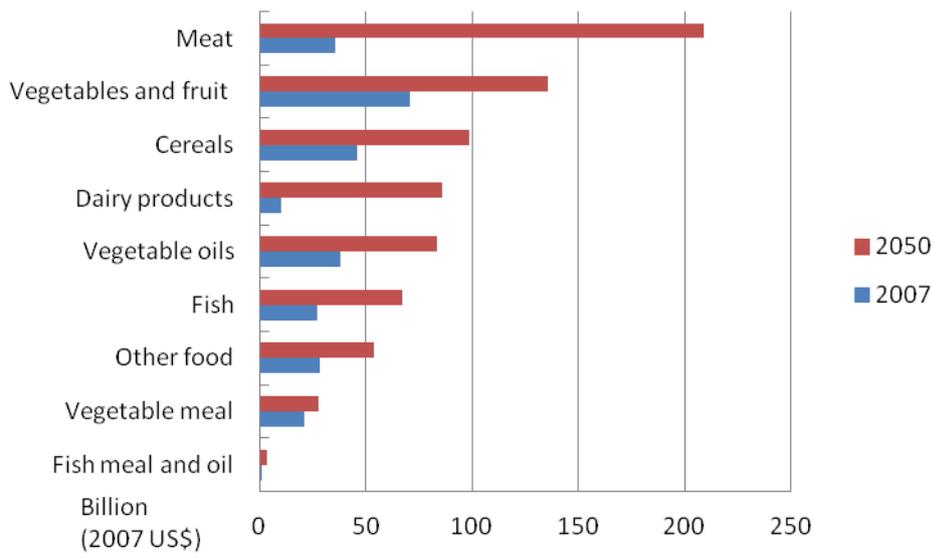
Figure 7 China’s imports by commodity grouping



Data source: ABARES model output

The largest increase in the real value of world agrifood imports is for meat (Figure 8). Meat contributes 36 per cent of the rise in global agrifood imports over the projection period. Shares of meat and dairy products in total agrifood imports are projected to more than double between 2007 and 2050, rising from 13 per cent to 27 per cent for meat and from 4 per cent to 11 per cent for dairy products. Import shares are estimated to fall for most other commodity groups.

