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South America: an emerging competitor for Australia's beef industry

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Summary

Global demand for beef is expected to expand significantly over the next several decades, especially in Asia, which will present opportunities for exporters. At present Australia and South America account for almost half of world trade. While the two regions have historically targeted different markets, South America has emerged as a significant competitor for the Australian beef industry, with many South American countries improving their access to Australia's traditional markets.

The objective of this report is to investigate how increased competition with selected South American beef exporting countries could affect Australian beef exports over the longer term. Developing a deeper understanding of what has driven growth in their beef exports is critical to understanding how these emerging competitors could affect Australia's beef exports in the future. First, an analysis of the main drivers of beef export growth since 2000 in each of the selected countries and potential policy implications for Australia is presented. Second, the potential impacts of actual and hypothetical changes to policies and operating environments on Australia's future beef exports are examined.

Drivers of past growth

An analysis of the drivers of past export growth indicates that the real value of exports for each country increased primarily because of improvements to its own market access, in absolute terms. Australia benefited the most of the five countries analysed. Australia's free trade agreements with the United States and South-East Asian countries contributed to its improved market access, as did its status as a high quality, disease-free beef producer, which allowed it to avoid embargoes placed on other countries over animal disease concerns.

With the exception of Argentina, the dominant driver of the growth in beef exports in South America between 2000 and 2014 was also improved market access (Table S1). However, lower export supply costs—primarily achieved from improvements to on-farm productivity—were also a major contributor to export growth for Brazil and Paraguay. Growth in import demand and changes in real exchange rates had a less significant influence for all countries.

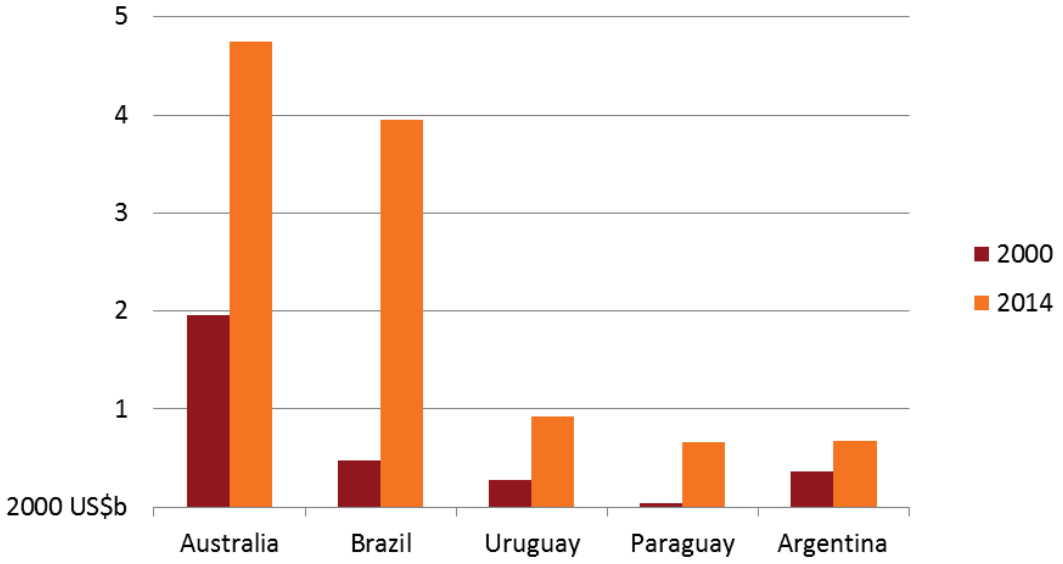
Brazil's beef export revenue grew rapidly in real terms over the period of analysis, from less than US$500 million in 2000 to around US$4 billion in 2014 (in 2000 US dollars) (Figure S1). Of the South American countries investigated, only Brazil's beef exports grew by more than Australia's. Prior to 2015, Brazil primarily exported lower-value manufacturing beef to different markets than Australia, so direct competition was relatively limited. Brazil's growth in beef exports was largely driven by improved market access and lower export supply costs. The latter can be attributed to significant direct investment in on-farm productivity. In May 2015, Brazil's market access was further broadened when it gained access to the Chinese beef market. Exports to China increased quickly, surpassing Australia's exports to that market by December 2015.

Table S1 Percentage contribution to export revenue change by driver, 2000 to 2014

Export growth drivers	Australia	Brazil	Argentina	Uruguay	Paraguay
	%	%	%	%	%
Export supply costs					
- Own	14	29	-448	-30	28
- Competitor	12	8	-4	10	15
- Total	26	37	-452	-20	43
Market access					
- Own	120	87	383	155	79
- Competitor	-32	-32	-228	-47	-21
- Total	88	55	155	108	58
Exchange rates					
- Own	-33	5	291	-2	14
- Competitor	11	-5	71	5	-21
- Total	-22	0	362	3	-7
Import demand					
- Total	8	8	36	9	6

Source: ABARES modelling results

Figure S1 Beef export value, Australia and South America



Source: United Nations Statistical Division 2016

Argentina's beef export revenue growth between 2000 and 2014 was notably slower than the other major exporters included in this analysis. Exports were constrained by the Argentine Government's export restriction, as well as macroeconomic factors, including high domestic inflation and currency controls.

Uruguay became South America's second-largest beef exporter by value after overtaking Argentina in 2010. Uruguay's improved market access was achieved by its strengthened reputation in world markets for managing traceability in its beef supply chain.

Paraguayan beef exports grew significantly between 2000 and 2014 as a result of strong productivity growth. The country continues to have considerable potential to further expand beef production and exports. Paraguay exports lower-value manufacturing beef to different markets than Australia, and the industry remains hampered by sanitary issues, including foot and mouth disease. Direct competition with Australia is therefore currently limited.

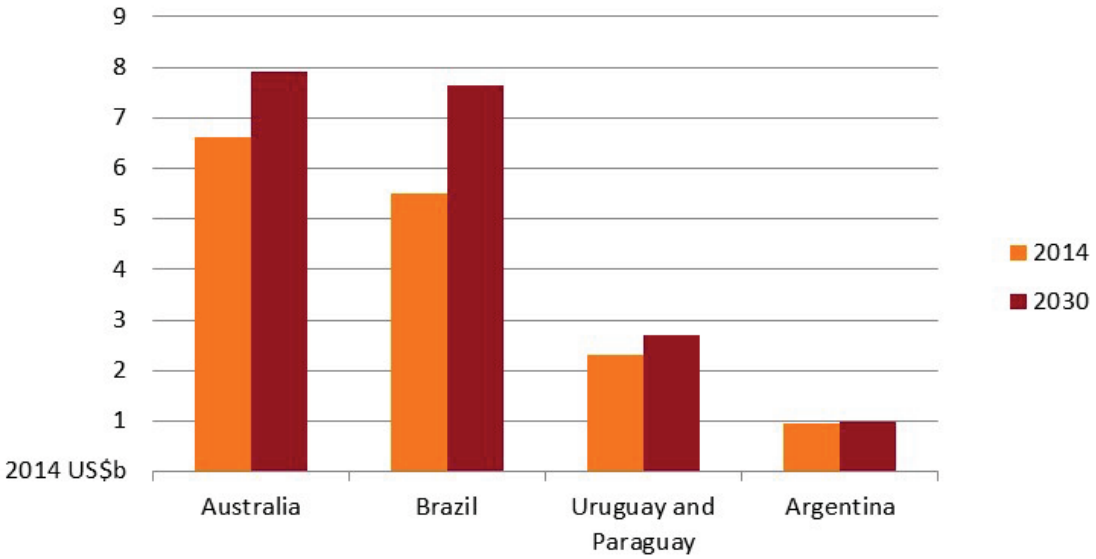
Scenario analysis

In the second part of the analysis, projections of beef exports to 2030 are undertaken. The projections include a baseline and three alternate scenarios, including:

1) removal of Argentine agricultural export restrictions
2) improved market access for South American beef exports
3) improvements in domestic transport infrastructure in Brazil and Australia.

In the baseline projection, beef export revenue is higher in 2030 than in 2014 for all major beef exporters (Figure S2). Between 2014 and 2030, export revenue (in 2014 US dollars) is projected to increase significantly for Brazil (39 per cent), Australia (20 per cent) and Uruguay and Paraguay (16 per cent). Export growth for Argentina is lower (4 per cent).

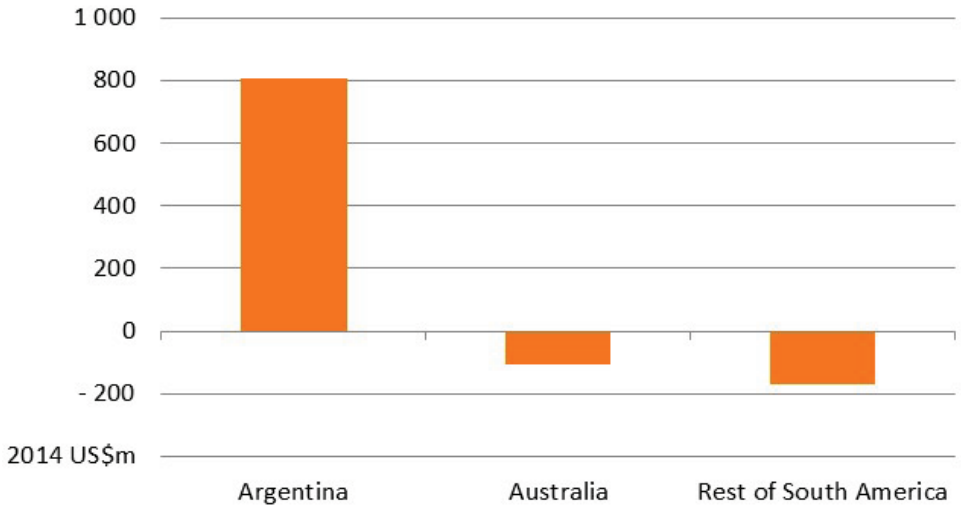
Figure S2 Projected beef export value, baseline



Source: ABARES modelling results

The first scenario considers the implications of the Argentine Government's removal of agricultural export restrictions in late 2015. This policy change is projected to significantly increase Argentina's beef exports over the projection period relative to the baseline (Figure S3). There is minimal impact on beef export returns for Australia and the other South American countries. Although Argentine exports increase strongly from a very low base, the Argentine export price is not projected to be significantly lower than other exporters, and therefore Argentine beef is not projected to displace other suppliers from expanding shared markets, such as China.

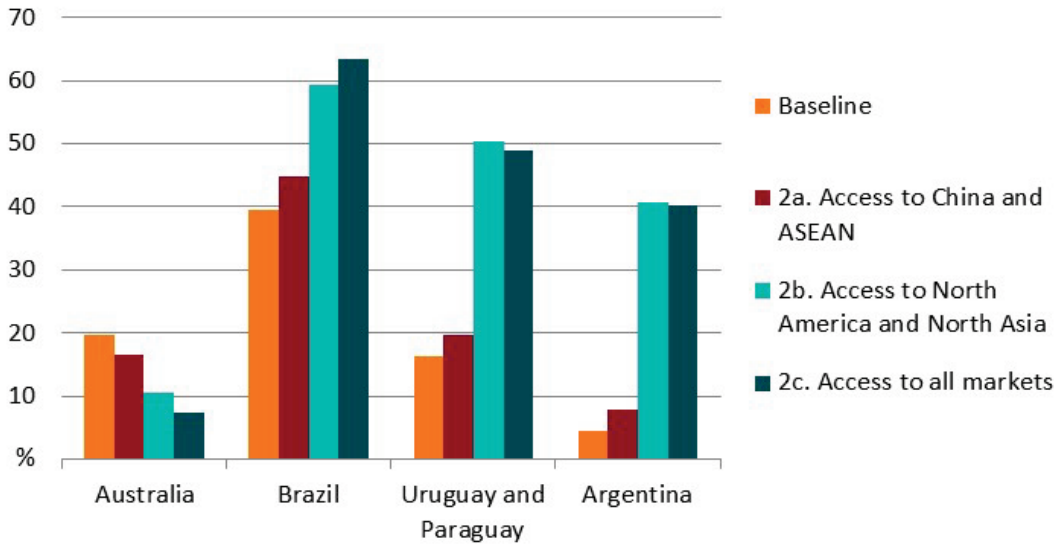
Figure S3 Difference in beef export value compared with baseline, Argentina scenario



Source: ABARES modelling results

The second scenario, which is in three parts, considers the export implications for all five countries of improved market access for South America in Asia and North America. The scenario includes, among other things, an assumed improvement to Brazil's access to ASEAN and the impact from Brazil's recently acquired access to China in May 2015. These recent and assumed market access improvements are projected to significantly affect Australia's exports over the outlook period (Figure S4). Improved South American market access to China and ASEAN (scenario 2a) lowers Australia's exports, but by less than half as much as improved market access to North America and North Asia (scenario 2b). Improved South American market access to North America and North Asia causes a significant decline in Australia's export returns, almost halving Australia's export growth over the projection period.

