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Australian Industry Report 2016

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Foreword

While I write this foreword, I am watching the Australian cricket team reassert its competitiveness in test matches against Pakistan. Having been ranked as the number one men's Test nation in the world, Australia slipped to third on the back of successive series losses to Sri Lanka and South Africa.

People argue about the veracity of these rankings in the same way as they argue about global economy rankings in exercises like the Global Competitiveness Index produced by the World Economic Forum.

That is because competitiveness, once you scratch and burrow into it, proves to be surprisingly slippery to define and measure. First, it is a relative concept. You might improve but your opponents might improve more. Second, factors beyond your own control matter. On a cricket field it might be the pitch, for an economy it might be the exchange rate. Third, the playing environment – the rules of the game – affects incentives and behaviour. Test and one-day games require different tactics to succeed. Poor rules can hinder and hold back an economy by favouring incumbents over start-ups. Fourth, a cricket team is made up of individuals of varying capabilities, some stars, some newly emerging talents and some whose best days are behind them. Similarly, an economy is made up of industries of varying strengths which are themselves made up of businesses that differ tremendously in their attributes, in their risk appetite and in their performance.

In this report we scratch and burrow into the competitiveness of Australian industries, looking at it from a range of angles, covering the impact of rising energy costs, whether exporters out-perform other businesses and how far along the path Australian business is towards digital maturity.

We argue that competitiveness can't be condensed down to a single number – although productivity growth is the best performance indicator to measure improvement – but rather is an attribute that we observe. Competitive economies are ones that are open to the world, attracting investment and people. They have high levels of innovation and business start-ups, and a diverse industry base and export profile and workforce.

Competitiveness can wither and atrophy, and there is some evidence that this has been the case in Australia in recent years, notwithstanding 25 years of economic growth. Should that be sustained over the longer run it will be detrimental to living standards. It requires constant vigilance on the part of all players — industry, government, education providers, and the science and research community — to renew themselves and strive to lift their game.

Mark Cully
Chief Economist
Department of Industry, Innovation and Science

January 2017

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Australia has recorded 25 years of consecutive economic growth, expanding by 2.8 per cent in 2015-16. But underneath the headline indicator lie risks to the Australian economy, such as uncertain international conditions, continuing poor business investment, slow wages growth and mixed labour market conditions.

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The challenge of modern industry policy is to maximise growth, while minimising the economic costs of its associated disruption.

Executive summary

Australia has just recorded its 25th consecutive year of continuous economic growth — a remarkable achievement. But what should be done to ensure we remain competitive on the world stage? Australia's competitiveness has once again come under scrutiny. Our ranking on international measures of competitiveness has slipped, real GDP per capita trends show signs of weakening, and keeping up with both technological advances and ongoing globalisation pose constant challenges.

This year's *Australian Industry Report* sheds lights on competitiveness — a multifaceted and elusive concept that can be measured in different ways. The report supports decision making through nine short chapters on important topics related to the competitiveness of Australian industries and the economy in general.

The first chapter examines how competitiveness can be measured, and compares Australia's relative performance to other countries. It points to competitiveness challenges such as falling productivity growth, falling business investment, and low collaboration between businesses and research institutions. These issues are substantiated by an overview of the economy in Chapter 2, which reveals that despite Australia's remarkable growth achievement over the past 25 years, there are risks to future growth.

Chapter 3 takes a closer look at cost competitiveness. Modelling shows that while business cost reduction provides overall economic benefits, the outcomes of these cost reductions vary widely by industry. Given the growing importance of energy policy and related targets, energy costs are scrutinised in Chapter 4. Results show that rising energy costs have a small detrimental impact on the export competitiveness of Manufacturing industries. The significance of energy costs to competitiveness is generally overshadowed by other factors.

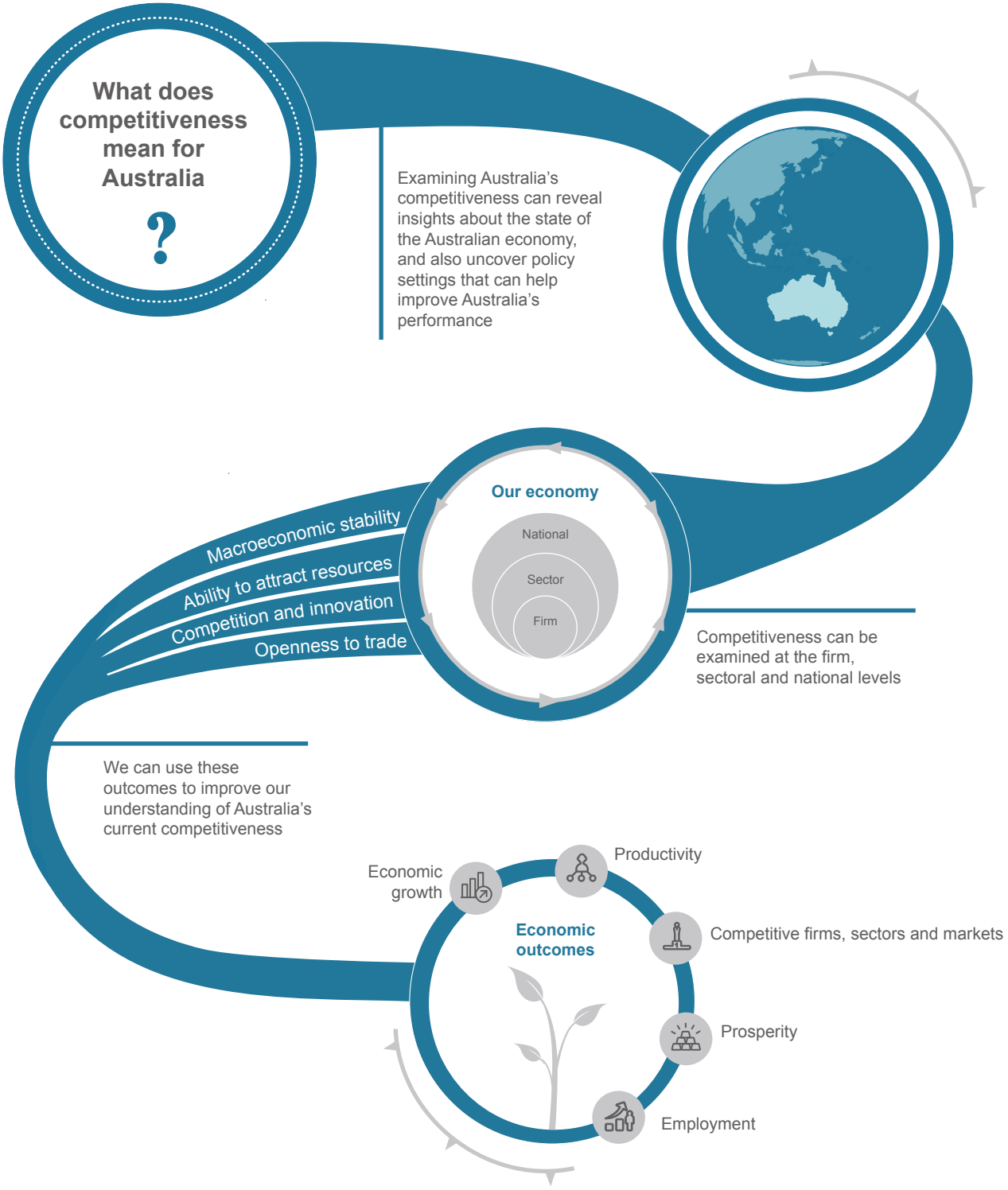
Exporting is an indicator of international competitiveness. Chapter 5 investigates the dynamic relationship between business export behaviour and performance. New firm-level results show continuous exporters consistently outperform non-exporters. Chapter 6 discusses another important factor of business performance — digital maturity. It argues that Australia is not fully tapping into its potential to drive competition, innovation and productivity.

Using new experimental estimates of Gross Regional Product per capita, Chapter 7 shows that the benefits of growth across Australia have been uneven, benefiting some regions more than others. Agglomeration (population density) and mineral resources are identified as two key determinants of regional performance.

Chapter 8 discusses common issues affecting further growth in industry growth sectors, and acknowledges the work being undertaken by the Industry Growth Centres to overcome these issues. Ultimately, success depends on getting sectors working smarter and more collaboratively with each other. The final chapter showcases a feature article by Martin Baily from the US Brookings Institution that examines the role of industry policy in managing the process of creative destruction.

1 Australia's competitiveness

Examining the importance of competitiveness, alternative ways of measuring it, and analysing how Australia is performing.



In today's increasingly interconnected global economy, a country's success is determined by its competitiveness.

Australia's firms, industries and regions are constantly being challenged by new competitors in domestic and international markets. Both the International Institute for Management Development (IMD) and the World Economic Forum (WEF) have found that Australia's competitiveness has been falling.

Understanding the extent to which this is true will not only reveal important insights about the state of the Australian economy, but also uncover policy settings that can help improve Australia's performance.

This chapter introduces the overarching theme — competitiveness — for the *Australian Industry Report 2016.* It explores the topic of competitiveness through multiple lenses, and examines the following questions:

- What is competitiveness?
- Why is competitiveness important?
- What is the best way to measure competitiveness?
- How does Australia's competitiveness compare to that of other countries?

The concept of competitiveness is difficult to define and measure. Competitiveness can be considered from many perspectives. It can be examined at the firm, sectoral and national levels, or by looking at the inputs that create competitiveness and the outcomes that signal competitiveness.

This chapter examines competitiveness by focusing on economic outcomes at the national level — identifying a set of characteristics and associated indicators that would be expected to be seen in a competitive economy. Together, these indicators can be used to improve our understanding of Australia's current competitiveness.

Exploring concepts of competitiveness

While there are many different definitions of 'competitiveness', it is generally understood to be 'the capacity to compete with one's rivals'.[1] It is a broad concept that can be measured by many different indicators. The micro dimension of competitiveness considers competition among firms. In contrast, the macro dimension refers to competition among countries.

Porter[2] and Krugman[3] consider that businesses rather than nations compete, while others note that competition can mean the productivity growth of a nation, or the fate of firms or enterprises.

---

1 There are a range of differing competitiveness definitions available. Department of Industry, Innovation and Science (2014) *Australian Innovation System Report 2014*, European Commission, *European Competitiveness Report,* 2000–2002, Hawkins J (2006) The Concept of Competitiveness, The Treasury, *Treasury Working Paper 2006–02*; and President's Commission on Competitiveness, *The Report of the President's Commission on Competitiveness*, written for the Reagan administration, 1984.

2 Porter, M. 1990 *The competitive advantage of nations*. Free Press, New York

3 Krugman, P. 1998 *Strategic sectors and international competition in structural change, industrial location and competitiveness.* Elgar, Cheltenham

International competitiveness has traditionally been linked to comparative advantage. This is based on opportunity cost (i.e. the opportunity cost of one good in terms of another) with differences determined by endowments of labour, capital and land. So long as endowments differ, trade can lead to specialisation gains.

Competitiveness can therefore also be about value differentiation. For a country, this may be about capitalising on natural assets (e.g. mineral commodities) or advantages such as proximity to markets. For a firm, this can be about establishing a niche market distinct from their competitors.

It is also worth acknowledging that competitiveness is frequently associated with cost. At the firm level this can include the cost of wages, interest, transport, logistics and energy. Chapter 3 explores the impact of different types of cost reductions in more detail.

Implicit in this discussion is the fact that competitiveness is a relative concept. A firm wishes to be better than their competitors, a country to be more attractive than its neighbours. Competitiveness is dynamic, with the desire to improve, resulting in a continual raising of the bar. Maintaining prior performance is therefore insufficient, as competing tends to require continuous improvement.

Competitiveness can be examined at the firm, sectoral and national level — as shown in Figure 1.1.

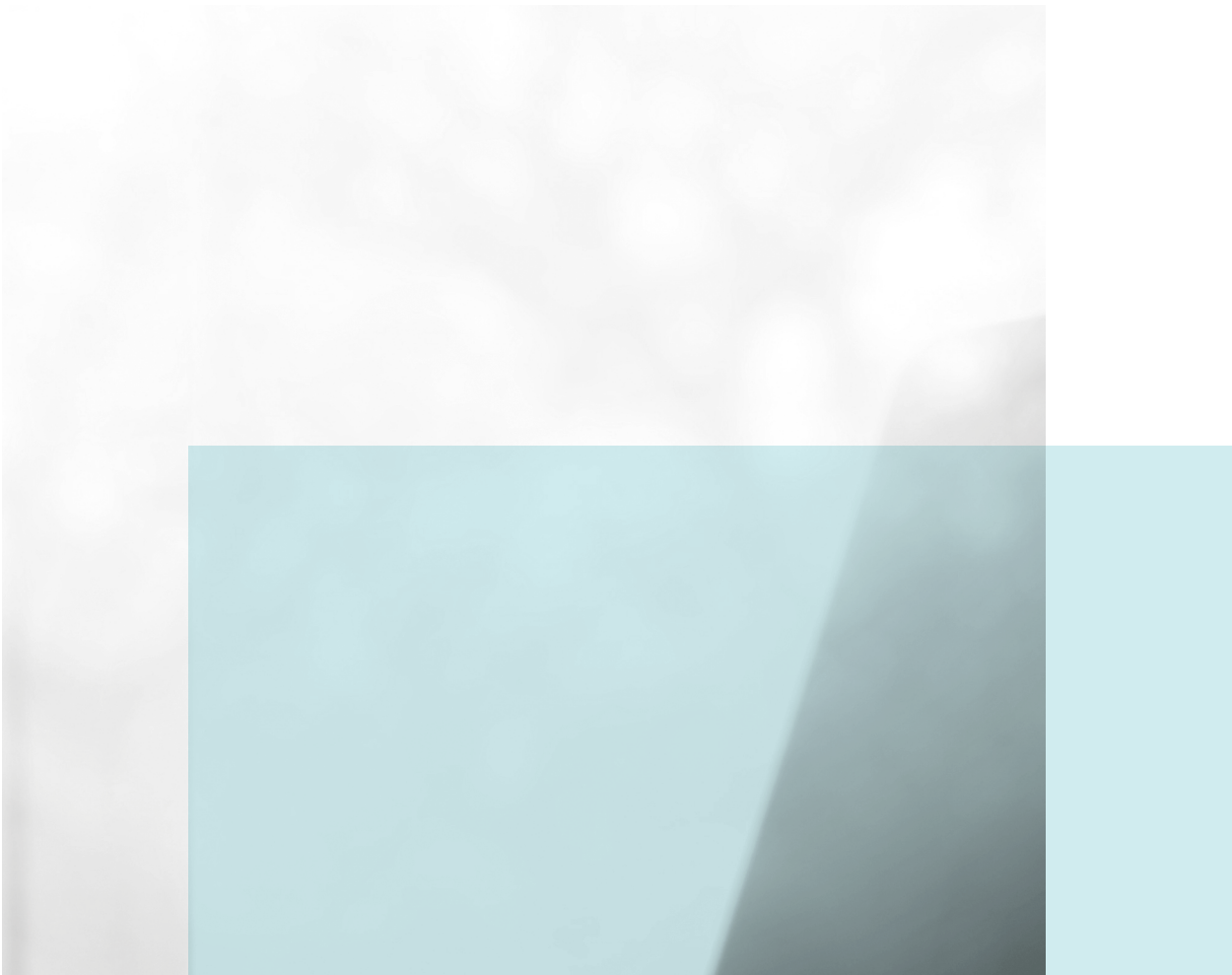
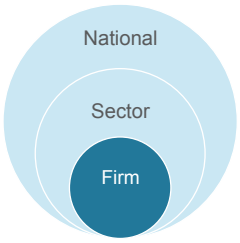


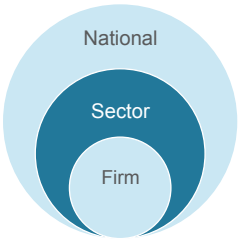
Figure 1.1: Competitiveness at the firm, sector and national level



Firm level

Competitiveness at the firm level is based on the capacity of firms to compete, grow and profit.

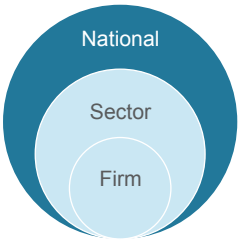
Firm-level competitiveness resides in the ability of firms to consistently and profitably produce products that meet the requirements of an open market in terms of price and quality. The more competitive a firm is relative to its rivals, the greater its ability to gain market share will be. Ultimately, any firm that remains uncompetitive — unless it receives support or protection — will go out of business.



Sector level

Competitiveness at the sector level is the ability of a sector in a country to compete successfully, without protection or subsidies, against competing sectors from other countries.

It is also the ability of the sectors in a country to be as efficient and effective as those in internationally leading countries for those sectors.



National level

Competitiveness at the national level is defined by the Organisation of Economic Co-operation and Development (OECD) as 'the degree to which, under open market conditions, a country can produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding domestic real income.'[1]

In this context, competitiveness is the capability of a country to achieve sustained economic growth by efficiently allocating available resources (e.g. human and natural resources, capital), alongside the appropriate structures, institutions and policies.

Source: (1) OECD (1992) *Programme on Technology and the Economy*, OECD, Paris, p. 237 and (2) Department of Industry, Innovation and Science (2016)

Measuring a country's competitiveness

The complexity and interdependence of an economic system means that any assessment of competitiveness needs to take into account a range of indicators.[4] No single indicator can capture every competitiveness dimension.

Composite indices

A number of organisations have produced composite measures that combine various metrics into a single index.

- The IMD *World Competitiveness Yearbook* looks at four main competitiveness factors and then breaks them down to a further five sub-factors. Altogether, it uses 342 competitiveness indicators, two-thirds from data and one-third from surveys.
- The WEF analyses 12 pillars of competitiveness to gather a total of 114 indicators, which are then combined using a weighted average formula.

Indices produced by the IMD and the WEF place Australia in the top 17th and 22nd of their respective samples for 2016, as set out in Table 1.1.

Table 1.1: Australia's performance in global competitiveness rankings

Indicator	*About*	*Australia's rank*
IMD *World Competitiveness Yearbook* (2016)	The indicator measures economic performance, government efficiency, business efficiency and infrastructure.	17th out of 61
WEF Global Competitiveness Index (2016–17)	The index examines institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication and innovation.	22nd out of 138

Notes: IMD ranking was out of 61 economies in 2016. WEF ranking was out of 138 economies in 2016–17.

Source: IMD (2016) *World Competitiveness Yearbook 2016* and WEF (2016) *The Global Competitiveness Report 2016–17*

While these indices present a general sense of how countries compare, they have a number of shortcomings. For instance, these indices:

- may use statistically unreliable sources, including small samples and opinion-based surveys
- have potential for double counting
- make their own assumptions about which indicators are included and how they are weighted.

The last point is particularly important. How factors combine to make an economy more or less competitive is a complicated story. For example, a high tax environment will detract from a country's competitiveness. But greater tax revenues can be used towards productivity-enhancing infrastructure and have the opposite effect. Likewise, increasing the average education level will have a significant positive effect on competitiveness initially.

[4] Marsh I and Tokarick S (1994) *Competitiveness Indicators: A Theoretical and Empirical Assessment, IMF Working Paper No. 94/29*, March, p. iii

But as the average increases, the effect is likely to diminish. The selection of indicators should therefore aim to be:

- meaningful — broadly accessible and measuring what they claim
- understandable — clear and unambiguous
- comparable — this is particularly important when comparing across countries
- accurate — collected in a manner which engenders confidence in the results
- transparent — able to be replicated.

Distinguishing between competitive inputs and outcomes

It is clear that the potential number of competitiveness measures is large. To consider which indicators are most important, it is helpful to be able to distinguish between the inputs to competitiveness, and the outcomes that they produce.

Inputs help to achieve overall competitiveness, and describe the components that contribute to overall performance. They can include things such as skills, the provision of infrastructure, regulatory and tax settings, trade barriers etc. Inputs may also be used as a proxy for outcomes when these are not readily observable.

In contrast, outcomes provide a true indication of competitiveness. They reveal the results or success of inputs. For this reason, they are typically more challenging to measure. For example, health outcomes might be focused on living to a certain age or with a certain quality of life, while inputs may be focused on the type and quality of medical care received.

A focus on outcomes for competitiveness also means it is possible to assess relative performance without needing to understand how it is produced. For example, there may be a number of reasons (inputs) that explain why Australian firms are competitive in foreign markets. But the fact that firms can (and do) export is the best way to demonstrate that they are competitive.

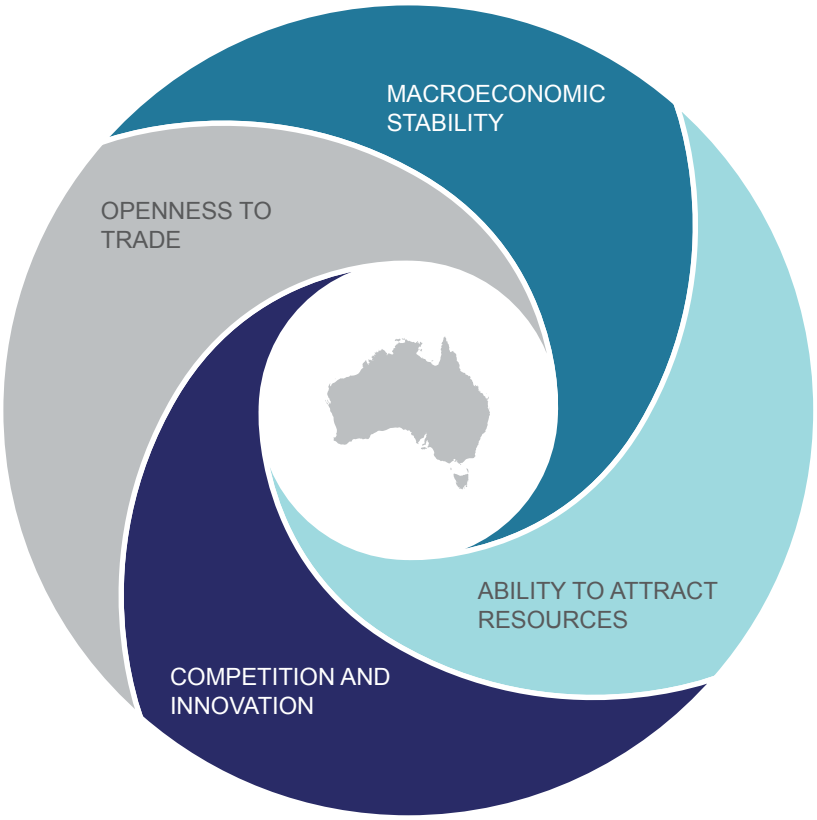
Outcomes typically associated with competitive countries are set out in Figure 1.2, and include:

- economic growth and a stable macroeconomic environment
- the ability to attract resources, such as skilled labour and investment
- high levels of innovation and competition
- well-functioning, competitive and open markets.

Where there is an improvement in any of these outcomes, it is generally a sign that competitiveness has also improved.

The next section examines how each of these outcomes can be measured, and assesses Australia's relative performance.

Figure 1.2: Outcomes typically associated with competitive countries



Source: Department of Industry, Innovation and Science (2016)

Competitiveness indicators

This section summarises the key outcome indicators associated with competitiveness.

Consistent with the idea of competitiveness as a relative concept, the selection of comparable countries is important. This chapter compares Australia's performance with the United States, Canada, the United Kingdom, New Zealand, Germany and Japan. In terms of the level of economic development, these countries are more or less similar to Australia. On occasion it has also been useful to compare Australia with the OECD average or euro area group of 19 countries.

Australia's relative performance is reported in Table 1.2.

Table 1.2: Australia and international comparison — indicators of competitiveness

		Indicators	*Australia*	*International comparison*
Characteristics of a competitive economy	Macroeconomic stability	GDP growth	2.5 per cent in 2015	2.2 per cent in 2015
		Multifactor productivity growth	–1.3 per cent (average annual change over five years) 2009–2014	0.5 per cent (average annual change over five years) 2009–2014 for the United States
		Unemployment rate	6.1 per cent in 2015	6.8 per cent in 2015
	Ability to attract resources	Private business investment	27.2 per cent (gross capital formation as a percentage of GDP) in 2014	20.7 per cent (gross capital formation as a percentage of GDP) in 2014
		Foreign direct investment	2.7 per cent (inward flow of foreign direct investment as a percentage of GDP) in 2014	1.2 per cent (inward flow of foreign direct investment as a percentage of GDP) in 2014
		Labour productivity growth	1.4 per cent (average annual change over five years) 2010–2015	0.5 per cent (average annual change over five years) 2010–2015 for the United States
		Skilled migration	128,550 visas granted to permanent migrants under the skills stream of Australia's migration programme in 2015–16	Similar metric unavalibale
	Competition and innovation	Businesses engaging in innovation	62.2 per cent of small and medium-sized enterprises in 2011	48.7 per cent of small and medium-sized enterprises in 2011
			77.9 per cent of large enterprises in 2011	75.3 per cent of large enterprises in 2011
		Businesses collaborating on innovation	24.0 per cent of small and medium-sized enterprises in 2009	31.7 per cent of small and medium-sized enterprises in 2009
			33.1 per cent of large enterprises in 2009	55.5 per cent of large enterprises in 2009
	Openness to trade	Merchandise and services exports	1.1 per cent of global merchandise exports in 2015	9.1 per cent of global merchandise exports in 2015 for the United States
			1.0 per cent of services exports in 2015	15.2 per cent of services exports in 2015 for the United States
		Terms of trade	10.3 per cent decline from 2013 to 2014	0.1 per cent increase from 2013 to 2014

Notes: All international comparison indicators use the OECD average, except for multifactor productivity, labour productivity, and merchandise and services exports which are for the United States.

Source: Department of Immigration and Border Protection (2016) *Report on Migration Programme 2015–16*; OECD (2016) *Economic Outlook*, Economic Outlook Annex Tables, Annex Table 18, Labour productivity; OECD (2016) *OECD Statistics*, Gross Domestic Product, Harmonised Unemployment Rate, Terms of trade; OECD, *Science, Technology and Industry Scoreboard*, 2015; The Conference Board *Total Economy Database*™ (September 2015) Growth Accounting and Total Factor Productivity, 1990–2014; The World Bank, *World DataBank,* World Development Indicators, Gross capital formation (% of GDP), Merchandise exports and Service exports; and United Nations Conference on Trade and Development, *UNCTADstat database*, Foreign direct investment: Inward and outward flows and stock, annual, 1970–2015, Percentage of Gross Domestic Product

Macroeconomic stability

All other things equal, a more competitive economy has higher economic growth and a lower unemployment rate.

Stability across these measures supports a better allocation of resources. Stability helps individuals and firms plan for the long term, which improves the quality and quantity of investment in the economy. Stability also assists in keeping price inflation within a target range, and improving the efficiency of the price mechanism in allocating resources.

The quality and sophistication of the financial system also plays an important role in achieving this stability. A well-developed financial system ensures stable flows of funds from savers to borrowers.

Ways to measure macroeconomic stability include:

- GDP growth
- multifactor productivity
- unemployment rate.

GDP growth

Gross Domestic Product (GDP) is one of the primary indicators used to gauge the health of a country's economy. GDP growth is important because it gives information about the size of the economy. The growth rate of real GDP is often used as an indicator of the general health of the economy. Stable GDP growth provides confidence for citizens, and assists in achieving good fiscal decision making by government.

Australia's GDP growth compares well internationally, and has strengthened in recent years.[5] In 2015, Australia's GDP grew by 2.5 per cent — slightly lower than its five-year average growth rate of 2.7 per cent. Australia's growth rate continues to be higher than the average growth rates for the OECD and euro area, but 2015 saw notable strong performance from New Zealand and the United States, recording 3.4 per cent and 2.6 per cent respectively.

Multifactor productivity

Multifactor productivity measures the growth in economic output above that directly attributable to growth in measured capital and labour inputs. As such, it captures the influence of improvements in production-related factors such as skills, technology and management practices. Multifactor productivity is the measure that comes closest to the underlying concept of productivity.

There has been a slowing of multifactor productivity growth across most advanced economies in recent decades. Australia's multifactor productivity growth has fallen below the rates of most OECD countries over the past ten years (see Figure 1.3) and recorded the weakest multifactor productivity growth of the comparator countries from 2009 to 2014.[6] The decline in Australia's multifactor productivity reflects high capital investment that has not yet been matched by the rate of growth in actual output, particularly in the Mining industry.

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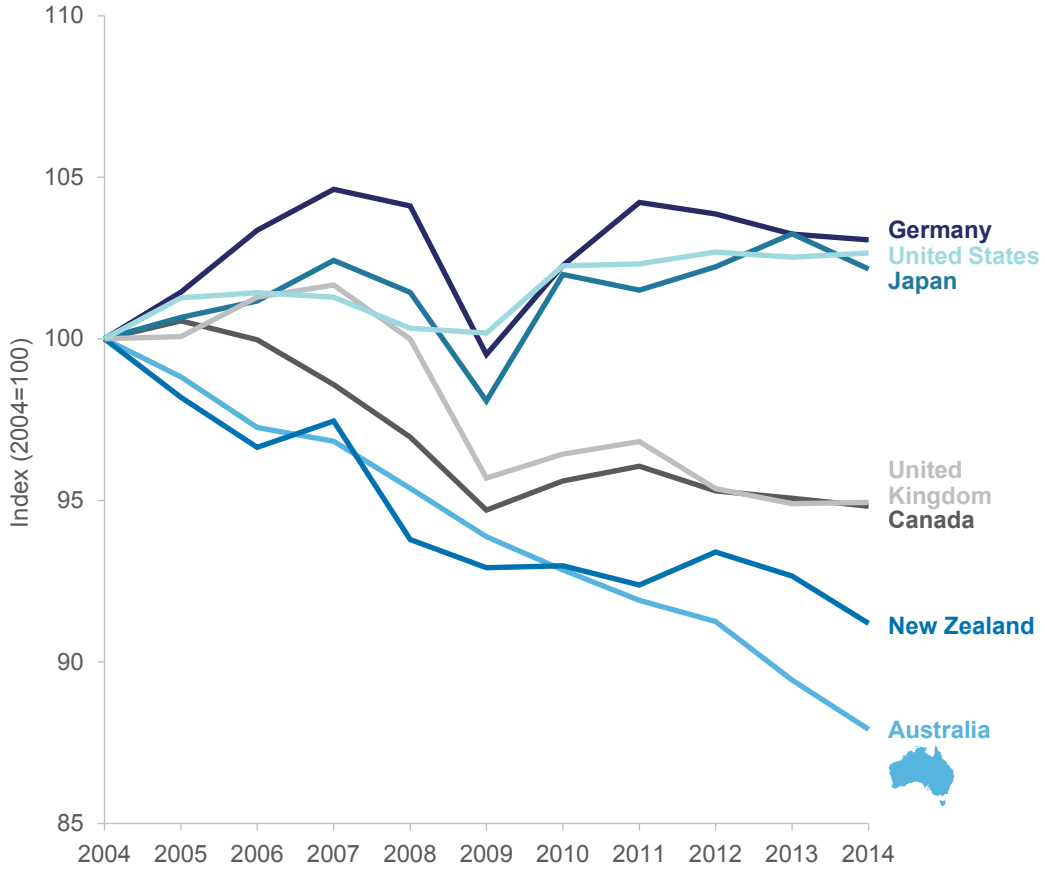
[5] GDP data sourced from OECD (2016) *OECD Statistics*, Annual National Accounts, Main Aggregates, Gross Domestic Product, constant prices, constant PPPs, reference year 2010, USD millions

[6] Multifactor productivity data sourced from The Conference Board *Total Economy Database*™ (September 2015), Growth Accounting and Total Factor Productivity, 1990–2014

Figure 1.3: International comparison, growth in multifactor productivity, 2004–2014



Source: The Conference Board Total Economy Database™ (September 2015), *Growth Accounting and Total Factor Productivity*, 1990–2014 and Department of Industry, Innovation and Science (2016) calculations

Unemployment rate

The performance of the labour market plays an important role in competitiveness and stability. A well-functioning labour market enables the allocation of workers to their most efficient use at a minimum social and economic cost. Low unemployment rates indicate that an economy is capable of generating new job opportunities.

Australia's unemployment rate has stabilised in recent years after several years of gradual increases.[7] In 2015, Australia's unemployment rate was 6.1 per cent — slightly higher than its five-year average. Solid outcomes in employment appear to reflect a combination of wage restraint (which has reduced potential job losses) and growth in labour-intensive industries.

Australia's unemployment rate continues to be lower than the unemployment rate in Canada and the euro area. Japan continues to hold the lowest unemployment rate of the comparator countries at 3.4 per cent, followed by Germany at 4.6 per cent. In the past year, notable strong improvement has come from the United States and the United Kingdom, with the unemployment rate in both countries falling by nearly 1 per cent to 5.3 per cent.

Ability to attract resources

A strong indicator that a country is competitive is its ability to attract resources, such as investment and skilled migration.

The overall investment climate depends on a number of factors such as the availability of finance, macroeconomic stability and the existence of sufficiently skilled workers. The

[7] Unemployment rate data sourced from OECD (2016) *OECD Statistics*, General Statistics, Key Short-Term Economic Indicators: Harmonised Unemployment Rate: all persons, seasonally adjusted

level of investment in information and communication technology has become increasingly important as a facilitator of improved technology and organisational or process change. The level of foreign investment is also important, as it helps to open up markets to new entrants and creates direct, stable and long-lasting links between economies.

Ways to measure the ability of a country to attract resources include:

- private business investment growth
- foreign direct investment
- labour productivity
- skilled migration.