Figure 8 World agrifood imports by commodity grouping

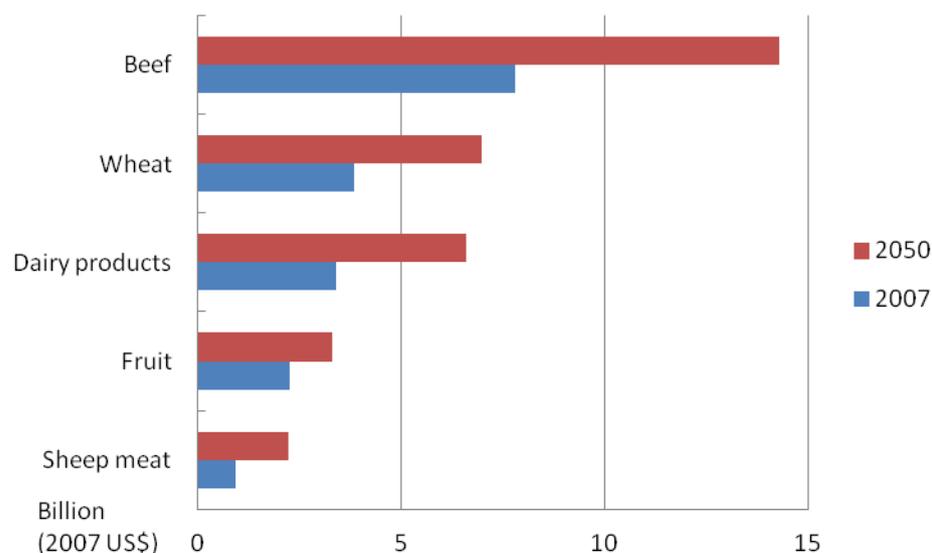


Data source: ABARES model output

4 Implications for Australia

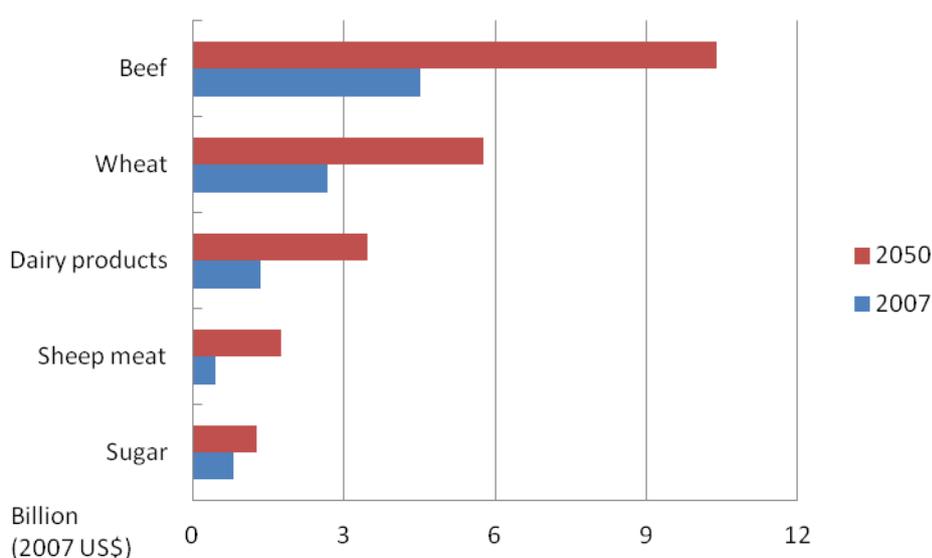
The projected increase in global agrifood demand is expected to lead to increased production and exports of key Australian agricultural commodities. In particular, the real value (in 2007 US dollars) of Australian production of agrifood products covered in this analysis is projected to be 77 per cent higher in 2050 than in 2007. This represents an average annual increase of 1.3 per cent. The largest projected increases in the real value of Australian production (in 2007 US dollars) are for beef, wheat and milk, including the milk equivalent of dairy products (Figure 9).

Figure 9 Australian agrifood production



Data source: ABARES model output

With Australia's position as an important exporter of several agricultural commodities, the projected increase in global agrifood demand and imports could lead to higher Australian agricultural exports. Australia's proximity to Asia provides a comparative transport cost advantage in exporting to the region. The real value (in 2007 US dollars) of Australia's exports of agrifood products covered in this analysis in 2050 is projected to be 140 per cent higher than in 2007, increasing by 2.1 per cent annually. The largest increases in the real value of Australian exports are projected for beef, wheat, dairy products, sheep meat and sugar (Figure 10).

Figure 10 Australia's exports by commodity

Data source: ABARES model output

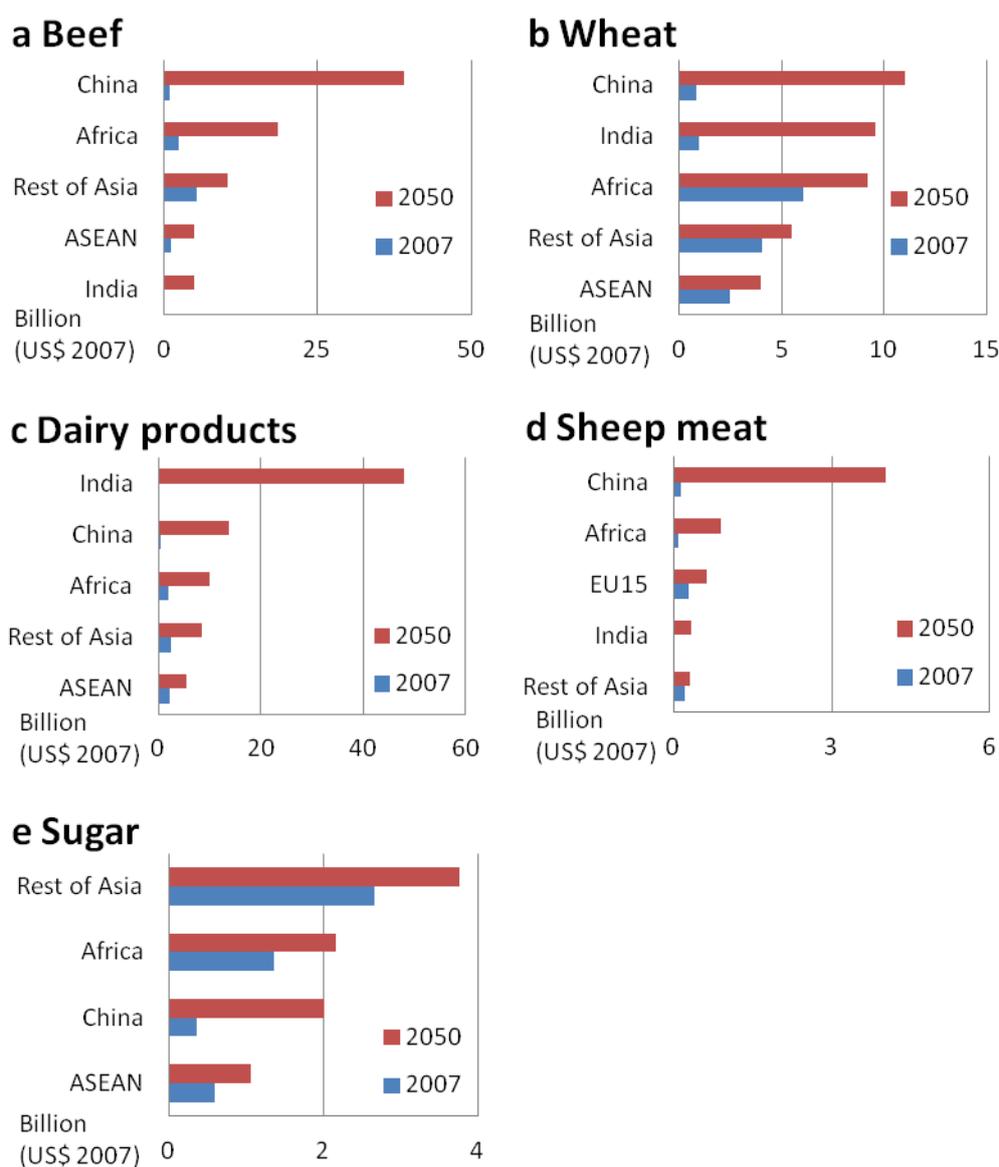
Bilateral trade flows (for example, Australian exports to various destinations) are not modelled in these projections. However, projected increases in imports for key Australian export commodities provide a broad indication of opportunities for Australian exports.