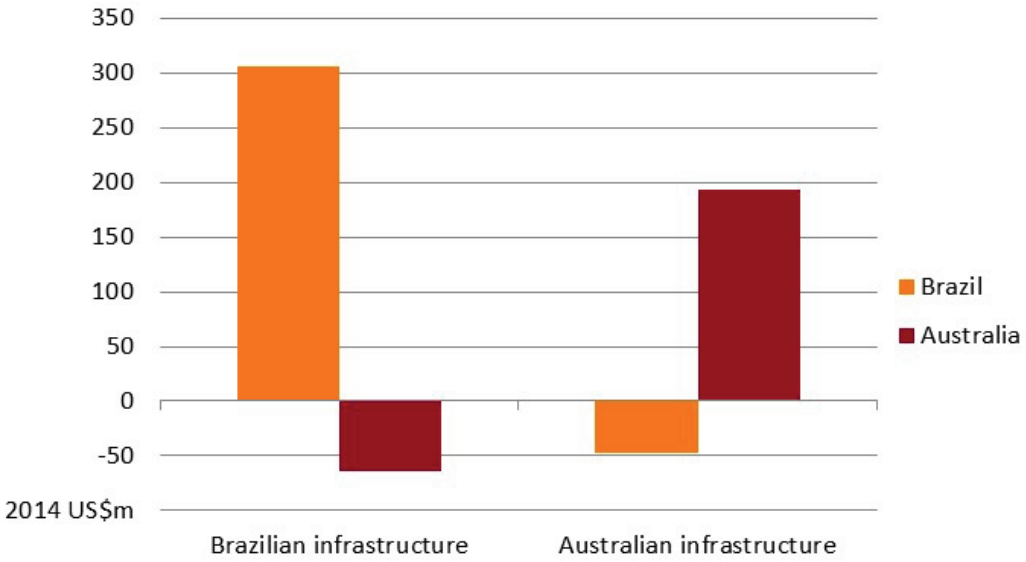
Figure S4 Beef export value growth between 2014 and 2030, market access scenarios



Source: ABARES modelling results

The final scenario investigates the benefits to the Australian and Brazilian beef industries from improved investment in domestic transport infrastructure, as set out in the policy directions of both countries. However, without a clear indication of how much will be committed to transport infrastructure important to the beef industry, the scenario assumes the investment is sufficient to reduce transport costs per tonne of beef by 15 per cent in each country. Under this assumption, the real value of Brazilian beef exports increases more than Australia's over the outlook period (Figure S5). This reflects the large share of transport costs in total costs in Brazil, in turn reflecting the relatively poor state of Brazil's existing infrastructure compared with Australia's.

Figure S5 Difference in beef export value between 2014 and 2030, infrastructure scenario



Source: ABARES modelling results

South America's ample pastoral land and relatively stable climate provide the underpinning for competitive beef industries over the longer term. However, for the foreseeable future, South American beef exporters will continue to be challenged by market access constraints based on disease concerns and by comparatively underdeveloped domestic infrastructure.

Improved market access has largely driven Australia's competitiveness in beef exports. To ensure the ongoing benefits of trade in light of its emerging competitors, Australia should continue to prioritise negotiations for improved market access and to maintain its status as a high-quality, disease-free and environmentally sustainable beef producer. The investments major beef exporting countries have made into disease reduction and traceability have lowered the risk of future disease outbreaks. Australia's beef exporters are therefore less likely than they have been in the past to benefit from improved market access resulting from such outbreaks, increasing the importance of measures to maintain competitiveness. Among these include Australia's need to improve productivity growth both on and off the farm. Over the longer term, strengthening global demand for protein and for safe and reliable food will provide opportunity for Australia to position itself strategically among those exporters who can deliver to higher-end markets.

1 Introduction

Global food demand is expected to increase markedly by 2050 because of growing populations, urbanisation and higher per person incomes in developing countries. Demand is projected to increase for a wide range of products including meat, fruit and vegetables, dairy products, cereals and fish (Linehan et al. 2012). ABARES modelling shows that growth will be strongest in Asia, with the real value of Asian agrifood demand projected to double between 2007 and 2050 (in 2007 US dollars) (Linehan et al. 2012).

Food production in Asia is also projected to expand significantly by 2050 (ABARES 2013). However, resource and structural challenges are likely to constrain the rate of growth. As a result, consumption growth is projected to outpace production growth, and imports will become an increasingly important component of the food supply. This will create opportunities for agricultural exporting countries, such as Australia and South America.

Australian agricultural exporters are considered well positioned to benefit from increased Asian food demand because of Australia's geographical proximity and 'clean and green' image. However, there are challenges. Among them is the increasing competition from other agricultural exporters. An expanding number of countries—including a number of South American countries—have been increasing their participation in international trade across an array of products as they improve their supply chain efficiency and expand their market access.

This report focuses on South American beef exports. Together, Australia and South America account for almost half of world beef exports. While each have historically targeted different markets, the degree of overlap has increased significantly as South American countries improve their access to Australia's traditional markets. Broadly, improvements in South American beef supply chains have enabled the region to be increasingly competitive against more traditional beef exporting countries. Improvement in the foot and mouth disease (FMD) status of many South American countries has also benefited their access to some markets.

The objective of this report is to investigate how increased competition with selected South American beef exporting countries could affect Australian beef exports over the longer term. Developing a broad understanding of what has driven beef exports in the past is a key part of understanding how these emerging competitors could affect Australia's beef exports in the future. This question is approached in two ways. First, a historical decomposition analysis is presented to provide an understanding of the main drivers of beef export growth since 2000 in each of the selected countries and potential policy implications for Australia. Second, employing a world beef projections model, the potential impacts of actual and hypothetical changes to policies and operating environments—both at home and abroad—on Australia's future beef exports are examined. A number of plausible scenarios are assessed against a baseline projection of global beef trade to 2030. The scenarios include the removal of Argentina's export restrictions; improved market access for South American beef in Asia and North America; and improved infrastructure efficiency in Australia and Brazil.

Before delving into the model-based analysis, a brief background of the South American agricultural sectors and beef industries are described in Chapter 2. The analytical approach is outlined in Chapter 3. Chapter 4 contains a more detailed description of the beef industries in each country of interest, presents the historical decomposition results and examines the potential policy implications of these results. Chapter 5 presents export growth projections to 2030 under the baseline projection and the three scenarios. Chapter 6 summarises the main findings of the study and implications for Australia. Appendix A presents information on the

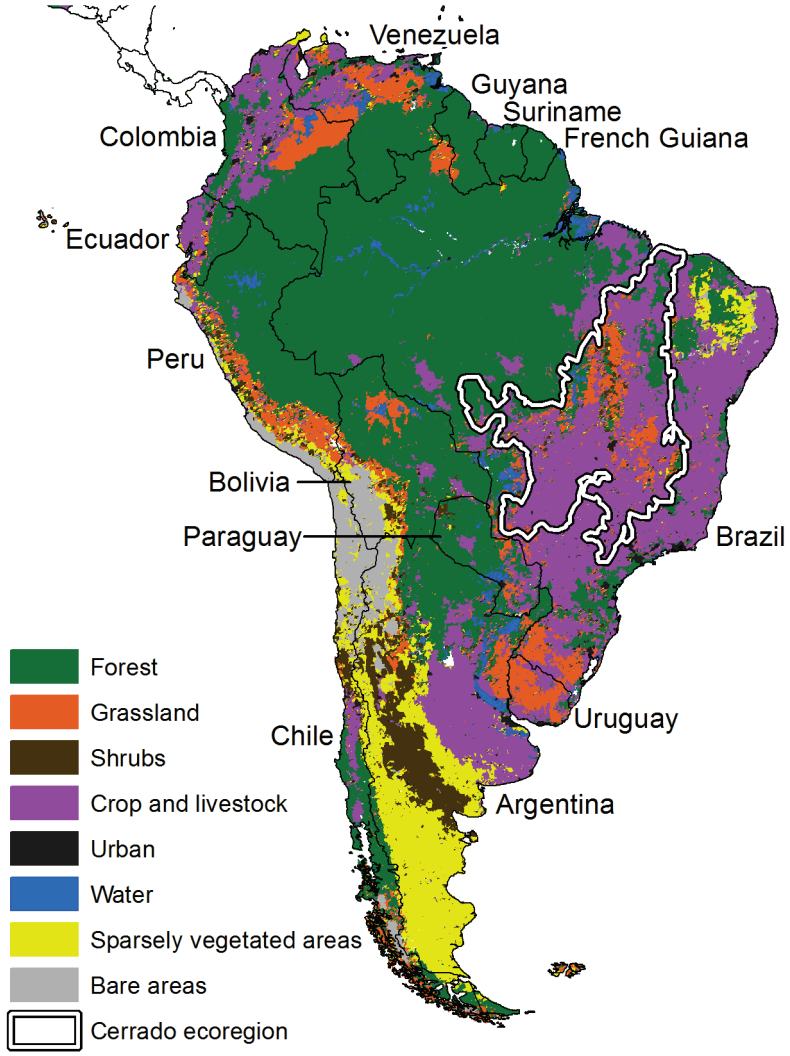
countries and regions contained in the world beef trade model and the model's underlying economic assumptions. Technical information about the structure of the model is published separately (Thorpe 2016).

2 Overview of South American agriculture and beef industry

South American agriculture

Agriculture in South America occurs across a range of climatic and regulatory environments (Map 1). Agriculture in the north of the continent is dominated by tropical products such as coffee and sugar, particularly in Brazil. The centre and eastern regions of the continent are more temperate, with widespread cultivation of grains and oilseeds, especially corn and soybeans. Livestock is produced in both intensive and extensive systems. The western and southern regions of the continent are drier, with less land available for extensive agricultural production.

Map 1 South American land use



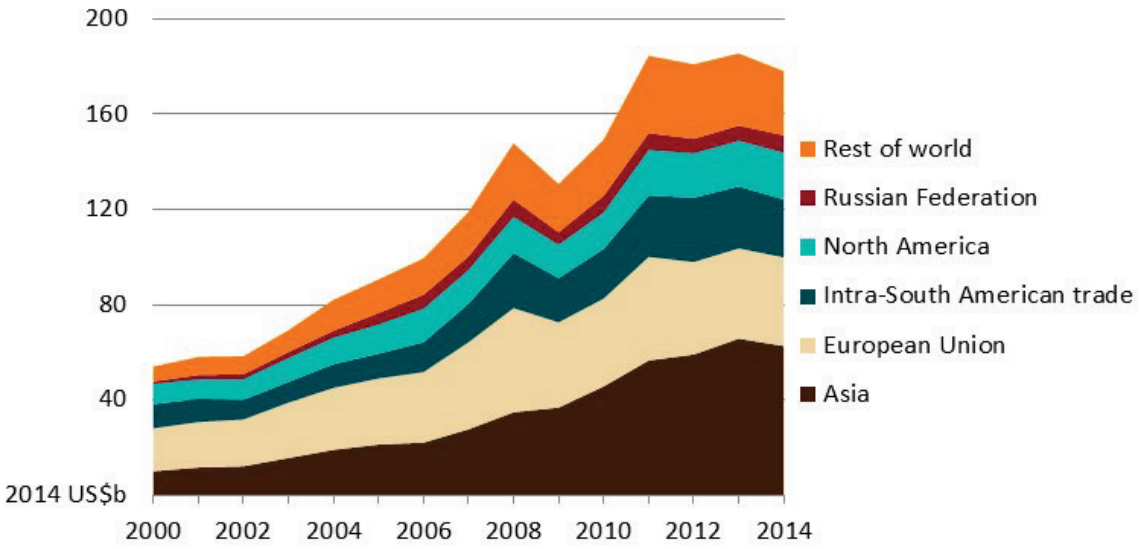
Source: FAO 2010

The gross value of agricultural production in South America has grown by almost 200 per cent in real terms since 2000, from US$127 billion to $370 billion in 2013 (in 2015 US dollars) (FAO 2016). This was around 8 times the value of Australia's agricultural production in 2013. The value of Brazil's agricultural production alone was 60 per cent of South America's total in 2013, and was dominated by soybeans, beef and sugar (FAO 2016).

Growth of the South American agricultural sector has followed the expansion of arable land area, which was supported by private investment. Public and private investment in research and development led to improved on-farm productivity and technology transfer, and contributed to higher agricultural production in some countries.

South American agricultural exports totalled US$175 billion in 2014, more than triple that of 2000 (United Nations Statistics Division 2015) (Figure 1). Its principal markets outside of the continent include Asia, the European Union and North America. Brazil's agricultural exports, valued at US$83 billion in 2014, accounted for nearly half of South America's total. Trade among South American countries comprised about 14 per cent (US$24 billion) of the total in 2014. The Mercosur customs union, which includes Argentina, Brazil, Paraguay, Uruguay and Venezuela, has contributed to trade liberalisation within South America by eliminating most tariffs between its members. Mercosur also has free trade agreements with other countries in the region, including Chile, allowing preferential access to its members.

Figure 1 South America, agricultural exports by destination



Source: United Nations Statistics Division 2015

Beef in South America

Cattle production has a long history in most South American countries. With over 350 million head on the continent (Table 1), the beef industry is the third-largest agricultural industry in South America by gross value of production, behind soybeans and chicken meat (FAO 2016). Brazil alone accounts for around half the continent's production, consumption and exports, but other countries are also significant producers and consumers. Argentina, Uruguay and Paraguay are major exporters of beef, while Chile and Venezuela are net importers (United Nations Statistics Division 2015).

Table 1 Cattle herd, South America

Country	Argentina	Brazil	Uruguay	Paraguay	Rest of South America	Total South America
unit	million head	million head	million head	million head	million head	million head
2000	48.7	169.9	10.4	9.7	60.2	298.8
2014	51.6	212.3	11.6	14.5	63.2	353.3
Change in cattle herd	%	%	%	%	%	%
2000 to 2014	6	25	12	49	5	18

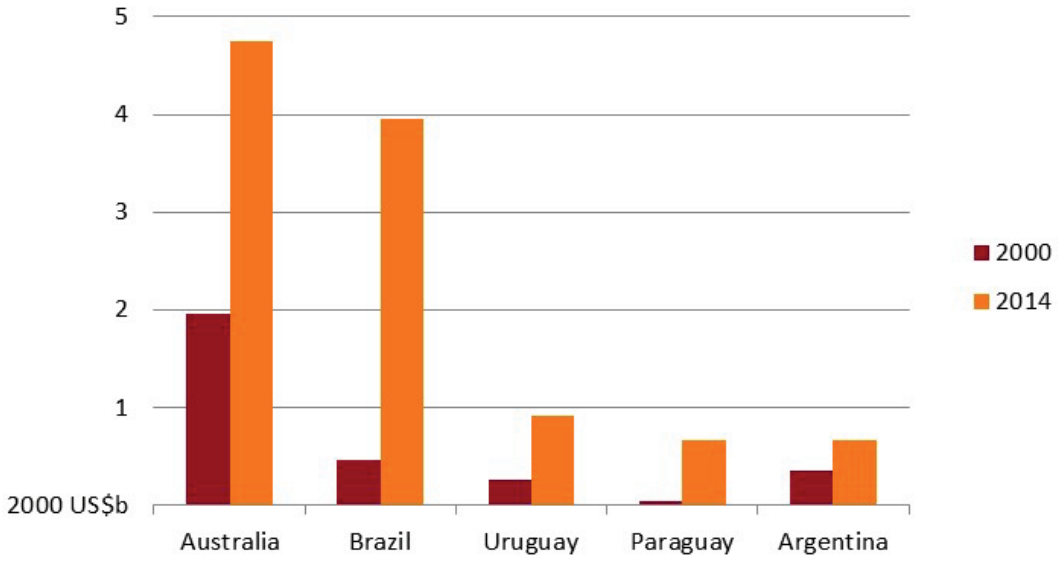
Source: FAO 2016

South American countries produced around a quarter of the world's beef and accounted for around 28 per cent of global beef exports in 2014. Exports of beef from the continent more than tripled between 2000 and 2014, from 560 thousand tonnes to 1.9 million tonnes. In comparison, global beef trade expanded by around 64 per cent over the same period.