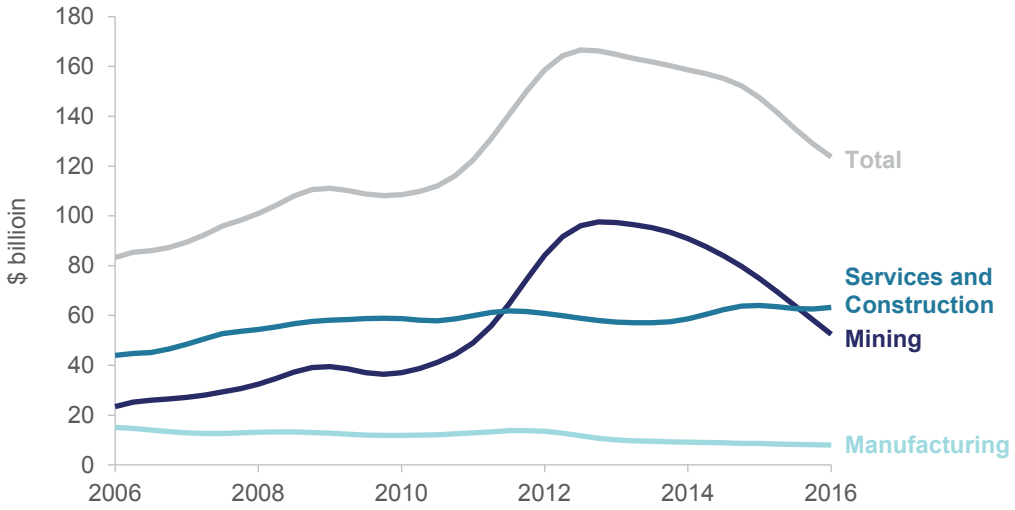
Private business investment growth

Investment is one of the most important determinants of long-run economic growth. Growth levels in business investment are associated with future business activity and patterns of economic growth.

Australia's business investment growth, measured by private gross fixed capital formation, has been negative since the December quarter of 2012.[8] Australia's business investment fell by 10.5 per cent from June 2015 to June 2016, and goes some way to explaining current subdued business conditions.[9] The recent fall in business investment is attributed to the winding back of mining investment, with other sectors and industries yet to make up the shortfall (see Figure 1.4).[10] This is inevitable, given that mining investment reached record-high levels.

Despite recent declines in Australia's business investment, Australia's gross capital formation as a percentage of GDP continues to be higher than all comparator countries.[11] In 2014, Australia's gross capital formation as a percentage of GDP was 27.2 per cent, followed by Canada at 24.2 per cent and New Zealand at 22.6 per cent.[12]

Figure 1.4: Australia, private capital expenditure by industry, June quarter 2006 to June quarter 2016



Notes: Year ended quarterly estimates, trend data, chain volume measures. Capital expenditure for Agriculture, Forestry & Fishing; Public Administration & Safety; Education & Training; Health Care & Social Assistance; and Superannuation Funds are not captured by this Australian ABS survey.

Source: ABS cat. no. 5625.0, table 3b

[8] ABS cat. no. 5206.0, table 2
[9] Ibid
[10] ABS cat. no. 5625.0, table 3b
[11] The World Bank (2016), *World DataBank*, World Development Indicators, Gross capital formation (% of GDP). Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.
[12] Ibid

Foreign direct investment

Foreign direct investment is an important form of capital movement. It is highly elastic, and responsive to the competitive environment in the target country. Foreign investment provides an additional source of funding when there is insufficient capital available domestically, and can be an important vehicle for economic development. Empirical evidence shows that inward investment boosts productivity, and outward investment complements exports and technology transfer.[13]

Growth in foreign direct investment has been significant for the past 10 years, and indicates that Australia is an attractive investment destination. The flow of foreign direct investment to Australia was $49 billion in 2015, which contributed to a year-ended stock of foreign direct investment of $735 billion.[14] The stock increased from 27 per cent of GDP in 2005 to 45 per cent of GDP in 2015.[15]

Internationally, foreign direct investment stocks were affected by the GFC, with most comparator countries experiencing a decline in 2008.[16] However, between 2010 and 2014, the United States experienced the largest increase in its foreign direct investment stock, increasing by 58.1 per cent.[17] This was followed by the United Kingdom at 51.9 per cent and New Zealand at 25.6 per cent.[18] Over the same period, New Zealand had the strongest inward flow of foreign direct investment, increasing by 230.5 per cent, followed by Canada which increased by 89.7 per cent.[19] In 2014, Canada had the highest inward flow of foreign direct investment as a percentage of GDP at 3.3 per cent, followed by Australia at 2.7 per cent and the United Kingdom at 1.8 per cent.[20]

Labour productivity

Labour productivity is the ratio of output to labour inputs (hours worked) used in the production process. An economy's labour productivity can be improved by adopting new practices, products and processes that add extra output or enable existing output to be produced with fewer inputs.

Labour productivity growth depends on investment in physical capital, technological advancement, and improvements in knowledge intensity and skills.

Australia's labour productivity growth exceeds most OECD countries.[21] Australia's labour productivity grew at an average annual rate of 1.4 per cent from 2010 to 2015. Australia recorded the strongest labour productivity growth of the comparator countries from 2010 to 2015, followed by Canada at 1.0 per cent and the United Kingdom at 0.8 per cent.

Skilled migration

Skilled migration boosts innovation, productivity and national income. Skilled migration allows a business to recruit the skills they need that may not be available locally. A country that can attract skilled workers adds to the stock of human capital, increases its knowledge and improves an economy's labour productivity.

Skilled migration continues to be a major component of Australia's labour market growth. In 2015–16, 128,550 visas were granted to permanent migrants under the skills stream of

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13 Caves R (2007) *Multinational Enterprise and Economic Analysis*, 3rd ed, Cambridge University Press, Cambridge.
14 ABS, cat. no. 5206.0, table 1 and ABS cat. no. 5352.0, table 1
15 Ibid
16 United Nations Conference on Trade and Development, *UNCTADstat database*, Foreign direct investment: Inward and outward flows and stock, annual, 1980–2014, US Dollars at current prices and current exchange rates in millions
17 Ibid
18 Ibid
19 Ibid
20 United Nations Conference on Trade and Development, *UNCTADstat database*, Foreign direct investment: Inward and outward flows and stock, annual, 1970–2015, Percentage of Gross Domestic Product
21 Labour productivity data sourced from OECD (2016) *Economic Outlook*, Economic Outlook Annex Tables, Annex Table 18, Labour productivity; and Department of Industry, Innovation and Science (2016) calculations.

Australia's migration programme.[22] According to the latest information from the *Continuous Survey of Australian Migrants*, the employment outcomes for these migrants were strong. Labour force participation for such migrants over the survey period was 95.6 per cent — much higher than the national rate of 64.8 per cent.[23]

Net overseas migration has exceeded the net natural increase in the population (i.e. births minus deaths) over the past decade. During this period, strong growth in skilled migration has been a key contributor to the overall rise in net overseas migration.[24] In 2014, Australia had the second fastest population growth rate in the OECD at 1.6 per cent, followed by New Zealand at 1.5 per cent.[25]

Competition and innovation

Competition enhances the efficient allocation of resources in the economy. It acts as a disciplining device, putting pressure on firms to become more efficient and driving them to innovate. It also benefits consumers by keeping prices low.

Healthy competition is supported by well-functioning regulation. Governments set the rules around market operation to address market failures, ensure markets operate with minimal barriers to entry, and restrict the misuse of market power. Effective monitoring and enforcement of competition rules form an integral part of competition policy. Despite its importance, indicators of the level of competition, or adequacy of competition regulation, are difficult to identify.

Competition also drives innovation, which plays a key role in improving productivity. Innovation generates new products, and provides new ways of producing them more efficiently, leading to productivity improvements. Although commonly linked with new technologies, innovation also encompasses applying new or better organisational structures and business processes.

There is strong empirical evidence that innovation benefits the economy and the competitiveness of Australian business.[26]

Ways to measure innovation include:

- businesses engaging in innovation
- businesses collaborating on innovation.

Businesses engaging in innovation

Businesses engaging in innovation tend to be more competitive, more capable of capturing increased market share, and more likely to increase employment than their competitors.

In 2011, the proportion of Australian small and medium-sized enterprises engaging in innovative activity (62.2 per cent) was higher than for the same cohort across the OECD, which averaged 48.7 per cent.[27] Australia ranked in the top five OECD countries in terms of innovative activity for small and medium-sized enterprise in 2011.

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[22] Department of Immigration and Border Protection (2016) *Report on Migration Programme 2015–16* p. 3
[23] Department of Immigration and Border Protection (2014) *Australia's Migration Trends* 2013–14, Canberra, p. 116
[24] Department of Immigration and Border Protection (2014) *Australia's Migration Trends* 2013–14, Canberra p. 23
[25] OECD (2016) *OECD Statistics*, Labour, Labour Force Statistics, Annual Labour Force Statistics, ALFS Summary tables, Population growth rate.
[26] Department of Industry, Innovation and Science (2014) *Australian Innovation System Report 2014,* Canberra, p. 1
[27] Businesses engaging in innovation data sourced from OECD, *Science, Technology and Industry Scoreboard*, 2015

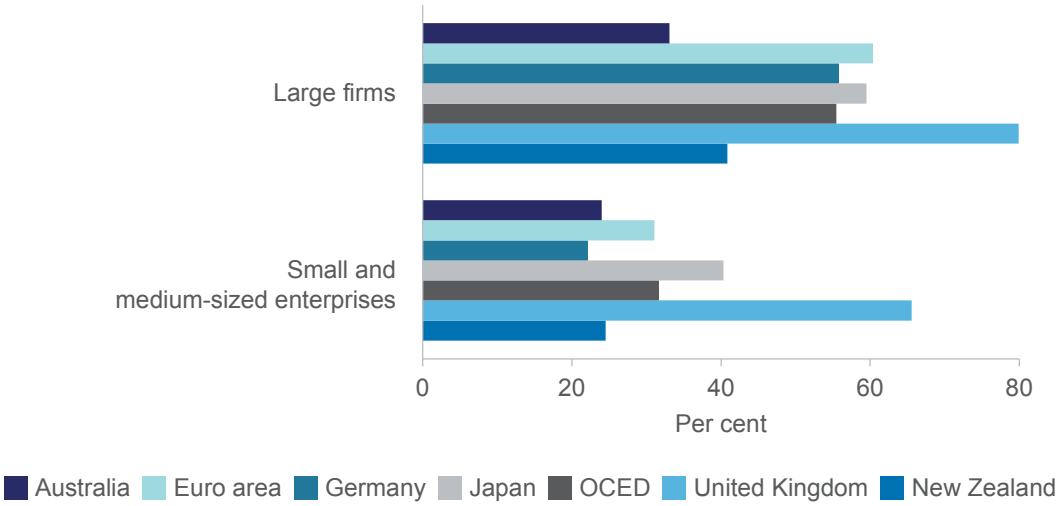
Australian large enterprises tend to engage more in innovative activity than smaller enterprises, but do not perform as well when compared with the top five OECD countries in 2011. Of the comparator countries, Germany had the highest proportion of large enterprises engaging in innovative activity at 92.2 per cent, while the United Kingdom had the lowest proportion at 56.2 per cent. Australian large enterprises are innovative by OECD standards, with 77.9 per cent of Australia's large enterprises engaging in innovative activity compared with the OECD average of 75.3 per cent. Australia is good at incorporating new-to-business innovations, but is poor at introducing new-to-market innovations.

Businesses collaborating on innovation

Businesses that collaborate on innovation are significantly more likely to report productivity and profitability growth and introduce more novel innovations, especially if this collaboration is with research organisations.

In 2009, the proportion of Australian small and medium-sized businesses collaborating on innovation was relatively low at 24.0 per cent, compared with the United Kingdom at 65.6 per cent and Japan at 40.3 per cent (see Figure 1.5).[28] Australian large firms have performed better than their smaller peers on collaborating on innovation — 33.1 per cent compared to 24.0 per cent in 2009. Internationally, the United Kingdom and Japan have the highest proportion of large firms collaborating on innovation, at 79.9 per cent and 59.5 per cent respectively.

Figure 1.5: International comparison, percentage of innovation-active firms collaborating on innovation, 2009

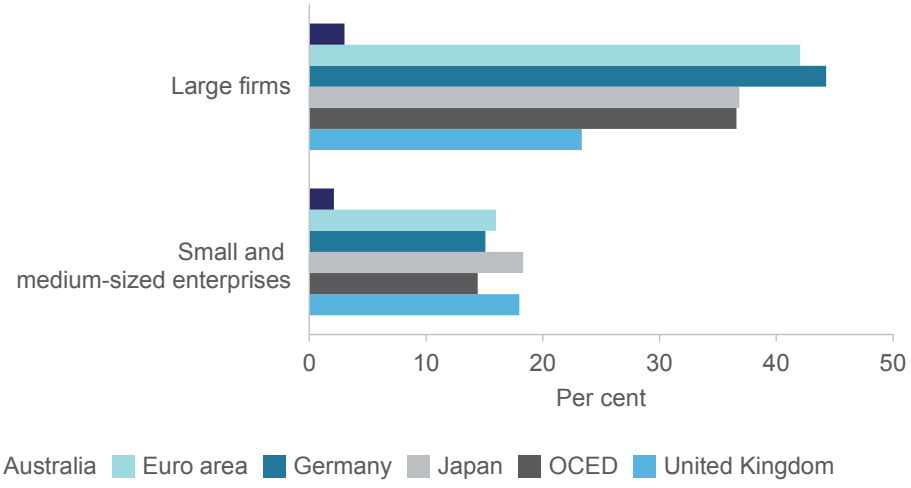


Source: OECD, *Science, Technology and Industry Scoreboard,* 2015

The degree of collaboration between Australian businesses and universities and other non-commercial research institutions was among the lowest in the OECD in 2011. As Figure 1.6 shows, Australia is well behind our comparator countries for university-to-business collaboration. The gap is particularly apparent between Australia's large firms and our international comparators.

[28] Businesses collaborating on innovation data sourced from OECD, *Science, Technology and Industry Scoreboard*, 2015

Figure 1.6: International comparison, percentage of innovation-active firms collaborating with universities and other non-commercial research institutions, 2011



Notes: Data not available for New Zealand.

Source: OECD, *Science, Technology and Industry Scoreboard*, 2015

Openness to trade

International competition is particularly effective for spurring efficiency and acting as a catalyst for innovation. Trade provides a competitive pressure to induce capital and labour to shift toward more efficient uses. Economies that are open to trade can specialise in producing what they do best. By opening up new markets, trade facilitates technology transfer, spreads best practice, and increases the potential return to new ideas.

Open economies typically build up substantial trade flows with other countries. The factors affecting trade share may be cyclical, and can include both currency and terms of trade movements. However, there is also a strong structural component that reflects underlying cost competitiveness and innovativeness. Chapter 5 contains more information on the relationship between exporting and firm performance.

Ways to measure a country's openness to trade include:

- merchandise and services exports
- terms of trade.

Merchandise and services exports

Exports provide a signal about global demand for a country's products, and indicate how well these products compete on international markets.

Australia's share of global exports has fallen in recent years, and is smaller than most OECD countries.[29] In 2015, Australia's share of global merchandise and service exports was 1.1 per cent and 1.0 per cent respectively. Australia's share of global exports remains higher than New Zealand, but lower than the United States, Germany and the United Kingdom. In 2015, the United States held the largest share of both global merchandise and services exports — 9.1 per cent and 15.2 per cent respectively.

Australia's share of global merchandise exports rose sharply between 2007 and 2011 (see Figure 1.7) as commodity prices spiked. Export performance over this period was underpinned by resource and energy exports, with other sectors performing moderately.

[29] Merchandise and services exports data sourced from The World Bank (2016), *World DataBank*, World Development Indicators, Merchandise exports (current US$) and Service exports (BoP, current US$)

Australia's share of global merchandise exports has been falling since 2011, as commodity prices retreat from their record highs.

Figure 1.7: Australia's share of global exports, 2005–2015

Source: The World Bank, *World DataBank*, World Development Indicators, Merchandise exports (current US$) and Service exports (BoP, current US$)

Terms of trade

The terms of trade is defined as the ratio of export prices to import prices. An increase in the terms of trade means that a country requires fewer exports to pay for a given volume of imports. This allows the reallocation of domestic factors of production from exports to domestic consumption or investment activities. The terms of trade has important macroeconomic implications through its influence on domestic purchasing power and per capita incomes. An improvement in the terms of trade tends to be associated with a higher standard of living.

Australia's terms of trade increased by 57 per cent from 2004 to 2011.[30] The rise was primarily driven by large increases in export prices for commodities such as iron ore and coal. Australia's terms of trade peaked in September 2011, and has since declined by 22 per cent between 2011 and 2014. This was the fastest decline of the comparator countries during this period, followed by Japan and Canada, while all remaining comparator countries recorded increased growth. Despite recent declines, Australia's terms of trade between 2004 and 2014 has still grown more than all comparator countries.

[30] Terms of trade data sourced from OECD (2016) *OECD Statistics*, National Accounts, National Accounts at a Glance, Expenditure, Terms of trade; and Department of Industry, Innovation and Science (2016) calculations.

How does Australia measure up?

Examining competitiveness from an outcomes perspective allows for an assessment of Australia's relative performance compared to our key comparator countries, and highlights where Australia's performance is declining or improving.

The competitiveness indicators identify a number of areas where Australia is performing well relative to other countries. Australia has a history of strong economic growth. Over the past five years, Australia recorded one of the fastest GDP growth rates among our comparator countries, increasing at an average annual rate of 2.7 per cent from 2010 to 2015, equal with the performance of New Zealand.

Australia's labour productivity growth has exceeded most OECD countries. Against our comparator countries, Australia recorded the strongest labour productivity growth from 2010 to 2015, increasing at an average annual rate of 1.4 per cent. This was followed by Canada at 1.0 per cent and the United Kingdom at 0.8 per cent.

But despite this strong performance, there are other areas where Australia lags behind.

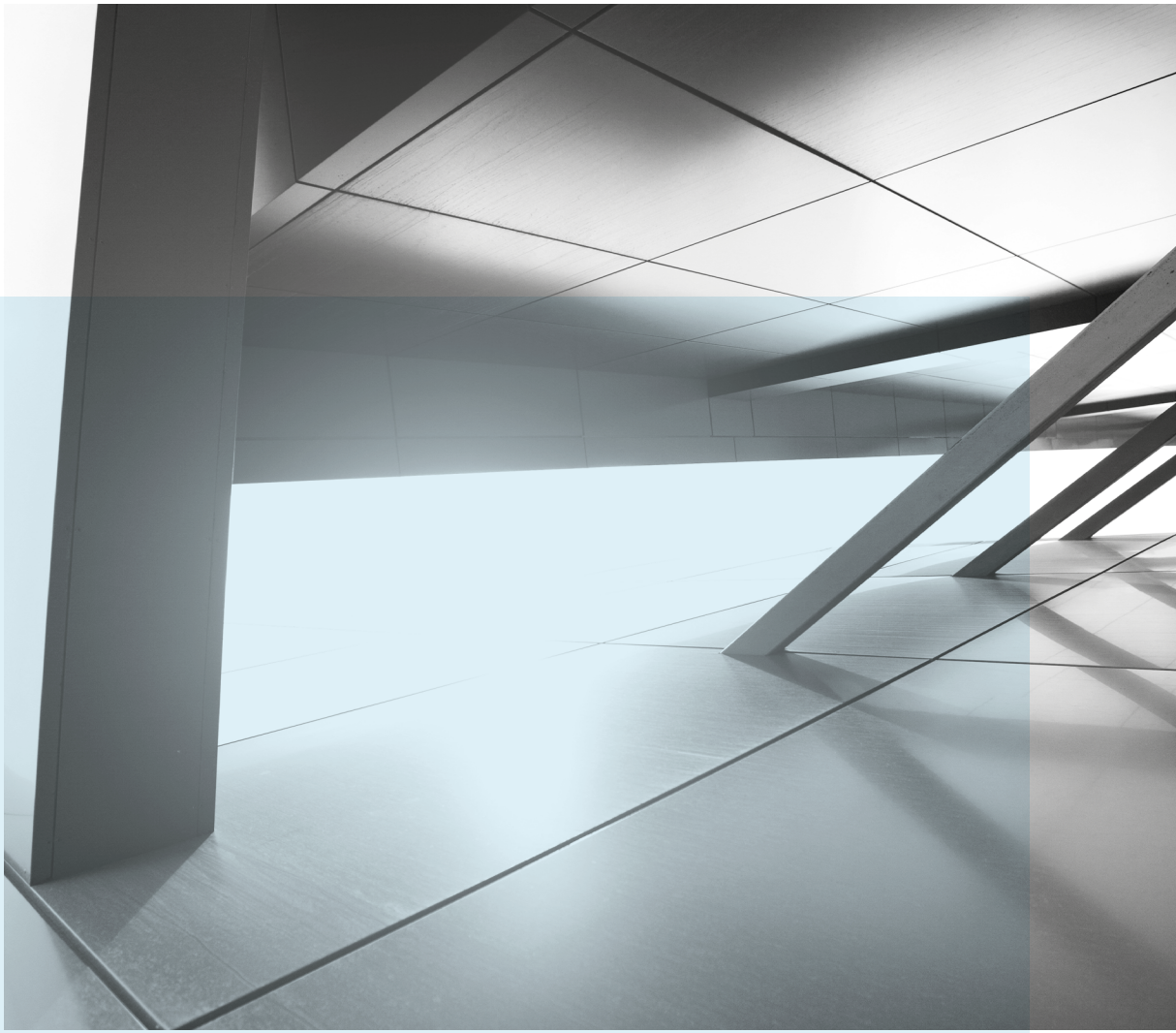
Australia's multifactor productivity growth has fallen below the rates of most OECD countries over the past ten years. While the mining boom increased Australia's output, it did so at the expense of productivity performance, caused by capital investment that was slow to come online. There are signs that Australia's multifactor productivity is improving as the mining sector moves into the production phase, but this is likely to take several years to manifest.

Business investment growth has been negative since the December quarter of 2012, and goes some way towards explaining Australia's current subdued business conditions. This trend is not unique to Australia, but Australia's fall has been particularly large due to the tapering of the mining investment boom.

Australia also faces challenges in innovation, particularly on business collaboration. Collaboration between businesses and universities and other non-commercial research institutions in Australia is one of the lowest in the OECD. Despite a recent focus on improving Australia's rates of collaboration, improvement has been slow, with Australia's comparators well in front.

The indicators identified in this chapter suggest our current competitiveness performance is mixed. The measures used to generate the IMD and WEF rankings are different to the outcome-focused indicators that appear in this chapter, and much more numerous. But the recent slip in these rankings does not appear to be inconsistent with this chapter's indicators.

Many of our comparators are much larger, with deeper pockets (albeit challenged by rising global debt levels) and stronger innovation and productivity performance. Australia will need to do more to keep up. By better understanding what drives our relative competitiveness, our policies can be clearly targeted at improving Australia's competitive economic performance. Subsequent chapters explore specific aspects of competitiveness in greater detail, and offer a wide range of policy insights and perspectives on improving Australia's competitiveness.



2 Economic conditions

Assessing Australian industry's economic performance over the past financial year, focusing on international, domestic and industry-specific developments.

International

Global growth forecast for 2016

3.1%

(IMF global growth forecast for 2016, down from 3.8%)

China's growth forecast for 2016

6.6%

(annual GDP growth, down from 6.9% in 2015)

Australia's growth in export values

–1.9%

(annual growth in export values, 2015–16)

Australia

GDP growth was strong in 2015–16, marking **25 years of continuous growth**

2.8%

(annual real GDP growth, 2015–16)

Business investment continues to decline

–16.2%

(growth from 2014–15 to 2015–16)

Low wages growth is occurring as disposable income growth falls

2.1%

(annual growth in the Wage Price Index as at June 2016, the lowest level since the late 1990s)

Unemployment rate is declining, but masks a rise in part-time and underemployment

Unemployment rate

5.6%

(as at September 2016)

Growth in:

Full-time	Part-time	Hours worked
1.3%	3.8%	–0.6%

(annual growth to quarter 3, 2016)

Industry

Services

Services continue to grow but with significant variation between sub-industries

Mining

Mining **volumes are strong despite price falls**, as the sector transitions into the production phase

Construction

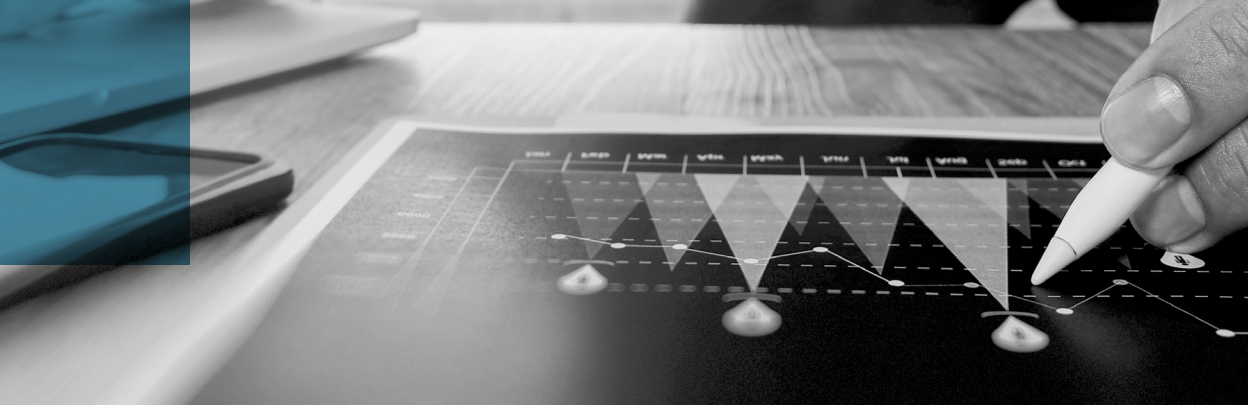
Construction growth is solid, despite decreased demand from Mining

Agricultural

Agricultural **output contracted** and the value of major **exports fell**

Manufacturing

Manufacturing **output and employment contracted**, but **export values increased**



In 2015–16, Australia recorded its 25th year of continuous economic growth. Given the uncertain economic and political situation around the world, this is a remarkable achievement. Australia is now only second to the Netherlands which has the longest record of economic growth, at 26 years.

This chapter reflects on both Australia's and the world's economic developments over the past year, as well as their impacts on Australian industry.

It starts with the impact of **international economic conditions** on the Australian economy. Advanced economies, such as the United States and Japan, are struggling to return to their pre-Global Financial Crisis (GFC) growth rates. China's economy continues to grow strongly, albeit below the double-digit highs of past years. The Brexit vote, which saw Britain vote to leave the European Union (EU), has added to global uncertainty, and highlights the growing unease around international trade. Together, these issues are affecting demand for three of our top exports — iron ore, coal and natural gas. They are also affecting domestic business confidence which, while improving, is still relatively weak in light of ongoing uncertainty.

The chapter then outlines how Australia's **domestic economy** fared in 2015–16. Australia's continuous economic growth and low unemployment rate indicate a strong economy. These positive achievements demonstrate that Australia is successfully transitioning away from the mining investment boom. However, beyond the headline figures, risks remain, including a continuation of poor business investment and confidence, a rise in part-time employment and underemployment, and slow wage growth.

The chapter concludes by examining **developments in Australian industry** in 2015–16. The Services sector continues to dominate the economy with the largest share of both economic output and employment. A divergence is emerging between growth in market and non-market services, with growth in the latter being stronger. Mining continues its transition from the investment to production phase, and export volumes are continuing to expand to record highs at the same time as commodity prices fall. Construction growth is up, driven by residential construction, and partially offsetting the Construction decline in the mining States of Western Australia and Queensland. Finally, both Manufacturing and Agriculture are showing mixed performances. Manufacturing continues to contract in terms of employment and output but is growing in export values while Agriculture is showing positive employment growth but a significant contraction of output and declines in export values.

International economic conditions

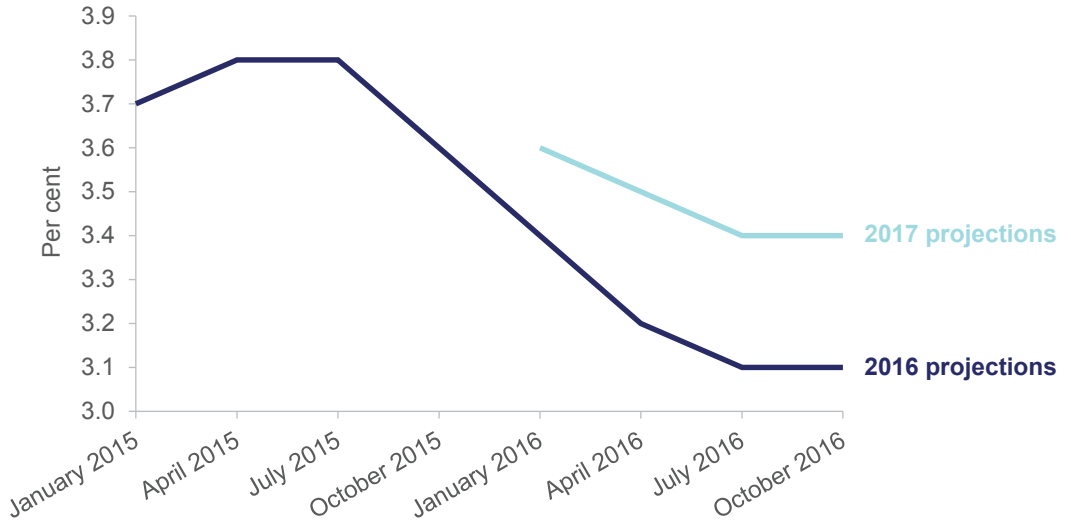
As a small, open economy, Australia benefits from foreign investment and trade. However, this openness means that changes in global economic sentiment and conditions can have a large impact on our economy. While positive sentiment can improve investment flows and trading opportunities, negative sentiment and conditions can lead to poor domestic consumption and business confidence, which in turn reduce investment and trade opportunities.

World economic growth prospects are currently pessimistic. Advanced economies have struggled to return to pre-GFC levels of growth. Growth in China, Australia's largest trading partner is below the double-digit highs of years past and the Brexit vote, which saw Britain vote to leave the European Union (EU) and election results around the world, have added to global uncertainty, and highlight the growing unease around international trade.

The outlook for global growth has been downgraded for 2016 and 2017

The International Monetary Fund's (IMF) global growth projections have been consistently downgraded since mid-2015. Figure 2.1 shows global growth projections for 2016 and 2017 by the dates these projections were made. In July 2015, global growth for the following year was projected at 3.8 per cent, but has since been downgraded to 3.1 per cent in July and October 2016. The IMF also downgraded its 2017 global growth projections from 3.6 per cent in January 2016 to 3.4 per cent in October 2016.

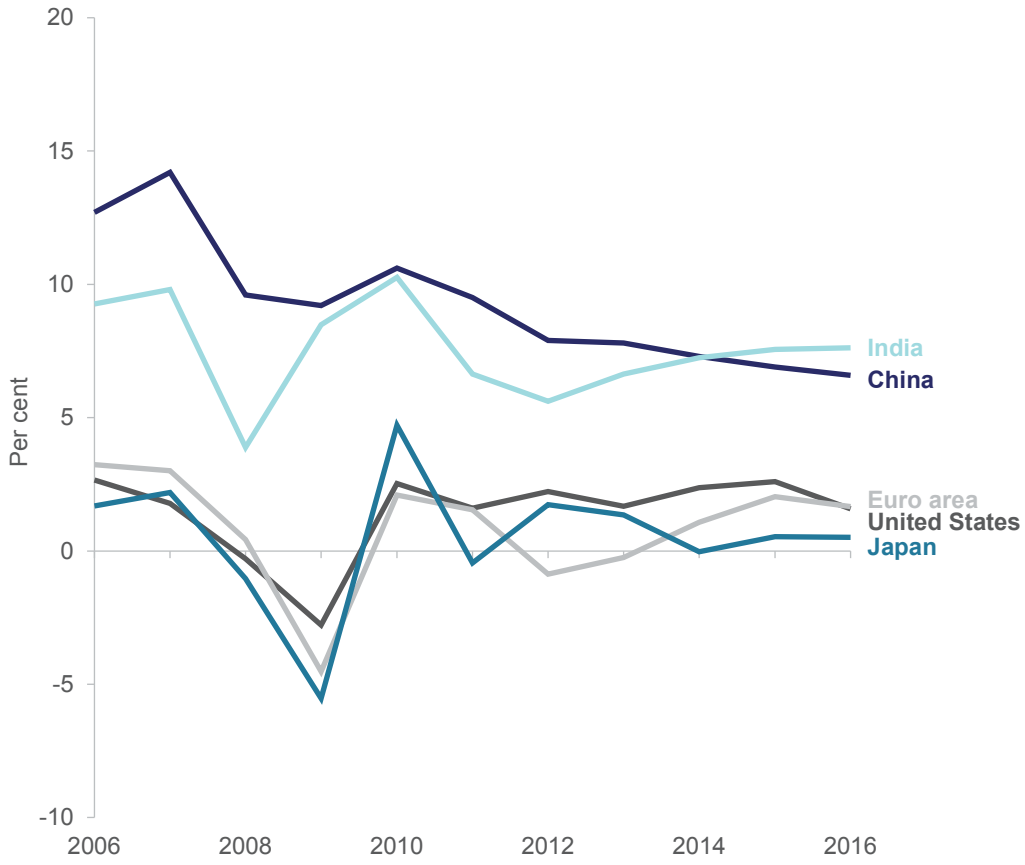
Figure 2.1: IMF global growth projections for 2016 and 2017, by quarter of estimate



Source: International Monetary Fund, *World Economic Outlook*, 2015 and 2016

The economic growth of Australia's major trading partners has been subdued. The forecast for China's growth in 2016 is 6.6 per cent, a decline from 6.9 per cent in 2015 (Figure 2.2). Growth in the euro area (EU countries that have adopted the euro as currency) is projected to contract from 2.0 per cent in 2015 to 1.7 per cent in 2016, and Japan's growth has been below 1.0 per cent since 2014. The United States is doing better, although its projected growth of 1.6 per cent for 2016 is more than a percentage point below its pre-GFC growth rate of 2.7 per cent in 2006.