Asia, in particular China, drives much of the increase in global import demand for products of interest to Australia. World beef imports are projected to be about 300 per cent higher in 2050 than 2007, with China's increased import demand accounting for 66 per cent of this rise. Africa is also projected to increase its import demand for beef significantly over the period, and is projected to account for 28 per cent of the rise in global imports of beef (Figure 11a).

World imports of wheat are projected to be about 135 per cent greater in 2050 than in 2007, increasing by 2 per cent annually. China and India account for most of this increase, with China contributing 40 per cent to the projected rise and India 34 per cent (Figure 11b). India drives the rise in import demand for dairy products, accounting for 64 per cent of the increase in the real value of dairy products imports (in 2007 US dollars) between 2007 and 2050, while China accounts for a further 18 per cent of the increase in the real value of dairy products imports over the projection period (Figure 11c).

In 2050 the real value of world sheep meat imports (in 2007 US dollars) are projected to be over 500 per cent higher than in 2007, with China projected to account for 71 per cent of this rise. Africa also contributes to the growth in sheep meat imports, accounting for 18 per cent of the total increase (Figure 11d). In 2050 the real value of sugar imports (in 2007 US dollars) is projected to be 41 per cent higher than it was in 2007, with China accounting for just over half of this rise in import demand. The rest of Asia and Africa also contribute significantly to this rise, accounting for 36 per cent and 26 per cent of the growth respectively (Figure 11e).

Figure 11 Sources of global agrifood import demand



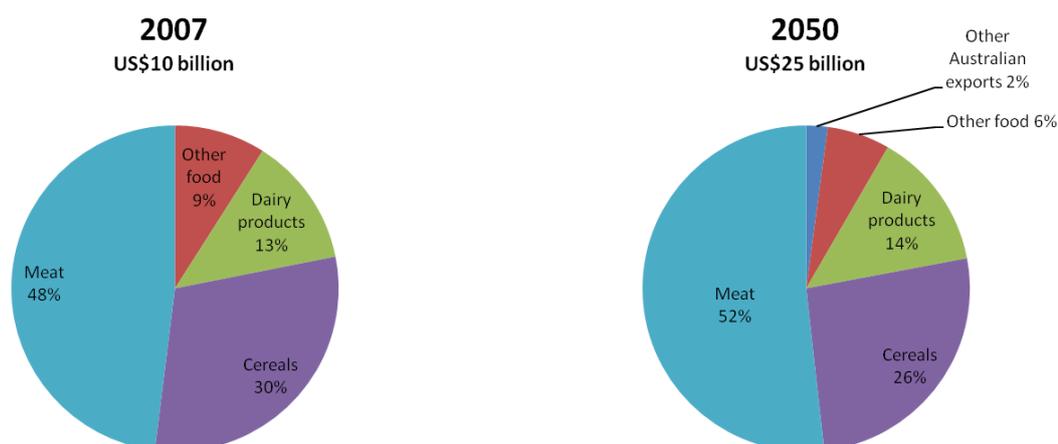
Note: ASEAN = Association of South-East Asian Nations; EU15 = European Union of 15 Countries.