Around one-fifth of the volume of South America's beef exports in 2014 were shipped to other South American countries, namely Chile and Venezuela. The main markets outside of the continent were the Russian Federation (26 per cent), Hong Kong (14 per cent), the Middle East (9 per cent) and the European Union (7 per cent). China has also recently become an increasingly important and growing market for South American exporters.

Brazil, Argentina, Uruguay and Paraguay are the four largest beef exporting countries in South America, and the value of their exports has increased considerably since 2000 (Figure 2). Despite their proximity to each other, there are significant differences between their beef industries.

Figure 2 Beef export value, Australia and South America



Source: United Nations Statistical Division 2016

Brazil and Argentina have large cattle herds and abundant pastoral land, but beef production is principally focused on supplying their large domestic markets. Because a relatively small share of production is traded, their ability to export is shaped by domestic conditions. Brazil's beef industry is large and characterised by a large proportion of small producers. Exports are mostly of lower-value manufacturing beef. The Argentine beef industry is more developed and exports

are higher quality than Brazil's but, until recently, exports were restricted by government policies. This constrained investment in the industry.

Although Uruguay and Paraguay have smaller beef industries than Argentina and Brazil, they also have smaller populations and, hence, lower domestic consumption. This has allowed their industries to become export orientated. Uruguay and Paraguay accounted for more than a quarter of South American beef exports in 2014, despite having less than 10 per cent of South America's cattle herd between them. Uruguay has a mature beef industry which produces high-value beef, although land constraints limit its prospects for expansion. Paraguay is an emerging producer of low-cost manufacturing beef, with exports expanding significantly since 2006 following a surge in direct foreign investment (USDA–FAS 2011).

3 Analytical framework

This study uses an economic model of world beef trade to undertake two forms of analysis. A historical decomposition analysis was undertaken to investigate the four key drivers that have contributed to export growth in the selected South American countries and Australia between 2000 and 2014. The model is then used to project beef export growth from 2014 to 2030 under a baseline and three policy scenarios. Information on the modelled countries and regions, and the economic assumptions underlying the analysis are contained in Appendix A. Technical information about the structure of the model can be found in the companion technical report by Thorpe (2016).

Decomposition model

The decomposition model analyses historical beef export revenue data by separating it according to its main drivers. For each region, the model provides estimates of the relative importance and contribution of these drivers to total beef export revenue between 2000 and 2014 (in 2000 US dollars).

The four export drivers investigated are:

- export supply costs
- market access
- real exchange rates
- income growth.

Export supply costs

The export supply costs driver captures a range of domestic factors that affect the price of exported beef—from the farm through to arrival of the product at port. It does not include the costs of shipping from the port of export to the destination market. The export supply costs driver is a key determinant of the competitiveness of each region, as domestic costs affect the relative returns to exporters. A technological improvement in a region's production process or increases in the scale of production, for example, can allow producers to supply beef more cheaply. A fall in the export price of beef can lead to stronger demand by importing countries.

Examples of factors that could potentially change export supply costs are:

- improvements in on-farm productivity
- a disease outbreak or adverse seasonal conditions, which affect the availability of slaughter cattle
- changes to on-farm costs, including capital and labour
- changes to off-farm transport costs
- changes to government regulations.

Export supply costs are split into two categories in the decomposition analysis: 'own export supply costs' and 'competitor export supply costs'. 'Own export supply costs' for a given exporting region are based on that region's costs. An increase in 'own export supply costs' would increase the price of exported beef, leading to a weakening in import demand for that region's beef and hence lower export revenue.

'Competitor export supply costs' reflect the domestic costs in other exporting countries. For example, in the case of Brazil, an increase in export supply costs in other regions could have a positive effect on Brazil's exports because, everything else being equal, Brazil's exports would be relatively cheaper.

Market access

The market access driver captures changes to the cost of exporting beef from each exporter to each destination market. It is distinct from the export supply costs driver because it refers only to those costs that apply after the product has left the region of origin. Market access can be affected by changes to:

- trade barriers, such as import tariffs, export taxes, tariff-rate quotas and sanitary or phytosanitary regulations
- non-tariff barriers, including embargoes and sanitary requirements
- transport costs.

As with the export supply costs driver, the market access driver is split into two categories: 'own market access costs' and 'competitor market access costs'.

Real exchange rates

Movements in the bilateral exchange rate between the local currencies of each exporter and importer also influence export performance by changing the relative import price of different suppliers. A lower real exchange rate makes a region's exports more competitive relative to its competitors, stimulating export demand and increasing export revenue. An increase in the real exchange rate would have the opposite effect.

Although the decomposition results are reported in 2000 US dollars, the modelling is done in local currency equivalent terms. More detail on the method used to account for real exchange rates is available in the technical annex (Thorpe 2016).

Income growth

Growth in the real gross domestic product (GDP) of beef importing countries is used as a proxy for income growth. An increase in a region's exports may occur because of stronger demand from a beef importing region stemming from the importing region's rising income over time. The income growth driver accounts for increases in beef exports attributable to income growth in importing countries.

Scenario analysis

The decomposition model is used to inform a baseline projection of potential future beef export growth for Australia and the four South American countries to 2030. The base year of the model is updated to 2014 in the projection model and the results are presented in 2014 US dollars.

Scenario analysis provides an indication of the impact on future beef export growth relative to the baseline. Three scenarios are developed which impose a plausible development in one or more of the selected beef exporting countries. The results from each scenario are compared with the baseline results to illustrate the possible impact of the change on the real export values of both the region in question and Australia.

Scenario 1—Removal of Argentine agricultural export restrictions

Since 2000 a major constraint on Argentina's beef exports was government policy which supported domestic consumption and prices by restricting exports. This policy was lifted in December 2015. The simulation estimates the effect of this policy change on Argentina's beef trade.

Scenario 2—Improved market access for South American beef

This scenario explores the effects of improved market access for South American beef exports to countries that restrict imports on sanitary grounds, including China, Japan, the Republic of Korea and the United States. Improved market access is provided by China and ASEAN in the first simulation; North Asia and North America in the second simulation; and all four regions in the third simulation.

Scenario 3—Improvements in transport infrastructure in Brazil and Australia

The effects of improved transport infrastructure in Brazil and Australia are examined in separate simulations. These simulations assume increased investment in domestic transport infrastructure in each country, which lowers transport costs by 15 per cent for beef exporters. Higher investment in transport could, for example, improve transport capacity and quality and reduce shipping times and transportation losses. The modelled proportionate decline in domestic unit transport costs between 2014 and 2030 is the same for both Australia and Brazil.

4 Decomposition analysis

This chapter contains detailed descriptions of the beef industries in Australia, Brazil, Argentina, Uruguay and Paraguay. It also presents the historical decomposition results and examines the potential policy implications of these results.

Australia

Overview of Australia's beef industry

Production

The beef industry is Australia's largest single agricultural industry. More Australian farms are engaged in raising beef cattle than any other agricultural activity. Around 55 per cent of Australian farms carry beef cattle, often in mixed farming systems with cropping and other activities (Department of Agriculture 2015).

Beef production is Australia's most extensive and geographically dispersed agricultural activity. There are significant differences between the northern and southern beef cattle industries, which have resulted in different production systems and market focus (Goesch et al. 2015).

Production in Australia's north consists principally of *Bos indicus* breeds (such as Brahman cattle) because of their ability to adapt to harsh climatic conditions and their resistance to cattle ticks. The trade-off for being able to produce cattle under these conditions is that the beef is generally of lower quality. This limits the suitability of northern cattle for particular markets. Many of the cattle produced in northern Australia are targeted at the live export market in South-East Asia, with the remaining cattle largely targeted at the manufacturing beef export market (Goesch et al. 2015).

The southern region has a more moderate climate and the industry is comprised largely of *Bos taurus* breeds (British and European cattle). Farms tend to be smaller, more intensive, more diversified, more likely to graze cattle on improved pastures and located closer to Australia's major population centres. Almost all of these cattle are slaughtered domestically, with around half of the beef consumed domestically and the other half exported (Goesch et al. 2015).

In 2015–16, Australia produced 2.3 million tonnes of beef and veal, an increase of 11 per cent by volume since 2000–01. The gross value of production totalled $12 billion. The cattle herd was estimated to 26.1 million head, with 8.8 million cattle slaughtered that year. In addition, 1.3 million cattle, worth $1.6 billion, were exported live.

Australia's beef cattle are predominantly grass fed. However, the use of feedlots has grown in response to strong demand for premium-grade grain-fed beef in both the domestic and export markets. In 2015, 30 per cent of cattle slaughter was finished in feedlots, compared with 22 per cent in 1992. Almost one million cattle were on feed at the end of 2015 (AFLA 2015).

Over the long term, Australia's potential to expand beef production is constrained by the availability of suitable land and its climate, particularly given the high incidence of drought. However, over the short to medium term, it is also influenced by changes in global beef markets. For example, between 2011–12 and 2014–15, drought conditions in many parts of the country and strong US demand for Australian manufacturing beef precipitated destocking and high slaughter of female cattle. The resulting low numbers of female cattle in the national herd as of June 2016 will constrain beef production and export growth over the medium term (Mullumby 2016).

Productivity

Although most beef is produced by large operations, the Australian beef industry also has a large number of small operations, often in mixed enterprises. The make-up of the industry partly explains why average productivity growth and profitability across the beef industry are low compared with other agricultural industries, since large specialised producers are generally more profitable than small ones (Jackson & Valle 2015).

Productivity in the beef industry grew by an average of 1.3 per cent a year between 1977–78 and 2013–14 (Ashton, Oliver & Valle 2016). However, productivity growth among the larger, more efficient farms (those with more than $200 000 in farm receipts) was higher, at 2.0 per cent a year (Martin 2015).

Cattle in Australia are often transported long distances by road and transport costs represent a significant proportion of the farm gate value of beef cattle for some producers, particularly in the north of the country (Martin 2015).

Exports

In 2015, Australia was the world's largest exporter of beef by value, followed by the United States, Brazil and India (United Nations Statistics Division 2016). In terms of quantity, Australia was the largest exporter followed by India, which exports low-value buffalo meat known as 'carabeef'.

The Australian beef industry is highly export focused, with 74 per cent of the production volume exported in 2015. In that year, Australia exported 1.29 million tonnes of beef, valued at $9.1 billion. That volume was 43 per cent higher than in 2000.

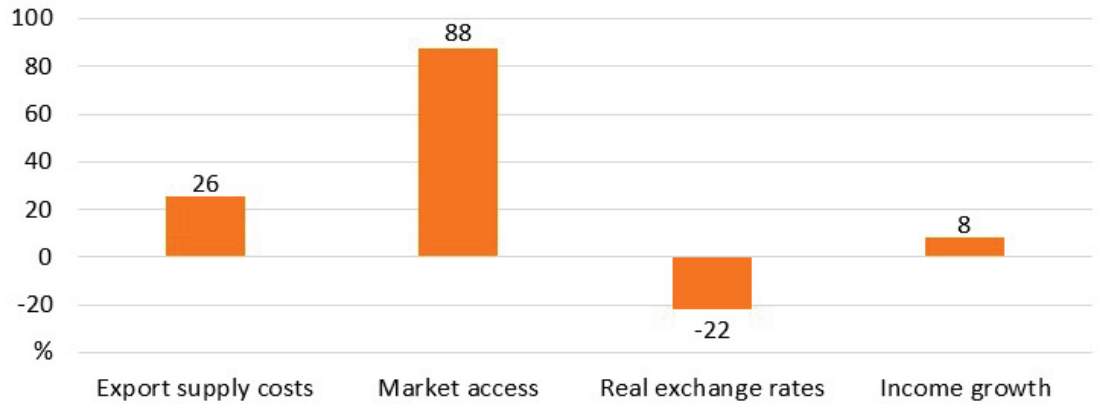
The United States and Japan have long been the major export markets for Australian beef, with the Republic of Korea a lesser but significant market. China has become an important market since 2012, with exports reaching 135 000 tonnes in 2015. Australia's proximity to Asia provides it with a shipping time advantage compared with some major competitors, such as Brazil (Goesch et al. 2015). However, when global shipping rates fall, the advantage of Australia's proximity to import markets is smaller. In 2015, the Baltic dry index, an indicator for international shipping rates, averaged considerably lower than its 2000 average. While this reduced transport costs for Australian exporters, it also benefited other exporters—providing a larger proportional benefit to countries with higher shipping costs to Australia's key markets.

In addition to exporting beef, a growing number of cattle have been exported live for slaughter. Live cattle exports for slaughter grew from 90 000 head in 1990 to 1.2 million in 2015, valued at $1.2 billion. Indonesia accounted for half the quantity of live cattle exports in 2015 and Vietnam just over a quarter.

Historical decomposition results—Australia

Between 2000 and 2014 the real value of Australian beef exports increased by almost 150 per cent in US dollar terms. The results from decomposition analysis demonstrate that the main driver of this increase was improvements to Australia's market access, while changes to the exchange rate over the period had a negative effect (Figure 3 and Table 2).