Figure 2.2: Annual GDP growth in Australia's major trading partners, 2006 to 2016



Notes: Constant prices. 2016 data are forecasts.

Source: Thomson Reuters DataStream

China's economy is making the transition to consumption-led growth

A key reason for the global growth downgrades is the lower-than-expected growth in the Chinese economy, which has been experiencing a downward trend since 2007 (Figure 2.2). In 2007 China had an annual GDP growth rate as high as 14.2 per cent, which dropped to 7.9 per cent in 2008 and is now forecast at 6.6 per cent in 2016.

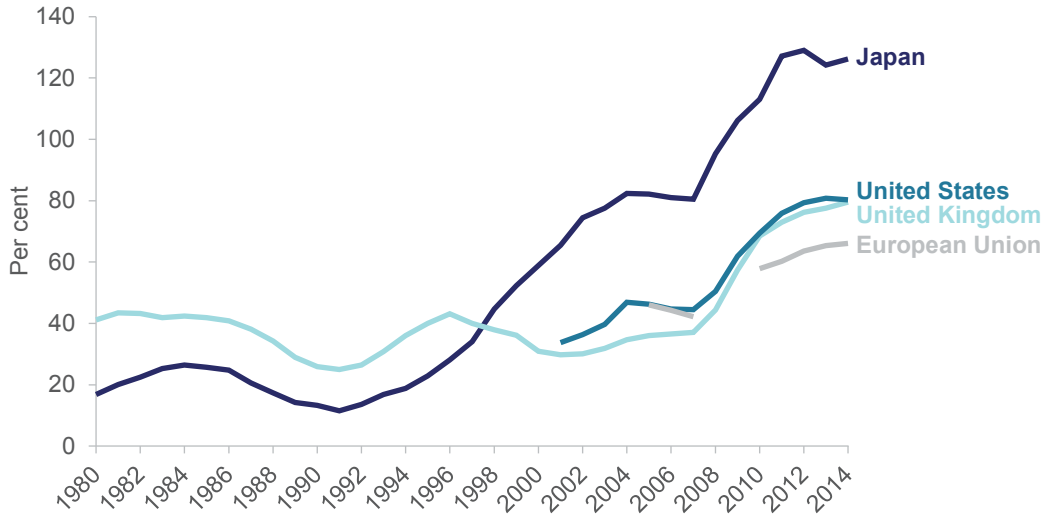
While China's recent growth rates are still strong, its transformation from investment-led growth to consumption-led growth is causing uncertainty amongst the international community. This is because the transformation has been hampered by a large state-owned sector that is slow to reform.

There are also concerns about China's housing market, one of the key drivers of China's economic growth. Strong demand for housing in major cities and excess housing stock in regional and rural cities has resulted in 'ghost cities' — fully constructed but empty office blocks and apartments. These developments are contributing to reduced demand for Australian iron ore and coal, which are key inputs for Chinese steel production, and in turn housing construction.

High debt levels and low cash rates are constraining growth in our key trading partners

Debt levels have reached historical highs since the GFC, and currently show no signs of falling back to pre-GFC levels (Figure 2.3). These high debt levels are constraining governments from using fiscal measures to stimulate their economies.

Figure 2.3: Net debt to GDP ratios, selected major trading partners, 1980 to 2014



Source: International Monetary Fund, *World Economic Outlook*, 2016

At the same time, constrained monetary policy options are preventing central banks from stimulating their economies. Normally the central bank cash rate is lowered to boost economic activity. But when the cash rate is already close to (or below) zero — as is the case in many countries — it leaves central banks with little power to stimulate the economy.

Japan, the United Kingdom, the United States and the euro area all currently have low or negative cash rates. The cash rate in the euro area is 0.0 per cent as at 31 October 2016, while Japan's became negative for the first time in its history. From February 2016, Japan's cash rate became –0.1 per cent. From August 2016, the United Kingdom's rate became 0.25 per cent, and the United States has been targeting a rate of 0.25–0.50 per cent since December 2015. Its cash rate at 31 October 2016 was 0.5 per cent.

Global trade appears to be slowing as anti-globalisation sentiment rises

The volume of world trade declined significantly in early 2009 following the GFC and has remained flat since then. According to the Netherlands Bureau for Economic Policy Analysis, world trade volume grew by just 0.3 per cent in the 12 months to August 2016.

Slow global growth is coinciding with a rise in anti-globalisation sentiment around the world. The IMF has linked rising discontent in developed countries to:

- workers' concerns about globalisation's impact on legacy industries such as manufacturing
- discontent over migrant worker flows
- frustration about accountability for the GFC
- multinational tax evasion.

This discontent culminated in a shock exit vote by Britons from the EU in June 2016, as well as the rise of anti-globalisation political parties around the world. This appears to have also influenced the results of the recent US presidential election.

The sentiment appears to be driving an increase in trade protectionist measures. The European Centre for Economic Policy Research has highlighted a rise in the gap between 'beneficial' and 'harmful' trade measures, where harmful trade measures include subsidies, tariffs, localisation requirements and industry assistance. Since 2010, the number of harmful trade measures implemented between January and April each year has typically averaged between 50–100. But between January and April 2016, the number of harmful measures increased to around 150. This meant that from 2015 to 2016 the gap between beneficial and harmful measures increased from approximately 65 to 90. While an increase in the number of government decisions is not directly correlated with the scale of protectionism, the rising gap between beneficial and harmful measures over this short period is significant.

Economic conditions have impacted the value of major Australian exports

The value of the Australian dollar appears to have reached a plateau in 2016, following its fall from the highs associated with the mining boom. Economic theory suggests this would tend to increase Australia's exports as they become cheaper to other countries. However, the lower global growth outlook, high debt levels and increased protectionist measures have softened demand, and likely contributed to a fall in the value of Australia's exports. Australia's export values declined from $318 billion in 2014–15 to $312 billion in 2015–16, a fall of 1.9 per cent. This was driven by a decline in the export values of three of Australia's top four exports — iron ore, coal and natural gas.

In 2015–16, the value of our top export — iron ore — fell 12.4 per cent to $47.7 billion, while the value of our second largest export — coal — fell 9.4 per cent to $34.3 billion. Values for our fourth largest export — natural gas — fell 2.1 per cent to $16.5 billion.

Despite the slowing Chinese economy, international education, which is Australia's third largest export, continued to grow. Annual growth in international education in 2015–16 was 9.4 per cent. Department of Education and Training data indicate that Chinese students were Australia's largest international student group in 2016 (at 28 per cent of enrolments to July 2016).

The domestic economy

Australia's strong real Gross Domestic Product (GDP) growth of 2.8 per cent in 2015–16, and low unemployment rate of 5.6 per cent (as at September 2016), place us in good stead for the future. However, other indicators and industry performance point to a more mixed economic picture, including:

- poor business investment and confidence
- slow wage growth
- a rise in part-time employment and underemployment (when an employee would prefer to work more hours but is unable to)
- the mixed performance of the Manufacturing and Agriculture industries.

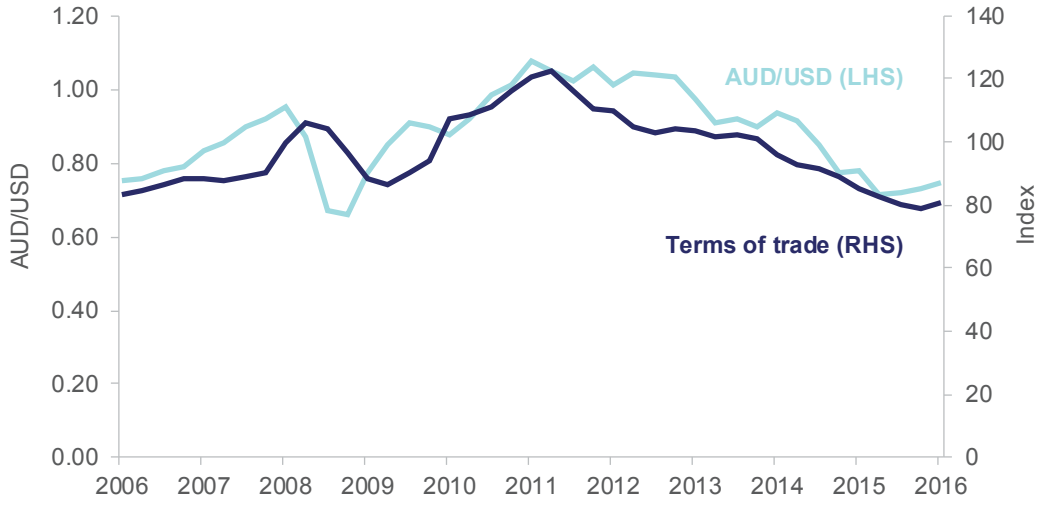
The economy continues to transition away from resources

Australia's recent economic strength has relied heavily on the resources boom, which is now transitioning into its production phase. Increased production means that in 2016 the resources sector produced record commodity volumes. Between 2012–13 and 2015–16, the volume of iron ore and concentrates produced was 66.3 per cent higher than between 2008–09 and 2011–12.

But the increase in commodity volumes and lower international demand have contributed to a reversing of the appreciation of the Australian dollar seen during the mining investment boom. From its peak of $1.08 USD (United States dollar) in June 2011, the Australian dollar fell to $0.71 USD in January 2016. Subsequent to this, the dollar has risen slightly to $0.76 in October 2016.

The fall in the exchange rate has been associated with declines in Australia's terms of trade (the ratio of export prices to import prices). This decline continued into 2016, with the terms of trade dipping to 80.5 in the June quarter of 2016 — the lowest level in more than a decade (Figure 2.4). However, as with the Australian dollar, the terms of trade appear to have reached a plateau in 2016.

Figure 2.4: Australia's exchange rate and terms of trade, June quarter 2006 to June quarter 2016



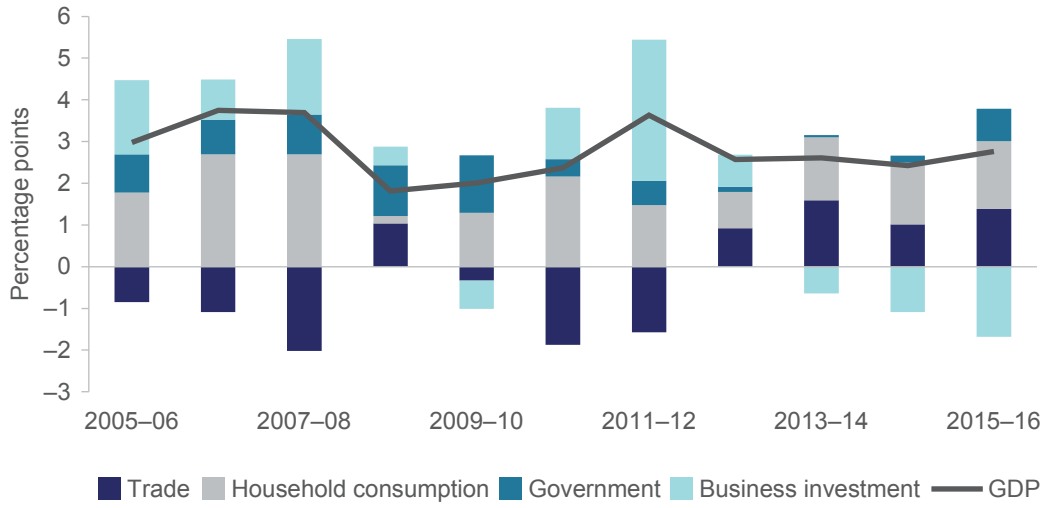
Notes: Terms of trade data is quarterly, seasonally adjusted data. Exchange rate data is an average of each quarter.

Source: ABS cat. no. 5206.0, table 01; RBA, historical daily exchange rates data

Falling levels of business investment continue to detract from GDP growth

GDP growth can be broken down into its constituent drivers: household consumption, government spending, business investment, and trade. Australia's real GDP growth of 2.8 per cent in 2015–16 was driven primarily by household consumption, closely followed by trade (Figure 2.5).

Figure 2.5: Contributions to annual GDP growth by key components, 2005–06 to 2015–16



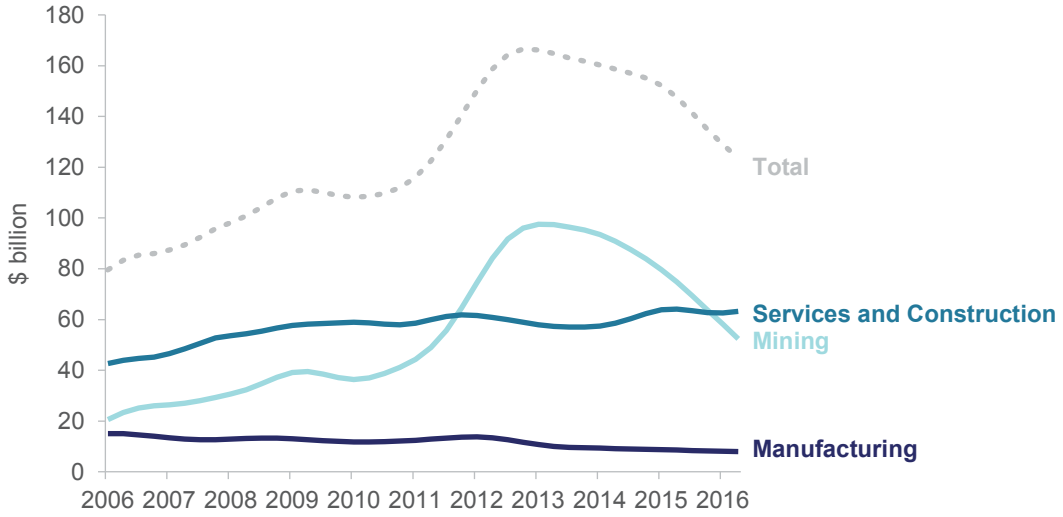
Notes: Original data, chain volume measures. 'Government' includes government consumption and government gross fixed capital formation. A GDP component below the horizontal axis indicates that the component experienced negative growth, bringing down (detracting from) GDP growth.
The figure excludes the following components of GDP growth: change in inventories, other private investment and statistical discrepancy. As such, the contributions by components in the figure do not add up total GDP growth.

Source: ABS cat. no. 5204.0, table 02

In 2015–16, household consumption and net exports contributed 1.6 and 1.4 percentage points to GDP growth respectively. Government expenditure also made a positive contribution of 0.8 percentage points to growth. In contrast, business investment detracted 1.7 percentage points from GDP growth.

This was caused by a continuation of falling business investment, particularly in Mining. In 2015–16, total business investment was $123.6 billion, a fall of 16.2 per cent from 2014–15 (Figure 2.6). Business investment in Mining was $52.4 billion in 2015–16, compared to $74.8 billion in 2014–15 — a fall of 29.9 per cent. In March 2016, investment in Mining fell below that for Services and Construction for the first time since December 2011. Non-Mining investment is not picking up at the same rate as the fall in Mining investment, despite two cuts to the Reserve Bank of Australia (RBA) cash rate to date in 2016. The outlook for future business investment and its impact on the domestic economy remains a concern.

Figure 2.6: Business investment by industry, June quarter 2006 to June quarter 2016



Notes: Data is real trend data. Levels are year-ended to the quarter.

Source: ABS cat. no. 5625.0, table 3b

Business conditions are improving, but confidence is lagging behind

The National Australia Bank (NAB) business conditions index is a composite index based on trading, profitability and employment conditions for the past month. In contrast, the confidence index measures the perception of future industry performance. This makes the conditions index a lagging (past-looking) indicator and the confidence index a leading (forward-looking) indicator.

Average business conditions improved in 2015–16 to be 9.9, a significant increase from 5.8 in 2014–15 (Figure 2.7).

Figure 2.7: NAB business conditions and confidence indices, 2005–06 to 2015–16

Notes: The NAB business conditions index is made up of trading conditions, employment conditions and profitability. Respondents are asked how the performance of each of these variables in their business has changed in the past month. The NAB business confidence index measures respondents' perceptions of their industry for the upcoming month. Positive numbers indicate optimists outweigh pessimists.

Source: Thomson Reuters DataStream

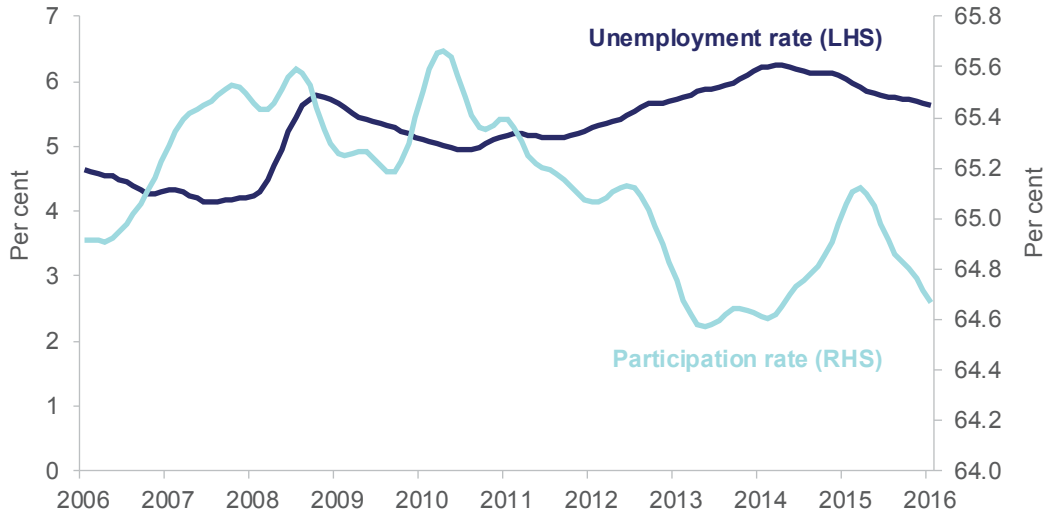
In contrast, average business confidence for 2015–16 was 4.4, a contraction of 12.7 per cent from 2014–15. This suggests that businesses are consistently predicting that they will perform worse (confidence) than they actually do (conditions).

One explanation is that businesses are working in an environment of uncertain global growth and domestic conditions, which is reducing their confidence. Improved business confidence will be a key factor in reversing the trend of falling business investment.

The unemployment rate is down, but masks rising part-time and underemployment

Australia's unemployment rate continued to fall in 2016, declining from highs of 6.3 per cent in January and July 2015 to 5.6 per cent in September 2016 (Figure 2.8). The participation rate has fallen since the latest peak of 65.1 per cent in late 2015 to be 64.5 per cent in September 2016.

Figure 2.8: Unemployment and participation rates, September 2006 to September 2016



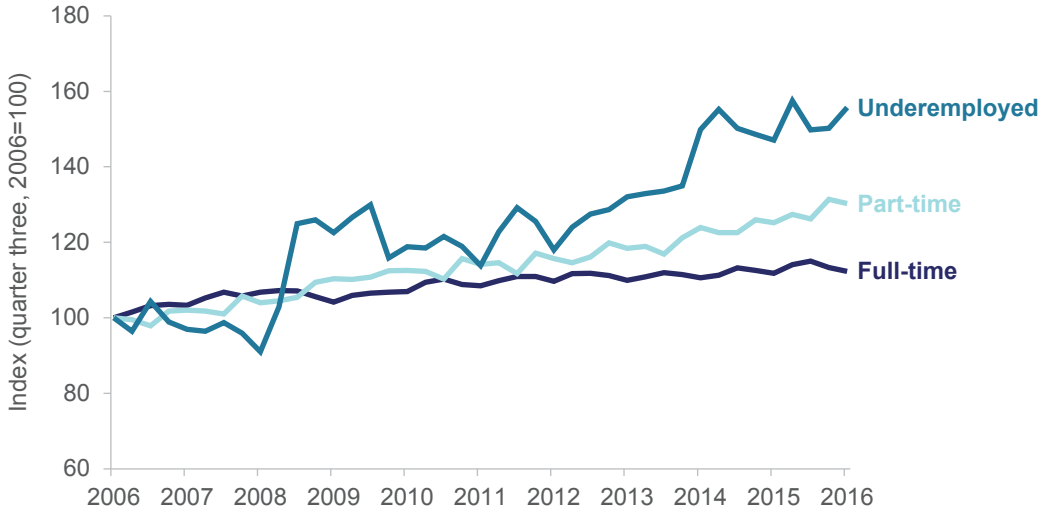
Notes: Trend data.

Source: ABS cat. no. 6202.0, table 12

But these high-level employment indicators are masking a changing trend in part-time and underemployment in the labour market. In the 12 months to the third quarter of 2016, employment growth was 2.1 per cent, while the average number of hours worked contracted by 0.6 per cent. This contraction in hours worked was likely a result of an increase in part-time employment. In the 12 months to the third quarter of 2016, growth in full-time employment was 1.3 per cent, compared to a much higher 3.8 per cent growth in part-time employment (Figure 2.9).

Underemployment also rose. Annual growth in the number of people who were underemployed averaged 2.0 per cent over the 12 months to the third quarter of 2016, considerably higher than the growth in full-time employment over the same period (Figure 2.9). According to the RBA, this rise in underemployment has resulted in excess capacity in the labour market, despite the seemingly positive unemployment picture.

Figure 2.9: Full-time, part-time and underemployed persons, August quarter 2006 to August quarter 2016



Notes: Original data.

Source: ABS cat. no. 6291.0.55.003, table 04, table 13 and table 19

Employment growth has also been unevenly distributed throughout the nation, with mining States experiencing a contraction in employment. Through-the-year employment growth in September 2016 for Queensland and Western Australia was –0.3 and –1.3 per cent respectively, compared to the national average of 1.4 per cent. In contrast, over the same period, the eastern States of New South Wales and Victoria experienced employment growth of 1.8 and 3.6 per cent respectively — higher than the national average. The transition of mining away from its investment phase (mainly based in Queensland and Western Australia) and increased output in services (mainly in New South Wales and Victoria) are the likely reasons for these patterns. Differences in regional performance across Australia are further discussed in Chapter 7 of this report.

Low wage growth is occurring as disposable income growth falls

In 2016, wage growth was the lowest in the history of the Wage Price Index series (which measures the change in wages from a fixed 'basket' of representative jobs). Through-the-year annual growth in the index for June 2016 was 2.1 per cent, the lowest level since the late 1990s.

In addition, data from the RBA, in association with the ABS, suggest that both the frequency and the size of wage increases have been falling in the past 10 years. For example, the share of jobs in the past year that had a 10 per cent increase in salary was less than 10 per cent, compared to 40 per cent six years ago. The falling terms of trade and low business confidence explain the weak wage growth.

Mirroring this trend, real net national disposable income (RNNDI) per capita continued to fall in 2016. RNNDI measures the income Australians have at their disposal, and is considered by the ABS as the best measure for living standards. Typically, GDP per capita and RNNDI per capita move in parallel. However, with the falling terms of trade, RNNDI and GDP per capita have diverged since 2012, with RNDDI growth falling while GDP growth continued to increase (Figure 2.10).

Figure 2.10: Annual growth in real GDP and RNNDI per capita, 1995–96 to 2015–2016

Notes: RNNDI per capita is the ABS' preferred measure of national wellbeing. It uses GDP, but adjusts it to include additional components that affect the purchasing power of Australians. Chain volume measures, original data.

Source: ABS cat. no. 5204.0, table 01

In 2015–16, growth in GDP per capita was 1.4 per cent while that for RNNDI per capita was –1.3 per cent. This continued divergence meant that the gap between RNNDI and GDP per capita increased to 2.7 per cent, up from 2.3 per cent in 2014–15. However, the latest quarterly data suggests this divergence may be reversing, in line with a plateauing of the terms of trade (refer to previous Figure 2.4). Seasonally adjusted quarterly growth (March versus June quarter 2016) was 0.2 per cent for both RNNDI and GDP per capita.

Low wages growth and RNNDI mean a weaker purchasing power for Australians, and are likely contributing to subdued consumer and business confidence.

Wages are an important part of business input costs and their influence on a firm's competitiveness is further discussed in Chapter 3 of this report.

Developments in Australian industry

The year 2016 was an eventful one for Australian industry. Australia saw several high-profile changes in the manufacturing sector, including the production of the last ever Australian-made Ford being produced in October. There was also the announcement of the Future Submarine Program, which will build a new fleet of Australian submarines in Adelaide.

Tourism set new records, with 7.7 million tourists visiting Australia in the twelve months to March 2016 and values for tourism-related services growing by 11.2 per cent in 2015–16 to $43.6 billion.

Resource production is still strong, despite the transition away from the resources investment boom. This year also marks the 50th year of iron ore shipments from the Pilbara in Western Australia.

Table 2.1 outlines the values and shares of output and employment for Australian industries in 2015–16.

Table 2.1: Output and employment by industry, 2015–16

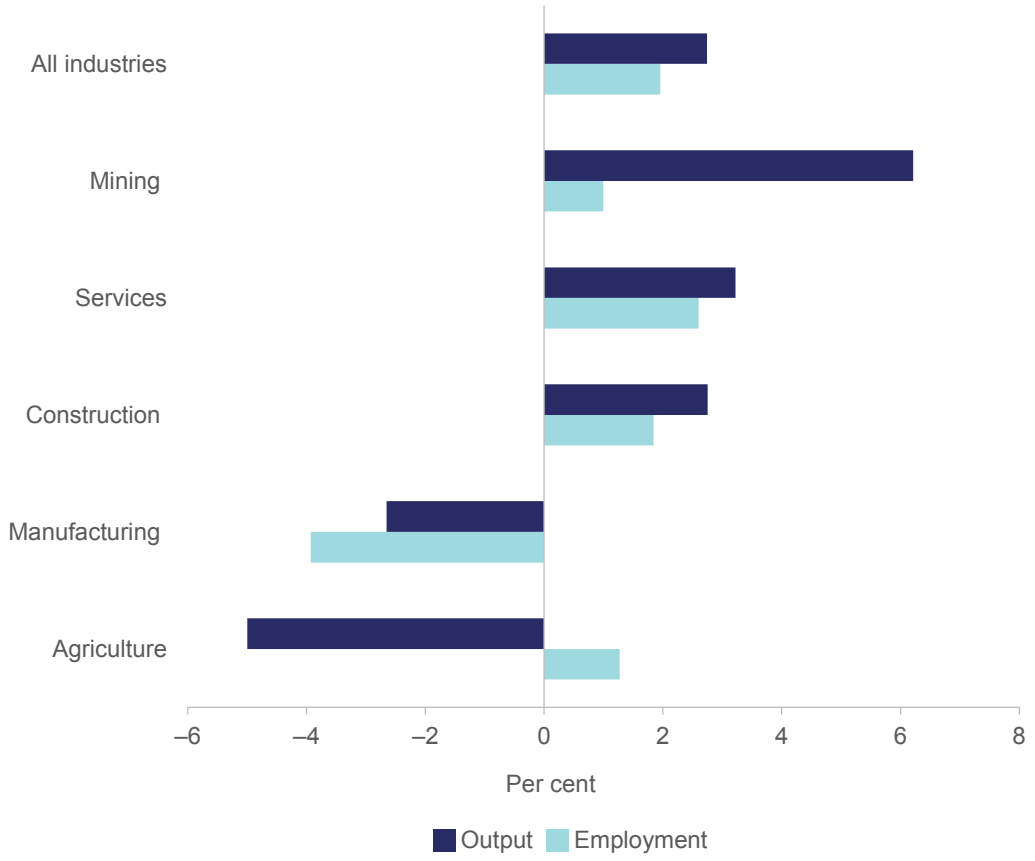
Industry	*Output ($ billion)*	*Share of GDP (per cent)*	*Employment (million)*	*Share of all industry (per cent)*
Services	1,015.1	61.1	9.4	79.2
Mining	114.9	6.9	0.2	1.9
Construction	134.2	8.1	1.1	8.8
Manufacturing	99.4	6.0	0.9	7.4
Agriculture	36.7	2.2	0.3	2.7
All industries	**1,400**	**84.3**	**11.9**	**100**

Notes: Output calculations use original, chain volume measures data. Employment data uses original data and is an average of all quarters in 2015–16.

Source: ABS cat. no. 5204.0, table 05; ABS cat. no. 6291.0.55.003, table 04

Figure 2.11 shows the growth in output and employment by industry between 2014–15 and 2015–16.

Figure 2.11: Annual output and employment growth by industry, 2015–16



Notes: Output calculations use original, chain volume measures data. Employment calculations use original data, average of four quarters.

Source: ABS cat. no. 5204.0, table 05; ABS cat. no. 6291.0.55.003, table 04

At 6.2 per cent, Mining was the strongest performer in terms of output growth, compared to a relatively low employment growth of 1.0 per cent. The taper in mining investment has not adversely affected demand for construction, with overall Construction output and employment growing by 2.8 per cent and 1.8 per cent respectively in 2015–16.

2015–16 saw mixed results for the Agriculture and Manufacturing sectors. While both experienced falls in output, Agriculture gained a small increase in employment from a low base, and Manufacturing exports continued to grow.

Services continue to grow, but with significant variation between sub-industries

In 2015–16, Services continued to be the largest part of the Australian economy, representing just over 60 per cent of GDP with output of $1,015 billion. Services sectors were also the largest employers, averaging 9.4 million employees in 2015–16.

The largest Services industry in terms of value was Financial & Insurance Services with $146.2 billion in output in 2015–16. In terms of employment, Financial & Insurance Services employed an average of 431,100 people.

The largest Services industry by employment in 2015–16 was Health Care & Social Assistance, employing around 1.5 million workers. It was also the second largest Services industry by value, growing by 3.9 per cent to produce $112.3 billion of output in 2015–16.

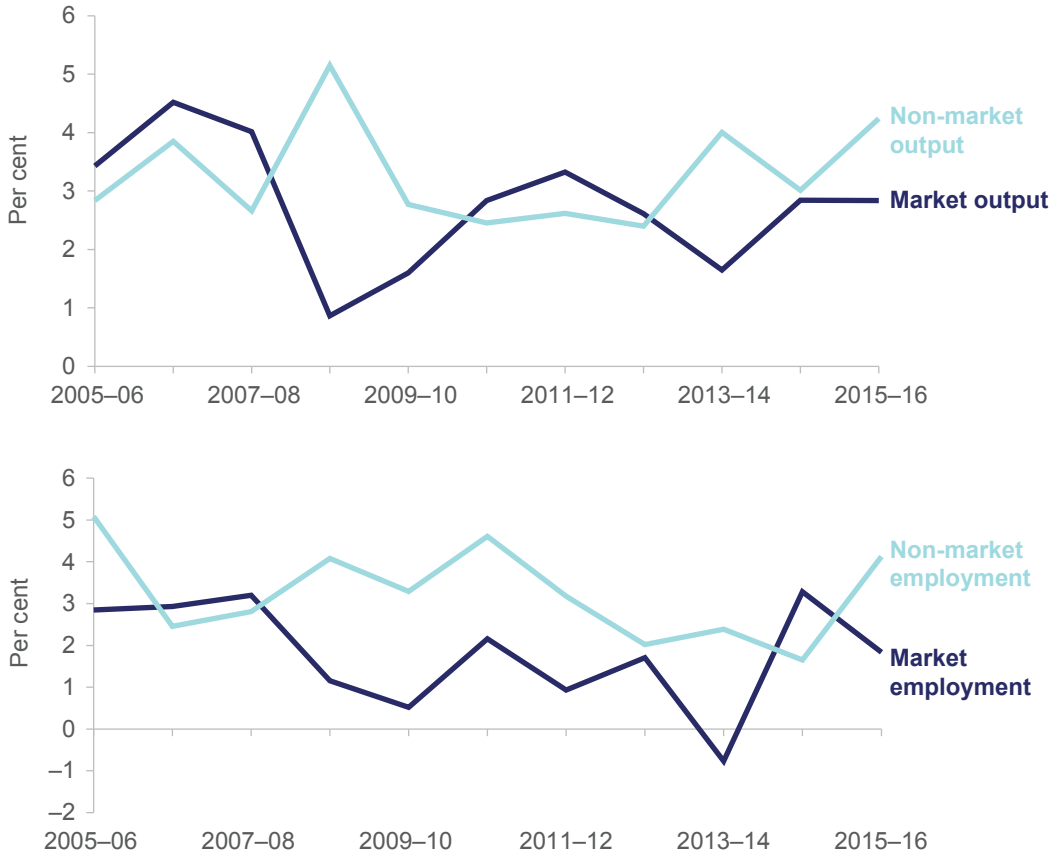
Services exports grew strongly in 2015–16, with Australia's top service export — international education — growing by 9.4 per cent to be worth $19.8 billion. The majority of international students studying in Australia were from Asia, with China being the number one source.

Personal Travel Services (excluding education-related travel) was Australia's second largest Services export after education in 2015–16. Personal Travel had strong annual output growth of 16.9 per cent, to be worth $16.5 billion. This suggests that Australia has remained an attractive destination for international tourists, likely supported by the lower Australian dollar.

Services can be divided between 'market' and 'non-market' services. Market services are sold at commercial prices, while non-market services are either provided free of charge or with significant price reductions due to heavy subsidies. Examples of non-market services are health care and education, which receive significant subsidies from governments. In 2015–16 market services represented 44.1 per cent of GDP, compared to 16.9 per cent for non-market services.