Data source: ABARES model output

While Australia is expected to meet some of the higher global import demand for these commodities, competition through increased exports is likely to come from other key exporting nations. The European Union is projected to be an important competitor for beef, dairy products, wheat and sugar. Other key competitors are projected to include Brazil (beef and sugar), the United States (beef and wheat), Eastern Europe (dairy products and wheat), New Zealand (dairy products and sheep meat) and Thailand (sugar).

The composition of Australia's exports is expected to change over the projection period. In particular, the share of meat in the total value of Australian agrifood exports (in 2007 US dollars) is projected to increase from 48 to 52 per cent, while the share of most other commodity groups falls (Figure 12).

Figure 12 Composition of Australia's agrifood exports



Note: The total value of Australian agrifood exports in the model is in 2007 US dollars. See Appendix for model coverage.

Data source: ABARES model output

Australia must remain competitive to meet the opportunities provided by higher agrifood demand. Given land and water constraints it will be increasingly important for Australia to maintain growth in productivity through ongoing investment in research and development.

Despite a substantial rise in the real value of Australia's exports (in 2007 US dollars), Australia contributes only 3 per cent of growth in the real value of global exports between 2007 and 2050. As Moir and Morris note (2011, p. 1), 'Australia's greatest contribution to global food security will be through provision of technical cooperation assistance to food-deficient countries'.

5 Conclusions

Global food demand is expected to increase substantially by 2050, due to increasing incomes and population. This report projects a substantial rise in food demand out to 2050, with the real value of agrifood demand expected to be 77 per cent higher than it was in 2007 (in 2007 US dollars). This represents an annual average increase of 1.3 per cent. The increase in agrifood demand is greatest in Asia, where demand is projected to double between 2007 and 2050. China is driving this demand, accounting for 43 per cent of the global agrifood increase, while India accounts for 13 per cent.

The projected increase in the real value of global agrifood demand (in 2007 US dollars) is greatest for vegetables and fruit, meats, cereals, dairy products and fish. Dairy products, meat and fish increase their share of global agrifood demand over the projection period, while cereals account for a smaller share. This highlights changing dietary patterns, particularly in developing countries, as incomes continue to rise over the longer term.

This paper presents projections of long-run trends in food demand that highlight opportunities for Australian agriculture. Higher import demand is projected for beef, wheat, dairy products, sheep meat and sugar. China accounts for much of the increased import demand for these products, while India is an important source of increased import demand for wheat and dairy products. Australia has a comparative advantage in the production of these agricultural commodities and in its proximity to Asia. This places Australia in a good position to meet some of this higher demand.

Australia needs to remain competitive to meet the opportunities that higher global agrifood demand will provide. If Australian agriculture is to maintain productivity growth in the face of land and water constraints, ongoing investment in research and development will become increasingly important.

The model-based projections presented in this report are conditional on a set of assumptions, notably in the macro-economic environment and changes in agricultural technology. They are also conditional on parameter values used to represent the sensitivities of demand and supply curves to economic forces. This conditional baseline may serve as a starting point for scenario analysis that shows the sensitivity of the projections to the conditioning assumptions and parameter values, which in turn may be influenced by economic policies.

World food production is subject to natural resource constraints. Arable land and freshwater availability differ widely around the world, explaining the comparative advantage of extensive agriculture in some regions and intensive agriculture in others. Projections in this report assume broad maintenance of these agro-environmental conditions and that farmers will adapt fully to any marginal changes in these conditions. Adverse local environmental conditions—whether global, regional or local in origin—weaken supply conditions and lead to greater intensification of food production.

Appendix: Model coverage

ABARES prepared the projections in this report using a purpose-built recursive dynamic and homogeneous product model of world agrifood markets. The model is an algebraic description of annual regional demand and supply decisions that could be taken by representative producers and consumers of agrifood products to maximise each of their long-term net benefits—given real prices, expenditure and agricultural technology constraints.