Figure 3 Contribution of beef export drivers between 2000 and 2014, Australia



Note: Values refer to each driver's net contribution to trade growth between 2000 and 2014, expressed as a percentage share.
Source: ABARES modelling results

Table 2 Own and competitor contribution of beef export drivers between 2000 and 2014, Australia

Export driver	Export supply costs	Market access	Real exchange rate	Income growth
	%	%	%	%
Own	14	120	-33	na
Competitor	12	-32	11	na
Total	26	88	-22	8

Note: Values refer to each driver's contribution to trade growth between 2000 and 2014 disaggregated by 'own' and 'competitor' effects, and expressed as a percentage share.
Source: ABARES modelling results

Export growth stemming from improvements to Australia's market access reflects the impact of its reputation as a consistent provider of high-quality beef and its avoidance of animal disease issues. Australia is FMD-free and has had no recorded cases of bovine spongiform encephalopathy (BSE), allowing it to avoid embargoes placed on other countries over those diseases. Free trade agreements with the United States (2005) and the ASEAN countries (2012) have also contributed to improving its market access to those regions by lowering tariff rates and expanding quotas for beef exports.

The market access driver includes improvements in both Australian market access and the effects of changes to competitors' market access. Improvements in market access for other beef exporters in some markets had a negative effect on Australia's real export value (–32 per cent from would otherwise have been the case), as improved access for other exporters reduced our relative competitiveness. The largest negative effect came from Uruguay, whose improvements in market access to North America reduced Australia's export growth between 2000 and 2014. This indicates strengthening competition between the two countries in that market.

Overall, the effect on Australia's export growth from its own market access gains significantly outweighed the negative effect from its competitors' market access successes. In net terms, the effect of market access gains accounted for 88 per cent of the growth in the real value of Australian exports between 2000 and 2014.

Rising export supply costs in competing countries contributed positively (12 per cent) to Australian beef exports between 2000 and 2014. This can largely be attributed to Argentina and the European Union, whose export supply costs increased significantly over the period. Australia competes with Argentina in China and the European Union, and competes with the European Union in Hong Kong. Argentina's export supply costs were higher because of restrictive export policies, while the EU beef industry was constrained by disease issues, including BSE, and reduced government support. Australia's relative cost competitiveness improved as a result.

Australia also benefited from a reduction in its own export supply costs over the period, accounting for 14 per cent of beef export growth between 2000 and 2014. A number of factors influenced Australia's declining export supply costs. Notably, the unit cost of beef production in Australia declined between 2008–09 and 2013–14, as producers reduced farm expenditures (Martin 2015). The combined effect of rising supply costs in competing countries and the reduction in export supply costs in Australia resulted in a 26 per cent contribution to Australia's export growth.

Higher global import demand stemming from income growth accounted for around 8 per cent of the growth in Australia's beef exports between 2000 and 2014.

The positive effect of the income growth, market access and export supply cost drivers on Australian real beef export revenue between 2000 and 2014 was partially offset by the appreciation of the Australian dollar over the period. The strengthening of the Australian dollar had a negative effect on the value of beef exports, as it caused export prices to rise in other currencies.

Brazil

Overview of Brazil's beef industry

Production

Brazil is the world's second-largest beef producer and the largest South American exporter. After Brazil's economy recovered from macroeconomic instability and hyperinflation during the 1980s, investment in the beef sector increased and production grew steadily through the following decade. Supported by the development of large agribusinesses, Brazil emerged as a significant beef exporter during the 2000s.

The Brazilian beef industry is large and diverse. Brazil's cattle herd in 2014 was around 212 million head, almost eight times the size of Australia's (FAO 2016). Much of the industry remains undeveloped and largely consists of small producers in the north and west of the country. These producers account for the majority of the cattle herd but principally supply the large domestic market (Duran 2014). During the 2000s, higher domestic investment spurred the development of a large-scale industry in the south of the country. While the herd in that region is smaller, it is the source of most of Brazil's exports.

Production in the south of Brazil is dominated by large Brazilian-owned multinational meat processors, including JBS, Brasil Foods and Marfrig. Farms are generally large. These multinationals are export focussed and also operate in pig meat and poultry processing

(USITC 2012). Vertical integration is common, with these firms also owning ranches and feedlots, which allows them to provide a consistent quality of beef to export markets (Ferraz & de Felicío 2010). They are also a major source of foreign direct investment in other South American countries. JBS owns abattoirs in Argentina, Uruguay and Paraguay, as well as Australia (JBS 2014).

Brazil's increase in agricultural production in recent decades has been supported by significant expansion in agricultural land area. In particular, the expansion of production into the Cerrado—a vast tropical savanna region in central Brazil—has significantly increased the availability of arable land (Map 1).

The opening of the Cerrado region for agriculture during the 1970s allowed crop land to expand without reducing pasture availability for beef production. This helped reduce competition for land and slowed the push towards feedlot use in Brazil. Only around 4 per cent of production is currently finished in feedlots but this still represents more than 4 million head on feed in 2014 (USDA–FAS 2015a) or around four times that in Australia.

The productivity gains achieved on Brazilian farms since 2000 have typically not been matched in other parts of the supply chain. Investment in infrastructure has been low relative to on-farm investment. Land transport and port costs are high, and bottlenecks are common at ports (USITC 2012). Production in the west and north-west of the country is subject to high transport costs as infrastructure in that region remains poor, making exports from those regions less competitive (de Zen 2014).

Exports

Although around 80 per cent of beef production is consumed by the domestic market, Brazil was the world's third-largest exporter of beef by volume in 2014, behind India and Australia. Prior to 2000, Brazil was periodically a net importer of beef because of macroeconomic instability which discouraged investment in the industry and constrained production. Expansion of the industry since 2000 has led to production exceeding domestic demand, which has allowed beef exports to steadily increase to more than 1.2 million tonnes in 2014.

Because beef production is mostly grass fed, about 90 per cent of Brazil's exports is shipped frozen to markets that demand lower-quality and less marbled beef. Brazil’s largest export market is the Russian Federation, a price-sensitive market which imports cheaper beef for processing. Other South American countries, particularly Venezuela and Chile, together account for around a fifth of Brazil's annual exports. Brazil also exports a relatively small quantity of high-quality chilled beef, the primary markets for which are Chile and the European Union.

The European Union is also an important market and Brazil is its largest supplier by volume. Of the European Union's beef quotas, the main quota is the Hilton high-quality beef quota, under which beef is subject to a tariff of 20 per cent. Brazil's share of that quota is 10 000 tonnes. Brazil also exports under the multilateral frozen manufacturing beef quota of 50 700 tonnes, which applies a tariff of 12.8 per cent plus a specific quota of up to 2 138 euros ($3 180) a tonne. Unlike Australia and Uruguay, Brazil does not have access to the zero-tariff hormone-free grain-fed beef quota. Brazil's exports to the European Union are usually outside of the existing quotas and face tariffs of 12.8 per cent plus a specific tariff of up to 3 041 euros ($4 520) a tonne.

In 2014, around one-fifth of Brazil's exports were destined for Asia, with Hong Kong as its main market. The value of chilled and frozen beef exports to Hong Kong more than doubled between 2012 and 2013, to almost US$1 billion, as a result of its strong import demand growth. Brazil was the single largest source of Hong Kong's beef imports that year, almost all which was frozen.

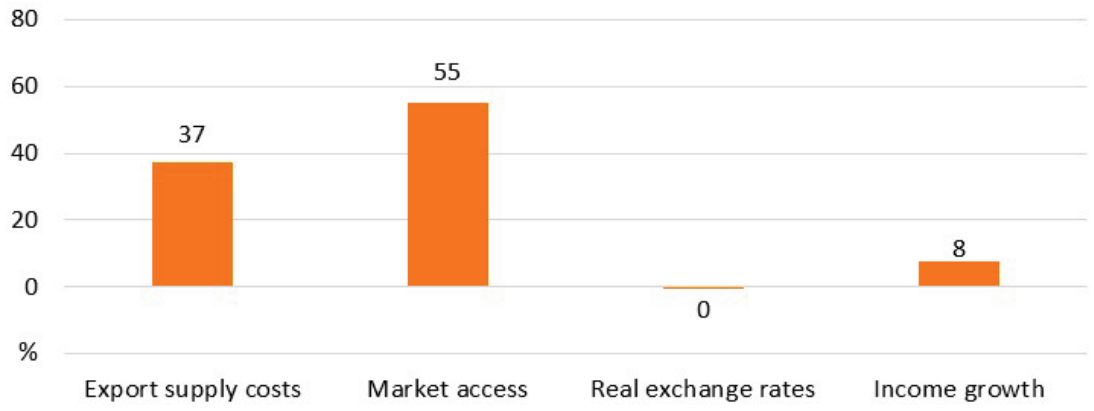
The main constraints affecting Brazil's beef exports are trade restrictions based on disease concerns. Cases of foot and mouth disease (FMD) in Brazil have restricted its access to a number of markets, including the United States, Indonesia and Chile. While Brazil as a whole is not FMD free, around 80 per cent of beef is produced in states classified as FMD free with vaccination by the World Organisation for Animal Health (OIE) (Ferraz & de Felicío 2010).

Despite disease concerns, Brazil's market access is improving. China allowed access to Brazilian beef in May 2015 and Brazilian exports to that market increased markedly. In addition, in August 2016 Brazil regained access to the United States, subject to a tariff-rate quota.

Historical decomposition results—Brazil

Between 2000 and 2014 the value of Brazil's exports grew significantly in real terms to around US$3.5 billion, an increase of more than 700 per cent and a larger increase than Australia's in real dollar terms (in 2000 US dollars) (Figure 2). The decomposition analysis indicates that the most significant driver of Brazil's beef export growth was improved market access, followed by lower export supply costs (Figure 4 and Table 3).

Figure 4 Contribution of beef export drivers between 2000 and 2014, Brazil



Note: Values refer to each driver's net contribution to trade growth between 2000 and 2014, expressed as a percentage share.
Source: ABARES modelling results

Table 3 Own and competitor contribution of beef export drivers between 2000 and 2014, Brazil

Export driver	Export supply costs	Market access	Real exchange rate	Income growth
	%	%	%	%
Own	29	87	5	na
Competitor	8	-32	-5	na
Total	37	55	0	8

Note: Values refer to each driver's contribution to trade growth between 2000 and 2014, disaggregated by 'own' and 'competitor' effects, and expressed as a percentage share.
Source: ABARES modelling results

The net contribution to Brazil's beef trade from improved market access explained 55 per cent of beef export growth between 2000 and 2014. It reflects, among other things, lower international shipping rates that have gradually reduced the comparative disadvantage faced by Brazil in exporting to Asia. Brazil has also opened markets in the Middle East, improved its

sanitary record and expanded access to other South American countries through Mercosur and related agreements.

Lower export supply costs accounted for 37 per cent of Brazil's export growth over the period analysed, with productivity improvements accounting for the majority of that contribution (29 per cent). Of the analysed countries, the contribution to export growth from the export supply costs driver is largest in Brazil, and is in contrast to most other major beef exporters who experienced a rise in export supply costs over the period analysed. Strong productivity growth in the beef sector resulted in a significant decline in real export cost for Brazilian beef which, in turn, led to stronger export demand and higher real export returns.

Both income and exchange rate effects were relatively muted for Brazil. The overall depreciation of the Brazilian real between 2000 and 2014 was largely offset by the depreciation of other exporters' currencies, resulting in only a marginal change in price competitiveness.

Brazil will remain one of the major forces in the global beef trade as domestic production and exports continue to expand steadily. Brazil's beef industry largely operates in a different segment of the world market than Australia—exporting large volumes of lower-value manufacturing beef—whereas Australia's industry focusses on higher-value cuts. However, Brazil does compete with Australia in some lower-value beef markets. Renewed access to the Chinese market has led to a sharp increase in Brazil's share in that market since the second half of 2015 and early 2016. This has been at Australia's expense because Brazil competes strongly on cost for lower-quality beef at a time when Australia's industry is expected to enter a herd rebuilding phase with reduced production. In addition, in August 2016 Brazil regained access to the United States, another of Australia's lower-value beef markets. Brazil does not have a free trade agreement with the United States and, therefore, its exports will be subject to a tariff-rate quota. As a result, Brazil will have relatively limited access to the US market, at least for a few years (The Beef Site 2016).

While a competitive beef exporter, there are potential constraints on the rate of Brazil's future export growth. Brazil will need to maintain its lower cost of production relative to other exporters and continue improving its market access. In the absence of government investment, high internal transport costs stemming from inadequate infrastructure may put upward pressure on the export price of Brazilian beef (USITC 2012). Agricultural land is also in high demand from alternative uses, accelerated by environmental policies limiting deforestation. This has the potential to increase feedlot production, which could change the share of high-quality beef produced and alter the country's influence on world trade.

Argentina

Overview of Argentina's beef industry

Argentina is the second-largest beef producer in South America and the fourth largest in the world. Argentina's beef exports were volatile during the 2000s and have been stagnant since 2010, largely as a consequence of government policies. Prior to 2016 the Argentine government restricted beef exports through export taxes and quantitative restrictions to ensure that a reliable supply of affordable beef was available for domestic consumption. This increased the risk associated with beef production as the quantitative restrictions were unpredictable and applied at short notice. As a result, many producers left the industry (Mathews & Vandeveer 2007).

Production

Argentina's temperate climate and extensive pasture provide the country with a comparative advantage in beef production as Argentine cattle have traditionally been grass fed. The herd consists of mainly European breeds, including Angus and Hereford, which perform well in Argentina's climate (Peck 2010).

As the largest beef producer on the continent prior to 1980, most of Argentina's available pasture land was brought into use by 2000. As a result of its early expansion, Argentina's beef industry now has less potential for growth than other South American countries such as Brazil or Paraguay. The land available for beef production has declined since 2000 because of competition from other uses, particularly cropping (USDA–FAS 2014a). While the Argentine cattle herd expanded to peak at almost 59 million head in 2007, a severe drought in 2008 and 2009 led to a 15 per cent reduction in the cattle herd by 2010. The herd has yet to fully recover and was around 52 million head in 2014.

The competition for land in central Argentina and the domestic availability of cheap feed has led to a shift towards grain-fed beef in Argentina. The Argentine Government encouraged this development with direct subsidy payments for feedlot owners between 2007 and 2010, with the same subsidies denied to grass-fed beef producers (Guevara & Grünwaldt 2012). In 2001, less than 10 per cent of Argentine beef production was finished in feedlots, but by 2012 feedlots produced around 50 per cent of finished steers (Deblitz 2012).