In 2015–16, non-market services grew more strongly than market services for both output (4.2 per cent vs 2.8 per cent) and employment (4.1 per cent vs 1.8 per cent). For output, this continues a trend observed since 2013–14 (Figure 2.12). Employment growth in non-market services was also stronger in regional areas, and is likely supporting regional employment. Our analysis indicates that non-market services employment growth was 6.4 per cent in regional (non-capital city) areas, compared to 2.3 per cent for capital cities in 2015–16.

Figure 2.12: Annual output and employment growth, market and non-market Services, 2005–06 to 2015–16



Notes: Output calculations use original, chain volume measures data. Employment data uses original data and is an average of all quarters for each year. The ABS defines non-market services as: Public Administration & Safety; Education & Training; and Health Care & Social Assistance.

Source: ABS cat. no. 5204.0, table 05; ABS cat. no. 6291.0.55.003, table 04

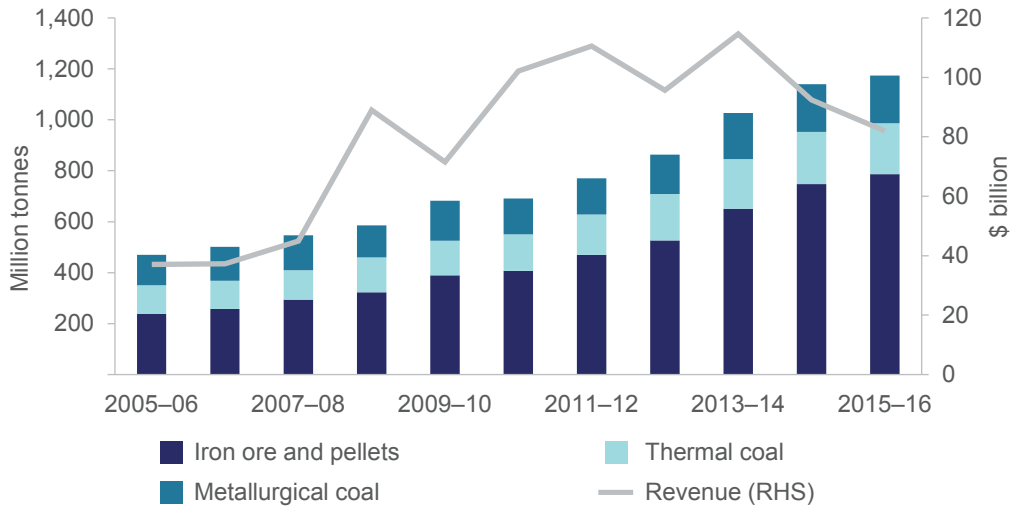
Mining volumes are strong despite price falls, as the sector transitions into the production phase

Mining output represented 6.9 per cent of Australia's GDP in 2015–16 at $114.9 billion. This ranked Mining as the third highest contributing industry to GDP after Services and Construction. Annual growth for Mining output was 6.2 per cent in 2015–16 — the highest growth rate of all industries.

Mining's production phase requires fewer employees than did the investment phase, which meant that annual employment growth in 2015–16 was only 1.0 per cent — the second lowest of all industries after Manufacturing.

Mining continued to produce record export volumes in 2015–16 (Figure 2.13). Volumes of Australia's key commodity exports — iron ore, metallurgical and thermal coal — increased by 3.0 per cent in 2015–16.

Figure 2.13: Volume and value of Mining commodity exports, 2005–06 to 2015–16



Notes: Revenue is the aggregate of iron ore, metallurgical coal and thermal coal values, expressed in nominal terms.

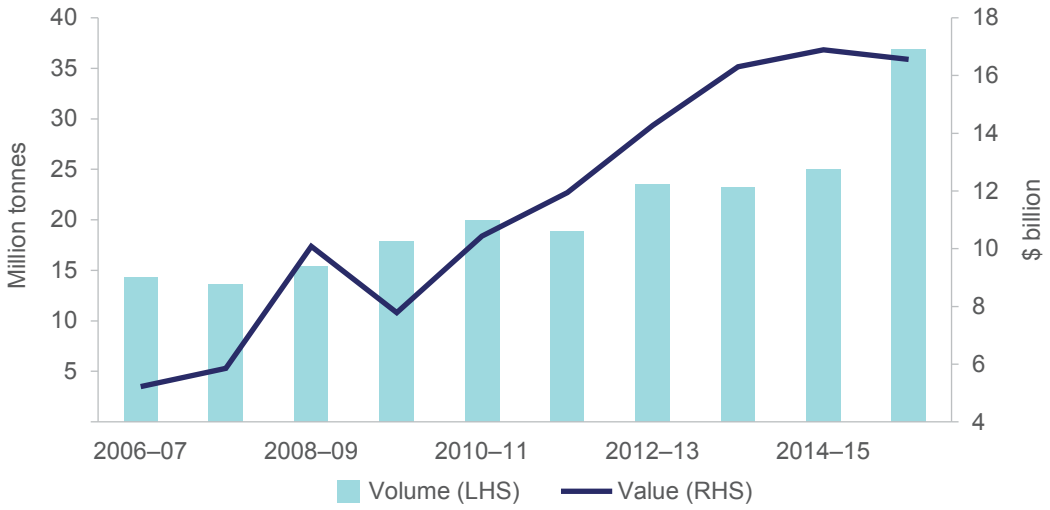
Source: Department of Industry, Innovation and Science, *Resources and Energy Quarterly*, September 2016 and September 2011 (Historical)

At the same time, commodity prices continued to fall, with lower Chinese demand for iron ore and coal occurring at the same time as other commodity-exporting countries ramped up production. The slowdown in China's housing market and China's shutdown of steel factories saw reduced demand for iron ore and metallurgical coal — key inputs into steelmaking. Despite increases in volume, lower commodity prices saw revenue for iron ore, metallurgical and thermal coal exports fall by 11.2 per cent between 2014–15 and 2015–16 (Figure 2.13). However, the latest data shows that commodity prices are picking up — prices for resource and commodity exports reached 13 month highs in August 2016.

Australia's Liquefied Natural Gas (LNG) has become a significant part of the mining sector. In line with international trends, Australia has increased its gas liquefaction capacity through a number of offshore projects in Western Australia, and coal seam gas projects in the eastern States.

Expansion in LNG production continued in 2015–16, with significant annual growth of 47.2 per cent in LNG export volumes (Figure 2.14).

Figure 2.14: Volume and value of LNG exports, 2006–07 to 2015–16



Notes: Volume is an estimate using the conversion: 1 million tonnes of LNG equals approximately 1.4 billion cubic meters of gas.

Source: Department of Industry, Innovation and Science, *Resources and Energy Quarterly*, September 2016 and September 2011 (Historical)

As LNG production is linked to the price of oil through the pegging of long-term contracts to oil prices, the collapse in recent oil prices is putting a strain on export values in the sector (Figure 2.14). In 2015–16, the value of LNG exports contracted by 2.0 per cent from 2014–15. Growth in export volumes will continue in the near future, and it is estimated that in the next two to five years Australia will become the largest LNG exporter in the world.

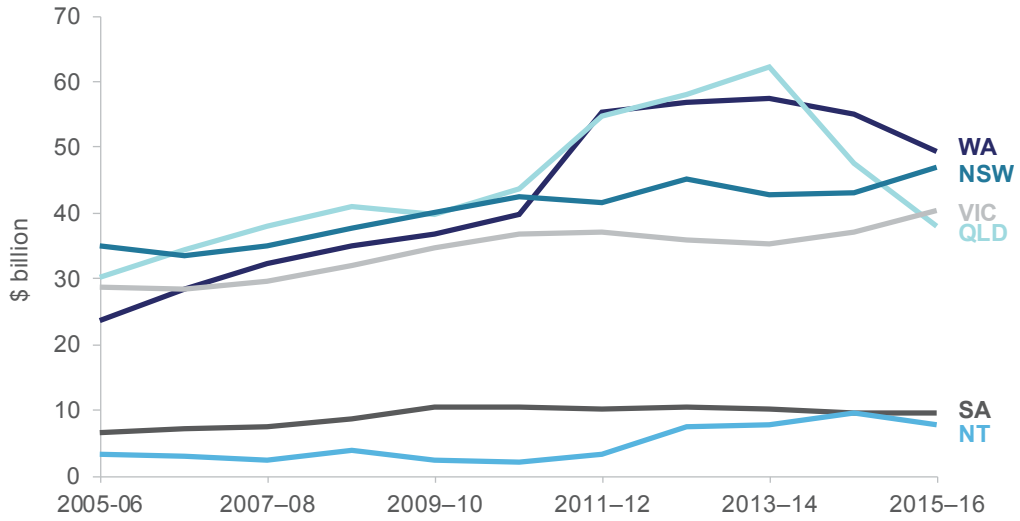
Construction growth is solid, despite decreased Mining demand

Construction is a large part of the Australian economy, accounting for 8.1 per cent of GDP in 2015–16, making it the second largest industry after Services. In 2015–16, it grew by 2.8 per cent in output terms, producing $134.2 billion of output and employing nearly 1.1 million workers.

In 2015–16, growth in Construction output was driven by building construction, with its value increasing 6.2 per cent. This growth was dependent on residential construction, which grew by 10.6 per cent, in contrast to non-residential construction which contracted by 1.3 per cent in 2015–16. In addition, the value of engineering construction work fell by 14.7 per cent in 2015–16, in line with the transition of the economy away from the resources investment boom.

Construction trends are exhibiting a distinct national pattern, with Construction continuing to increase in New South Wales and Victoria and declining in all other States (Figure 2.15). Construction in New South Wales is particularly strong, with significant building construction and major infrastructure projects such as the Westconnex, upgrades to the Princess Highway, and Metro and Light Rail developments in Sydney.

Figure 2.15: Construction work done by jurisdiction, 2005–06 to 2015–16



Notes: Original, chain volume measures.

Source: ABS cat no. 8755.0.0, table 08

Despite the fall in mining-related construction, a large number of major infrastructure projects have still been committed to or are under construction in areas where mining dominates, such as Northern Australia. According to Deloitte Access Economics data, Northern Australia has 66 major projects worth around $201 billion being constructed or committed to as at September 2016. These form around 46 per cent of all such projects across Australia.

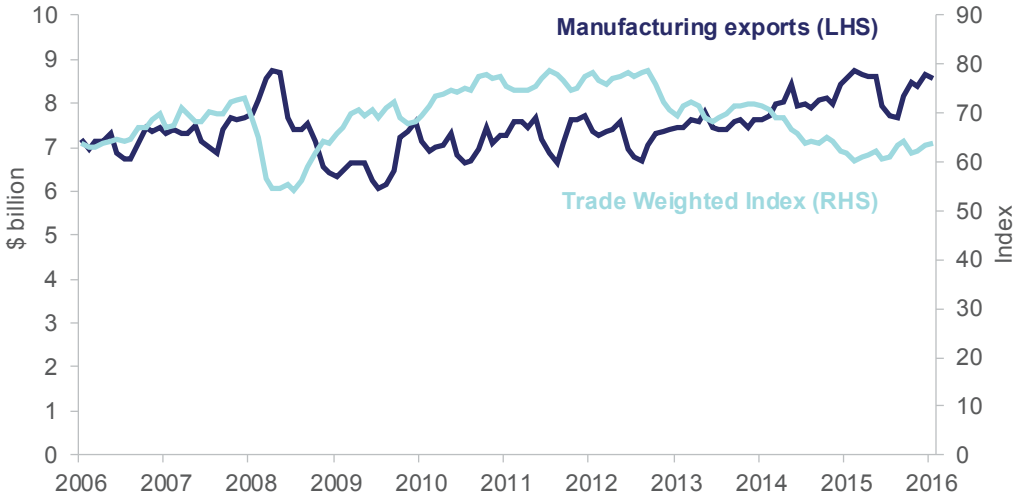
Manufacturing output and employment contracted, but export values increased

While Manufacturing made up 6.0 per cent of GDP in 2015–16, its share of the economy continues to shrink, with declines in both output (–2.7 per cent) and employment (–3.9 per cent). In 2015–16, it produced $99.4 billion of output, and employed 877,400 workers.

Although Manufacturing's output and employment has been declining, its share of exports has been increasing since January 2014. Manufacturing is now the second largest exporter after Mining, representing 32.2 per cent of the value of Australia's exports in 2015–16.

Manufacturing export volumes are strongly influenced by the exchange rate. In 2016, the value of Manufacturing exports continued to increase as the Australian dollar fell and then plateaued (see Figure 2.4). In 2015–16, total Manufacturing exports were $100.2 billion, up from $96.1 billion in 2014–15 (Figure 2.16). This represents an annual growth of 4.2 per cent — a strong result given that over the same period the value of all merchandise exports contracted by 4.5 per cent. The biggest Manufacturing exporters by value in 2015–16 were Primary Metal & Metal Product Manufacturing ($34.2 billion) and Food Product Manufacturing ($24.3 billion).

Figure 2.16: Value of Manufacturing exports and Australia's trade weighted index, August 2006 to August 2016



Notes: Export data is a three-month moving average, original and in current prices. The trade weighted index is an average of the Australian dollar's exchange rate with the currencies of its most important trading partners, weighted to reflect each trading partners' importance.

Source: ABS cat. no. 5368.0, table 32a; Thomson Reuters DataStream

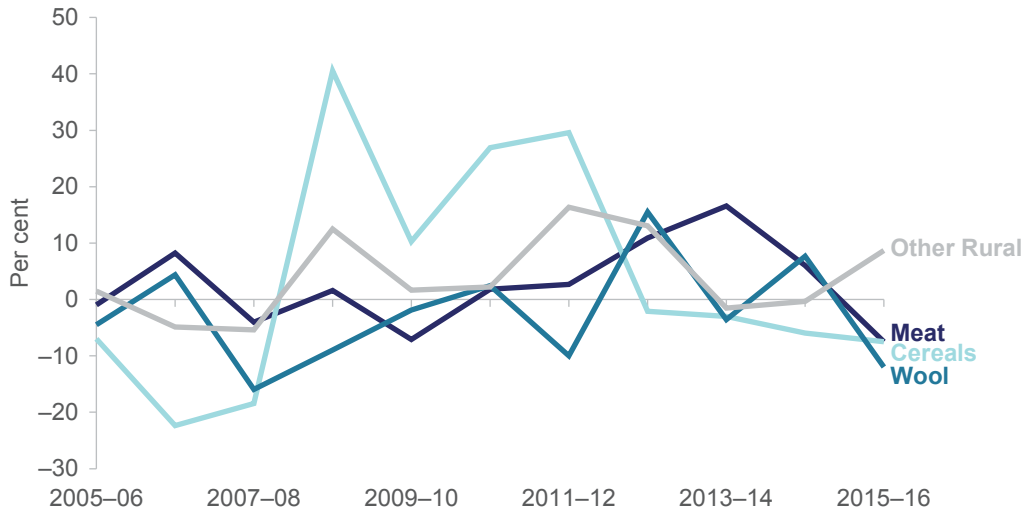
Agricultural output contracted and the value of major exports fell

Agriculture represented 2.2 per cent of GDP in 2015–16 — a similar share to that of previous years. Agricultural output in 2015–16 fell significantly by 5 per cent to $36.7 billion, making it the industry with the lowest annual growth. Agriculture employed an average of 321,600 workers in 2015–16, a slight increase of 1.3 per cent from 2014–15.

Within the broader agricultural sector, the Australian Bureau of Agricultural and Resource Economics and Sciences estimates that crop production rose 1.9 per cent in 2015–16 and livestock production fell 5.9 per cent. The declines in livestock production were the main driver behind the significant contraction in Agriculture's output in 2015–16.

The value of Agriculture exports fell for four of our major Agriculture products in 2015–16. In seasonally adjusted terms, the value of meat and cereal grains exports fell 7.5 per cent, and wool exports fell 12.0 per cent (Figure 2.17). This suggests that the falls seen in Agriculture output overall were also reflected on the export front. This is unsurprising, given that Agriculture is a highly export-focused industry. In contrast, the value of Other Rural exports grew by 8.7 per cent (Figure 2.17).

Figure 2.17: Annual growth in value of Agriculture exports, 2005–06 to 2015–16



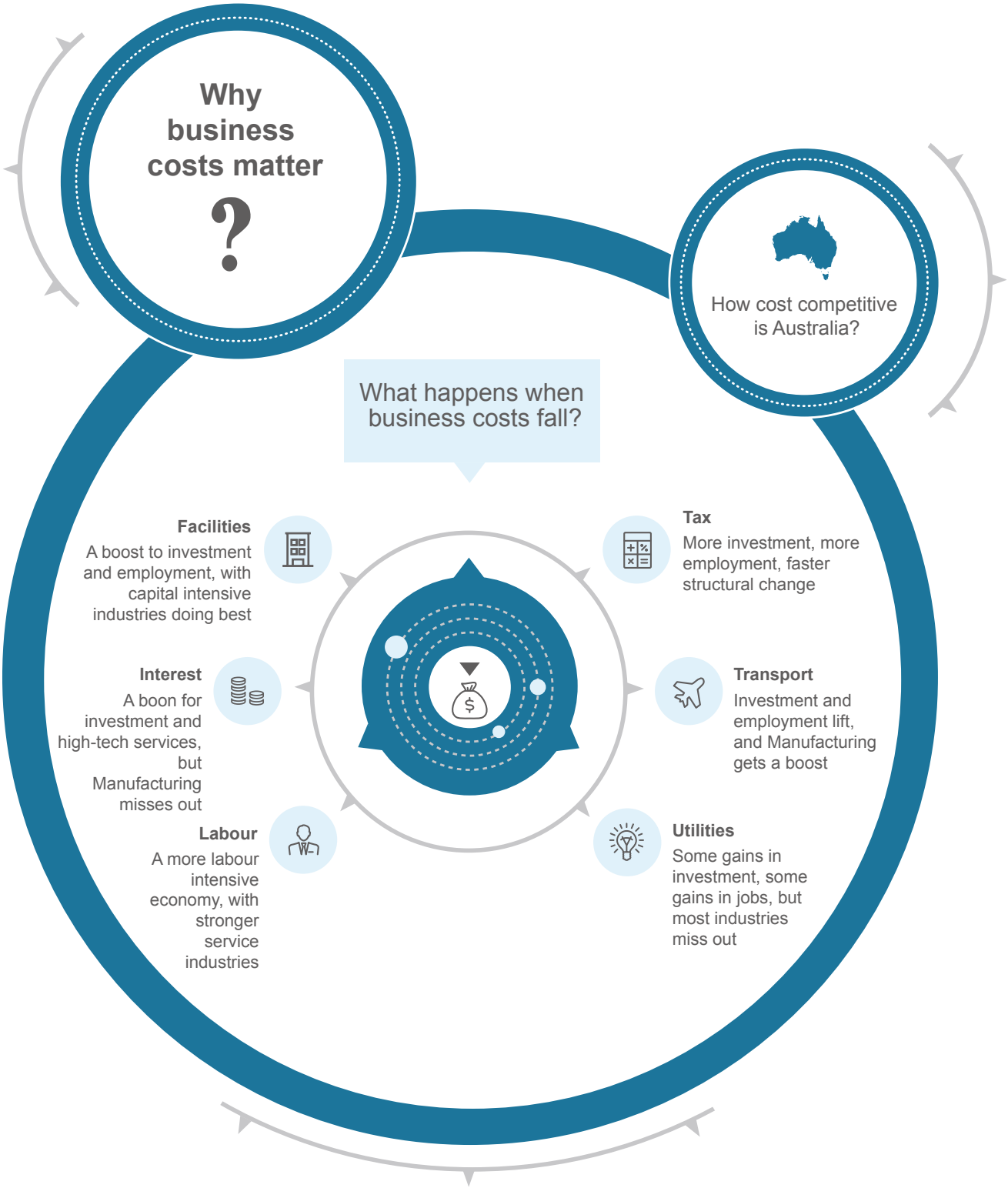
Notes: Chain volume measures, seasonally adjusted data. 'Meat' is meat and meat preparations; 'Cereals' is Cereal grains and cereal preparations; and 'Wool' is Wool and sheepskins.

Source: ABS cat. no. 5302.0, table 06

Within this group, the biggest growth in value for 2015–16 was in exports of Miscellaneous Edible Products & Preparations (71.8 per cent) and Crude Animal & Vegetable Materials (57.4 per cent). The value of exports in the biggest contributor to the Other Rural group — Dairy Products and Bird Eggs — grew by 7.7 per cent in 2015–16. Finally, the value of Live Animal exports grew by 18.2 per cent in 2015–16, indicating a continued recovery from the slowdown in 2009–2013 associated with controversies in live animal exports.

3 Reducing business costs

Examining how reducing business operating costs produce net benefits for the Australian economy, and how different types of cost reductions produce distinct advantages and disadvantages for different industries.



This chapter examines one aspect of competitiveness, namely cost competitiveness, which is the ability of a business to compete on the basis of its cost of production. A competitive advantage is obtained when a business can produce goods or services more cheaply than its competitors.

Business costs can be broken down in various ways. In this chapter we use six cost categories:

- rent and facility charges — payments to property owners for use of building and structures
- labour costs — all employee payments, including social contributions
- interest and debt charges — effectively, the cost of capital determined by the rate of interest
- transportation — costs for transport goods and people by road, rail, pipeline, water or air
- utilities — charges for the provision of electricity, gas and water
- taxes — the aggregate of company and insurance taxes.

Businesses and the wider economy can reap significant benefits if these costs can be restrained. Cost reductions are often seen as a way to create a universal benefit by increasing competitiveness and lowering living costs across the board. Cost reductions improve purchasing power for consumers; they are also regularly described as a way to move the economy toward the global frontier, generating jobs, innovation, and profitability.

This chapter examines the economy-wide impacts of different cost reductions using a Computable General Equilibrium (CGE) model. Not all cost reductions will be equivalent, because each industry has a different cost mix. CGE models are used widely to demonstrate the direct and indirect effects of a change in policy, technology, or some external factor. The purpose of the exercise is to estimate the benefits to individual industries and to the economy as a whole if cost reductions were able to be realised. Of course, for many businesses the reality they face is having to adapt to higher costs.

The department commissioned Cadence Economics to undertake economic modelling to assess the economic impact of particular cost reductions on different industries. Cadence Economics uses the Cadence Economics General Equilibrium Model (CEGEM). It is a multi-commodity, multi-region, dynamic model of the world economy[31]. Modelling for this chapter encompasses direct effects (the shock of the price fall itself) as well as indirect, second-order effects, including changes to capital supply and labour responses. These second order effects may outweigh the direct effects in some cases. Assumptions around the modelling are listed in Appendix 3.1.

The modelling scenarios were derived in the following way.

1. The impacts of a 5 per cent reduction in each of the six input costs was estimated, with reference to the overall cost of supply for each of the ANZSIC sectors.
2. These defined input cost reductions were mapped to the 17 CGE sectors.
3. The CGE model was then used to model the economy-wide impacts of the defined cost reductions.

[31] Further information on the model can be found in Appendix 3.1.

Key results from modelling the impact of lower input costs

While some economic theories ascribe universal benefit to cost reductions, modelling suggests that the reality of cost reductions is more complex. Modelling outputs show that while the benefits of cost reductions are significant, they also tend to be rivalrous, favouring particular industries at the expense of others. Depending on what is required by the production process, firms will substitute labour for capital, move from one location to another, or otherwise re-structure their affairs in an effort to maximise their competitiveness.

Across the economy, labour costs are by far the largest cost that firms face, at 63 per cent. As a service based economy, this is not surprising. But labour costs are significant for the goods producing industries as well. After wages, transport is the next biggest economy wide outlay at 10.1 per cent. Notably, the relative importance of different costs varies between industries. 31 per cent of Manufacturing costs, for example, are spent on transport. 30 per cent of Agriculture's costs, are interest costs.

Table 3.1 shows the relative importance of different inputs across industries in 2012–13.[32] For comparative purposes, it also shows (in parentheses) changes in the relative proportion of costs compared to four years before. Although input-output data should be treated with caution due to high standard errors, some trends can be observed. In particular, energy costs became more significant over the four years to 2012–13, notably in agriculture and manufacturing. Costs for transport and interest payments broadly trended down.

The ultimate outcomes of cost reductions vary widely depending on which cost is reduced.

It shows all forms of cost reduction lead to higher GDP growth. Within that broader picture, lower rent and facility costs provide strong support for employment and investment, although the benefits are concentrated among capital-intensive services and Construction. Lower interest rates support investment, but do little for employment, with the benefits being concentrated in Construction and high-tech services. In contrast, lower labour costs support a more labour-intensive and less capital-intensive economy, with benefits for labour-intensive services and losses for Manufacturing.

Lower business taxes create a solid benefit for investment and employment, with strong gains in Construction and high-tech services. Lower transportation costs support investment and employment, and also yield an unusually strong benefit for Manufacturing. Lower utility costs produce benefits for sectors reliant on electricity, gas and water.

Most cost reductions provide strong benefits to Construction and heavily capitalised services, while Manufacturing tends to record the greatest losses. This in part reflects resource switching between industries. Resource switching can also occur between inputs: reductions in wages and interest rates encourage switches between capital and labour without substantially increasing the overall rate of GDP growth.

The modelling undertaken for this chapter supports two propositions:

1. All kinds of cost reductions produce net benefits for the economy.
2. Each cost reduction produces its own distinct advantages and disadvantages at an industry level, with benefits tending to be rivalrous.

In considering policy to reduce costs, it is worthwhile making changes in accordance with a plan that anticipates side effects and links cost reduction to broader economic goals.

Table 3.2 sets out the macroeconomic effects from a five per cent cost reduction across the six cost types. For example, if transition towards an export-oriented economy is the goal, labour cost reductions would be the best option (although World Bank research suggests there may also be benefit in areas such as reducing port and other costs).[33] If the intent is to ensure primary industries and Manufacturing retain a strong place in the economy,

[32] Input cost shares can also change over time. For instance, energy input costs rose faster than other costs in 14 industries since 2008-09.

[33] http://www.doingbusiness.org/data/exploreeconomies/australia/

reducing transportation costs should be the focus. Transition to a more capital intensive, high-tech services economy can be accelerated by reducing interest rates and curbing tax-related costs.[34] However, job creation is best supported with a focus on compensation of employees, facility costs, and transportation.

Table 3.1: Input cost share by industry, per cent

Industry	*Rent*	*Interest*	*Labour*	*Tax*	*Transport*	*Utilities*
Agriculture, Forestry and Fishing	13.2 (+5.8)	29.8 (–9.9)	31.9 (+2.9)	3.3 (+1.2)	15.0 (–2.5)	6.8 (+2.5)
Mining	13.6 (–1.3)	13.2 (–8.2)	46.8 (+6.7)	3.9 (+1.7)	11.8 (+0.8)	10.6 (+1.8)
Manufacturing	4.5 (+6.6)	6.0 (–0.4)	43.4 (+0.5)	1.8 (–0.7)	30.8 (+2.3)	13.5 (+4.9)
Electricity, Gas, Water and Waste	1.3 (+0.1)	14.1 (–2.0)	21.1 (–8.5)	13.8 (+11.0)	2.5 (–1.1)	47.2 (+0.5)
Construction	9.2 (–2.8)	8.1 (–0.3)	61.5 (+1.0)	3.1 (+0.1)	15.5 (+3.7)	2.6 (–1.8)
Wholesale Trade	17.3 (+8.8)	3.7 (–0.9)	58.0 (–2.3)	2.9 (+0.1)	15.9 (–5.8)	2.2 (+0.0)
Retail Trade	16.0 (+10.0)	2.0 (–2.6)	68.6 (–8.9)	3.7 (–0.1)	4.8 (–0.6)	4.9 (+2.2)
Accommodation and Food Services	16.4 (+8.6)	6.1 (–1.7)	59.6 (–6.3)	4.3 (+0.2)	6.2 (–1.9)	7.4 (+1.2)
Transport, Postal and Warehousing	11.0 (–1.7)	9.6 (–4.0)	49.7 (+2.1)	3.7 (+0.5)	22.9 (+3.4)	2.9 (–0.3)
Information Media and Telecomms	13.7 (–3.4)	13.5 (+1.8)	55.7 (+1.7)	1.9 (+0.2)	8.6 (–3.7)	6.7 (+3.4)
Financial and Insurance Services	6.7 (+0.9)	0.0 (+0.0)	81.7 (–6.6)	6.8 (+2.0)	3.6 (+2.8)	1.2 (+1.1)
Rental, Hiring and Real Estate	31.3 (+20)	17.8 (–36)	33.5 (+16.2)	7.8 (–6.7)	1.6 (–0.2)	8.2 (+6.6)
Professional, Scientific and Technical	9.4 (+0.2)	8.7 (–3.4)	70.1 (+3.5)	3.2 (+0.1)	5.5 (–1.0)	3.2 (+0.5)
Administrative and Support Services	12.8 (+0.1)	3.1 (–1.2)	72.2 (+2.6)	3.5 (+0.2)	6.1 (–2.0)	2.3 (+0.2)
Public Administration and Safety	4.6 (–1.9)	0.8 (–1.6)	80.1 (–0.5)	2.3 (–0.3)	4.8 (–1.8)	7.4 (+6.1)
Education and Training	3.1 (–1.7)	0.9 (–4.3)	90.5 (+5.2)	1.3 (+0.2)	2.8 (+0.2)	1.4 (–0.4)
Health Care and Social Assistance	1.7 (–1.8)	1.2 (–0.9)	92.0 (+4.2)	1.8 (–0.2)	2.0 (–1.4)	1.3 (–0.1)
Arts and Recreation Services	14.3 (+2.3)	3.6 (–2.6)	68.2 (+0.9)	0.5 (–1.4)	9.0 (–1.7)	4.4 (+2.5)
Other Services	6.5 (–4.5)	5.3 (–0.3)	76.2 (+5.3)	4.1 (+0.5)	6.3 (+0.5)	1.6 (–1.5)

Source: Custom ABS data

[34] Economy-wide Modelling for the 2016–17 Budget, Treasury, May 2016, http://www.treasury.gov.au/~/media/Treasury/Publications%20and%20Media/Publications/2016/Budget%20Modelling/Downloads/PDF/160503_Economy-wide%20modelling.ashx

Table 3.2: Macroeconomic effects from a five per cent reduction in costs

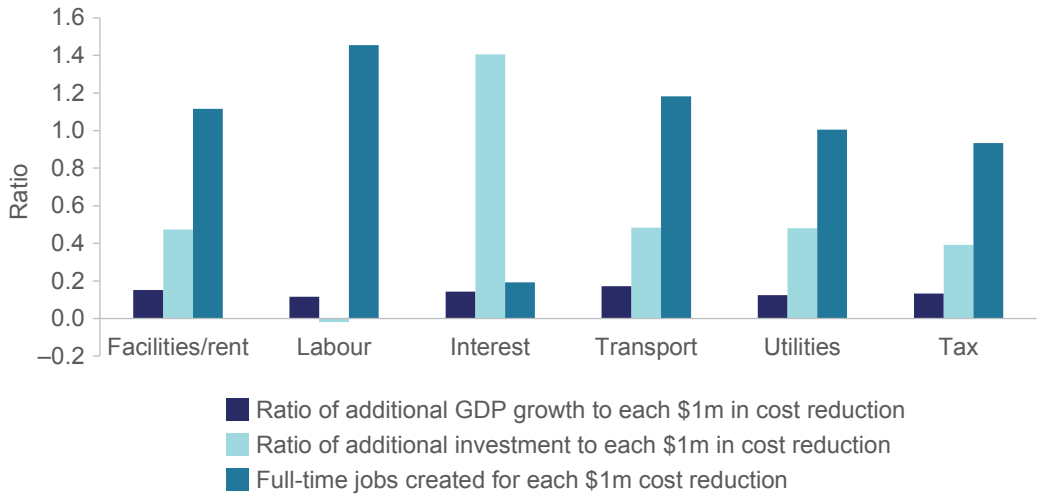
	Variable	Facilities/ rent	Interest	Labour	Tax	Transport	Utilities
Outcomes	Share of total costs (per cent)	9.6	6.6	63.0	3.7	10.1	6.9
	Modelled cost reduction ($m)	5,334	3,671	35,082	2,079	5,632	3,848

	Variable	Facilities/ rent	Interest	Labour	Tax	Transport	Utilities
Impact on economic variables	GDP ($m)	807	523	4,087	277	971	544
	Consumption ($m)	249	–730	2,673	120	379	170
	Investment ($m)	2,525	5,158	–676	815	2,729	1,848
	Government ($m)	–186	44	1,172	–55	–221	74
	Exports ($m)	–1,090	–2,272	911	–303	–1,253	–1,146
	Imports ($m)	692	1,676	–7	300	664	469
	Employment (FTE)	5,948	705	51,017	1,939	6,658	3,996

Source: Modelling results obtained from Cadence Economics

Figure 3.1 shows the proportional (as opposed to absolute) effect of cost changes on GDP, investment and employment from different cost reductions.

Figure 3.1: Ratio of economy-wide impact to cost reduction



Source: Modelling results obtained from Cadence Economics

As an example, if a cost reduction of $1 million produces $150,000 in additional GDP, the multiplier is 0.15. Among the various input costs, transportation inputs produce the strongest proportionate benefits to GDP (at 0.17), while tax and utility reductions produce relatively weaker outcomes.

The jobs measure for this chart also records the number of full-time equivalent jobs created for each $1 million in cost reductions. All cost reductions produce increased employment, although the range of impacts is wide. Unsurprisingly, labour cost reductions are the most effective means to promote job growth, with interest rate cuts doing little in this regard. However, investment follows the opposite profile, being strongly supported by interest rate cuts, but actually reduced by labour cost reductions.

The following sections outline the effects of reductions in each of the six modelled costs in greater detail. Each section will outline how the results of cost reduction play out across industries, with tables recording industry-specific data for each cost input. These tables include changes to costs, industry value added, and employment for each individual industry.

Box 3.1: Australia's global cost profile

International cost data provide some context to the analysis in this chapter.