Given the homogeneous product nature of the model, in this framework it is not possible for an individual region to simultaneously export and import the same product. In reality the same good will not be simultaneously exported and imported at the same point in time and place for an individual region. This is because transport costs are incurred in exporting to, and importing from, the world market so that simultaneous exporting and importing will incur double the transport cost.

Simultaneous exporting and importing that is observed in aggregated trade data commonly reflects commodity aggregation. There can be regional, seasonal or quality differences between goods that are being aggregated. For example, exporting a product from a surplus region in a country and importing that product into a deficit region in the same country can be more economical than transporting the product from the surplus to the deficit region within the same country. However, in a homogenous product model it is not practical to disaggregate commodities to a level that always avoids simultaneous exporting and importing of the same aggregate product. For this reason models have to simplify reality.

The base year of the ABARES model is therefore calibrated so that for:

- net exporters—exports are equal to recorded exports, minus recorded imports
- net importers—imports are equal to recorded imports, minus recorded exports.

In the model, product is measured in primary product equivalent. For example, dairy product exports represent the primary product (milk) equivalent of dairy exports, while beef exports include the meat equivalent of live cattle exports. Use of primary product equivalent supply and use concepts involves quantity aggregation of a nation's processed and unprocessed food content in a way that avoids double counting. In particular, given the calorific content of each food item, knowledge of the primary product equivalent of annual production and consumption can be used to calculate the total calorific value of all food produced and consumed by a nation annually.

For meaningful aggregation of different commodities, key results from the model are expressed as real values, obtained by multiplying quantities in the projection year by base year world prices (in 2007 US dollars). Like real gross domestic product, changes in an agrifood real value series over time reflect changes in the component quantities. For a single commodity a given percentage change in real value is a pure volume change of the same percentage.

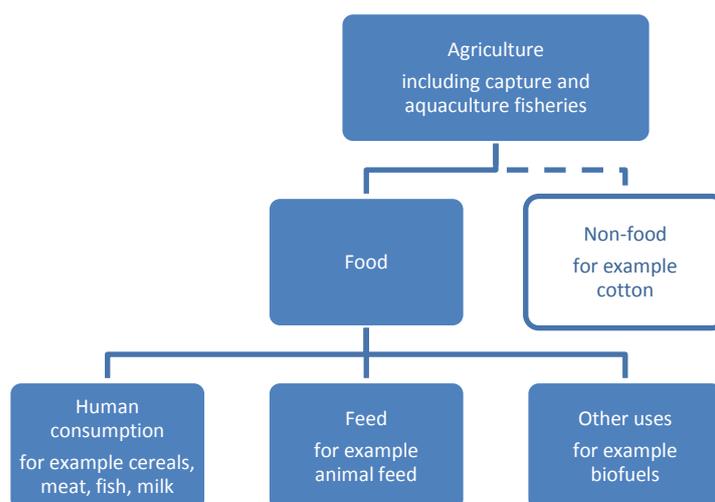
Where real values are used in the paper it is important to note the following:

- In the model, world prices generally refer to primary product and volumes are in primary product equivalent. World prices in 2007 US dollars are used in reporting primary equivalent values. Because of processing costs, the primary product equivalent value of production, consumption or trade will be less than the sum of the processed and unprocessed values.

- Core primary product equivalent volume data are from the Food and Agriculture Organization of the United Nations (FAO). Commodity balances and representative world price data are also mainly from the FAO.
- Commodities in the agrifood model are based on commodity definitions used in [Food and Agriculture Organization food balance sheets](#) (FAO 2011). Model coverage of agrifood excludes beverages.

In the model, agrifood is defined as agriculture output that is used for food, including capture and aquaculture fisheries (Figure 13). This includes food for human consumption, animal feed and food products that have other uses, such as biofuels. It does not include non-food agriculture outputs such as cotton.

Figure 13 Modelling scope



Commodities in the model, together with further aggregations that are used in the discussion of results, are listed in Table 1. Countries/regions in the model are listed in Table 1 and Table 2.