Argentina's beef industry also faces risks from disease outbreaks, particularly FMD. In 2001, major outbreaks of FMD occurred in Argentina, Brazil and Uruguay. The outbreaks closed access to export markets, causing a rise in domestic beef supplies and a steep decline in beef prices. Argentina was classified as FMD free in 2007 (OIE 2015). Although southern Argentina is FMD free without vaccination, the majority of the Argentine cattle herd is located in the northern half of the country where the herd is regularly vaccinated against FMD.

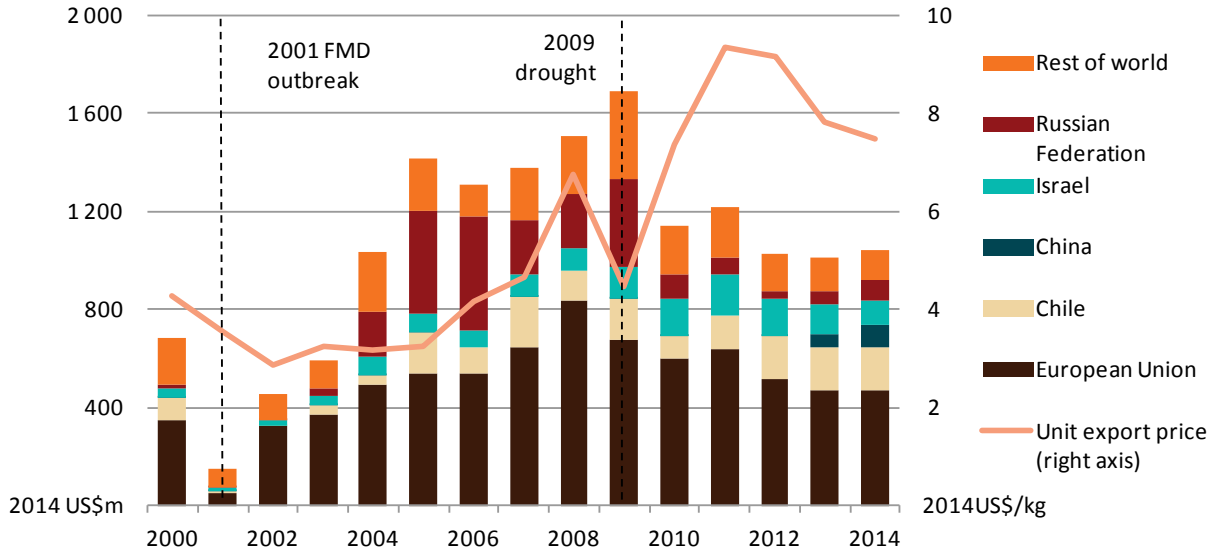
Exports

Prior to 2000, Argentina was the largest beef exporter in South America. Between 2000 and 2009, Argentina's beef exports were highly variable because of animal disease, drought and government policy decisions. However, since 2010 exports have been relatively stable. In 2014, Argentina's main export markets were the European Union (45 per cent by value), Chile (16 per cent), Israel (9 per cent) and the Russian Federation (8 per cent) (Figure 5).

Argentina exports high-value marbled beef. Israel and Chile, both high-value markets, have been less sensitive to the rise in the price of Argentine beef since 2010. Although the Russian Federation was a major market for Argentina during the mid 2000s, Brazil and Paraguay have largely replaced Argentina in that market because of the higher price of Argentine beef and the unreliability of its exports because of government policies.

The main markets where Australia competes with Argentina are the European Union and China. Prior to 2013, Argentina's exports to China were negligible. By 2014, China accounted for 9 per cent of Argentina's beef exports.

Figure 5 Beef exports, Argentina



Source: United Nations Statistics Division 2015

Market access remains a challenge for Argentina. Because of disease concerns, Japan and the Republic of Korea continue to ban beef imports from Argentina. These countries do not generally accept imports from countries that vaccinate their herd against FMD in any region of the country. Argentina regained access to the US market for frozen and chilled beef in June 2015 but, as of March 2016, exports had yet to recommence pending US recognition of Argentine food safety standards.

Historical decomposition results—Argentina

Argentina's export revenue growth between 2000 and 2014 increased 86 per cent in real US dollar terms, the lowest of the countries analysed in this report. Slower growth compared with its regional competitors and Australia was largely attributable to the Argentine government's policies to restrict beef exports. These policies imposed significant costs on producers, causing the industry to contract. The negative impact of these policies is reflected in a rise in export supply costs, which were compounded by the high rate of domestic inflation under a fixed exchange rate regime affecting the Argentine economy over that period (Figure 6 and Table 4).

Argentina's rise in export supply costs between 2000 and 2014 are estimated to have reduced real export revenues by more than US$1 billion from what otherwise could have been achieved in 2014. Higher export supply costs were largely offset by the significant devaluation of the Argentine peso over the same period. This means that, although export supply costs were considerably higher in domestic currency terms, only some of this cost increase was passed on to export markets because of the sharp depreciation of the peso.

Argentina's own market access improvements between 2000 and 2014 are high in percentage terms. This primarily reflects a relatively small increase in trade on a small base volume of trade. The positive contribution to trade from market access is outweighed by the negative effect from higher export supply costs.

Figure 6 Contribution of beef export drivers between 2000 and 2014, Argentina

Note: Values refer to each driver's net contribution to trade growth between 2000 and 2014, expressed as a percentage share.
Source: ABARES modelling results

Table 4 Own and competitor contribution of beef export drivers between 2000 and 2014, Argentina

Export driver	Export supply costs	Market access	Real exchange rate	Income growth
	%	%	%	%
Own	-448	383	291	na
Competitor	-4	-228	71	na
Total	-452	155	362	36

Note: Values refer to each driver's contribution to trade growth between 2000 and 2014 disaggregated by 'own' and 'competitor' effects, and expressed as a percentage share.
Source: ABARES modelling results

Argentine beef maintains a reputation for quality in the world market and competes directly with Australia in some higher-value markets, such as the European Union. However, the policy-induced constraints on beef exports has detracted from this reputation in some markets and its cost competitiveness has been weakened by high domestic inflation. It is these issues the current Argentine government is aiming to alleviate with policy changes introduced in late 2015 (see Chapter 5).

Uruguay

Overview of Uruguay's beef industry

Production

The Uruguayan cattle herd is considerably smaller than the Brazilian and Argentine herds. It has remained relatively steady since 2000, with the herd in 2014 numbering about 12 million head. Despite having fewer cattle than its regional competitors, Uruguay has emerged as an increasingly important beef exporter. Although the country has limited agricultural land, it also has a small population and stable beef consumption. This has allowed both the Uruguayan government and its beef industry to invest in the production of high-value beef for export.

Uruguay has a temperate climate with reliable rainfall, allowing beef production to be mostly grass fed. As in Argentina, around 85 per cent of Uruguayan cattle are *Bos taurus* breeds, which produce the marbled beef favoured for table consumption rather than further processing. This differentiates Uruguayan beef from that of Brazil and Paraguay (Peck 2006).

Uruguay is a small country and arable land is in high demand. This is reflected in agricultural land prices which increased five-fold between 2004 and 2014 (IMF 2014), following the rise in world prices for corn and soybeans. While the strengthening demand for crop land is increasingly displacing producers of grass-fed beef, lot feeding is not commonly used. Lot feeding sector capacity is around 250 000 head (equivalent to only 2 per cent of the herd) and most of that production is aimed at the European Union under the grain-fed quota (FAS–USDA 2015b).

Uruguay's beef industry is heavily influenced by Brazilian agribusiness. JBS, Minerva Foods and Marfrig have taken advantage of Uruguay's disease-free status by investing in its abattoirs. This has provided them with additional capability to export to a wider range of markets (USITC 2012).

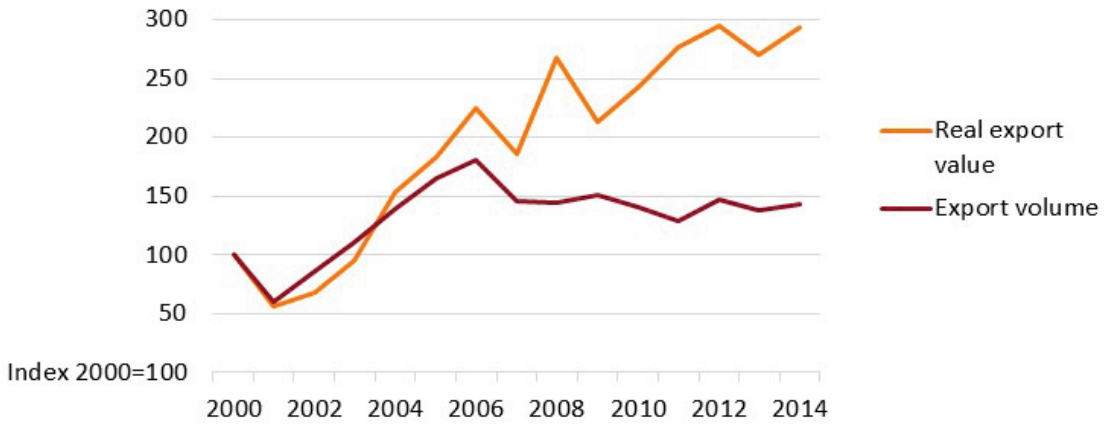
The main form of government support for the Uruguayan beef industry is the subsidised compulsory livestock identification programme, which manages disease outbreaks through comprehensive cattle traceability. The programme aims to add value to Uruguayan beef, increase the sector's credibility and assist in opening export markets (IICA 2013). Complete cattle traceability makes Uruguay unique among South American beef exporters. Although Uruguay suffered from an outbreak of FMD in 2001, its comprehensive cattle identification system allowed it to regain market access relatively quickly.

Exports

Uruguay has been South America's second-largest beef exporter by value since overtaking Argentina in 2010. Its beef industry is export orientated, with more than 60 per cent of production exported annually.

Uruguay's beef exports are comparable to Australia's. It ships high-value beef with a focus on traceability and a clean image, with the aim of capturing a premium price in export markets. Uruguay's beef production has also been universally hormone-free since 1984 (Bervejillo 2015). The success of Uruguay's investment in the industry is demonstrated by its export growth. Between 2000 and 2014 the real value of Uruguay's beef exports increased by more than 200 per cent, despite export volumes only rising by around 50 per cent (Figure 7).

Figure 7 Beef exports, Uruguay



Source: United Nations Statistics Division 2015

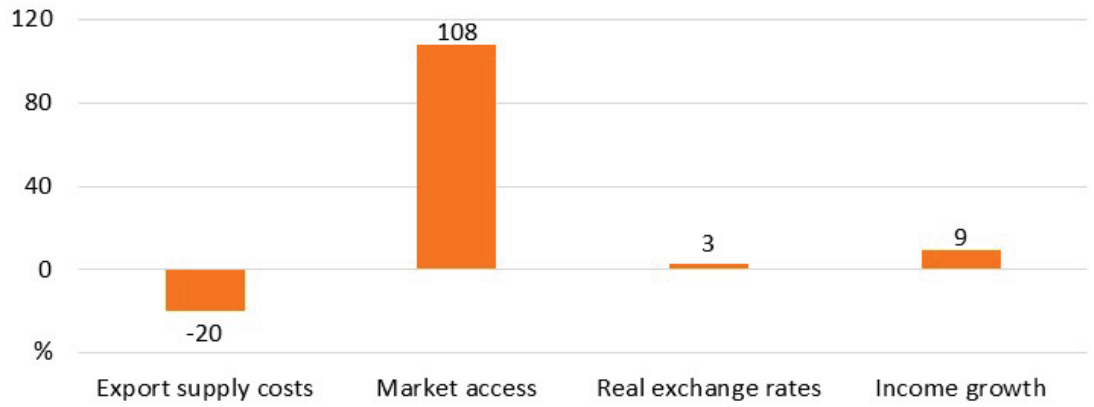
As a member of Mercosur, Uruguay shares the benefits of the FTAs negotiated by the customs union. However, the Uruguayan beef industry's peak body considers the absence of further FTAs

with key markets, such as China, to be one of the main challenges facing the industry (Caputi 2013).

Historical decomposition results – Uruguay

Uruguay's beef export value increased by almost 250 per cent in real terms between 2000 and 2014. The rise in export supply costs had a negative effect on export growth, although these were more than offset by Uruguay's significant improvements in market access over the period as a whole (Figure 8 and Table 5).

Figure 8 Contribution of beef export drivers between 2000 and 2014, Uruguay



Note: Values refer to each driver's net contribution to trade growth between 2000 and 2014, expressed as a percentage share.
Source: ABARES modelling results

Table 5 Own and competitor contribution of beef export growth between 2000 and 2014, Uruguay

Export driver	Export supply costs	Market access	Real exchange rate	Income growth
	%	%	%	%
Own	-30	155	-2	na
Competitor	10	-47	5	na
Total	-20	108	3	9

Note: Values refer to each driver's contribution to trade growth between 2000 and 2014 disaggregated by 'own' and 'competitor' effects, and expressed as a percentage share.
Source: ABARES modelling results

The rise in export supply costs in Uruguay between 2000 and 2014 is the result of increased land and labour costs, which stem from land supply or availability constraints and the strong competing demand for land for soybean production. Higher export supply costs in Uruguay caused export growth to be 30 per cent lower that what otherwise might have been the case.

Factors contributing to Uruguay's improved market access were its extensive cattle traceability and certified hormone-free production systems. These have provided Uruguay with a competitive advantage relative to its regional competitors.

Exchange rate effects on Uruguay's export revenue between 2000 and 2014 were minor. However, the appreciation of both the Australian and New Zealand dollars against the US dollar made these countries' beef exports relatively more expensive than Uruguay's. The influence of import demand on Uruguay's exports also played a relatively minor role in export growth over

the period, although income growth in the Middle East was the most important contributor from that driver.

Paraguay

Overview of Paraguay's beef industry

Production

The Paraguayan beef industry is smaller and less developed than those of Brazil and Argentina. It is characterised by a large number of small producers—over 90 per cent of beef producers have herds of fewer than 100 cattle (USDA–FAS 2015c). Despite the structure of the industry, Paraguay is the only South American beef exporter, apart from Brazil, to have expanded its cattle herd since the mid 2000s. The FAO estimates the Paraguayan herd grew by 38 per cent between 2007 and 2014 to 14.5 million head (FAO 2016).