KPMG data[35] provide a breakdown of labour, transport, utility, facility, tax and finance costs for a range of countries. The data suggest business costs in Australia rose sharply during the resource boom as wages increased strongly without a congruent rise in productivity. Costs were also pushed up by electricity grid upgrades, when investment aimed at improving grid resilience lead to higher energy costs. After falling to 8th position (out of 10 measured countries) in 2014, Australia has subsequently recovered to 5th place in 2016. This reflects a combination of three factors:

- Wage growth has slowed, with recent quarters showing effectively nil growth in real terms. High-wage jobs connected to the Mining industry have diminished at the same time that jobs have been created in lower-wage areas such as healthcare
- Utility costs have stabilised as upward pressure on energy prices has reduced
- Record-low interest rates have reduced the cost of capital.

Australia's overall cost competitiveness increased by 9.9 per cent between 2014 and 2016. This improvement was heavily influenced by the fall of the Australian dollar relative to the value of the US dollar over this period. Figure 3.2 shows Australia's current cost profile compared to competing economies.

Like most countries, Australia's largest inputs are labour costs, which account for 62 per cent of total costs. This ratio is broadly consistent with labour costs elsewhere, although there is a notable gap between developed and developing countries (Mexico's labour costs account for only 36 per cent of the total).

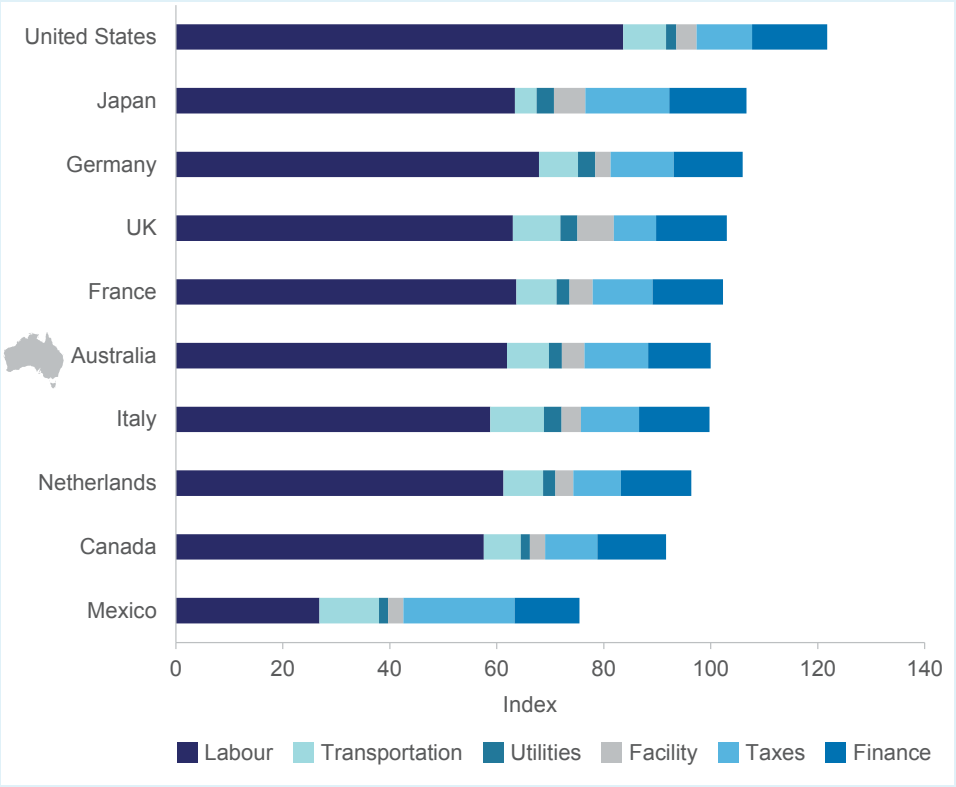
KPMG data suggest that Australia pays a slight premium on transport costs (at 8 per cent of total costs), reflecting the natural disadvantages of a large land area and thinly spread population. Taxes make up 12 per cent of business costs in Australia — behind only Japan and Mexico as a share.

While Australia is a low-taxing country overall, there is an unusually high proportion of tax levied on industry (as opposed to consumption and land). Most industries pay a relatively high cost for facility leasing — this has a particular impact on the Manufacturing industry, which is the largest user of these services. Finance and

[35] KPMG (2016) *Competitive Alternatives*, p. 12

utility costs sit at roughly the median level for all measured industries including digital services, corporate services, and manufacturing.

Figure 3.2: Business input cost profiles by country, 2016



Source: KPMG *Competitive Alternatives Database*, 2016

Work by the World Bank[36] provides alternative indicators that are tracking Australia's cost performance. This research suggests that Australia has a mixed and middling performance in terms of business costs. Australia remains relatively close to the leading nations in terms of ease of starting a business, although some ground was lost in 2016 when Australia's ranking dropped from 7th to 11th (out of 189 economies). Australia enjoys an efficient and cheap process for obtaining construction permits (ranking 4th), while access to credit also remains cheap (ranking 5th).

However, business costs are pushed up by border compliance, which is a significant item for many exporters. Australia ranks 89th in its ease of trading across borders. This is partly due to the distance of Australia from many trading partners. However, it also reflects issues with some port facilities and regulation.

Getting electricity is not especially fast or easy for business in Australia: the survey ranks Australia at 39th for this measure. However, supply and distribution are reliable and well-monitored once access has been established. While wages are relatively high, World Bank data suggest labour market regulation is quite well constructed and efficient in Australia relative to many other nations.[37]

[36] http://www.doingbusiness.org/data/exploreeconomies/australia/

[37] *Doing Business 2016*, Australian Economy Profile, World Bank, pp. 91–92 http://www.doingbusiness.org/data/exploreeconomies/australia/~/media/giawb/doing%20business/documents/profiles/country/AUS.pdf?ver=3

Lower rent and facility costs create solid employment and investment benefits

Facilities and rent are the aggregate of payments to Rental, Hiring and Real Estate Services. They cover all payments to property owners for the use of building and structures.

A five per cent reduction in facilities and rent creates solid benefits for value added, investment and employment. Reductions in facility costs are also the second most effective means for stimulating employment, with 1.12 full-time equivalent jobs created for each million dollars in cost reductions.

As Table 3.3 shows, the benefits are uneven at the industry level. A reduction in rent and facility costs leads to significant cost reductions across all primary industries. The cost reduction for Mining is particularly significant (–$391 million) due to that industry's unusual dependence on fly-in fly-out workers, which requires upkeep of a large amount of temporary accommodation. Manufacturing and Agriculture, Forestry & Fishing, being capital intensive, record a marked benefit from lower facility costs as well.

Table 3.3: Industry changes from a five per cent reduction in rent/facility costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–153	–63	–415
Mining	–391	–190	–285
Manufacturing	–212	–298	–2,052
Electricity, Gas, Water & Waste	–35	–33	–99
Construction	–482	599	4,971
Wholesale Trade	–596	153	1,131
Retail Trade	–526	135	999
Accommodation & Food Services	–291	75	552
Transport, Postal & Warehousing	–398	37	201
Information Media & Telecommunications	–178	14	38
Financial and Insurance Services	–190	–118	–688
Rental, Hiring & Real Estate	–630	496	2,572
Professional, Scientific & Technical	–432	340	1,764
Administrative & Support Services	–295	232	1,207
Public Administration & Safety	–187	–195	–1,819
Education & Training	–103	–107	–1,000
Health Care & Social Assistance	–78	–81	–757
Arts & Recreation Services	–73	–88	–172
Other Services	–85	–102	–201
Total	**–5,334**	**807**	**5,948**

Source: Modelling results obtained from Cadence Economics

Among service industries, the largest cost reductions flow to Rental, Hiring & Real Estate[38], reflecting a greater benefit from higher use of its services. Industries with large floor space — notably Wholesale Trade and Retail Trade — are also expected to benefit from a substantial cost saving. Given the competitive, consumer-facing nature of these industries, such benefits are likely to be passed on rapidly, leading to lower consumer prices. Other service industries such as Professional, Scientific & Technical Services also record a notable cost reduction due to their capital intensity.

While the cost reduction is nearly universal, the benefit for value added tends to favour service industries at the expense of primary industries. The model suggests that initial benefits translate into a higher Australian dollar, which then produces the fall in exports of around $1 billion annually. The model predicts that investment flows subsequently divert away from primary industries due to lower trade competitiveness.

Construction records notable benefits to both input costs and value-added. The model estimates that higher investment encourages greater spending on buildings and structures by a range of industries. In effect, this creates a broader and more resilient uplift for construction relative to the narrow, resource or housing-based demand that has characterised the past 10 years. There may also be a 'virtuous cycle' occurring, in which lower facility costs encourage greater construction, leading to further falls in rent and facility costs as the supply of fitted-out premises increases.

Labour cost reductions encourage a pronounced resource shift between capital and labour

Labour costs represent the total remuneration to employees in return for work done by employees during the accounting period. They include wages and salaries as well as social contributions. The model also counts the additional statutory labour costs created by labour and payroll taxes. Compensation of employees accounts for just over 60 per cent of total input costs. Accordingly, even small changes create significant flow-on effects throughout the economy.

A reduction in labour costs creates powerful incentives for a shift in resources between capital and labour. Overall, a five per cent fall in labour costs would be expected to create more than 50,000 jobs. Although full-time equivalent jobs pick up strongly (with growth of 1.45 full-time equivalent jobs per $1 million in cost reductions), there is far less benefit for overall value added (+$0.12 million per $1 million in cost reductions). In effect, resource switching between capital and labour changes the source of economic output without necessarily increasing it.[39]

As Table 3.4 shows, while employment growth is significant, it is not homogenous across industries. Growth is expected to concentrate in industries that are growing most rapidly to begin with. Strong growth in employment for labour intensive sectors such as Healthcare, Education and Other Services reduces the pool for hiring in other industries. At the same time, lower capital spending leads to a net loss in value added for Manufacturing and Construction, who typically supply capital inputs.

[38] Results for Rental, Hiring & Real Estate should be treated with caution. Changes in rent costs are not fully accounted for in the model, and changes to rental costs are likely to affect this industry differently from others. It is likely that value-added benefits to Rental, Hiring & Real Estate are overstated.

[39] Labour elasticity within the model is at the lower end of typical estimates for this measure.

Table 3.4: Industry changes from a five per cent reduction in employee compensation costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–367	–267	–2,756
Mining	–1,345	644	1,775
Manufacturing	–2,033	–427	–9,434
Electricity, Gas, Water & Waste	–575	55	153
Construction	–3,231	–178	–4,126
Wholesale Trade	–2,002	206	2,895
Retail Trade	–2,254	232	3,260
Accommodation & Food Services	–1,054	109	1,524
Transport, Postal & Warehousing	–1,794	173	1,740
Information Media & Telecommunications	–726	108	531
Financial and Insurance Services	–2,313	37	–3,584
Rental, Hiring & Real Estate	–674	95	2,227
Professional, Scientific & Technical	–3,215	454	10,617
Administrative & Support Services	–1,665	235	5,499
Public Administration & Safety	–3,275	343	4,419
Education & Training	–3,098	325	4,180
Health Care & Social Assistance	–4,116	431	5,553
Arts & Recreation Services	–351	394	6,919
Other Services	–996	1,117	19,623
Total	**–35,082**	**4,087**	**51,017**

Source: Modelling results obtained from Cadence Economics

Employment outcomes are mixed, although the lack of strong output growth is virtually universal across industries. Reduced labour costs create a large cost saving for primary industries and labour-intensive service industries including Construction, Health Care, Education, Public Administration, and Retail Trade. However none of these industries (except Mining and Other Services, who face minimal risk of being crowded out) appear to gain much benefit to production.

Consumer behaviour changes subtly under a lower wage outcome, with a shift away from imported goods towards domestic consumption. This is a product of the high degree of cost reduction received by domestic industries, which improves the competitiveness of domestically produced items.

The predictions of this modelling are reflected by various current trends in the economy. Wage growth has effectively been zero in real terms over the past 12 months[40]: a time when investment also has been lacklustre[41] and employment growth has picked up more rapidly than broader economic conditions would have ordinarily implied[42]. Should labour input costs start to fall, this existing trend would be magnified.

[40] ABS cat. no. 6345.0 (March 2016), *Wage Price Index,* key figures
[41] ABS cat. no. 5625.0 (March 2016), *Private New Capital Expenditure and Expected Expenditure*, Australia, key figures
[42] ABS cat. no. 6202 (May 2016), *Labour Force Survey*, key figures

Lower interest rates support investment, but produce only a muted benefit for employment

Lower interest costs effectively model a small cut (of around 8 basis points) in official interest rates. This variable is under the control of the RBA and can be affected only in highly indirect ways through traditional policy measures.

Changes in interest rates create an unusual benefit profile, overwhelmingly favouring investment, which is expected to rise by $1.4 million for each $1 million in cost reduction. This reflects the fact that lower interest rates directly reduce the cost of capital. In effect, this creates the opposite outcome to that brought about by lower labour costs.

There is a far more muted benefit to job creation, with hiring rising by only 0.19 FTE per $1 million in cost savings. This makes reductions in interest rates the least effective means to stimulate job creation among the various input costs.

As Table 3.5 shows, the vast bulk of gain is to the Construction industry, largely because lower interest rates encourage development of buildings and structures by other industries and consumers. Industries with a close connection to Construction — notably Rental, Hiring & Real Estate — draw a spill-over benefit as the number of business and residential premises under management increase.

Table 3.5: Industry changes from a five per cent reduction in interest costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–343	62	–97
Mining	–380	–801	–806
Manufacturing	–279	–249	–2,429
Electricity, Gas, Water & Waste	–385	56	–411
Construction	–428	1,645	7,763
Wholesale Trade	–129	117	–229
Retail Trade	–66	60	–118
Accommodation & Food Services	–108	98	–193
Transport, Postal & Warehousing	–347	129	–1,397
Information Media & Telecommunications	–176	–12	58
Financial and Insurance Services	0	–333	1,216
Rental, Hiring & Real Estate	–358	398	–1,305
Professional, Scientific & Technical	–397	442	–1,447
Administrative & Support Services	–71	79	–258
Public Administration & Safety	–33	–36	–85
Education & Training	–30	–33	–77
Health Care & Social Assistance	–54	–58	–136
Arts & Recreation Services	–18	–218	137
Other Services	–70	–823	518
Total	**–3,671**	**523**	**705**

Source: Modelling results obtained from Cadence Economics

The model suggests that the additional capital investment spurred by lower interest rates is directed overwhelmingly to the industries with the most existing capital intensity. Highly capital-intensive industries such as Professional, Scientific & Technical Services and Agriculture, Forestry & Fishing are well placed to benefit from a lower cost of capital. However, there are negligible-to-poor outcomes for other industries. These modelling outcomes offer a partial explanation as to why recent interest rate cuts may have yielded minimal benefit for manufacturing and labour-intensive service industries.

Investment demand leads to a surge in imports. This reflects the greater demand for imported capital, spurred on by the lower capital cost. However, exports record little immediate benefit, and the consequent deterioration in net trade leads to a lower benefit to GNP than might have been expected. Over time, interest rates may affect economic growth and inflation more generally, but there is a notable lag due to this initial worsening in net trade.

Reductions in transport costs support investment and employment, with strong manufacturing benefits

Transportation inputs include business use of road, rail, pipeline, water, air, port handling and transport insurance, as well as the margin on supply of these facilities. Transportation inputs are used most significantly by primary industries and Construction.

Reductions in transportation costs are linked to a significant profile of benefits. Cheaper transportation inputs produce a strong employment outcome (1.18 full-time equivalent jobs per $1 million in cost savings), as well as solid benefits for investment. The value-add benefit is slightly more muted, but only because benefits up and down the supply chain are not captured by the model, meaning benefits to GDP are probably understated. Higher investment also leads to higher capital imports, which national accounts statistics treat as a detraction from GDP.

Cheaper transportation costs support a structural shift towards a more investment and export driven growth model. This helps to accelerate economic shifts already underway, and insulates Australia somewhat from domestic economic shocks.

Unlike other input cost reductions, a lowering of transportation costs creates striking and clear benefits for the Manufacturing industry. Manufacturing is a high user of transport, and lower transport input costs offset the ‘tyranny of distance’ and improve export competitiveness. They also allow for more rapid movement of goods, easing bottlenecks and increasing the ability to respond to changes in demand. Improvements in the supply chain are non-rivalrous and do not create risks of Manufacturing being ‘crowded out’ by other sectors. Benefits are likely to grow over time as the supply chain used by manufacturers becomes more globally integrated and complex.

As Table 3.6 shows, public investment to remove bottlenecks and improve transport infrastructure also produces benefits to Mining value added. However, it also allows Mining to reduce its employment, likely through a reduction of resources to its specialised transport functions.

Table 3.6: Industry changes from a five per cent reduction in transport costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–172	–36	–219
Mining	–341	–483	–616
Manufacturing	–1,443	669	3,578
Electricity, Gas, Water & Waste	–67	–2	–55
Construction	–813	722	5,026
Wholesale Trade	–547	188	978
Retail Trade	–158	54	283
Accommodation & Food Services	–109	37	194
Transport, Postal & Warehousing	–827	726	3,500
Information Media & Telecommunications	–112	–12	–103
Financial and Insurance Services	–103	–270	–1,530
Rental, Hiring & Real Estate	–32	29	96
Professional, Scientific & Technical	–253	231	769
Administrative & Support Services	–141	129	429
Public Administration & Safety	–196	–292	–2,423
Education & Training	–97	–145	–1,202
Health Care & Social Assistance	–90	–134	–1,110
Arts & Recreation Services	–47	–160	–338
Other Services	–82	–282	–597
Total	**–5,632**	**971**	**6,658**

Source: Modelling results obtained from Cadence Economics

Construction, which is a large user of transportation infrastructure (particularly road transport) benefits strongly both in value added and employment terms. This is partly due to the direct advantages created by cost reductions. However, it also reflects the likelihood that cost reductions created by greater public investment leave more room and funds for private spending on infrastructure. Both public and private spending support construction directly by increasing demand.

Transport, Postal & Warehousing also attains significant (and unsurprising) benefits, being the primary users of economic infrastructure. Other service industries gain in smaller amounts, since much of the product of such industries is delivered digitally or in other ways that require less direct use of traditional transport.

Lower utility costs produce benefits in energy-intensive sectors

Utility costs encompass all forms of spending by businesses on electricity, gas and water supply. While this is a relatively small input cost overall (6.9 per cent), it comprises a more significant share of input costs for Mining (10.6 per cent) and Manufacturing (13.5 per cent), and, for obvious reasons, makes up the highest share of costs in Electricity, Gas and Water (47.2 per cent).

Changes to utility costs appear to yield a relatively muted benefit for the economy. A five per cent reduction in utility costs is estimated to increase total employment by just under 4,000 full-time equivalent jobs across the entire economy.

Lower utility costs create a slightly stronger benefit for investment, although this is less than gains through reductions in rent and facilities, transport, and interest rates. While cheaper energy leads to higher capital imports, there is no offsetting benefit to exports, which leads to a deterioration in net trade.

As Table 3.7 shows, economic benefits are highly concentrated in energy intensive sectors including Manufacturing, Construction, and Electricity, Gas and Water. Energy costs have been elevated in recent years by an increase in investment aimed at improving grid resilience, and to a lesser extent, through emission reduction programmes.

Table 3.7: Industry changes from a five per cent reduction in utility costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–78	–29	–181
Mining	–305	–127	–128
Manufacturing	–631	306	1,741
Electricity, Gas, Water & Waste	–1,284	204	485
Construction	–138	412	3,066
Wholesale Trade	–78	24	130
Retail Trade	–160	50	269
Accommodation & Food Services	–131	41	219
Transport, Postal & Warehousing	–106	–19	–166
Information Media & Telecommunications	–87	1	–28
Financial and Insurance Services	–34	–163	–938
Rental, Hiring & Real Estate	–164	77	272
Professional, Scientific & Technical	–145	68	240
Administrative & Support Services	–54	25	88
Public Administration & Safety	–303	–35	–371
Education & Training	–48	–6	–58
Health Care & Social Assistance	–59	–7	–72
Arts & Recreation Services	–23	–146	–301
Other Services	–21	–131	–271
Total	**–3,848**	**544**	**3,996**

Source: Modelling results obtained from Cadence Economics

Lower utility prices create significant benefits to the Construction industry, although the benefit to employment appears to outweigh the benefit to value added. This suggests that the Construction industry could respond to lower utility costs by engaging in less capital intensive and more labour intensive techniques. This behavioural response was also noted in the resources industry at a time when high global demand encouraged the use of less efficient methods for resource extraction.

Most other industries record little to no change in their costs, output or employment.

Tax reductions support services and divert resources away from primary industries

For the purposes of the Cadence CGE model, 'taxes' are company and insurance taxes. Income and payroll taxes are modelled as a labour cost, while tariff costs are not captured. The relationship between taxes and economic growth is highly complex, and modelling results in this area should be taken as indicative only. The tax reduction modelled in this chapter is a simple cut in tax revenue collected by the government.

Company taxes are a relatively small input cost, but are notable for being a cost entirely created by government. Reductions in company tax lead to improved value added by removing deadweight costs. Company taxes deter foreign investors, and also reduce the pool of domestic funds a business has available to invest in itself. This leads to lower capital investment and less ability for firms to capitalise on economies of scale. Taxes also encourage firms to structure themselves to minimise tax rather than most efficiently meet the demands of a market.

As Table 3.8 shows, a reduction in these distortions is expected to yield a balanced and beneficial result, with payoffs to employment and investment. This is similar to results suggested by Treasury modelling, which looked at the incidence of company tax in Australia.[43] Most research suggests that company tax has an impact first and foremost on wage and salary earners. The modelling results indicate that a small (5 per cent) reduction in business taxes leads to an increase in employment by around 2,000 full-time equivalent jobs, with 1.45 jobs created for each $1 million saved.

[43] Treasury (2014) The incidence of company tax in Australia, *Economic Roundup*, issue 1

Table 3.8: Industry changes from a five per cent reduction in tax costs

Industry	*Cost reductions ($m)*	*Value added ($m)*	*Employment (FTE)*
Agriculture, Forestry & Fishing	–38	–19	–115
Mining	–112	–67	–86
Manufacturing	–82	–68	–394
Electricity, Gas, Water & Waste	–376	82	222
Construction	–162	211	1,681
Wholesale Trade	–99	22	174
Retail Trade	–123	28	215
Accommodation & Food Services	–76	17	133
Transport, Postal & Warehousing	–134	14	98
Information Media & Telecommunications	–25	–2	2
Financial and Insurance Services	–192	27	174
Rental, Hiring & Real Estate	–156	75	398
Professional, Scientific & Technical	–146	70	373
Administrative & Support Services	–81	39	207
Public Administration & Safety	–95	–58	–498
Education & Training	–45	–28	–237
Health Care & Social Assistance	–79	–48	–414
Arts & Recreation Services	–2	–1	0
Other Services	–53	–17	5
Total	**–2,079**	**277**	**1,939**

Source: Modelling results obtained from Cadence Economics

The model suggests that existing issues around job losses in Manufacturing and Agriculture, Forestry & Fishing are exacerbated by the change. This is because primary industries, which have relatively low levels of profitability, gain relatively less from a lower profits tax. When resource switching to other industries is factored in, these industries face a small net negative outcome from lower taxes. This resource switching comes about because industries that were already the most profitable — notably Construction, Utilities, Rental, Hiring & Real Estate, and Professional, Scientific & Technical Services — inherently gain the most from a lower tax on profits, which enhances their relative competitive advantage. Modelling suggests they are subsequently able to attract a greater share of total investment and a greater choice of qualified employees.

Government-linked sectors including Health Care & Social Assistance, Education & Training, and Public Administration & Safety also gain little from a lowering of tax on private profit.

As with most other input cost reductions, Construction is a key beneficiary. While the Construction industry is not among the most profitable at present, the model predicts significant flow-on benefits from the higher rate of investment by other, more profitable industries. Building and structure investment by Professional, Scientific & Technical services, Utilities, and Rental, Hiring & Real Estate services is already providing significant benefit to Construction: this benefit is enhanced as more of this kind of investment becomes feasible. The results suggest that a company tax cut would bolster frontier industries and industries connected to them, accelerating the pre-existing resource and structural shifts already underway in the economy.

What measures can be applied to reduce costs?

Cost reductions in any of the six business input costs examined in this chapter improve the workings of the economy, leading to increases in economic activity and employment.

There is no magic wand to wave that can reduce business costs by five per cent as we have hypothetically modelled. Indeed, the reality that businesses face on a day-to-day basis is one of *rising* costs and working out how they might adapt to these. It is precisely in this adaptation process that some businesses find ways of containing costs — for example, by embracing new digital technologies — and this is sufficient to give them an edge over their competitors and seize some additional market share and increase revenues and profits.

When we add up all of the instances where this occurs across the more than two million businesses in Australia, what we see is the underlying dynamic of competitive pressures generating productivity growth. It is productivity growth that foremost puts downward pressure on business costs and generates gains for consumers through lower prices and better quality goods and services. All else equal, growth in labour productivity will reduce labour costs, improvements in energy efficiency will reduce utilities costs, and innovations in business processes will reduce facilities costs.

Government plays a direct role in certain input costs. For instance, public institutions set the cash interest rate and the national minimum wage. The provision of infrastructure by government can lower transport and other costs by removing bottlenecks. But by far the most important role for government is to set an institutional environment in which competition flourishes. That means understanding the impact that company taxes and payroll taxes have on the incentives for businesses to grow, and striking the right balance in regulation between protection (of consumers, the environment and from predatory behaviour of other businesses) and promotion of entrepreneurship and innovation.

Appendix 3.1: The CEGEM model

CEGEM is a multi-commodity, multi-region, dynamic model of the world economy. Like all economic models, CEGEM is a based on a range of assumptions, parameters and data that constitute an approximation to the working structure of an economy. Its construction has drawn on the key features of other economic models such as the global economic framework underpinning models such as Global Trade Analysis Project (GTAP) and Global Trade and Environmental Model (GTEM), with state and regional modelling frameworks such as Monash-MMRF and TERM.

Labour, capital, land and a natural resource comprise the four factors of production. On a year-by-year basis, capital and labour are mobile between sectors, while land is mobile across agriculture. The natural resource is specific to mining and is not mobile.

A representative household in each region owns all factors of production. This representative household receives all factor payments, tax revenue and interregional transfers. The household also determines the allocation of income between household consumption, government consumption and savings.

Capital in each region of the model accumulates by investment less depreciation in each period. Capital is mobile internationally in CEGEM where global investment equals global savings. Global savings are made available to invest across regions. Rates of return can differ to reflect region specific differences in risk premiums.

The model assumes that regional labour markets operate in an environment where employment and wages adjust in each year so that, for example, if there is an increase in the demand for labour, the real wage rate increases in proportion to the increase in employment from its base case forecast level. The coefficient of adjustment is chosen so the employment effects of a shock are largely eliminated after about ten years. Labour supply is determined by demographic factors. The modelling scenarios used a labour supply elasticity of 0.1, which suggests a relatively tight labour market.

CEGEM determines regional supplies and demands of commodities through optimising behaviour of agents in perfectly competitive markets using constant returns to scale technologies. Under these assumptions, prices are set to cover costs and firms earn zero pure profits, with all returns paid to primary factors. This implies that changes in output prices are determined by changes in input prices of materials and primary factors.

The advantage of a global model such as CEGEM is that it accounts for bilateral trade flows of all commodities between regions. Goods are imperfect substitutes, implemented through the Armington assumption. The model does not require the regional current account to be in balance as the capital account can adjust to maintain balance of payments equilibrium.

The following should be taken into account when assessing modelling outputs:

- Benefits up and down supply chain aren't captured by the model. This likely leads to understating the benefits of changes to transportation costs
- Limitations may occur to the underlying features of the model (fixed vs. relative prices, fixed ratios of intermediate inputs etc.)
- There is a risk that some labour costs and fuel costs could be double counted between 'transport' and 'utilities/labour'.
- Materials as an input is not captured. For industries such as Manufacturing and Accommodation & Food Services, this is the most important input.

Base data

The starting point for the base data in CEGEM is the global database produced by the GTAP. This database is comprised of 140 country and regional groups and 57 production sectors. The Australian component of this database was supplied by the Productivity Commission, and is based on Australian input-output tables produced by the ABS.

For the purposed of this exercise, the database has been aggregated to the 17 sectors and two modelling regions shown in Table 3.9.

Table 3.9: Sectors and Regions in CEGEM

Number	*Sector*	*Number*	*Region*
1	Agriculture	1	Australia
2	Coal	2	Rest of the world
3	Oil		
4	Gas		
5	Other minerals		
6	Manufacturing		
7	Iron		
8	Electricity		
9	Water		
10	Construction		
11	Trade		
12	Transport		
13	Communications		
14	Finance		
15	Other business services		
16	Recreation and other Services		
17	Government, Education and Health		

Source: Obtained from Cadence Economics

Scenario development

To develop the cost reduction scenarios as described in the chapter the following procedure was implemented:

1. Estimated the impact a 5 per cent reduction in each of the defined input costs had on the overall cost of supply for each of the ANZSIC sectors (using the scope of costs as set out in Table 3.10).
2. Mapped these defined input cost reductions to the 17 CGE sectors described in Table 3.9.
3. Used the CGE model to model the economy-wide impacts of the defined cost reductions.

Table 3.10 provides an account of how each of the defined inputs costs where defined. Generally, they were assessed using the latest input-output table as provided by the ABS. For example, wages were defined as the Compensation of Employees for each of the industries as defined in the input-output table. Results from the model are not scalable. It may be possible to infer the impact of a small deviation (say 5.5% or 6%) from the 5% modelled reduction. But some variables are too elastic or inelastic to respond with perfect scalability if the price shock was substantially different (i.e., doubled to 10 per cent, or reversed to a 5 per cent increase).

Where the defined cost is not well-specified in the input-output table, we used the *Australian Industry* (ABS publication) to attain more detail.

Table 3.10: Cost reduction scenarios and the impact on cost reductions

Defined input cost	*Scope of cost*
Facilities	ANSZIC Division L: Rental, Hiring & Real Estate services
Finance/ interest costs	Interest Expenses^
Taxes	Other taxes less subsidies on production
Transportation	All transportation inputs including margin on supply **
Utilities	All utilities inputs including the margin on supply***
Wages	Compensation of Employees in the 2012–13 Input Output table*

* *Source:* cat. no. 5209.0.55.001 *Australian National Accounts*: Input-Output Tables — 2012–13
** Transport margins on supply include, road, rail, pipeline, water, air, port handling and marine insurance
*** Utilities margins on supply include gas and electricity
^ *Source:* cat. no. 8155.0 *Australian Industry*, 2013–14 (Table 4)

4 The energy–competitiveness relationship

Uncovering energy costs' impact on the competitiveness of Australia's industries.

Measuring the response of:

1. Energy efficiency to energy price changes
2. Export competitiveness to energy intensity/cost changes

The switch to cleaner technologies and the impact of related government assistance

Background

Environmental considerations and rising energy costs have thrust energy use and energy efficiency to the fore

Energy costs have been rising in Australia, particularly for certain industries like Manufacturing

The extent to which energy costs impact on competitiveness is not well known in Australia

Energy prices

Higher energy prices in Australia have not been fully offset by reductions in energy intensity, resulting in rising energy costs over time

CleanTech

Government assistance (CleanTech) had wider impacts by also boosting business performance

International competitiveness

Rising energy costs have a negative impact on the international competitiveness of energy intensive industries. Its significance, however, is generally overshadowed by other factors

Reduced emissions

Policy measures designed to encourage a switch to cleaner technologies have successfully reduced emissions

Rising energy costs have the potential to affect both individual businesses (at the micro level) and broader economic activity and competitiveness (at the macro level). The impact will be greater for businesses that specialise in energy-intensive products or for businesses that are not as energy efficient as their competitors. While energy price rises may induce firms to become more energy efficient, the response is unlikely to fully offset the price rise — meaning energy costs rise when energy prices rise reducing competitiveness.

In Australia, industrial electricity prices have outpaced inflation between 2002–03 and 2013–14 by a factor of three.[44] In contrast to electricity, industrial natural gas prices have more closely tracked CPI over the same time period. But the recent opening-up of domestic natural gas to international markets is likely to bring increased volatility.

The impact of changing energy costs on industry competitiveness is not well known in Australia. This chapter investigates the energy efficiency response (as measured by energy intensity) of industries to energy price changes using Australian energy data. The chapter also explores how changes in energy intensity and energy costs affect the export competitiveness of industries. The relationship is explored fully by a research paper that is available from the Office of the Chief Economist (OCE) website.[45]

Analysing energy costs is worthwhile for four reasons.

1. Energy costs as a proportion of total costs are prominent and rising for certain industries, such as Manufacturing and Transport, Postal & Warehousing. This can be observed for Australia and many other developed and developing countries throughout the world.
2. Energy policy is becoming more important. One of the key priorities of the *Energy White Paper* released in 2015 was keeping energy prices down while increasing energy productivity.[46] Similarly, the *National Energy Productivity Plan 2015–2030* (NEPP) outlines measures to improve Australia's energy productivity by 40 per cent by 2030.[47]

   Energy reform is also touted in the *Competition Policy Review*, including reference to deregulation of electricity and natural gas prices.[48] The *Industry and Innovation Competitiveness Agenda* highlights the need to improve regulation to provide competitive energy prices and greater choice for Australian households and businesses.[49]
3. Energy sectors around the world are making the transition to low-carbon generation technologies to slow the effects of climate change. Within this trend, the overarching objectives of a competitive, reliable, affordable and secure energy system remain important.