Table 1 Commodities in the agrifood model

Commodity	Aggregate commodity	Commodity	Aggregate commodity
Beef a b	Meat	Soybean oil	Vegetable oils
Pig meat	Meat	Rapeseed	Other food
Sheep meat a c	Meat	Rapeseed meal	Vegetable meals
Poultry	Meat	Rapeseed oil	Vegetable oils
Eggs	Other food	Sunflower seed	Other food
Dairy products d	Dairy products	Sunflower meal	Vegetable meals
Wheat e	Cereals	Sunflower oil	Vegetable oils
Rice f	Cereals	Other vegetable meals	Vegetable meals
Maize	Cereals	Other vegetable oils	Vegetable oils
Other cereals g	Cereals	Vegetables	Vegetables and fruit
Potatoes	Vegetables and fruit	Fruit i	Vegetables and fruit
Sweet potatoes h	Vegetables and fruit	Sugar j	Other food
Other roots	Vegetables and fruit	Fish low value k	Fish
Soybeans	Other food	Fish high value k	Fish
Soybean meal	Vegetable meals	Fish meal and oil concentrate	Fish meal and oil concentrate

Note: Commodities in the agrifood model are based on commodity definitions used in the [Food and Agriculture Organization food balance sheets](#) (FAO 2011). **a** Includes meat equivalent of live animal trade. **b** All bovine meat, including buffalo. **c** Includes goat meat. **d** Milk and milk equivalent of dairy products. **e** Includes wheat equivalent of flour and bakery products. **f** Milled equivalent. **g** Includes barley equivalent of malt, excludes beer. **h** Includes yams. **i** Excludes wine. **j** Raw sugar equivalent. **k** Includes seafood products.

Table 2 Regions in the agrifood model

United States	Central Asia b	Thailand	Rest of Oceania j
Canada	India	Vietnam	Egypt
Mexico	Pakistan	Rest of South East Asia d	Rest of North Africa
Brazil	Bangladesh	West Asia e	Nigeria
Argentina	Sri Lanka	Turkey	Rest of Middle and Western Africa
Rest of America	Rest of South Asia c	European Union 15 f	Republic of South Africa
Japan	Indonesia	Eastern Europe g	Rest of Southern and Eastern Africa
Republic of Korea	Malaysia	Southern Europe h	
China	Myanmar	Rest of Europe i	
Rest of East Asia a	Philippines	Australia	

Note: Regions used in the ABARES agrifood model are based on [United Nations geographical regions](#) (United Nations 2011b). **a** China (Hong Kong) Special Administrative Region, China (Macao) Special Administrative Region, Democratic People's Republic of Korea and Mongolia. **b** Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. **c** Afghanistan, Bhutan, Islamic Republic of Iran, Maldives and Nepal. **d** Brunei Darussalam, Cambodia, Lao People's Democratic Republic, Singapore and Timor-Leste. **e** Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Saudi Arabia, Syrian Arab Republic and United Arab Emirates. **f** Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. **g** Belarus, Bulgaria, Czech Republic, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia and Ukraine. **h** Albania, Andorra, Bosnia and Herzegovina, Croatia, Gibraltar, Holy See, Malta, Montenegro, San Marino, Serbia, Slovenia, and The former Yugoslav Republic of Macedonia. **i** Åland Islands, Channel Islands, Estonia, Faeroe Islands, Guernsey, Iceland, Isle of Man, Jersey, Latvia, Lithuania, Norway, Sark, Svalbard and Jan Mayen islands, Lichtenstein, Monaco and Switzerland. **j** Predominantly New Zealand.

Data source: ABARES model output

The model-based projections presented in this report are conditional on a set of assumptions. Assumptions about the annual average growth rate in real incomes for each region in the model are presented in Table 3.

Table 3 Average annual real income growth, 2007–50

Country or region	Annual real income growth %	Country or region	Annual real income growth %
United States	2.3	Philippines	3.8
Canada	1.9	Thailand	2.7
Mexico	2.4	Vietnam	4.3
Brazil	3.0	Rest of South East Asia	2.7
Argentina	3.3	West Asia	3.6
Rest of America	3.0	Turkey	2.6
Japan	1.1	European Union 15	1.4
Republic of Korea	2.2	Eastern Europe	2.4
China	5.5	Southern Europe	1.6
Rest of East Asia	3.0	Rest of Europe	1.7
Central Asia	3.9	Australia	2.6
India	5.4	Rest of Europe	2.5
Pakistan	3.5	Egypt	3.2
Bangladesh	4.3	Rest of North Africa	3.2
Sri Lanka	4.3	Nigeria	5.5
Rest of South Asia	4.9	Rest of Middle and Western Africa	4.6
Indonesia	4.2	Republic of South Africa	3.0
Malaysia	3.6	Rest of Southern and Eastern Africa	5.3
Myanmar	4.3		

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