Beef production is focused in the south-east of the country, adjacent to the majority of the population and where the climate is more temperate. The undeveloped north-west Chaco region has a warmer, drier climate and is largely forested. However, land clearing has accelerated on the north-west frontier, with the rate of pasture land expansion in western Paraguay among the highest on the continent (Graesser et al. 2015). While there is the potential to expand agricultural land use in this area, transport costs are currently high as infrastructure remains poor (USDA–FAS 2014b).

Around half of Paraguay's cattle herd is comprised of crossbreeds of local *Bos indicus* breeds, with the remainder imported *Bos taurus* breeds (USDA–FAS 2014b). Most production is grass fed with limited lot feeding.

Exports

Paraguay exports around 60 per cent of its beef production annually. Beef exports in 2014 reached a record 278 million tonnes—larger in volume terms than both Uruguay and Argentina and a six-fold increase compared with 2000.

Paraguay's advantage in export markets is its low cost of production, which is supported by a low tax burden (USDA–FAS 2014b). Relatively cheap land, a temperate climate in the beef producing areas and low labour costs also contribute to a low-cost environment (USDA–FAS 2013). However, because Paraguay is landlocked, beef exports depend on transportation through other Mercosur countries to access export markets. Beef is usually shipped by river barge to Uruguay before being exported (Borror 2014). Although this increases the cost of transportation relative to its neighbours, Paraguay's low on-farm cost of production allows it to remain competitive on world markets.

Since 2004 the Russian Federation has been Paraguay's main beef export market and an important factor behind its strong export growth since 2000. As a low-cost supplier of manufacturing beef, Paraguay is more competitive in the Russian market than either Argentina or Uruguay. Paraguay also exports to neighbouring Brazil. This trade is assisted by the Mercosur agreement and trade between different branches of Brazilian agribusinesses that have a strong presence in Paraguay.

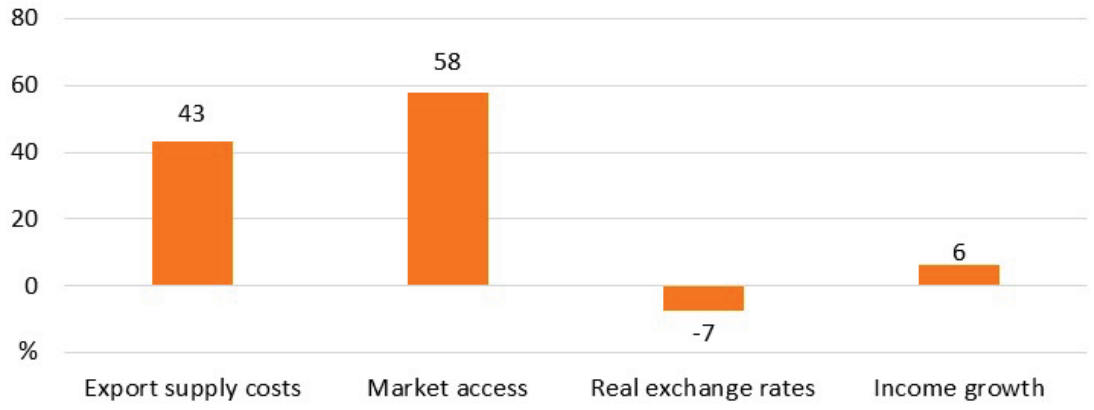
Although classified as FMD free with vaccination by the OIE, Paraguay suffered from FMD cases as recently as 2011 and 2012. These cases slowed export growth as Chile, Israel and the European Union responded by temporarily banning imports of Paraguayan beef. The European

Union's ban was not lifted until March 2015. Exports to Asia also remain limited, although Hong Kong has been an increasingly important market since 2012.

Historical decomposition results—Paraguay

Paraguay's export drivers follow a similar pattern to Brazil's, with a large contribution from lower export supply costs and improved market access (Figure 9 and Table 6). When comparing the five countries in this report, the percentage export growth between 2000 and 2014 was largest for Paraguay—largely because of the near absence of beef exports in 2000. By 2014, Paraguay had become the third-largest South American beef exporter, in value terms.

Figure 9 Contribution of beef export drivers between 2000 and 2014, Paraguay



Note: Values refer to each driver's net contribution to trade growth between 2000 and 2014, expressed as a percentage share.
Source: ABARES modelling results

Table 6 Own and competitor contribution of beef export drivers between 2000 and 2014, Paraguay

Export driver	Export supply costs	Market access	Real exchange rate	Income growth
	%	%	%	%
Own	28	79	14	na
Competitor	15	-21	-21	na
Total	43	58	-7	6

Note: Values refer to each driver's contribution to trade growth between 2000 and 2014 disaggregated by 'own' and 'competitor' effects, and expressed as a percentage share.
Source: ABARES modelling results

Market access was the largest contributor to export growth between 2000 and 2014. In Paraguay's case, the main improvement in market access was between Paraguay and the rest of South America. Other important market access improvements include the development of trade relationships with the Middle East and the Russian Federation, markets with which Paraguay traded very little in 2000.

Paraguay's lower export supply costs were another major driver behind export growth from 2000 to 2014, accounting for around 28 per cent of its export growth over the period. Increases to competitors' export supply costs explained 15 per cent of Paraguay's export growth over the period, most of which could be attributed to declining production conditions in Argentina and the European Union. This helped Paraguay become more price competitive in the Russian Federation, where it competes with both these exporters.

The contribution of income growth in importing countries, and hence growth in import demand, to export growth in Paraguay was the smallest among the analysed countries. The effect of changes in bilateral exchange rates were also small and a net detraction from growth, since the depreciation of the Argentine peso against the Russian ruble encouraged Argentine exports to that market at the expense of Paraguayan beef.

Paraguay has potential to expand production and exports, and the potential to expand pasture land in the north-west of country. Any expansion in production will depend on the application of forest conservation laws and improved infrastructure, as well as on cattle breeding to maintain or increase productivity growth in tropical climates.

Like Brazil, Paraguay exports lower-value manufacturing beef to different markets than Australia's, so direct competition with Australian beef exports is relatively limited. This would only change if Paraguay were to obtain market access to countries like the United States, which is Australia's principal market for manufacturing beef. Importing countries' fear of FMD incursion currently restricts Paraguay's access to most high-value markets. Without better controls or investment in cattle traceability, Paraguay is unlikely to secure access.

Historical analysis: policy implications for Australia

Since 2000 the beef industries of Brazil, Argentina, Uruguay and Paraguay have undergone significant changes. Investment in their respective industries has led to general improvements in production efficiency, disease management and supply chain traceability. Despite the variety of short term setbacks which affected production in each of these countries since 2000, over the longer term there has been significant production and export growth, particularly for Brazil.

Australia’s export growth since 2000 was primarily driven by improvement to its market access. This suggests Australia will need to continue to prioritise its efforts to negotiate trade agreements and to maintain existing trade relationships that support access for Australian beef. Although Australia’s market access has improved from the recently negotiated free trade agreements with north Asia, these agreements are based on tariff changes. Health and safety protocols and regulations still need to be negotiated to facilitate, preserve or increase Australia's access across markets.

Global demand for protein and for safe and reliable food will support exporters who can deliver to higher-end markets. Maintaining a production system that ensures Australia's status as a sustainable, disease free (clean and green) beef producer is critically important. It will allow Australia to distinguish itself on quality since it cannot compete on cost with South American exporters.

Australia will also need to invest in both on- and off-farm productivity growth to remain price competitive. Productivity growth will be important for the Australian industry as a whole but particularly the component that is exposed to competition from low cost producers of lower-value meat. Australia can continue to target premium beef markets that prefer highly marbled beef from *Bos taurus* breeds, but climatic and environmental conditions in northern Australia do not suit these breeds, limiting the production options for those producers. Producers in northern Australia will necessarily continue to compete in the lower-value markets where South America is also operating.

A potential area for improved productivity growth is in the beef processing sector where there is evidence that the Australian beef industry needs to increase supply chain efficiency (Goesch et al. 2015). The cost of processing beef in Australia is high, around two to three times

more than in the United States and South America. This is primarily because of high labour and energy costs (Goesch et al. 2015). Australia needs to ensure there are no inappropriate hurdles to consolidation in the processing sector. Consolidation has potential to reduce costs of production and improve productivity through increased mechanisation and lower labour costs.

Inefficiency in road transport is a potentially significant constraint in some Australian beef supply chains. While options such as user pays pricing and funding allocation models have the potential to improve the economic efficiency of road transport networks, there are significant practical limitations to this model for the beef industry. For example, there are likely to be roads in rural areas dedicated to servicing the beef industry that farmers could not afford to maintain under a user pays system (Goesch et al. 2015). It will be important to ensure that funds available for upgrading road infrastructure are targeted so that benefits are maximised. The use of CSIRO's Transport Network Strategic Investment Tool (TraNSIT) in the Australian Government's Northern Australia Beef Roads Programme will help in this regard.

All levels of government will need to continue to reduce the cost of complying with regulations along the beef supply chain. Efforts to tackle regulatory barriers that impede innovation and competition, and undermine competitiveness will be critical to enhancing productivity growth in the beef industry over the longer term.

5 Scenario analysis

The objective of this chapter is to investigate the potential impacts of hypothetical and actual policy changes on Australia's future exports. To do this, a projections component of the world beef trade model was developed. The assumptions underlying the projections to 2030, include:

- income growth, derived from International Monetary Fund forecasts of gross domestic product for beef importing countries (Table A2)
- productivity growth, derived from United States Department of Agriculture and ABARES productivity assumptions (Table A3)
- real bilateral exchange rates, which are assumed unchanged over the projection period from 2014 average values
- market access settings which are assumed unchanged from 2014. However, import tariff reduction schedules for beef negotiated in selected free trade agreements are included.

From this model, a baseline projection of real export revenues between 2014 and 2030 was estimated for the four South American countries and Australia.

Three scenarios were developed which consider some policy directions of the named countries. The objective of each scenario was to assess the effect of that policy on real export revenues compared with the baseline. The estimated impact on competitors' beef export revenues is also reported to highlight potential changes.

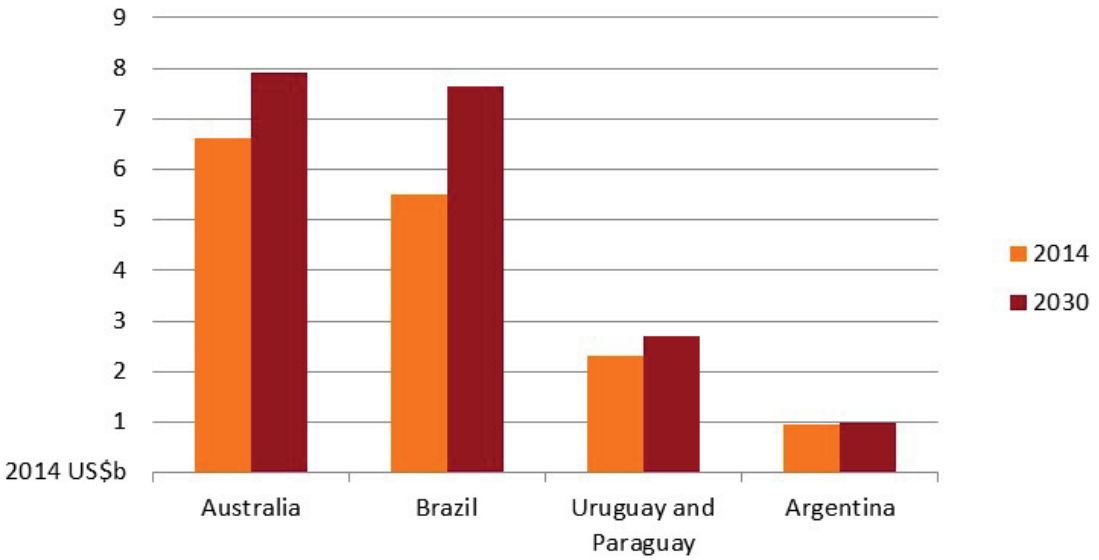
The three policy scenarios are:

1) removal of Argentine agricultural export restrictions
2) improved market access for South American beef exports
3) improvements in domestic transport infrastructure in Brazil and Australia.

Baseline projection

In the baseline projection, real beef export revenue (in 2014 US dollars) is higher in 2030 than 2014 for all major beef exporters. Export revenue increases significantly for Brazil (39 per cent) and Australia (20 per cent), and Uruguay and Paraguay (16 per cent). Export growth in Argentina is relatively low (4 per cent) (Figure 10).

Figure 10 Projected beef export value, baseline



Source: ABARES modelling results

These results are driven by a rise in volumes exported rather than by price increases. Average beef export prices fall slightly in real terms over the projection period compared with 2014. In Australia real export prices fall by 2 per cent and in Brazil by 6 per cent.

Income growth in beef importing countries support the growth in the import demand for beef. The real value of beef imports to the China–Hong Kong region increases by around 55 per cent between 2014 and 2030, while ASEAN imports increase by around 40 per cent and North American beef imports by 17 per cent. In contrast, changes to the real value of beef imports in North Asia are minor over the projection period, increasing by only 1 per cent. This latter result is broadly consistent with ABARES's long-term projections of food consumption in North Asia, where consumption growth is relatively flat because of a projected population decline and low income growth (ABARES 2013).

Although the total value of Australian beef exports is projected to increase by 20 per cent over the baseline projection period, this does not necessarily translate into increased market share in its export markets. In the baseline, Australia's share of beef imports in the China–Hong Kong and the ASEAN regions increases gradually. In all other markets, Australia's share of beef imports declines. This is because of increased competition from South American beef in the European Union and North America, and from North American beef in North Asia where it continues to regain the market share lost following the BSE crisis of 2002.

Scenario 1 Removal of Argentine agricultural export restrictions

Background

While Argentina was a major exporter in the first half of the 2000s, the volume of its exports has been comparatively low since 2010. This was largely because of government policies. Prior to 2016 the Argentine government restricted beef exports through a 15 per cent export tax as well as quantitative restrictions (Regúnaga & Rodriguez 2015). The quantitative restrictions applied to a range of agricultural commodities and limited the quantity that could be exported on an

ad hoc basis. The policy focused on staple foods considered important to the domestic population, including beef.