   As part of this transition, Australia has committed to reducing the impacts of climate change through the United Nations Conference of Parties (COP) 21 Paris Agreement.[50] Policy makers need to know how energy markets and related reforms will affect the economy as a result of this commitment.
4. Energy efficiency measures to reduce energy costs are growing in importance in most countries.

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[44] Based on ABS custom data request
[45] Horne M and Reynolds C (2016) *Energy costs and export competitiveness: evidence from Australian industries*, Department of Industry, Innovation and Science, Research Paper (forthcoming)
[46] Department of Industry and Science (2015) *2015 Energy White Paper*, p. 2, report
[47] COAG Energy Council (2015) *National Energy Productivity Plan 2015–2030*, p. 4, report
[48] Harper et al. (2015) *The Australian Government Competition Policy Review*, p. 52
[49] Australian Government (2014) *Industry Innovation and Competitiveness Agenda*, Canberra, Box B3, pp. 41–42
[50] 2015 United Nations Climate Change Conference, held in Paris, France, from 30 November to 12 December

To determine the impact that energy costs have on competitiveness, analysis summarised in this chapter adopts the methodology of *Energy Efficiency and EU Industrial Competitiveness: Energy Costs and their Impact on Manufacturing Activity* by the Vienna Institute.[51] In the report, the authors conduct a cross-country study of the Manufacturing industry to investigate whether:

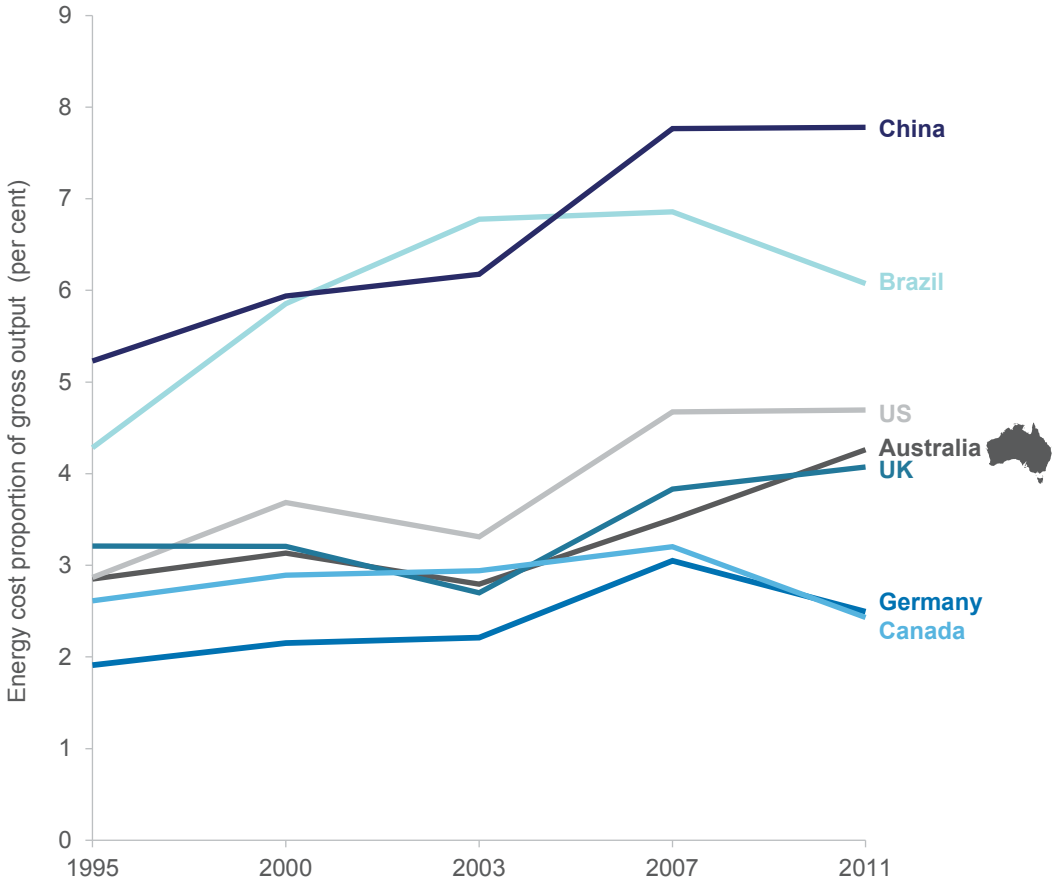
- energy price shocks drive energy efficiency improvements
- energy intensity or energy costs impact competitiveness, as measured by revealed comparative advantage (RCA).

Energy costs vary by country and by industry

Changes to energy costs relative to output have competitiveness implications. All else being equal, rising energy costs imply that a firm or industry is becoming less competitive compared to similar firms or industries.

From a whole-of-economy perspective, the magnitude of energy costs is influenced by the types of industries that make up the economy (Figure 4.1). Service-based economies such as Australia and the UK typically have lower proportional energy costs than more heavy-industry based economies such as China. In addition to the structural composition of an economy, the type of energy generation (the energy mix) impacts on energy cost levels as well.

Figure 4.1: Energy cost inputs to production as a percentage of gross output, Australia and selected countries, 1995 to 2011



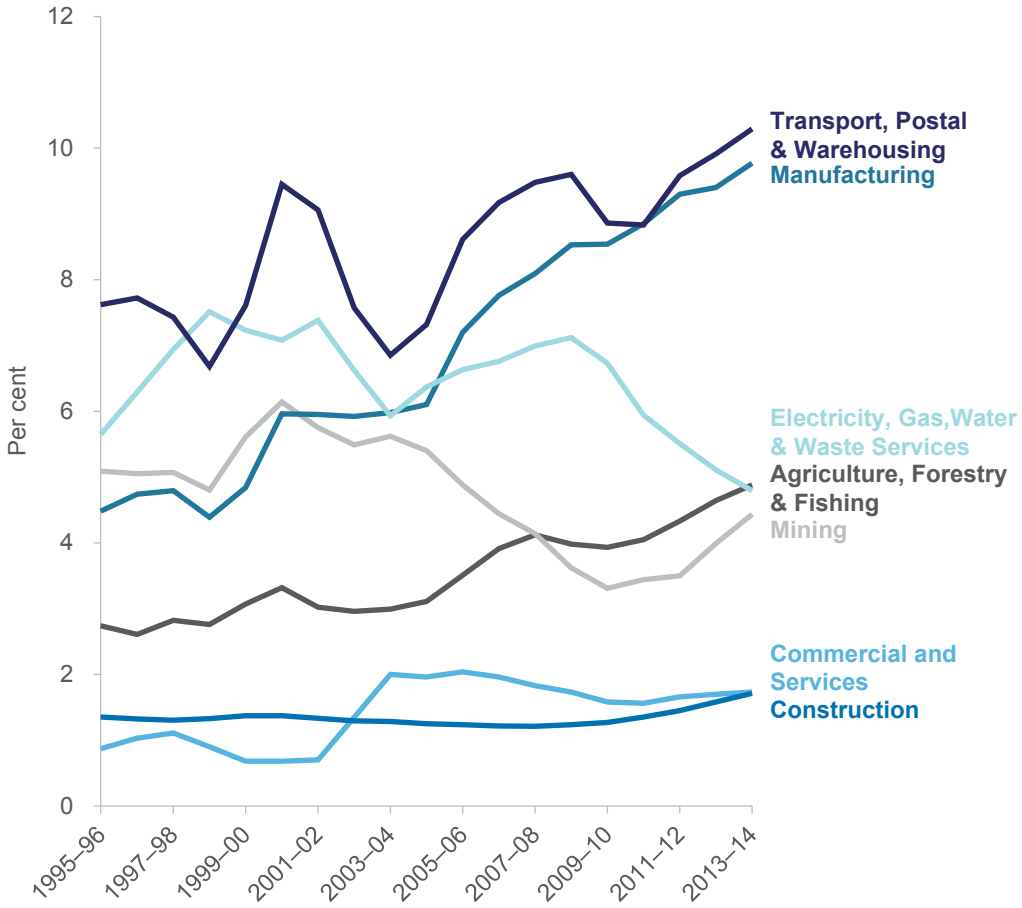
Source: World Input Output Database (WIOD)

[51] Astrov V et al. (2015) *Energy Efficiency and EU Industrial Competitiveness: Energy Costs and their Impact on Manufacturing Activity*, The Vienna Institute for International Economic Studies, Research Report 405

This comparison of country energy costs is made possible by using the *World Input Output Database (WIOD)*.[52] However, data is only available up to 2011. Since 2011 commodity prices have fallen, coinciding with (and being partly driven by) a large increase in the supply of energy, including the 'shale gas boom'. These developments have led to a fall in overall energy costs for certain countries.

Estimates for Australian industrial energy costs since 2011 are available from the ABS' new experimental estimates of Capital, Labour, Energy, Materials and Services (KLEMS). For certain industries (such as those in Commercial & Services and Construction) energy costs as a proportion of total costs are small and relatively unchanged over time (see Figure 4.2). But energy costs for Manufacturing and Transport, Postal & Warehousing increased sharply to around 10 per cent in 2013–14.

Figure 4.2: Energy cost as a proportion of capital, labour, energy, materials and services (KLEMS) input costs, 1-digit industries, 1995–96 to 2013–14



Notes: The KLEMS estimates for industry energy inputs do not necessarily align with the industry energy inputs calculated in Table 3.1 in the previous chapter. KLEMS estimates classify electricity transmission, distribution, on-selling and electricity market operation; and gas supply as a service input rather than energy input.

Source: ABS cat. no. 5260.0 *Experimental Estimates of Industry Level KLEMS Multifactor Productivity, 2013–14*

The ABS KLEMS estimates define cost inputs using a more granular classification that cannot be achieved using publicly available ABS data, as used in Chapter 3. The main difference is that aspects of electricity transmission, distribution and on selling; and gas distribution are classified as services costs rather than energy costs. This means that the industry estimates of energy costs in Table 3.1 do not necessarily align with the estimates in Figure 4.2.

[52] Timmer M et al. (2015) An Illustrated User Guide to the World Input-Output Database; the Case of Global Automotive Production, *Review of International Economics*, 23, pp. 575–605

Within these 1-digit industry groups, certain sub-industries have an even higher proportion of energy costs. For instance, electricity and natural gas inputs to Basic Non-Ferrous Metal Manufacturing were equal to 76 per cent of its Gross Value Added (GVA) in 2013–14.[53] Additional energy-intensive sub-industries are Pulp, Paper & Paperboard Manufacturing and Natural Rubber Product Manufacturing.

Despite these figures, aggregate energy costs as a proportion of gross output for the economy as a whole remain low. The *WIOD* shows that Australia's energy inputs have increased from three per cent of gross output in the mid-1990s to just above four per cent in 2011.[54] The KLEMS data tells a similar story.

What can levels of energy intensity tell us about energy efficiency?

The energy efficiency of firms and industries has improved markedly over time, both in Australia and throughout the world. Improvements in energy efficiency at the economy and industry levels are typically tracked by measures of energy intensity.

Analysis reported in this chapter defines energy intensity as energy product (total energy, electricity or natural gas) used per unit of real GVA. High levels of energy intensity are generally associated with low levels of energy efficiency and vice versa. The benefit of analysing energy intensity (rather than energy use or energy efficiency) is that output produced per unit of energy is easily comparable across countries or industries.

However, it does have one key limitation: it is not a direct measure of energy use or energy efficiency, and so improvements in energy intensity are not necessarily due to improvements in energy efficiency. It may be due to a changed structural composition of the economy (to less energy-intensive industries), or a changed level of real output.[55] This means care needs to be taken when interpreting changing energy intensity in the context of energy efficiency.

A focus on electricity and natural gas

When honing in on final (end-use) energy, electricity and natural gas are the two main energy sources in Australia (other than oil-derived fuels). In 2013–14, natural gas accounted for 21 per cent of net energy use by industry, while electricity accounted for 23 per cent.[56] In Manufacturing, these percentages increase to 40 per cent and 24 per cent respectively. This prominence, combined with data availability, mean electricity and natural gas are the basis of the energy-competitiveness investigation later in the chapter.

Energy prices

Price variables are incorporated to investigate whether industries adjust their energy intensity — and by extension, their energy efficiency — to energy price changes.

But sourcing energy price data at the industry level is challenging, partly due to the confidentiality of energy contracts between firms and energy providers. The Australian Energy Market Operator (AEMO) and International Energy Agency (IEA) provide aggregate indices, but these are less useful for studying effects at the industry level.

Another challenge is that firms often enter multi-year energy contracts, so they may be unaffected by short-term price fluctuations as represented by aggregate price indices.

Industry price data was sourced from the ABS (by special request) for the years 2002–03 to 2013–14. The annual data are nominal price indices for all 1-digit, and some 2-digit, ANZSIC industries.

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[53] ABS cat. no. 5209.0.55.001 table 2, *Australian National Accounts*: Input-Output Tables 2013–14
[54] Timmer M et al. (2015) op. cit.
[55] Stanwix G et al. (2015) *End-use energy intensity in Australia*, Department of Industry and Science, Research Report, Canberra, June, p. 1
[56] ABS cat. no. 4604.0 *Energy Account Australia, 2013–14*

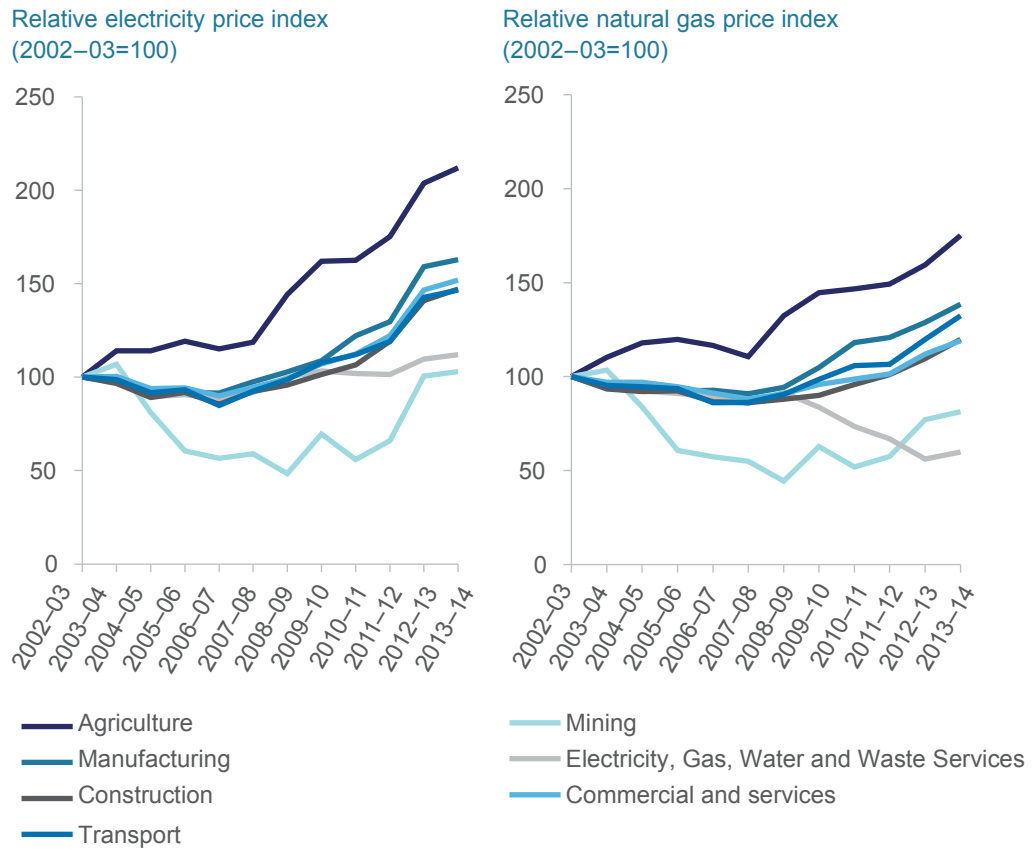
An initial investigation shows that electricity and natural gas prices have consistently increased over the past decade for all industries. The one exception is the nominal gas price for the Electricity, Gas, Water & Waste Services industry, which has remained broadly constant.

Before analysing the extent to which energy prices affect energy efficiency, prices need to be transformed to better reflect the cost relative to output (consistent with the Vienna Institute paper methodology). This is because it is the proportional cost share that is the greater consideration for business.

To account for this, the nominal price indices are divided by industry output price deflators to determine the relative energy price. This better reflects how much of an energy price increase (or decrease) is being absorbed by the industry in the form of an increased (or decreased) cost relative to output.

For most industries, the price of electricity and natural gas relative to the price of industry output has increased substantially over the five most recent years of data — in some cases, by more than 50 per cent. The relative price increase for Agriculture has been particularly large, with the relative electricity price more than doubling over the entire eleven year period. But this is mainly due to weak growth in output prices rather than Agriculture being subject to higher nominal price growth than other industries. A notable exception to all other industries is the Mining industry (see Figure 4.3), where the persistent initial decline meant energy costs were decreasing in prominence, despite a steady increase in the underlying nominal price index. Much of the relative decrease was due to the large increase in the value of output for the Mining industry as part of the resources boom.[57] But in the past five years this trend has reversed, with relative energy prices rising.

Figure 4.3: Relative electricity and natural gas price indices for 1-digit industries, 2002–03 to 2013–14



Source: ABS special request; Department of Industry, Innovation and Science calculations

[57] Downes P et al. (2014) *The Effect of the Mining Boom on the Australian Economy, Research Discussion Paper 2014–08*, Reserve Bank of Australia, August 2014

The trends for both price indices are similar, although the magnitude of change has been greater for electricity than for natural gas. A notable exception is the recent decline in the relative natural gas price for Electricity, Gas, Water & Waste Services. This corresponds with an unchanging underlying gas price index for this industry and rising output growth.

The three components discussed — energy costs, energy intensity (proxy for energy efficiency) and energy prices — will provide insight into the relationship energy has with competitiveness.

Do Australian industries improve their energy efficiency in the face of rising energy prices?

Results from Horne and Reynolds (2016) show that Australian industries respond to energy price rises by becoming more energy efficient (i.e. they reduce their energy intensity).[58] While the response differs in magnitude (depending on industry and energy type), it is consistently much smaller than the actual price rise in the short term, which means that energy costs rise when energy prices rise.

This is an intuitive result, particularly for the short term. It is difficult for firms to immediately improve their energy efficiency or switch to alternative, cheaper sources of energy in response to price shocks.

Energy efficiency responses are expected to be larger over the long term and for energy intensive-industries. However, this could not be fully tested due to data limitations. For 1-digit industries, the effect was smaller than estimated for the EU by the Vienna Institute. This is partly due to the inclusion of industries with proportionally low energy costs such as Commercial & Services (Figure 4.2).

The average energy intensity response for 2-digit Manufacturing industries is larger. But again, it is still not large enough to prevent energy costs rising as energy prices rise in the short term. These findings are in line with expectations and consistent with other research.[59] Testing the response for energy intensive Manufacturing sub-industries over the long term will likely find larger responses.

Identifying the relationship between relative energy prices and energy intensity relies on controlling for other factors. Without doing so, the magnitude of relationships is typically inaccurate due to 'unobserved' influence. For this study, capital intensity (capital per employee) is included because capital-intensive industries are more likely to be energy-intensive. A linear time trend, output gap and carbon tax and GFC dummy variables are also included. Full details are available in the technical paper.[60]

The industries in the 1-digit analysis are Mining; Manufacturing; Electricity, Gas, Water & Waste Services; Construction; Transport; and Commercial & Services.

Below is a summary of the 1-digit industry energy intensity response to price change, followed by the same analysis for 2-digit Manufacturing.

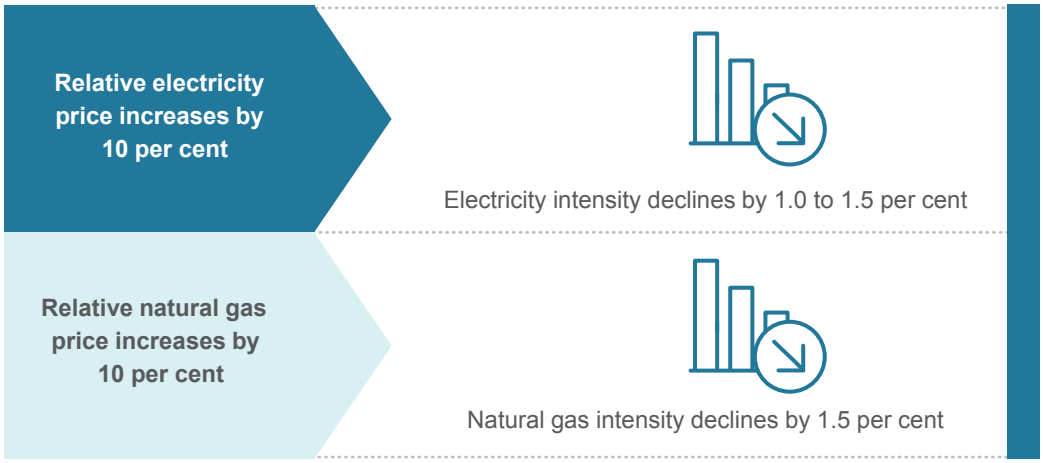
Results for the 1-digit industry aggregation

Multiple models were tested using relative electricity and/or relative natural gas prices to explain changes in the different energy intensities — electricity intensity, natural gas intensity and energy intensity.

The most meaningful relationships involved electricity intensity and natural gas intensity rather than the broader energy intensity. For electricity, a 10 per cent increase in the relative price of electricity leads to a reduction in electricity intensity of roughly 1.0 to 1.5 per cent (Figure 4.4), depending on model specification.

[58] Horne and Reynolds (2016) op. cit.
[59] Astrov V et al. (2015) Op Cit and Horvath A (2014) The effect of energy prices on competitiveness of energy-intensive industries in the EU (Chapter 9), *International Entrepreneurship and Corporate Growth in Visegrad Countries*, Mickolc: University of Miskolc, pp. 129–146
[60] Horne and Reynolds (2016) op. cit.

Figure 4.4: Short-run electricity intensity and natural gas intensity response to relative energy price changes, 1-digit industry analysis



Source: Department of Industry, Innovation and Science calculations

A similar negative relationship exists between relative natural gas prices and natural gas intensities. A 10 per cent increase in the relative price of natural gas leads to a reduction in natural gas intensity of roughly 1.5 per cent.

However, control variables lacked explanatory power for natural gas models, meaning the results are not as robust as those uncovered for electricity. Still, the results are partly substantiated by a recent cross-country study that finds a high price responsiveness for natural gas demand, albeit in the long run.[61]

Results using 2-digit Manufacturing aggregation

Following the 1-digit analysis, analysis turns to four Manufacturing sub-industry groups. The groups were:

- food, beverages and textiles
- wood, paper and printing
- petroleum and chemical products
- metal and other manufacturing.

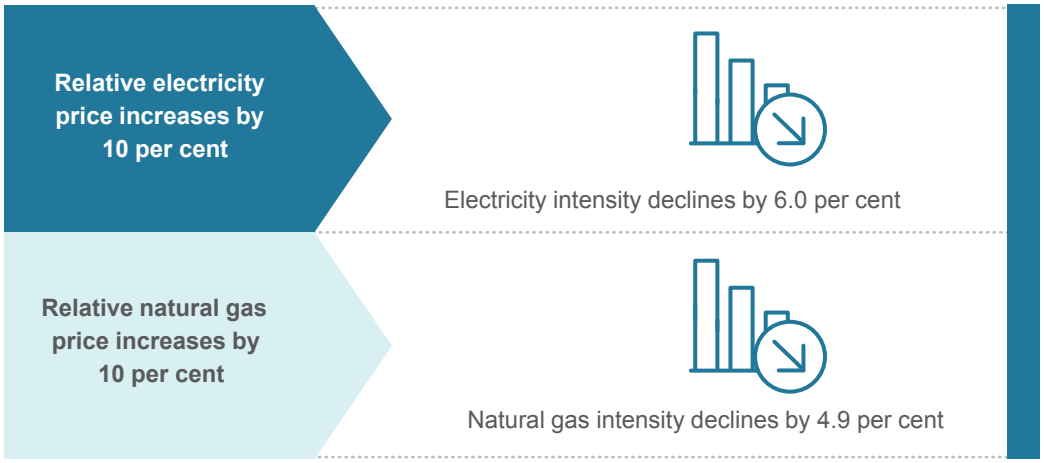
This allows for a refined focus on some of the most energy-intensive industries, where energy price rises are much more likely to drive improvements in energy efficiency/intensity.

One of the first aspects that stands out from the analysis is that relative prices have a statistically significant impact on overall energy intensity. This is in contrast to the 1-digit analysis where electricity intensity and natural gas intensity models returned significant results (there were no statistically significant results for overall energy intensity).

The impact of relative natural gas and relative electricity prices on energy intensity were much larger than for the 1-digit analysis. For a 10 per cent increase in the relative price of electricity or natural gas, energy intensity declines by between 4.9 and 6.0 per cent (Figure 4.5). This is a very large short-term effect, but is in line with expectations that energy prices matter more for energy-intensive industries.

[61] Burke P and Yang H (2016) The price and income elasticities of natural gas demand: International evidence, *Energy Economics* 59, pp. 466–474

Figure 4.5: Short-run energy intensity response to relative energy price changes, 2-digit Manufacturing analysis



Source: Department of Industry, Innovation and Science calculations

But these results are not particularly robust. The sample size is small, and the inclusion of control variables used in the 1-digit analysis did not have any explanatory power in multiple alternative specifications for these 2-digit Manufacturing groups. This means the model constructed is likely to be inadequate. The results remain preliminary until they can be substantiated by data that allows for a more thorough investigation.

The relationship between energy prices and energy intensities is in line with expectations, and consistent with other research.[62] While the extent that price drives energy efficiency/intensity is small in the short term, the magnitude is expected to be larger once industries have had more time to effectively switch energy sources or alter their energy-use behaviour.

Energy efficiency has the potential to enhance the cost competitiveness for a variety of industries — particularly energy-intensive sectors such as Manufacturing.

The Clean Technology Investment Programme aimed to help Manufacturing businesses invest in energy-efficient equipment, technologies, processes and products. The following feature article investigates what impact the programme had on the participating firms' emissions and growth performance.

[62] Astrov V et al. (2015) op. cit.

Feature article: Measuring the impact of the Clean Technology Investment Programme

Sasan Bakhtiari — Senior Economist, DIIS

In 2011, the Australian Government introduced a Clean Energy Future Plan: the Clean Energy Act (2011).[63] One element of the plan was a Clean Technology Investment Fund (CleanTech). It was aimed, in part, to help Manufacturing facilities make a smoother transition to newer and cleaner technologies and equipment.

The CleanTech programme ran from the beginning of 2012−13 to the end of 2013−14, and offered grants of up to half the proposed clean technology project cost. Manufacturing facilities were the main target of the programme. (Note: A facility is a plant or establishment that may or may not be tied to a larger parent firm that controls multiple facilities.)

A two-part study investigated:

- whether the CleanTech programme helped Manufacturing facilities to improve their energy and emissions efficiencies
- whether there was any broader impact from the CleanTech programme through instigating dynamism and growth among firms that received those grants.[64]

In these studies, comparisons are based on a multitude of performance indicators at the firm and facility level. The two main sources of information are The National Greenhouse and Energy Reporting Scheme (NGERS)[65] and the Business Longitudinal Analysis Data Environment (BLADE).[66]

The Department of Industry, Innovation and Science keeps an administrative record of all facilities and projects that received CleanTech grants to monitor their progress. This list is used to identify those firms and facilities in each database that received assistance via CleanTech. In total, 547 projects received CleanTech grants, most of which concluded by 2014.

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[63] See Act C2011A00131 on http://www.comlaw.gov.au

[64] Bakhtiari S (2016) Clean Technology, Regulation and Government Intervention: The Australian Experience, Department of Industry, Innovation, and Science (forthcoming) and Bakhtiari S (2016) Business Dynamics of a Clean Energy Policy, Department of Industry, Innovation, and Science (forthcoming)

[65] This reporting scheme was introduced in 2008 as part of Australia's international obligations. The database is available from the Clean Energy Regulator by authorisation (see http://www.cleanenergyregulator.gov.au). The database reports energy consumption and emissions for each facility.

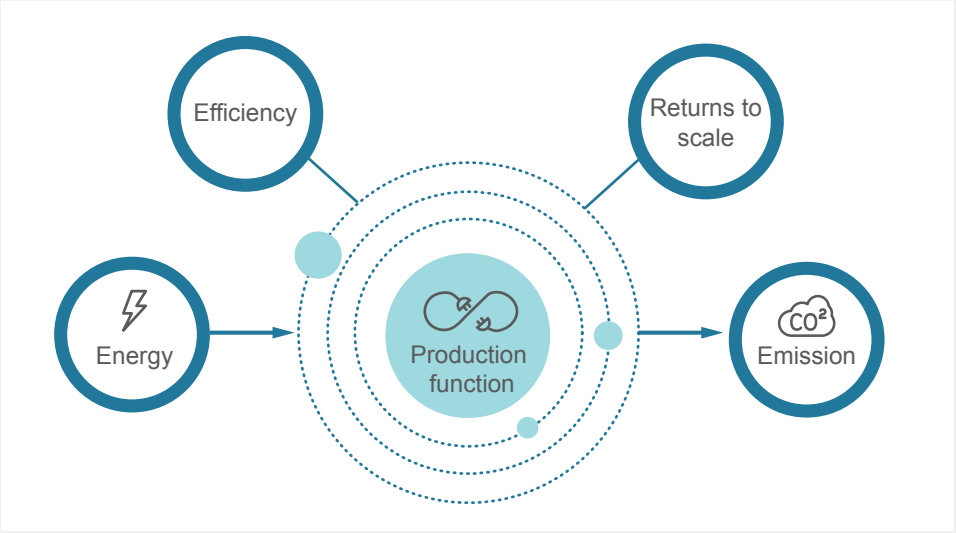
[66] The BLADE is a statistical asset that integrates financial and business characteristics data for over 2 million actively trading businesses in Australia from 2001–02 to 2013–14. Firm-level data from other sources (subject to the approval of the Australian Bureau of Statistics (ABS)) can be linked to the BLADE by using the Australian Business Numbers (ABNs) of firms.

On clean technology

The CleanTech programme was designed to accelerate emissions reductions and encourage adoption of newer and cleaner technologies and equipment. The main point of interest in this analysis is whether reductions in Manufacturing emissions are directly associated with shifts in technology rather than changes in the scale of business activity.

The analysis adopts a production function approach, where facilities consume energy (input) and produce emissions (output) as shown in Figure 4.6. Using this approach, it is possible to isolate and study the amount of change in facilities' emissions that is due to a change in technology between two time periods, holding energy consumption fixed.

Figure 4.6: A production function presentation of emissions technology



Source: Department .of Industry, Innovation and Science

This analysis method is applied to the change that took place from 2010−11 to 2013−14. This period captures changes in firm behaviour that have likely occurred since November 2011, when the Clean Energy Act (2011) passed legislation but was not actually in force. It also captures changes for the period when the scheme was in force — from July 2012 to July 2014.

Overall, there has been a 9.7 per cent reduction in Manufacturing emissions directly associated with the technological shift, rather than a change in energy consumption.

Facilities receiving the CleanTech grants achieved some extra emissions reduction on top of the general trend, but in different ways. Small and very large facilities (in terms of energy consumption) seem to have invested more heavily in clean technology and realised larger-than-average emission reductions. A significant proportion of mid-size facilities with CleanTech grants achieved emission reductions by reducing energy consumption.

On growth and job creation

The availability of CleanTech grants to eligible firms and their facilities was meant to create a smoother path to switching technologies with minimal operational interruption. To test this, the BLADE can be used to identify operational characteristics of CleanTech and non-participating firms. (Note: This part of the analysis was carried out at the firm level rather than the facility level.)

Carefully comparing the CleanTech firms with a comparison group (through a matching process explained in the box below) shows that the CleanTech programme helped firms not only to maintain their operation levels, but also to expand faster. Both employment and turnover among these firms grew about 25 per cent faster than similar firms without CleanTech grants. Exports grew about 50 per cent faster, but only for those CleanTech firms already exporting. Moreover, the results show that CleanTech firms are more likely to create full-time jobs compared to the firms in the comparison group. As expected, some increase in capital expenditure is also detected.

A difference-in-differences approach

Evaluating whether receiving CleanTech grant(s) by a firm has any impact on the performance indicator *X* means ideally considering

Δ = *X* of a firm with CleanTech – *X* of the same firm without CleanTech

and averaging the difference over all firms for statistical purposes.

However, it is impossible to observe a firm in both states simultaneously.

The next best alternative is to construct a set of counterfactuals that closely mimic the CleanTech firms. In this study, the counterfactuals rely on a matching process where each CleanTech firm is matched to its three nearest neighbours. The nearness of a neighbour is determined based on similarity in employment size, prior growth in employment, exports and foreign ownership status, and the industry group of the firm.

For *X*, I used the next period growth in employment, turnover, exports, and capital expenditure. The average treatment effect (Δ) shows the impact of CleanTech on the growth rate.

Repeating the same exercise within sub-groups of firms with certain characteristics sheds additional light on the areas of CleanTech that have been the most effective. The most interesting finding is that the CleanTech programme has been most effective among firms that experienced job losses before the programme. With the help of CleanTech, these firms started creating jobs and seeing their turnover increase.

While there is no evidence that CleanTech helped firms start exporting, exporting firms with CleanTech grants also saw their export values increase faster than similar firms. Finally, most of the positive impacts of the CleanTech programme seem to be concentrated among medium-sized and large firms.