The stated aim of these export restrictions was to ensure a reliable supply of affordable food for domestic consumption. As reported in Chapter 4, these policies had significant unintended consequences, including reduced profitability for the Argentine beef industry and increased risks associated with production, as producers could not be certain about how much of their production the government would allow them to export annually. As a result, many producers left the industry and some land was diverted to cropping (Mathews & Vandeveer 2007).

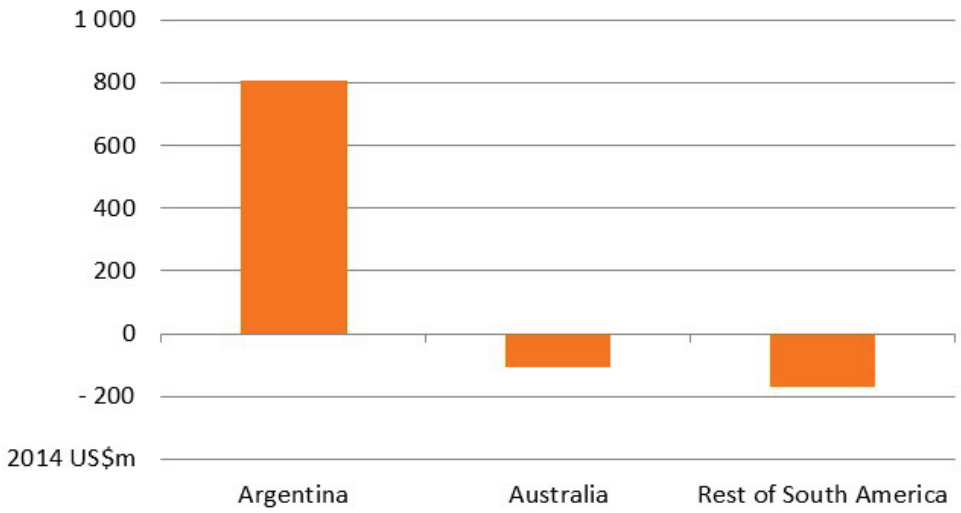
In December 2015, Argentina's agricultural export policies were reformed (USDA–FAS 2015d, Williamson 2016). The Argentine Government removed most of its agricultural export taxes and quantitative export restrictions on grains, oilseeds and livestock products, including beef. At the same time, macroeconomic reforms were implemented, including the removal of currency controls on the Argentine peso. This led to a sharp depreciation in the currency, which significantly lowered the price of Argentine beef on the world market, thereby increasing its competitiveness.

In this scenario, the effect on beef export revenues of the newly introduced Argentine export policies are estimated for Argentina. Their indirect effects on the beef exports of the three other South American beef exporting countries, as well as Australia, are also reported.

Scenario 1 results

With the removal of export restrictions, the real value of Argentina's beef exports is projected to be US$800 million higher in 2030 than if the restrictions were maintained (in 2014 US dollars) (Figure 11). This reflects almost a doubling of the export volume between 2014 and 2030, compared with the 4 per cent increase projected in the baseline. The real export price is projected to fall by 4 per cent over this period, as the removal of export restrictions allows exporters to price more competitively.

Figure 11 Difference in beef export value compared with baseline, Argentina scenario



Source: ABARES modelling results

Beef exports from Australia and other South American countries are only minimally affected by Argentina's gain. By 2030 the real value of Argentine beef exports is roughly equal to Uruguay

and less than a quarter of Brazil. Even with the decline in export price and higher availability of beef for export, this result suggests that Argentina may struggle to gain market share given how well established its South American competitors are in the markets they share.

Australia and Argentina currently do not export beef to many of the same markets. For that reason, the projected increase in Argentine beef exports in this scenario only leads to a slight contraction in the value of Australia's exports. Australia loses market share to Argentina in the China–Hong Kong and ASEAN regions, both of which are price-sensitive markets. However, the effect on Australia's total beef exports is small, as it has the capacity to divert trade to its other established markets in which Argentina does not have access, such as North Asia.

While the removal of the Argentine export restrictions is expected to increase Argentine beef production and exports, no trade effects from that policy change have yet been observed. For that reason, this policy reform was not included in the baseline projection since it would not have had a significant impact on the other scenarios. As a result, the baseline projection and scenarios 2 and 3 each assume the continuation of Argentina's agricultural export restrictions.

Scenario 2 Improved market access for South American beef

Background

Sanitary issues, including FMD, are major impediments to world beef trade. Incursions of FMD, such as the South American outbreak in 2001, have resulted in trade bans on beef by importing countries. Because of the ease of spreading FMD, importing countries with large domestic cattle herds apply stringent import restrictions (Rushton & Knight-Jones 2013). Reopening closed markets is therefore often slow, with stringent certification procedures required by importing countries, even once the outbreak has been contained.

South America has a history of FMD outbreaks and the disease remains endemic in some parts of the continent (Naranjo & Cosivi 2013). A widespread outbreak in Argentina, Uruguay and Paraguay occurred in 2001 and 2002, with additional cases reported in Brazil in 2005 and Paraguay in 2012. The economic cost of FMD in South America has led to intergovernmental cooperation, with the current plan aiming to eliminate the disease in the continent by 2020 (Naranjo & Cosivi 2013).

Vaccination is the main approach used by South America to manage FMD. As of 2016 the majority of the South American cattle herd resides in regions that are recognised as FMD free with vaccination by the OIE (OIE 2015). Vaccination rates are high in Uruguay and Argentina, and more than 97 per cent of the Brazilian herd is vaccinated (The Cattle Site 2015).

Despite the improved management of FMD in South America, some exporters are yet to regain access to markets lost during the 2000s. For example, Japan and the Republic of Korea do not accept beef from areas where FMD vaccinations are practised and the United States only allows imports from selected countries following an audit process (USDA–FSIS 2015).

In order to expand exports to these markets, each of the South American countries is actively trying to comply with importing country regulations. The possible effects of improved market access for South America are explored in this scenario. The scenario is divided into three parts, defined by the regions to which South American beef exporters are assumed to obtain access. Each of those importing regions either currently restricts or bans imports on FMD and other sanitary grounds, or has just recently approved imports from formerly banned countries. As full

eradication of FMD in South America is unlikely in the foreseeable future, these scenarios assume that the importing regions begin accepting beef imports from countries classified as FMD free with vaccination, as some currently do with Uruguay.

The three parts of the scenario are simulated as follows:

2a) improved market access for all South American beef exporters to the China–Hong Kong and the ASEAN regions

2b) improved market access for all South American beef exporters to North America (the United States, Canada and Mexico) and North Asia (Japan and the Republic of Korea)

2c) improved market access for all South American beef exporters to all four regions above.

Each simulation in this scenario is modelled by gradually improving market access for the South American exporters in the relevant markets. By 2030, each country's access is set equal to the most favoured nation (MFN) tariff rates faced by other beef exporting countries.

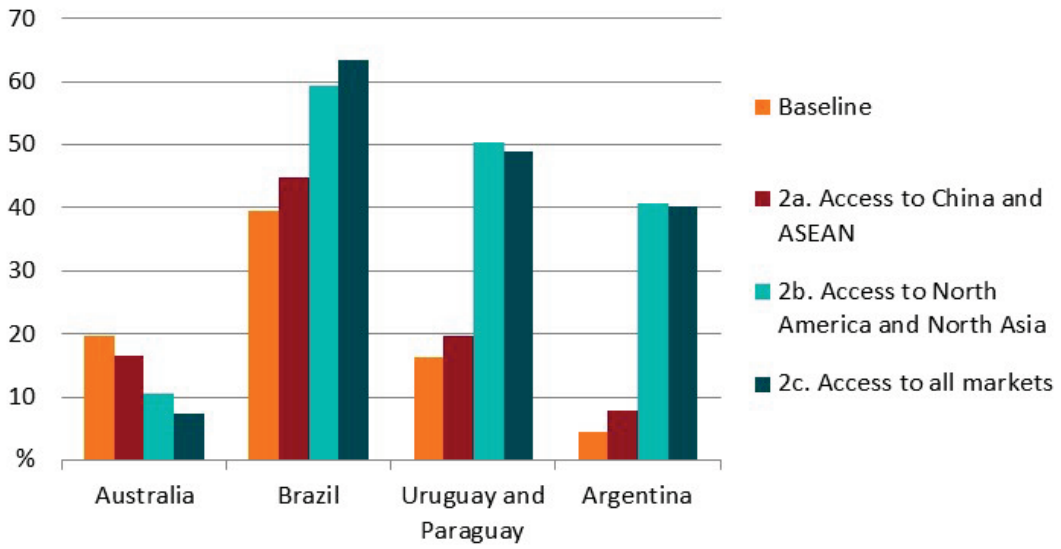
Scenario 2 results

2a. Access to the China–Hong Kong and ASEAN regions

In this simulation, all South American beef exporters gain access to China–Hong Kong and the ASEAN countries, and market access is assumed to further improve between 2014 and 2030. Brazil benefits the most under this simulation compared with the baseline as a result of improved access to the ASEAN region (Figure 12). Brazil's total beef exports increase by 45 per cent by 2030, compared with a 39 per cent increase in the baseline. Brazil's beef exports are US$300 million higher (in 2014 US dollars) in 2030 compared with the baseline.

Argentina, and Uruguay and Paraguay also benefit from improved access to the ASEAN region because both Argentina and Uruguay had market access to the China–Hong Kong region but relatively limited access to ASEAN in 2014.

Figure 12 Beef export value growth between 2014 and 2030, market access scenario



Source: ABARES modelling results

2b. Access to North America and North Asia

North America and North Asia are both important markets for Australian beef. North Asia imports significant quantities of frozen grass-fed beef, as well as higher-value chilled grain-fed beef from Australia. Both regions currently provide limited market access to South American beef. When market access for the other South American producers is improved in this scenario, the value of Brazil's total beef exports in 2030 is 14 per cent (or over US$1 billion) higher compared with the baseline. For Argentina it is 35 per cent higher and for Uruguay and Paraguay, together, it is 29 per cent higher.

Notably, average unit export prices for beef from Argentina, Uruguay and Paraguay are between 9 per cent and 10 per cent higher in 2030, compared with the baseline, because of access to these higher-value markets.

As discussed in Chapter 4, Brazil regained access to the US market in August 2016. However, the US tariff-rate quota will limit Brazil's access to the US market in the short term. Not only does the tariff-rate quota limit Brazil's capacity to export to the US market but import protocols still need to be finalised. For that reason, Brazil's access to the United States, at least in the short term, will have very little effect on Australian exports.

2c. Access to China–Hong Kong, ASEAN, North America and North Asia

Under a scenario where South America is granted access to all four specified beef importing markets, this simulation indicates the strongest increase in South American exports over the projection period would be to the North Asian market. Brazil is the only South American country to increase total exports compared with scenario 2b. Brazil also benefits from higher export returns from its improved access to the ASEAN region.

Compared with the baseline, the value of Australian beef exports is lower in 2030 in each of the three market access simulations (Figure 12). South America's access to Australia’s two most important export regions, North Asia and North America, has a more significant negative impact on Australia's real export returns in 2030 than scenario 2a. In scenarios 2b and 2c, Australia's export growth is more than halved compared with the baseline in 2030.

This scenario shows that growth in Australia's beef exports will be slow if South American beef exporters gain similar market access to Australia, unless Australia diverts more export trade to lower-priced markets in the ASEAN region and the Middle East. The consequence of diverting trade is that the export unit price for Australian beef to those markets would be lower in 2030 than in the baseline under each scenario.

Over the past 15 years, Australia's beef industry has benefited from disease outbreaks in other countries, including in South America. When these outbreaks occurred, the drop in supplies available for export or the ban on exports from the afflicted country provided an opportunity to Australian beef exporters. However, South American countries have been investing in disease reduction and traceability mechanisms. Not only has this lowered the risk of future disease outbreaks, but the traceability systems potentially shorten the periods for which beef exports may be banned. As a result, Australia is not likely to benefit as strongly from disease outbreaks as it did in the past. The Australian beef industry will therefore need to develop a more structured approach to maintaining its competitiveness over the longer term that does not rely on opportunistic market access advantages.

Scenario 3 Improvements in transport infrastructure in Brazil and Australia

Background

The availability and quality of domestic infrastructure affects agricultural producers' costs and therefore their competitiveness in both domestic and world markets. Although Australia's transport infrastructure is more developed than Brazil's (WEF 2015), the agricultural sectors of both countries could benefit from improvements to their domestic infrastructure.

3a. Brazil

Improvement to Brazil's transport infrastructure would significantly improve its agricultural competitiveness (WEF 2015, USITC 2012). Brazilian logistics infrastructure, which includes storage, handling and transport, was estimated to account for an average of almost 30 per cent of agricultural production costs in 2012. In comparison, average logistics costs in the United States accounted for only 5.5 per cent of agricultural production costs in 2012 (USITC 2012).

Around 60 per cent of Brazilian cargo is transported by road. However, Brazil's road system is relatively undeveloped. It is characterised by poor and mostly unpaved roads and inefficient road freight networks. Fewer than 15 per cent of Brazil's roads are paved (USITC 2012). Brazil's road freight network is concentrated in the south of the country near the main ports. Consequently, transportation of goods from the north of the country to the ports in the south and south-east incurs relatively high costs.

The Brazilian Government has begun to take steps to address its infrastructure problems. The National Plan for Transportation and Logistics (NPTL) sets out a strategy for the Brazilian Government to address many of its transportation issues by 2023. Major rail investment is planned to link the country from north to south and east to west. Over 50 per cent of the US$146 billion NPTL investment will be allocated to rail projects (US$76 billion) and around a quarter will be allocated to roads (US$35 billion) (USITC 2012).

The first infrastructure simulation examines the potential impact on Brazilian beef exports of improved domestic infrastructure. Improvements in infrastructure efficiency could include, for example, improved transport capacity, reduced time of transport, lower transport costs and reduced product loss during transport. The projected changes to Brazil's beef exports in 2030 are compared with the baseline, in which infrastructure efficiency does not change over the projection period.

3b. Australia

Compared with Brazil, Australia has a comparatively well-developed transportation system (WEF 2015). However, there is potential to improve efficiency within the agricultural supply chain through the expansion and improvement of existing transport infrastructure (Goesch et al. 2015). Because beef production is the most extensive and geographically dispersed agricultural activity in Australia, improvements to the transportation network that increase the speed and efficiency of delivering cattle and beef to market could be fundamental in supporting the competitiveness of the beef industry (Goesch et al. 2015).