Summary

A micro-econometric analysis of the Manufacturing sector allows to decouple the technology-related effect of the CleanTech programme on firms and their facilities from size and other effects. The findings point out that:

1. Overall, there has been a general shift towards the adoption of cleaner technologies.
2. Small and large facilities had extra reductions in emissions by investing more heavily in clean technologies.
3. Mid-size CleanTech facilities achieved extra emissions reduction by investing in reducing energy consumption, particularly through electricity efficiency.
4. The CleanTech programme had a wider impact by helping contracting businesses turn around and start creating jobs and increasing turnover. It also helped exporting businesses increase the value of their exports. Overall, the CleanTech programme seems to have boosted business activity in the Manufacturing sector.

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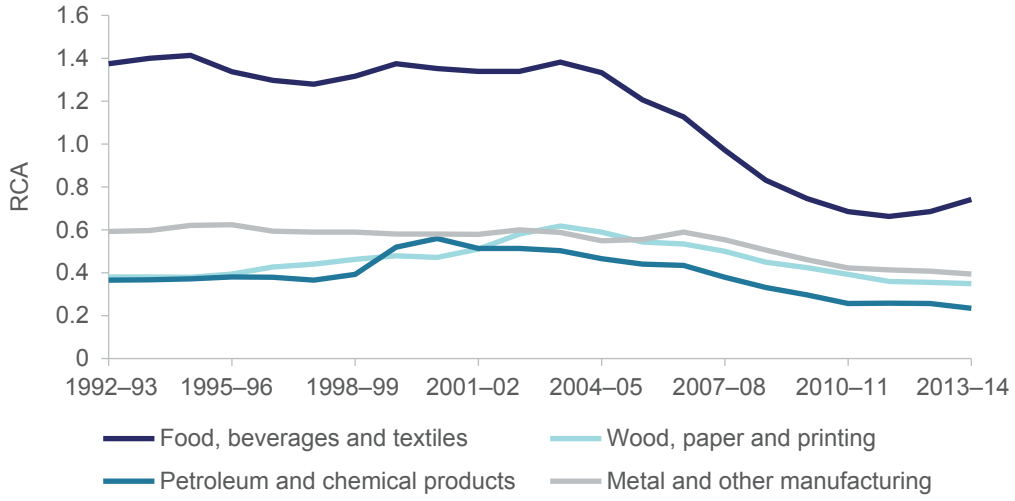
Do energy costs have an impact on Australia's industrial competitiveness?

The results of the analysis underlying this chapter show that increases in energy intensity (and associated increases in energy costs) have a negative but small impact on the competitiveness of Australia's Manufacturing industries, as measured by RCA and accounting for other factors.[67] However, no relationship is found when the analysis is extended to less energy-intensive industries.

RCA is an applied use of comparative advantage theory. It compares export volumes for industries or products/services of a domestic economy to the share of the same industries or products/services in world trade. Values greater than one imply a comparative advantage.[68]

To illustrate, all four Manufacturing groups analysed earlier had values of less than one in 2013–14 (Figure 4.7), with a general decline across all groups for the time period of data available. This implies that these Australian industry groups are uncompetitive relative to the rest of the world.

Figure 4.7: RCA for 2-digit Manufacturing groups, 1992–93 to 2013–14



Source: Department of Industry, Innovation and Science calculations

The relationship between RCA and energy intensity, or RCA and energy costs is the principle focus to investigate the energy-competitiveness relationship. Labour productivity is also included in the analysis as a control variable given its established link with competitiveness.[69] Likewise, capital intensity and wages and salaries are incorporated, as per the Vienna Institute paper.

Multiple specifications also include the price of industrial energy for Australia relative to industrial energy prices for OECD countries. A higher ratio implies that Australia has higher energy costs and *vice versa*.

[67] Horne and Reynolds (2016) op. cit.
[68] Department of Industry (2014) *Australian Innovation System Report 2014*, Canberra, Box 3.1 p. 83
[69] See for example Auzina-Emsina A (2014) *Labour productivity, economic growth and global competitiveness in post-crisis period*, 19th International Scientific Conference; Economics and Management 2014, ICEM 2014, 23–25 April 2014, Riga, Latvia

Results

The main finding for the 1-digit analysis is that there is no identifiable relationship.This may be due to data limitations or an inadequate model specification. For instance, RCA data is not readily available for service-based industries — 1-digit industries are restricted to Agriculture, Mining and Manufacturing because they are the only industries with reliable export data.

While a relationship might exist for a broader spectrum of industries, RCA cannot test this. However, including lower energy cost industries (as per Figure 4.2) may mean that the influence of energy costs on export performance is even less relevant.

To determine whether a relationship exists within higher energy-intensive industries, the analysis was extended to the same Manufacturing sub-industries investigated earlier:

- food, beverages and textiles
- wood, paper and printing
- petroleum and chemical products
- metal and other manufacturing.

An effect was uncovered using a growth (or first-difference) model.[70] The finding was that a 10 per cent increase in energy intensity (and implied increase in energy cost) leads to an average reduction in RCA of 0.01 (Figure 4.8) across the four 2-digit Manufacturing groups. While this effect size appears small, in the context of RCA values less than one (Figure 4.7), it is larger than it first appears.

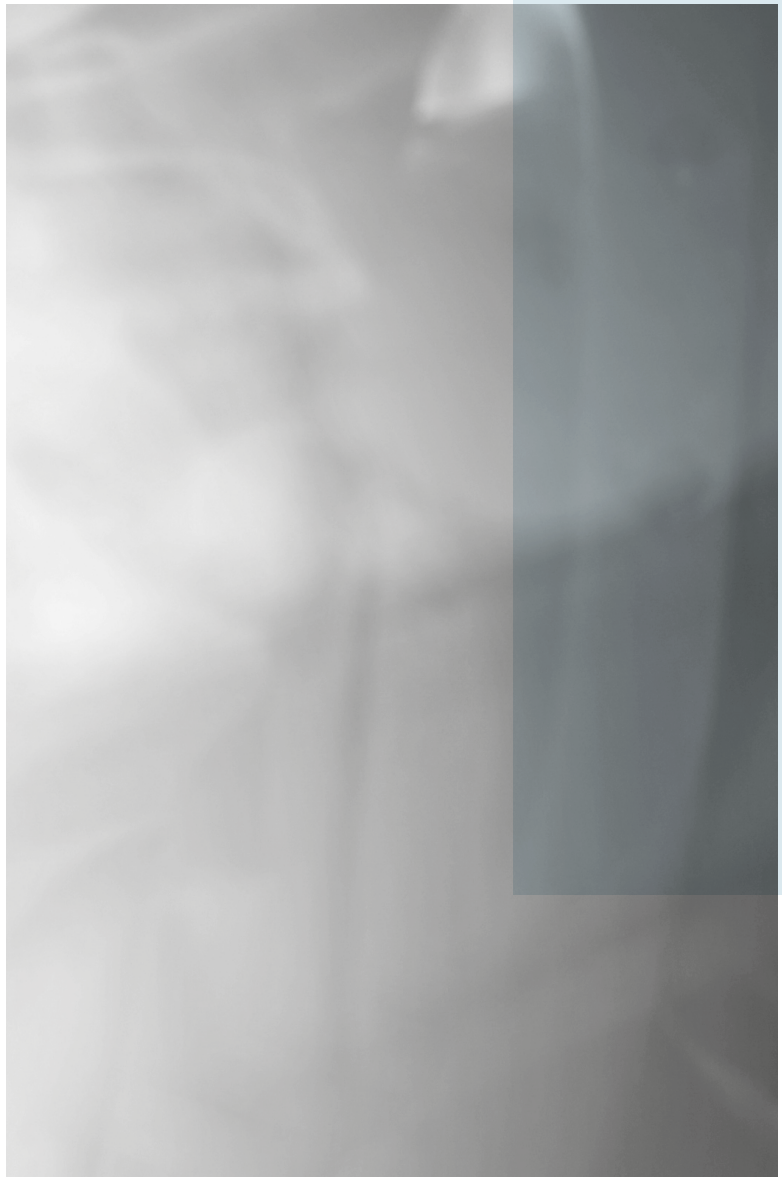
Figure 4.8: Energy intensity and industrial competitiveness as measured by RCA, 2-digit Manufacturing

Source: Department of Industry, Innovation and Science calculations

For control variables, the relative price of energy in Australia compared to other OECD countries proved to have high explanatory power, with an effect size similar to changes in energy intensity. That is, a 10 per cent decrease in the relative price of energy in Australia led to an increase in RCA of about 0.01. Labour productivity tended to have a positive influence on RCA, while capital intensity had a negative influence on RCA.

The available Australian data show that rising energy costs do have a detrimental but small impact on the competitiveness of Australian Manufacturing industries after controlling for other factors. But there is no discernible effect for less energy-intensive sectors. Testing these results definitively will require longer time period data sets covering a wider range of industries (particularly energy-intensive industries) that are currently unavailable.

[70] This is an econometric specification whereby changes in growth rates are used to test a relationship.



5 Export behaviour and business performance

A statistical overview of exporters and an empirical analysis of the performance of exporters relative to non-exporters.

Exporting is:

- a driver of economic growth
- an indicator of international competitiveness
- interrelated with innovation

Firm-level evidence on business performance prior and subsequent to exporting is essential for designing export promotion policy

Historically, Australia's exports have contributed significantly to its prosperity.[71] While the once-in-a-generation mining boom has reaffirmed the national gains from exporting, it is also beneficial at the firm level through:

- higher sales, given the availability of a larger market
- scale effects from spreading costs over a larger production volume
- a more diversified sales base that can insure against risks and seasonality associated with the domestic market
- knowledge and technology diffusion advantages
- a greater focus on efficiency and product quality as heightened competition is likely to lead to more innovation.

Recognising these benefits, the Australian Government supports exporters through measures such as the Export Market Development Grants, Tradex and Duty Drawback Scheme as well as agencies such as Austrade and the Export Finance and Insurance Corporation.

As discussed in Chapter 1, competitiveness has various dimensions. Exporters compete in foreign markets where competition can be more intense than at home. Hence, exporting is viewed as an indicator of the international competitiveness of businesses. This suggests there is a robust relationship between exporting and firm performance.

The Australian firm-level results presented in this chapter contribute to the international economic literature showing that:

- exporters are generally larger in terms of employment, output and productivity, and pay higher wages, than otherwise comparable non-exporters[72]
- superior business performance is more likely to precede, rather than follow, exporting.[73]

The creation of the Business Longitudinal Analysis Data Environment (BLADE) has made it possible to conduct more sophisticated microdata analysis of business performance in Australia. In the context of this chapter, microdata can shed more light on a number of important policy questions, such as:

- Is a solid business performance track record a prerequisite for initial export success?
- What are the barriers to exporting?
- Do new exporters grow in subsequent years?
- Do continuous exporters outperform intermittent exporters?
- What is the impact of government export assistance programmes and free trade agreements on export performance?
- Is diversification into additional products and/or foreign markets associated with improved business performance?

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[71] McLean I (2013) *Why Australia prospered: The shifting sources of economic growth*, Princeton University Press, Princeton

[72] Bernard A and Jensen J (1995) Exporters, jobs, and wages in US manufacturing: 1976–1987, *Brookings Papers on Economic Activity: Microeconomics*, pp. 67–119
Bernard A and Wagner J (1997) Export and success in German manufacturing, *Weltwirtschaftliches Archiv*, 133(1), pp. 134–157

[73] Wagner J (2007) Exports and productivity: A survey of the evidence from firm-level data, *World Economy*, 30(1), pp. 60–82

A recent study[74] by the OCE at the Department of Industry, Innovation and Science attempts to answer some of these questions using BLADE data. The study aims to reveal whether exporters outperform non-exporters in terms of employment, output, productivity, wages and investment. This chapter presents the key findings of the study.

Beginning with a statistical overview of Australian exporters, the chapter provides evidence on:

- the average size gap between exporters and non-exporters in terms of selected performance indicators
- business performance before and after foreign market entry
- the performance of continuous and intermittent exporters
- the impact of exporting on the probability of business survival.

Although causal relationships are not examined, the empirical evidence presented in the chapter is strongly suggestive. Businesses demonstrate superior performance several years before beginning to export. The evidence on business performance after foreign market entry is less clear cut, since current export status is a poor guide for future performance. However, exporters demonstrate a higher probability of survival than non-exporters.

A significant proportion of businesses start and stop exporting every year. As such, it is necessary to distinguish between continuous and intermittent exporters. The results suggest continuous, but not intermittent, exporters perform significantly better in all performance measures than businesses that never export.

An overview of Australian exporters

Within BLADE, more than 65,000 Australian businesses are identified as exporters in any given year.[75] Goods feature prominently in Australia's export basket, and thus over a third of exporters are concentrated in just four industry divisions — Mining, Manufacturing, Wholesale Trade and Information Media & Telecommunications.[76] Exporters account for 8–14 per cent of all businesses in these industries.

As shown in Table 5.1, the median employment level of exporters in these industries ranged between 5 and 17 workers in 2013–14. The age of the median exporter was 9–12 years in the same year.

[74] The study uses Business Activity Statement (BAS) data for the period 2004–05 to 2013–14, and follows the methodology of Bernard & Jensen (1999). See:
Bernard A and Jensen J (1999) Exceptional exporter performance: cause, effect, or both?, *Journal of International Economics*, 47, pp. 1–25
Tuhin R and Swanepoel J A (2016) Export behaviour and business performance: Evidence from Australian microdata, *Department of Industry, Innovation and Science research paper*, (forthcoming)

[75] Businesses that report at least $2,000 (in current prices) of export sales in BAS are counted as exporters. This is consistent with the ABS definition of an exporter.

[76] Successive results presented in the chapter are based on the businesses from these four industry divisions only.

Table 5.1: Median values of key characteristics and indicators for exporters in selected industry divisions, 2013–14

Key statistics (median)	*Mining*	*Manufacturing*	*Wholesale Trade*	*Information Media & Telecom.*
Turnover[a]	7,800	2,109	1,654	397
Export value[a]	1,373	105	112	42
Capital expenditure[a]	40	7	1	0
No. of workers[b]	17	15	8	5
Firm age (years)	12	12	10	9
Export to turnover ratio	0.52	0.07	0.09	0.15

Notes: (a) Thousand dollars in current prices, rounded to the nearest thousand; (b) head count

Source: Calculation based on the microdata from BLADE

The median export value in 2013–14 varied widely, ranging from around $1.4 million for Mining to about $40,000 for Information Media & Telecommunications. In addition, the median export values for Manufacturing and Wholesale Trade were around $100,000 in current prices.

Similar inter-industry differences are apparent for the export to turnover ratio[77] and capital expenditure. The median export to turnover ratio for Mining was over 0.5 in 2013–14, reflecting the high export intensity of the industry. However, at the median, only 7 per cent of Manufacturing turnover is generated from exports. Finally, the median capital expenditure was $40,000 for the Mining-industry exporters, but much less for other industries.

Born-global businesses

Businesses that start exporting at birth — the so-called 'born-global' businesses — are of particular interest. While larger and more mature businesses are more likely to export, born-global businesses defy this trend. This highlights their underlying strength (e.g. in terms of productivity or innovation) that enables them to enter the export market in the same year they start business operation.

Across all industries, there were around 3,000 born-global businesses in 2013–14.[78] They are highly export-oriented — generating, on average, a third of their turnover from exports. However, they are not big employers. In most industries, the median employment in born-global businesses varies between 1 and 3 workers. By and large, born-global businesses do not stand out in terms of the median capital expenditure either.

While they are found in all industries, nearly half of all born-global businesses are from Wholesale Trade and Professional, Scientific & Technical Services. The median export value generated by born-global businesses of these two industries ranged between $35,000 and $67,000 in 2013–14.

[77] This ratio shows the proportion of turnover generated from exports.
[78] Key statistics for born-global businesses vary little over time. For example, the statistical profile of the 2004–05 cohort of born-global businesses is similar to that of the 2013–14 cohort.

Average size gap between exporters and non-exporters

Table 5.2 shows the average size gap between exporters and non-exporters in terms of the levels of selected performance indicators.[79] Relative to non-exporters, exporters are on average about 24 per cent larger in employment and around 40 per cent larger in value-added.

Table 5.2: Average size gap between exporters and non-exporters in the levels of selected performance indicators, 2004–05 to 2013–14

Performance indicators[(a)]	*Level in exporter over and above non-exporter (per cent)*
Employment	23.8
Value-added	40.2
Labour productivity	13.4
Average wage	11.5
Capital expenditure	7.6

Notes: (a) Employment is the number of workers (headcount), value-added is turnover minus operating expenses, labour productivity is value-added per full-time equivalent (FTE) worker, average wage is total wages divided by total FTEs. Value-added, labour productivity, average wage and capital expenditure are in 2011–12 prices.

Source: Estimation based on the microdata from BLADE

In addition, full-time workers in exporting businesses are over 13 per cent more productive, and receive 11.5 per cent more in wages. Exporters also commit 7.6 per cent more in capital expenditure than non-exporters.

These results suggest there are substantial differences between exporters and non-exporters in terms of performance. Measures of employment, output, productivity, wages and investment are larger for exporting businesses. The remainder of the chapter examines the sources of these large differentials.

Business performance before exporting

This section examines business performance before their foreign market entry. For tracking performance over shorter intervals, the dataset is divided into two sub-periods:

- 2004–05 to 2008–09
- 2009–10 to 2013–14

Businesses that enter the export market in the final year[80] of each sub-period are compared against non-exporters in terms of the initial[81] levels of selected performance indicators.

The results in Table 5.3 show that the differences between future exporters and non-exporters are still substantial. For example, businesses that enter the export market in 2008–09 were already 10.4 per cent larger in employment in 2004–05.

[79] The analysis uses data on around 350,000 businesses for the decade to 2013–14, and takes into account their size, age, industry class, jurisdiction, year of operation and unobserved heterogeneity. Data on every business is not available for every year due to entry and exit.
[80] 2008–09 for the first sub-period and 2013–14 for the second.
[81] 2004–05 for the first sub-period and 2009–10 for the second.

Table 5.3: Pre-export size gap between future exporters and non-exporters in the initial levels of selected performance indicators

Performance indicators	*Level in future exporter over and above non-exporter (per cent)*	
	2004–05	**2009–10**
Employment	10.4	11.9
Value-added	12.5	18.3
Labour productivity	–	–
Average wage	–	–
Capital expenditure	5.0	2.9

Notes: '–' denotes statistically insignificant estimates.

Source: Estimation based on the microdata from BLADE

Relative to non-exporters, exporters also had higher levels of output and investment four years before beginning to export. For example, businesses that enter the export market in 2013–14 invested about 3 per cent more than non-exporters in 2009–10. However, no statistically significant difference between future exporters and non-exporters is apparent in terms of labour productivity and wages.

Further, export market entrants in the final year of each sub-period are compared against non-exporters in terms of the average pre-export growth. Estimates presented in Table 5.4 show that future exporters grew faster than non-exporters during the four years before their foreign market entry.

Table 5.4: Average annual pre-export growth differentials between future exporters and non-exporters

Performance indicators	*Growth in future exporter over and above non-exporter (percentage points)*	
	2004–05 to 2007–08	**2009–10 to 2012–13**
Employment	0.6	0.6
Value-added	2.6	1.7
Labour productivity	4.4	2.6
Average wage	4.7	3.4
Capital expenditure	3.2	2.1

Source: Estimation based on the microdata from BLADE

For example, the average employment growth rate for businesses that become exporters in 2008–09 was 0.6 percentage point higher per year between 2004–05 and 2007–08. Future exporters also realised significantly faster growth in other variables.

While not determining the causal relationship from business success to exporting, the results in Tables 5.3 and 5.4 suggest exporters outperform non-exporters even before beginning to export.

Exporter performance after exporting

Exporters accumulate knowledge on foreign consumers, competitors and technology.[82] Competition is also greater in the export market.[83] Since learning and competition generally lead to performance improvement, it is expected that exporting may also improve business performance.

This section examines exporter performance after their foreign market entry. The growth performance of businesses that export in the initial year[84] of each sub-period is compared against that of non-exporters. The results for the annual rates of change and the average annual growth over the intervals are presented in Tables 5.5 and 5.6, respectively.[85]

Over one-year horizons (Table 5.5), exporters grow faster than non-exporters in employment, but not in value-added. For example, the annual employment growth for businesses that exported in 2004–05 was 0.1 percentage point higher during 2004–05 to 2008–09. However, the annual value-added growth for these businesses was 1.3 percentage points lower over the same period.

Labour productivity and average wage in exporters also increase at significantly higher rates than for non-exporters. Also notable is the finding that the wage growth differential is larger than the productivity growth differential. The results for capital expenditure growth are mixed.

Table 5.5: Annual post-export growth differentials between initial exporters and non-exporters

Performance indicators	*Growth in initial exporter over and above non-exporter (percentage points)*	
	2004–05 to 2008–09	**2009–10 to 2013–14**
Employment	0.1*	0.2
Value-added	–1.3	–1.7
Labour productivity	4.8	3.1
Average wage	6.3	4.4
Capital expenditure	–1.0	0.9*

Notes: * denotes statistically weak estimates.

Source: Estimation based on the microdata from BLADE

In terms of the average growth during the intervals (Table 5.6), exporters outperform non-exporters only in labour productivity and average wage. Within a few years after foreign market entry, exporters show slower (or no faster) growth than non-exporters in terms of jobs, output and investment.

[82] Silva A, Afonso O and Africano A (2012) Learning-by-exporting: What we know and what we would like to know, *International Trade Journal*, 26(3), pp. 255–288

[83] Kostevc C (2009) Foreign market competition as a determinant of exporter performance: Evidence from Slovenian manufacturing firms, *World Economy*, 32(6), pp. 888–913

[84] 2004–05 for the first sub-period and 2009–10 for the second.

[85] If X is a variable in natural logarithm, then the *annual growth* in X is given by $\Delta X_t = X_t - X_{t-1}$ and the *average annual growth* in X between year T and year 0 is given by $\Delta X_T = (X_T - X_0)/T$.

Table 5.6: Average annual post-export growth differentials between initial exporters and non-exporters

Performance indicators	*Growth in initial exporter over and above non-exporter (percentage points)*	
	2004–05 to 2008–09	**2009–10 to 2013–14**
Employment	–0.1	–
Value-added	–1.3	–1.5
Labour productivity	2.0	1.7
Average wage	2.6	2.6
Capital expenditure	–0.7	–

Notes: '–' denotes statistically insignificant estimates.

Source: Estimation based on the microdata from BLADE

Performance of continuous and intermittent exporters

Some of the results presented in the previous section are likely to contrast with the general policy expectation regarding the growth performance of exporters. However, it should be noted that subsequent export behaviour of businesses that exported in the first year of a period is not taken into account for the analysis in the previous section.

In fact, there is significant churn in export market participation. On average, around 10 per cent of exporters stop, while nearly 5 per cent of non-exporters start, exporting every year. Hence, to understand the source of the discontinuity in exporter performance, it is necessary to examine the impact of business entry and exit in relation to export markets on subsequent business performance.

The large number of businesses moving in and out of export markets means that initial export status is poorly correlated with subsequent export behaviour, especially over longer intervals. As such, businesses in the dataset are classified into three distinct groups:

- continuous exporters — export every year of the period under observation
- non-exporters — do not export in any year
- switchers — change their export status within an interval.

Taking any two of these groups at a time, the growth performance of one group is compared against that of the other. Annual growth differentials in the variables are reported in Table 5.7. Differences in the average annual growth during 2004–05 to 2013–14 are shown in Table 5.8.

Table 5.7: Annual growth differentials for continuous exporters vs non-exporters vs switchers, 2004–05 to 2013–14

Performance indicators	*Growth in the first group over and above the second group (percentage points)*		
	Continuous exporter vs non-exporter	**Continuous exporter vs switcher**	**Switcher vs non-exporter**
Employment	0.5	0.5	0.1
Value-added	2.7	1.9	0.3
Labour productivity	3.3	2.2	0.8
Average wage	3.6	2.5	0.8
Capital expenditure	1.0	1.1	0.6

Source: Estimation based on the microdata from BLADE

The results are much clearer this time. In terms of annual growth (Table 5.7), continuous exporters perform significantly better than both non-exporters and switchers. The employment growth rate in continuous exporters is 0.5 percentage point higher than that of non-exporters or switchers.

Growth rates of output, labour productivity, wages and investment are around 1–4 percentage points higher for continuous exporters. In addition, even switchers outperform non-exporters in terms of one-year growth rates in all variables.

Analysis of the average growth over the entire period (Table 5.8) shows that continuous exporters pull much further ahead of non-exporters in terms of output, labour productivity and wages. A similar pattern emerges when continuous exporters are compared to switchers. However, employment and value-added grow no faster in switchers than in non-exporters. Switchers still outperform non-exporters in terms of the average growth in labour productivity, wages and capital expenditure.

Table 5.8: Average annual growth differentials for continuous exporters vs non-exporters vs switchers, 2004–05 to 2013–14

Performance indicators	*Growth in the first group over and above the second group (percentage points)*		
	Continuous exporter vs non-exporter	**Continuous exporter vs switcher**	**Switcher vs non-exporter**
Employment	0.6	0.5	–
Value-added	3.9	1.7	–
Labour productivity	6.3	2.3	1.2
Average wage	7.4	3.1	1.3
Capital expenditure	1.2	1.1	0.3

Notes: '–' denotes statistically insignificant estimates.

Source: Estimation based on the microdata from BLADE

Exporting and business survival

The analysis in the preceding sections is conditional on the business having survived. This section presents evidence on arguably the most important potential benefit from exporting — business survival. Given the costs of business failures and the resulting dislocation of workers, any benefit from exporting in terms of a higher survival rate would be significant.

Empirical studies of exporters have shown that business export status is associated with a higher survival rate.[86] To determine if exporting has any effect on business survival, the probability of a business surviving from year *t–1* to year *t* is modelled based on the export status and selected performance indicators (levels of employment, value-added, labour productivity, average wages and capital expenditure) in year *t–1*.

The results strongly support the hypothesis that exporting is associated with a higher probability of business survival. On average, an exporter is about 8 per cent more likely to survive to the following year than a non-exporter with similar characteristics. The levels of employment, value-added, labour productivity and capital expenditure are also positively correlated with the probability of business survival.

[86] Wagner J (2013) Exports, imports and firm survival: First evidence for manufacturing enterprises in Germany, *Review of World Economics*, 149, pp. 113–130

6 Australian business and digital maturity

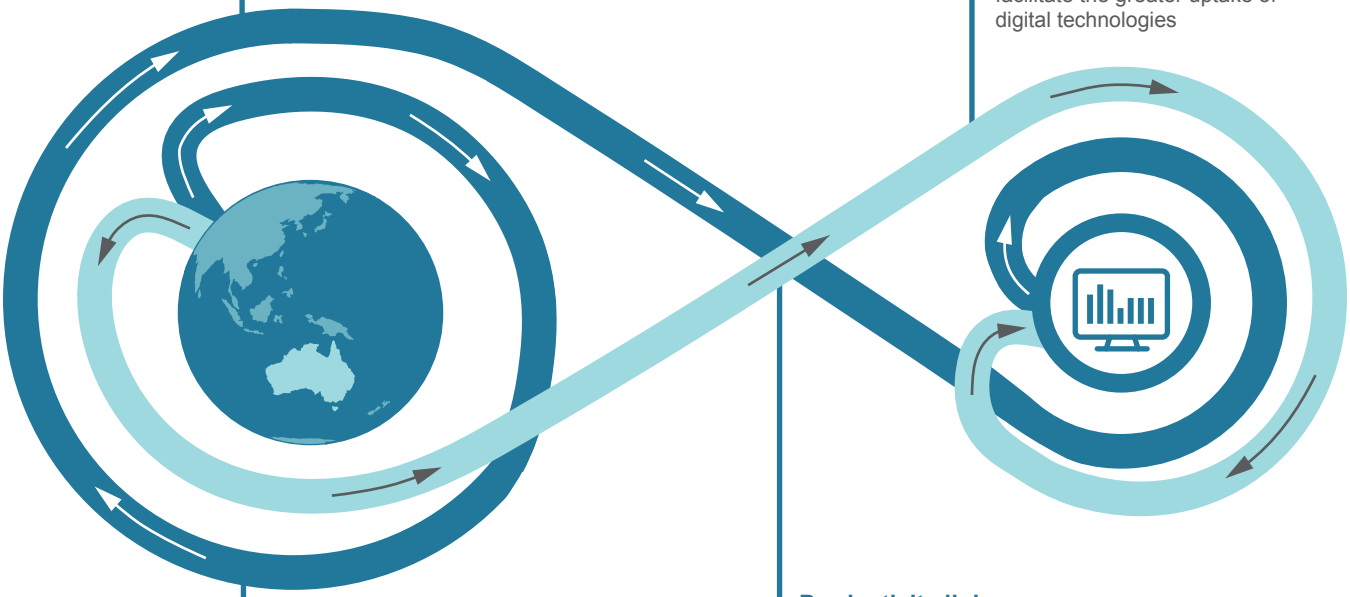
Examining the role of digital maturity in driving higher business productivity and economic growth, and demonstrating the benefits of better measurement for both business and government.

Making our economy strong

Digital maturity is considered to be a strong contributor to productivity at both the firm and economy-wide levels

Measuring digital maturity

New ways of measuring digital maturity will help in the development of policies that facilitate the greater uptake of digital technologies



Productivity linkages

Policy makers need stronger evidence of the link between digitally mature firms and productivity

Lifting productivity

Higher levels of digital maturity may help lift sluggish productivity growth

Challenges

Many Australian businesses, particularly SMEs, are not tapping into the full potential of digital technologies

Opportunities

As a result, they may be missing out on the productivity benefits of digital maturity

Digital technologies have immense potential to drive competition, innovation and productivity. There are many types of digital technologies ranging in levels of sophistication. Examples include internet connections, websites, emails, cloud computing, social media, e-commerce, online platforms, automated supply chain management and digital assets. Applications for these technologies have included innovations such as driverless vehicles, 3D printing, drones and wearable technology.

Not all sectors and firms in Australia are making full use of the potential of digital technologies. As a result, these firms are not as productive or efficient as they could be. In contrast, "digitally mature" firms are using digital technologies in sophisticated and innovative ways to continually improve their performance and competitive advantage. Digitally mature firms are in a strong position to take advantage of the opportunities offered by an increasingly connected and globalised economy.

There is now strong evidence that at an economy-wide level, business investment in digital technologies results in higher productivity over the long term.[87] This suggests that at the firm level, digitally mature businesses are more productive and competitive compared to firms that use digital technology at a relatively basic level. It also points to a growing gap in the economy between digitally mature firms and less digitally mature firms, with the latter running the risk of being left behind in the highly competitive world of the 21st century.

This chapter discusses why digital maturity is important for Australia's productivity growth and competitiveness, the challenges in measuring digital maturity, and how Australian businesses compare internationally. The department also outlines its plans to develop stronger evidence on digital maturity in Australia. Such evidence will allow policy makers and businesses to more accurately benchmark Australia's performance against other advanced economies.

Understanding digital maturity

Digital maturity is the extent to which a business uses digital technologies to improve its performance and competitive advantage, and includes more than just a firm's expenditure on computer equipment or software. To achieve digital maturity, a firm needs to adopt a strategic, integrated and holistic approach so it can make the most of its investment in digital technology.[88]

Digitally mature businesses tend to be more productive and competitive than less digitally mature firms. This capability can be a significant source of growth at a time of slowing productivity in the Australian economy. Digital maturity enables a firm to transform its operations and create new ways to exchange and provide services.

[87] Shahiduzzaman M, Layton A and Alam K (2015), 'On the Contribution of Information and Communication Technology to Productivity Growth in Australia' *Economic Change and Restructuring* 48, p. 300

[88] Shahiduzzaman M, Kowalkiewicz M, Barret R and Briggs A (2015) Technology investment is not enough: Growing Australia's Productive Digital Economy, *PwC Chair in Digital Economy based at Queensland University of Technology research paper* http://www.chairdigitaleconomy.com.au/wp-content/uploads/2015/12/ITandDEPaper_vFINa.pdf

Elements of digital maturity

Digital maturity has two elements:

- the level of technology investment and usage (digital intensity) intended to improve a firm's operational activities
- the level of management capabilities needed to create digital transformation within an organisation.[89]

Businesses can be at different stages of digital maturity according to how they use digital technologies and management capability. Figure 6.1 shows the four stages of digital maturity.

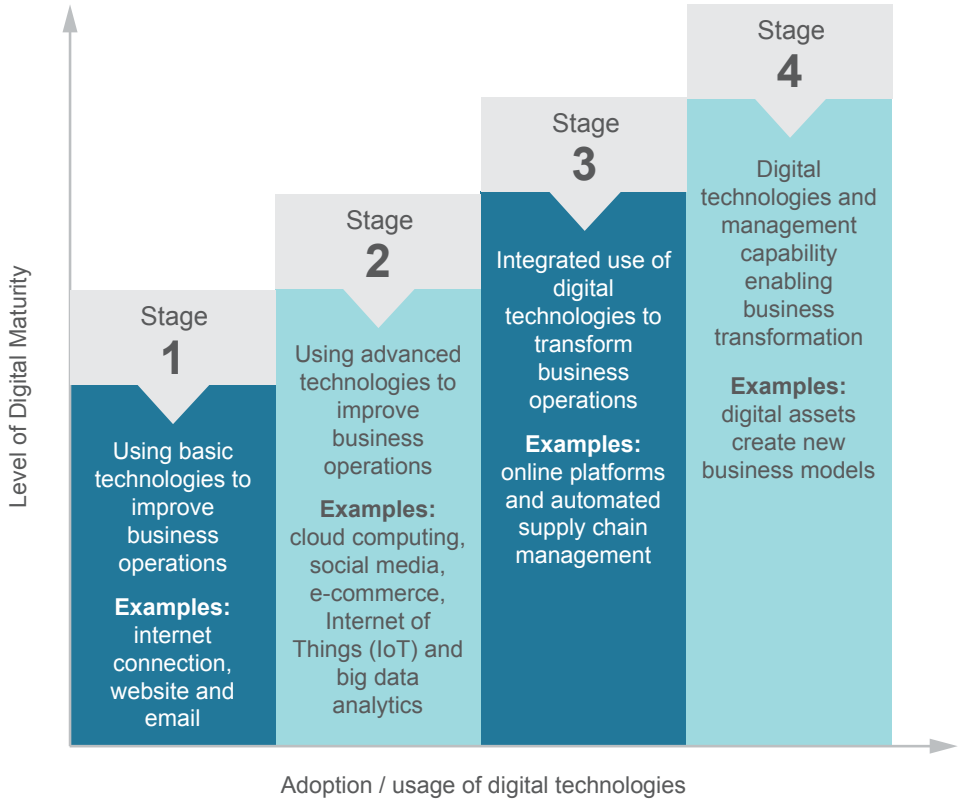
At the early stages of digital maturity, businesses use basic technologies such as connectivity to the internet, having a website, and using email to better communicate with suppliers and customers.