The second infrastructure simulation examines the potential impact on Australian beef exports of improved domestic infrastructure. This simulation aligns with the Australian Government Agricultural Competitiveness White Paper which states that Australia is committed to 'investing in reliable, efficient and cost-effective water, transport and communications infrastructure to support the development and growth of the agriculture sector' (Australian Government 2015).

The Australian Government has allocated $42 billion to the Infrastructure Investment Programme to improve road and rail infrastructure.

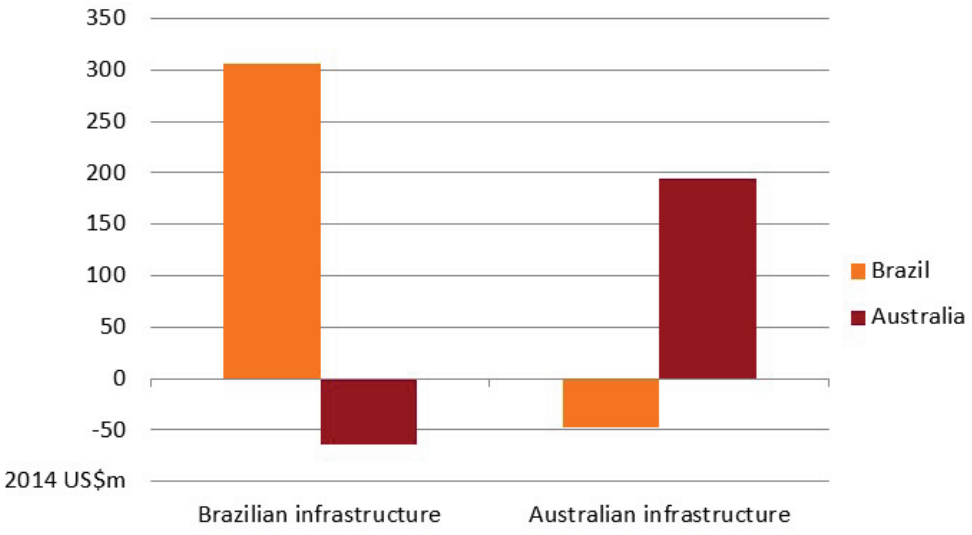
Without knowing how much the investment in domestic transport infrastructure will benefit the beef industries directly, the Brazilian and Australian infrastructure simulations both assume it will be enough to reduce transport costs by 15 per cent for beef exporters in 2030 compared with the baseline. As a consequence, the results of this scenario should be seen as indicative only. As transport costs are a larger share of beef production costs in Brazil, this assumption equates to modelled export supply costs being around 8 per cent lower in 2030, while Australian export supply costs are around 6 per cent lower.

Scenario 3 results

3a. Brazil

The lower assumed cost of transportation for Brazilian beef exporters leads to a relatively small increase in exports in 2030 compared with the baseline, from US$7.7 billion in the baseline to almost US$8 billion (in 2014 US dollars). However, the increase is sufficient for Brazil to overtake Australia as the world's largest beef exporter by value, since the improved competitiveness of Brazilian beef leads to a minor fall in the total value of Australian beef exports of US$65 million (in 2014 US dollars) (Figure 13).

Figure 13 Difference in beef export value compared with baseline, infrastructure scenarios



Source: ABARES modelling results

Because the value of Brazilian beef exports in 2030 is only projected to be 4 per cent higher compared with the baseline, the export growth across its export markets is also relatively low and evenly distributed. Brazilian beef exports to the China–Hong Kong region, the European Union and ASEAN are projected to increase slightly, displacing some Australian exports to these markets.

3b. Australia

Improved transport infrastructure in Australia leads to an increase in beef exports but to a lesser extent than Brazil. This result reflects the comparatively better quality of Australian infrastructure at the outset, and the lower marginal improvement to total Australian export supply costs. Investment in Australian transport infrastructure is estimated to add around US$200 million to Australia's total beef export revenue compared with the baseline in 2030.

Australian beef exports by destination change only slightly as a result of more efficient transport infrastructure. Australia's market share in the China–Hong Kong and ASEAN regions in 2030 are projected to be only 1 percentage point higher than in the baseline. Trade to other markets remains relatively unchanged. This reflects the fact that Brazilian export prices remain below Australia's, even with the improvement in transport infrastructure. Australia is largely taking market share from other higher-cost exporters, such as Uruguay and the European Union.

The results from both the Brazil and Australia infrastructure simulations suggest that improvements to transport infrastructure can provide benefits to the beef industry. However, the magnitude of the benefit differs depending on the quality and efficiency of the existing transportation system.

6 Conclusion

Since 2000 the beef industries of Brazil, Argentina, Uruguay and Paraguay have undergone significant changes. Investments in their industries have led to general improvements in production efficiency, disease management and supply chain traceability. Despite the variety of short-term setbacks which affected production in each of these countries since 2000, over the longer term there has been significant production and export growth, particularly in Brazil.

South American beef exports have typically been destined for markets not shared by Australia. However, South American beef is increasingly gaining access to markets which were once inaccessible, such as China. As a result, Australian beef is now competing in some major markets against a product from a lower-cost supplier—a supplier whose growth potential is generally viewed as significant.

Despite the perceptions of South America's growth potential, there are policy, resource, infrastructure and market access constraints that are mitigating the rate at which beef exporting countries in the region can meet that potential. This report provides a brief overview of the beef industries in each of the four South American beef exporting countries, as well as Australia. Decomposition analysis provides an understanding of the underlying factors that have supported export growth for each country between 2000 and 2014. Beef export projections to 2030 and scenario analyses provide assessments of the effects on export growth of some potential changes in domestic and international operating environments across all five countries.

For the five beef exporting countries profiled in this report, improved market access was the main driver of real export revenue growth (in 2000 US dollar terms) between 2000 and 2014. Australia's beef sector, in particular, was able to capitalise on its disease-free status to improve its market access during a period when embargoes were being placed on other countries over disease concerns.

Between 2000 and 2014, Brazil’s productivity growth and improved supply chain efficiencies contributed markedly to its competitiveness on the world beef market. Real export revenue grew from less than a quarter of Australia's in 2000, to be almost equivalent by 2014. This growth occurred with relatively little impact on Australia's trade because of the limited direct competition between the two countries. However, in May 2015 Brazil gained access to China. The speed with which it has been able to penetrate that market has so far principally been the result of diverting its trade away from Hong Kong rather than by increasing domestic beef production. By December 2015, Brazil was the largest supplier of imported beef to China. Brazil's capacity to supply the quality of beef demanded by China at relatively low cost gives it a competitive advantage in that growing market. In addition, in August 2016, Brazil regained access to the United States, another of Australia's lower-value beef markets. However, the existing US tariff-rate quota will limit Brazil's access to the US market, at least for a few years.

While smaller than Brazil, the other South American beef exporting countries each have comparative advantages. Uruguay benefits from a similar reputation to Australia for being a clean and green agricultural producer, allowing it to secure access to similar markets as Australia. However, because there is limited scope for further expansion in the Uruguayan beef industry, it is unlikely to compete with Australia to any greater extent than it does presently. Paraguay is expanding its cattle herd and there is potential for exports to also expand given market access opportunities and continued investment. However, it is a small-scale exporter compared with Brazil and Australia, and supplies markets that are not shared with Australia.

Hence, competition between Paraguayan and Australian beef in the world market is expected to be minimal in the foreseeable future.

Argentina has the potential to re-emerge as a major beef exporter following the removal of export restrictions in late 2015. However, as indicated in the scenario analysis, it is difficult for Argentina to increase its share of major world markets given how well established its South American competitors are in the markets they share. Because it does not share many markets with Australia, competition between Australia and Argentina is unlikely to be strong over the projection period.

Given the importance of market access to past export performance for all five countries, projections of exports under a scenario of additional market access for South America illustrated the potential adverse impact on Australia's exports to major markets. It will be important for Australia to continue its effort of extending its reach into numerous smaller markets to give its beef industry flexibility and an ability to respond to changes in its markets by diverting trade.

The investments major beef exporting countries have made into disease reduction and traceability have lowered the risk of future disease outbreaks. Australia's beef exporters are therefore less likely than they have been in the past to benefit from improved market access resulting from such outbreaks, increasing the importance of measures to maintain competitiveness.

Improvements to domestic transport infrastructure would benefit the beef industries of both Brazil and Australia but to different extents. Brazil gains a much greater increase in the value of its beef exports than Australia, given an identical percentage reduction in domestic unit transport costs over the projected period. This result reflects the large share of transport costs in total costs in Brazil, in turn reflecting the relatively poor state of Brazil's existing infrastructure compared with Australia's. There is evidence that inefficiency in road transport is a potentially significant constraint in some Australian beef supply chains, particularly in northern Australia. However, investments in road infrastructure are expensive, so it will be important to ensure that available funds are well targeted. The use of CSIRO's Transport Network Strategic Investment Tool (TraNSIT) in the Australian Government's Northern Australia Beef Roads Programme will help in this regard.

Australia will also need to improve productivity growth both on and off the farm to maintain its export competitiveness. For example, climatic and environmental conditions in much of northern Australia are conducive to the production of *Bos indicus* cattle. The product from this stock competes in lower-value markets with South America. As a result, increasing productivity will be very important for these producers to remain price competitive. Efficiencies off farm may need to be found in the processing sector, given the high cost of processing beef in Australia relative to the United States and South America. Consolidation in the processing sector, for example, has potential to bring down production costs. It will be important to ensure there are no inappropriate regulatory barriers that limit the scope for productivity improvements.

It will be important for all levels of government to continue to prioritise their efforts to reduce the cost of complying with regulations. This not only includes addressing regulatory constraints affecting beef supply chains but also streamlining regulatory barriers that cut across multiple industries. Efforts to tackle regulatory barriers that impede innovation and competition, and undermine competitiveness will be critical to enhancing productivity growth in the future.

Australia should continue to target premium markets and improve market access. It will need to continue to prioritise its efforts to negotiate trade agreements and to maintain existing trade

relationships that support access for Australian beef. It also needs to maintain a production system that ensures its status as a clean and green beef producer. This will allow Australia to distinguish itself on quality when it cannot compete on price with lower-cost exporters. Strengthening global demand for protein and for safe and reliable food will provide an opportunity for Australia to position itself strategically among those exporters who can deliver reliably to growing higher-end markets.

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Appendix A Regions and assumptions

In the decomposition and projection models, beef is considered a homogenous product that is differentiated only by country of origin. Beef exports include boxed and carcase beef. They do not include processed beef or live cattle exports, nor are the exports differentiated by quality.

In the projection model, some beef trading countries are combined into regions while others are explicitly defined. The regions specified in the model are defined in Table A1.

Table A1 Modelled countries and regions

Region	Country coverage
Argentina	Argentina
ASEAN	Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Burma, Philippines, Singapore, Thailand and Vietnam
Australia	Australia
Brazil	Brazil
China–Hong Kong	China and Hong Kong
European Union a	EU–27: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom
India	India
Middle East	Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, State of Palestine, Saudi Arabia, Syria, United Arab Emirates and Yemen
New Zealand	New Zealand
North America	United States, Canada and Mexico
North Asia	Japan and Republic of Korea
Paraguay	Paraguay
Rest of South America	Bolivia, Chile, Colombia, Ecuador, Falkland Islands, French Guiana, Guyana, Peru, Suriname and Venezuela
Russia	Russian Federation, Belarus and Ukraine
Uruguay	Uruguay

a For ease of calculation, all references to the European Union refer to EU–27.

Economic assumptions

The projections model includes assumptions about future regional economic growth and agricultural productivity growth, and market access outcomes for beef achieved in free trade agreements negotiated by beef exporting countries.

Economic growth contributes to changes in beef import demand in the projections model. For this analysis, annual GDP growth estimates between 2015 and 2020 from the International Monetary Fund (IMF 2015) are extended to 2030 (Table A2). Real annual GDP growth for each region is an average of the growth of the countries contained within that region, weighted by the share of regional GDP.

Table A2 Average annual GDP growth, 2015 to 2030

Importing region	China	EU	North Asia	ASEAN	North America	Middle East	Russian Federation	Hong Kong	Rest of South America
	%	%	%	%	%	%	%	%	%
Income growth	6.3	1.9	1.6	5.4	2.3	4.2	1.9	3.1	3.0

Source: IMF 2015

In the historical decomposition analysis, the export supply cost driver included more than just the effect of productivity growth. However, for the projection analysis, agricultural productivity growth is used as a proxy for changes to export supply costs, since other influences, including seasonal conditions and disease outbreaks, are unforeseeable. These latter factors are assumed unchanged over the projection period.

In the baseline scenario, productivity assumptions vary by exporting region. Because a consistent series of beef sector productivity growth estimates across regions is not available, the analysis uses average annual total factor productivity (TFP) growth for all agriculture between 2001 and 2012 (Table A3).

Table A3 Average annual productivity growth rates, 2015 to 2030

Exporting region	Australia	Argentina	Brazil	Uruguay	Paraguay	EU	North America	India	New Zealand
	%	%	%	%	%	%	%	%	%
Productivity growth	1.60	0.51	3.23	2.01	0.19	1.28	1.96	2.32	0.98

Sources: USDA–ERS 2015, ABARES calculations

In the baseline projection, market access is assumed to remain constant at its 2014 base year level for the period from 2014 to 2030. No changes to market access are assumed beyond those achieved in recently negotiated free trade agreements, including the China–Australia Free Trade Agreement (2015), the Japan–Australia Economic Partnership Agreement (2014) and the Korea–Australia Free Trade Agreement (2014). These agreements, which do not appear in the historical decomposition as they were not in force prior to 2014, will improve market access for Australia over the projection period. Other agreements included in the projection model are the US–Korea Free Trade Agreement (2012) and the EU–South Korea Free Trade Agreement (2011). A tariff reduction for US beef exports to Japan under the Trans-Pacific Partnership Agreement (signed in 2016 but not in force as of October 2016) was also included in the projections model.

Real bilateral exchange rates are assumed to remain at their 2014 average.