At the middle stages of digital maturity, businesses implement a more integrated, strategic approach to using digital technologies. For example, they may use advanced technology in sophisticated ways to improve their operations.

At the advanced stages of digital maturity, firms shift from simply digitising business operations to combining digital technologies in innovative and transformative ways. This often involves business leaders radically rethinking how their organisation operates and implementing a clear vision of the organisation's digital future.[90]

Achieving digital maturity is a dynamic and evolving process. Firms will never reach a state of complete digital maturity. Instead they must constantly examine new ways to use technology to increase productivity and maintain their competitive edge.

Figure 6.1: Stages of digital maturity



Source: Department of Industry, Innovation and Science

[89] Westerman G, Bonnet D and McAfee A (2012) The advantages of digital maturity, *MIT Sloan Management Review* http://sloanreview.mit.edu/article/the-advantages-of-digital-maturity/

[90] Westerman G and Bonnet D (2015) Revamping your business through digital transformation, *MIT Sloan Management Review* http://sloanreview.mit.edu/article/revamping-your-business-through-digital-transformation/
Kane G et al (2015) Strategy, not technology, drives digital transformation, *MIT Sloan Management Review* http://sloanreview.mit.edu/projects/strategy-drives-digital-transformation/

Importance of digital maturity

Australia's productivity has been lagging. New sources of growth are needed to maintain a high-wage economy and high living standards. There is strong international evidence to suggest that digital technologies can drive innovation and, in turn, enhance productivity and competitiveness.[91]

Digital maturity drives productivity growth and competitiveness

The benefits of digital maturity are significant at both the firm and economy level.

At the firm level, digitally mature firms are agile, using innovative practices to transform their operations. This allows for lower cost structures through the use of more efficient processes, thereby increasing productivity. Small and medium-sized Australian businesses that have reached advanced levels of digital maturity generate more revenue, create more jobs, and are more likely to be exporting compared to less digitally mature businesses.[92] By being more ready to experiment with new processes and technologies, they foster a more innovative and competitive marketplace. As a consequence, goods and services are produced at lower prices and higher quality. This ultimately leads to higher performing firms.

At a time of slowing demand for resources and softer commodity prices, Australia needs new sources of competitive advantage. Improving the uptake of digital technologies across all firms and industry sectors could make a significant contribution to economic growth. Digital maturity can generate new sources of income by allowing firms to access new and more geographically dispersed markets.[93]

Digital maturity can also provide an opportunity for Australia to remain a productive economy characterised by high-income, high-quality jobs. New evidence from the OECD suggests the main source of the slowdown in multifactor productivity is not so much innovation slowing down (it is continuing apace in the most globally-advanced firms), but rather the slowdown in the spread of innovation throughout the economy.[94] Earlier research at the Productivity Commission showed that the accelerated use of computers brought substantial productivity gains throughout the 1990s.[95] More recent evidence suggests that digital technologies are now generating varying productivity effects across Australian industries.[96]

Challenges in measuring digital maturity

Stronger evidence on how Australian firms use technologies will help both government and business to develop effective measures to seize the opportunities that digital technologies provide.

To better understand the links between digital maturity and higher productivity, new ways are needed to measure the use and impact of digital technologies on both firms and the wider economy. However, measuring the digital maturity of Australian businesses can prove challenging for three reasons:

1. There are continual changes and rapid advances in digital technologies.
2. Firms are combining digital technologies in a growing number of sophisticated ways.
3. The impacts from using digital technologies can be long-reaching and difficult to quantify.

These challenges are examined in further detail in this section.

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[91] *OECD (June 2016), Stimulating Digital Innovation for Growth and Inclusiveness*
[92] Deloitte Access Economic Report commissioned by Google, *Connected Small Businesses 2016*
[93] Boston Consulting Group (2013) *Ahead of the Curve: Lessons on Technology and Growth from Small-Business Leaders.* http://www.bcg.com.cn/export/sites/default/en/files/publications/reports_pdf/BCG_Ahead_of_the_Curve_Oct_2013.pdf
[94] OECD (2015), *The Future of Productivity* p. 8
[95] Productivity Commission (2004), *ICT use and productivity — a synthesis from studies of Australian firms*
[96] Bureau of Communications Research (February 2016), *IT Use and Australia's productivity — Where are we now?*

Rapid advances and sophisticated combinations of digital technologies

Rapid advances in technology present a key challenge in measuring the extent to which Australian businesses use digital technologies. Over the past 10–15 years, developments in hardware, software and network technologies have made it easier for firms to access and use digital technologies in every business operation.

Businesses are also using combinations of new technologies and applications, such as cloud computing, the Internet of Things and data analytics in highly sophisticated ways. It is difficult to separate and measure how individual components contribute to a firm's digital maturity. Businesses are using complex combinations of digital intensity, transformation management approaches and other strategies to realise the benefits of digital technology. For example, manufacturing processes that were once standalone and analogue are becoming increasingly digitised. This facilitates the development of "smart factories" that are significantly more flexible, transparent and customisable.

These rapid changes in technology and market trends make it difficult to obtain accurate and up-to-date data on the extent that firms and sectors are adopting digital technologies.

National statistical organisations are also grappling with these challenges and are taking steps to improve data collection on business technology adoption. The Australian Bureau of Statistics (ABS) continues to refine its annual Business Characteristics Survey (BCS), which now includes questions on the use of more advanced technologies such as cloud computing, intelligent software, data analytics and the Internet of Things. However, the ABS does not measure the impact of digital technologies on the entire economy.

Measuring impacts of digital technologies is challenging

Assessing the impact of digital technologies on firm performance and the wider economy is challenging, since digital maturity involves more than just physical investment. Recent evidence shows that it takes more than technology investment alone to improve a firm's performance.[97] Therefore, any methodology used to measure the impact of digital technology needs to assess both changes in investment and management practices to better harness digital technology.

New research also indicates that digital technology may be having a much greater impact on economic growth than expected. A recent report commissioned by the UK government suggests that if the digital economy were fully captured by official statistics, it could add between one-third and two-thirds of a per cent to the UK economy's growth rate.[98] The report argues that traditional measurements of GDP, which were developed when the economy was dominated by goods and services, are struggling to account for the impact of digital technologies.

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[97] *Technology Investment is not enough; Growing Australia's productive Digital Economy* http://www.chairdigitaleconomy.com.au/wp-content/uploads/2015/12/ITandDEPaper_vFINa.pdf

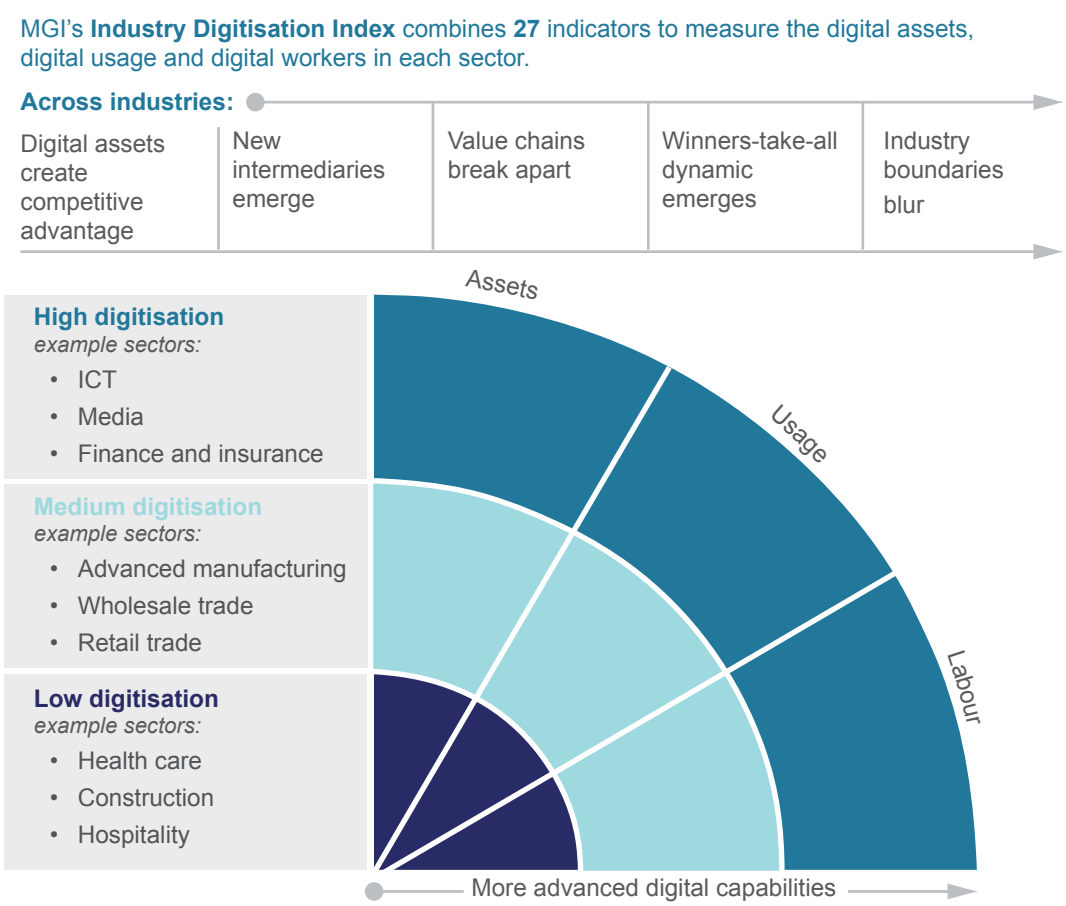
[98] UK Government 2016 Press notice: *'Take economic statistics back to the future' says Charlie Bean*, https://www.gov.uk/government/publications/independent-review-of-uk-economic-statistics-final-report/press-notice-take-economic-statistics-back-to-the-future-says-charlie-bean

New approaches for measuring digital maturity

International organisations such as the OECD and the G20 are now looking to develop better measures of the contribution of digital technology to the economy. This is in response to concerns that GDP does not directly account for economic benefits such as time saved, increased choice, and lower costs of production. Therefore, new approaches are needed to better estimate GDP growth and labour productivity increases.

The McKinsey Global Institute (MGI) provides an example of a model that better measures the impacts of digital technologies on an economy (see Figure 6.2). The Industry Digitisation Index (MGI Index) provides insights on digital maturity in the US economy (and more recently in Europe) using three broad categories — digital usage, digital assets, and digital workers.[99] McKinsey estimates that greater levels of digitisation could add up to US$2.2 trillion to US annual GDP by 2025.

Figure 6.2: McKinsey's Industry Digitisation Index



Source: McKinsey Global Institute

The challenge for business leaders and policy makers is to keep up to speed with the rapid changes brought about by digital technologies. Meeting this challenge requires a good understanding of what should be measured and how it should be measured, to ensure Australia is adopting and using the latest technologies and business models.

[99] McKinsey Global Institute (MGI) (December 2015), *Digital America. A tale of the haves and have-mores*

The department is developing stronger evidence on digital maturity in Australia. This evidence will help the government develop policies that facilitate business take-up of digital technologies. It will also help policy makers and business to accurately measure the impact of digital technologies on the economy. This work includes:

- Analysing the relationship between the adoption and usage of digital technologies, and the subsequent performance of Australian industries. To these ends, the department is investigating how it can leverage the Business Longitudinal Analysis Data Environment (BLADE) — a statistical asset that integrates financial and business characteristics data for more than two million active businesses in Australia.
- Working collaboratively with Data61 (the CSIRO's digital research unit[100]) to identify and develop a research methodology for measuring digital maturity using non-traditional data sets (Open Data Signals). Data61 is already exploring the use of non-official data sources to investigate the relationship between the use of digital technologies and firm performance.
- Building a statistical dashboard that aggregates and visualises data on Australia's engagement and performance in the digital economy. The "digital economy dashboard" will provide up-to-date statistics and regular analysis of how Australia is performing on various measures of the digital economy, including digital maturity.

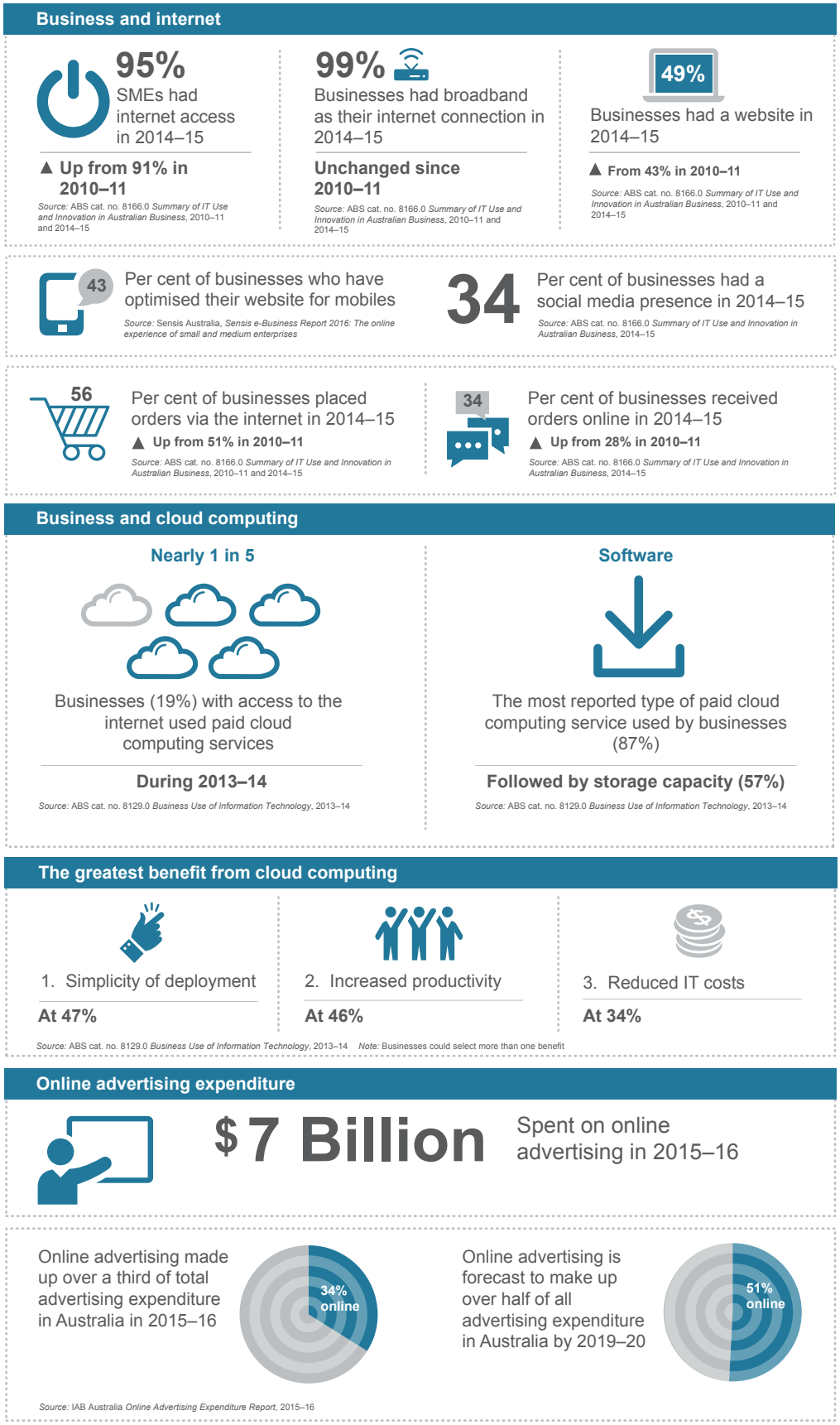
How are Australian firms performing?

Current measures of digital maturity indicate that many Australian businesses are lagging in the sophisticated use of digital technologies. Most businesses have internet access, about half have a website, and relatively few have a social media presence (see Figure 6.3).

Small and medium-sized enterprises (SMEs) tend to lag behind larger firms in their use of technology. For example, firms with four or fewer employees were the lowest users of cloud computing, compared to those with 200 or more employees.

[100] Data61's work includes making government data more accessible, improving industry cyber security, linking businesses with data researchers and training businesses in data analytics.

Figure 6.3: Business use of ICT



Source: Australian Bureau of Statistics, Australian Communications and Media Authority, Interactive Advertising Bureau Australia, Sensis, Price Waterhouse Coopers

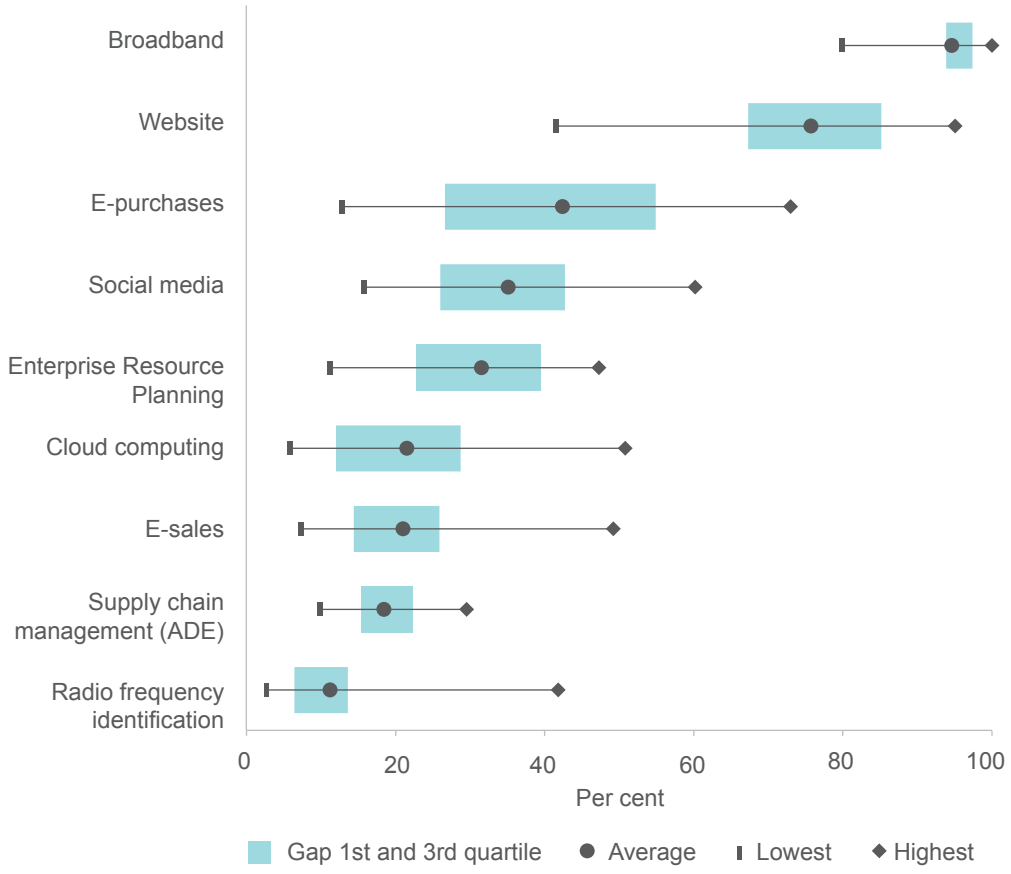
Australian businesses — especially SMEs — are missing out on the productivity benefits digital technology offers. Given the contribution of SMEs to the Australian economy, the data suggests many could be more productive if they were to increase adoption of digital technologies. There is also evidence that many businesses do not have a digital business strategy. The data show a growing gap in terms of growth and productivity between SMEs with a digital business strategy and those without one.

How does Australia compare internationally?

By international standards, Australian businesses are not fast adopters of technology. On a number of digital engagement indicators, Australia ranks in the middle of the pack of advanced economies, rather than at the forefront. For example, Australia is ranked 20th among OECD countries in terms of enterprises having a website — a cornerstone digital asset for any business to interact with customers and suppliers.[101] Australia also ranks 12th for business IT investment as a proportion of total capital investment.[102]

OECD studies show that many businesses, particularly SMEs that lag in productivity, also lag in digital maturity.[103] Despite the greater capacity for advanced ICTs (e.g. cloud computing, supply chain management, and enterprise resource planning software) to improve productivity, SME's adoption continues to be lower than their adoption of less advanced technologies such as broadband networks or websites (Figure 6.4).[104]

Figure 6.4: Diffusion of selected ICT tools and activities in enterprises, 2014



Source: OECD *Science, Technology and Industry Scoreboard,* 2015

[101] OECD *Digital Economy Outlook* (2015), p.133
[102] OECD *Digital Economy Outlook* (2015), p.161
[103] OECD *Digital Economy Outlook*, (2015), p. 47
[104] OECD *Science Technology and Industry Scoreboard*, (2015)

The World Economic Forum (WEF) also ranks countries on their adoption and use of ICT using the Networked Readiness Index (NRI).[105] The NRI measures the capacity of countries to leverage ICT to improve competitiveness and wellbeing. It ranks each country's performance across four categories of indicators:

- the overall environment for technology use and creation (political, regulatory, business, and innovation)
- ICT infrastructure, affordability and skills
- the use of technology by government, the private sector and individuals
- the economic and social impact of new technologies.

According to the WEF, Australia ranks 18th overall on the NRI, having slipped two positions from previous years due to a decline in connectivity and affordability (see Table 6.1).[106] The report notes that business use of ICTs in Australia was lagging compared to other countries (ranked 24th). It suggests that an increasingly sophisticated and innovative use of ICT is the common element of countries experiencing greater economic and social benefits from technology.[107]

Table 6.1: Where Australia ranks on key digital indicators[108]

Indicator	*Ranking (out of 139 countries)*
Network Readiness Index	18
Overall business use of ICTs	24
Availability of latest technology	24
Firm-level absorption of new technology	22
Business capacity for innovation	25
ICT use for business-to-business transactions	26
Internet use for business-to-consumer transactions	25
Impact of ICTs on new services and products	41
Employment in knowledge-intensive activities	13

Source: World Economic Forum, *Global Information Technology Report 2016*
http://reports.weforum.org/global-information-technology-report-2016

[105] *The Global Information Technology Report 2016*
https://www.weforum.org/reports/the-global-information-technology-report-2016
[106] Affordability (57), fixed broadband subscriptions remain expensive (US$46.7 per month adjusted for purchasing power parity, ranked 100th worldwide)
[107] *The Global Information Technology Report 2016*
https://www.weforum.org/reports/the-global-information-technology-report-2016
[108] Australia ranks higher on the overall NRI than on a number of digital indicators because it performs well on broader environmental indicators such as the political and regulatory environment and infrastructure.

7 The geographic distribution of economic activity

Explores the relationship between new experimental estimates of Gross Regional Product per capita and factors known to influence regional performance.

Australia's economy recorded 25 years of continuous economic growth. Despite this, some regions have benefited more than others. This uneven performance has important implications for the sustainability of remote and regional areas

Why do regions differ in terms of economic performance ?

Develop experimental estimates of **Gross Regional Product (GRP)**

Compare **GRP vs known factors**, that influence regional performance

Key findings

The new experimental estimates provide insight into the distribution of economic activity across Australia

Over **2/3** of Australia's economic activity is generated within less than **1%** of Australia's land area — in Australia's capital cities

A further **8%** of Australia's economic activity is from the mining regions of Western Australia Outback (the location of the Goldfields and Pilbara) and the Bowen Basin in Queensland

Outcomes

The results show that agglomeration, specialisation, infrastructure, structural change and knowledge intensity are all **positively related** to the performance of regions

These results are useful for explaining why **regions differ in performance** and in guiding government policy regarding regional assistance

Australia's economy has recorded 25 years of continuous economic growth. Having grown on average by around three per cent per year, today's economy produces more than twice what it did 25 years ago.

At a regional level this growth has been far from uniform and some regions have benefited more than others. The resource-intensive States exhibited particularly strong growth, while Tasmania and South Australia fell behind, with average annual growth rates closer to two per cent during this period.[109]

This chapter aims to provide insight into why regions differ in terms of economic performance. It uses regional output per person — Gross Regional Product (GRP) per capita — to measure regional performance. There are a number of factors that add to or detract from a region's economic performance. These factors can add up to significant differences in performance. For example, in 2014–15, GRP per capita in the Sydney Central Business District (CBD) was 14 times more than in the Queensland region of Moreton Bay South.

The chapter begins by developing experimental estimates of GRP, focusing on sub- State regions (known as Statistical Area level 4 (SA4) regions), which are developed by the ABS. In this chapter, the term 'regions' refers to all SA4s, which include regions located in both metropolitan and non-metropolitan areas.

The experimental estimates of GRP per capita are then plotted against factors known to influence regional performance — agglomeration, specialisation, infrastructure, structural change and knowledge intensity — to explore their relative importance.[110] The results show that all factors are positively related to the performance of a region. In particular, agglomeration and mineral resources are two factors that are associated with high levels of GRP per capita.

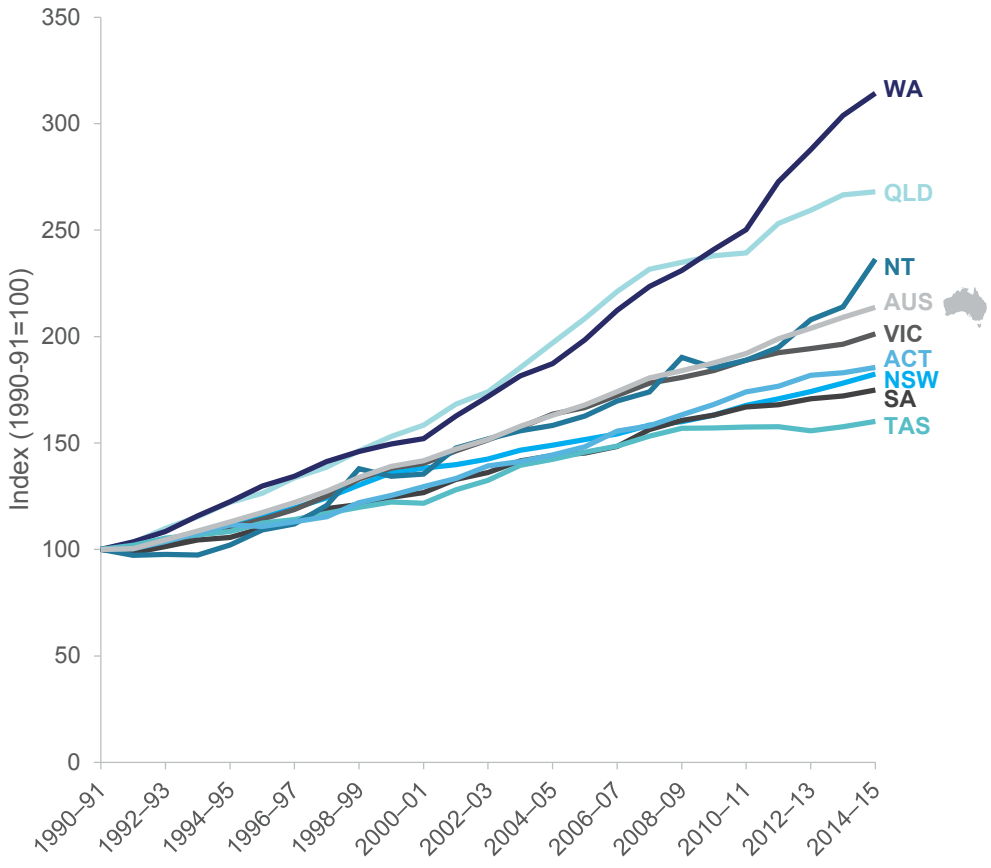
Accompanying this chapter is the release of an interactive mapping tool containing key regional statistics, including the experimental estimates of GRP. It can be found at https://industry.gov.au/Office-of-the-Chief-Economist/Publications/AustralianIndustryReport/Industry-Innovation-Map.html.

The performance of Australia's regions

Figure 7.1 shows the uneven performance of Australia's States and Territories, over the past 25 years in terms of output. Although all States and Territories experienced positive growth, not all of them followed the same growth trajectory. During this period, the resource-intensive States of Queensland and Western Australia consistently grew above the national rate. Victoria and the Northern Territory hovered around the national rate, while Tasmania, South Australia and the Australia Capital Territory grew below the national rate.

[109] ABS cat. no. 5220.0 (2014–15), *Australian National Accounts: State Accounts*, table 1
[110] Agglomeration refers to the concentration of people and industry within a region.

Figure 7.1: Gross State Product growth, 1990–91 to 2014–15

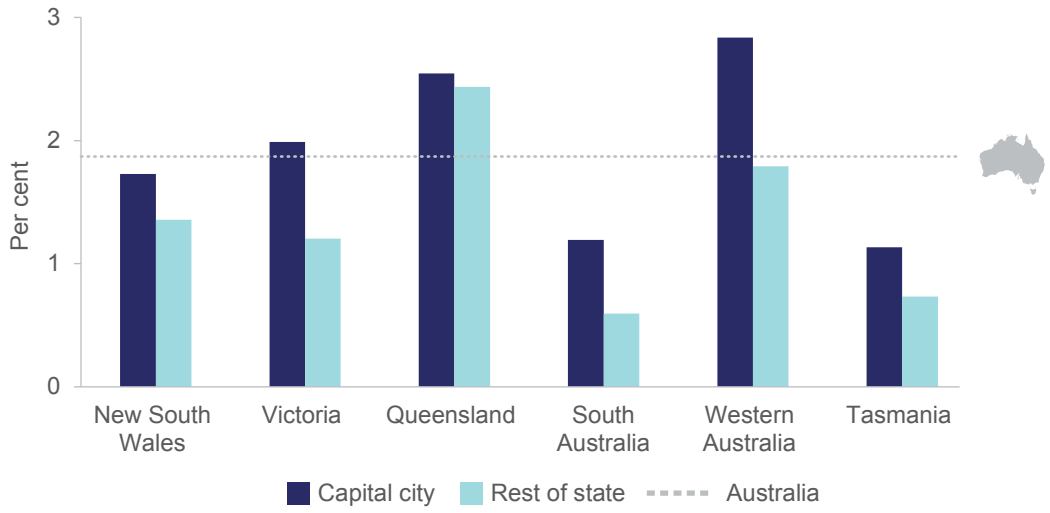


Notes: GSP figures are chain volume measures.

Source: ABS cat. no. 5220.0, table 1, *Australian National Accounts: State Accounts*, (2014–15)

Uneven performance is also reflected in regional employment figures. Figure 7.2 shows that capital cities are performing better than non-capital city areas. Employment is growing faster in State capital cities than respective regional areas. It also shows how much the mining boom has influenced employment in Western Australia and Queensland.

Figure 7.2: Average annual employment growth, 1992–2016



Notes: Data only available for States.

Source: ABS cat. no. 6291.0.55.003 EQ3, *Labour Force, Australia, Detailed, Quarterly*, (May 2016)

It is important to note that employment growth in capital cities is occurring off a higher base. In absolute terms, there has been much higher growth in the number of employed persons in capital cities compared to regional areas. Over this period, the absolute growth in employed persons amounted to almost three million more employed persons in State capital cities, compared with just over one million more employed persons in State regional areas.[111]

The uneven performance of regions has important implications for the sustainability of non-metropolitan regions. Increasing regional competitiveness can improve regional performance and economic growth by securing access to local and other markets. A region's competitiveness is determined by many factors, some of which can be influenced or affected by government policy.

In contrast to employment growth, there is little available data relating to regional output. The experimental estimates of GRP presented in this chapter will contribute to examining the performance of regions in the context of output. Box 7.1 contains a detailed description of SA4 regions.

[111] ABS cat. no. 6291.0.55.003, EQ3, *Labour Force, Australia, Detailed, Quarterly*, (May 2016)

Box 7.1: Defining Australia's regions

The Australian Statistical Geography Standard (ASGS) is a hierarchical classification system of geographical regions. The system starts with mesh blocks as the smallest regional areas. Mesh blocks aggregate to Statistical Area level 1s, which aggregate to Statistical Area level 2s, Statistical Area level 3s and Statistical Area level 4s.

SA4s are the largest sub-State regions (displayed in Figure 7.3). SA4 boundaries reflect population limits within each State and Territory. For regional areas, these population limits are around 100,000 to 300,000 persons. For capital city areas the population limits are around 300,000 to 500,000 persons.

Figure 7.3: 2011 Australian Statistical Geography Standard Statistical Area level 4 (SA4)

Source: ABS, *Australian Statistical Geography Standard (ASGS): Volume 1*, July 2011

There are 87 SA4 regions in Australia, with 43 located in greater State capital city areas. The remaining 44 are remote and regional locations. SA4s are intended to be a proxy for labour markets. But as the boundaries are restricted by population limits they often cut across or combine labour markets, which has implications for regional economic analysis. As seen in Figure 7.3, some outback SA4s cover significant areas of land. For example, the Western Australia Outback is the largest SA4, and contains many discrete areas of economic activity (e.g. the Pilbara and Goldfields). SA4s on the east coast are more reflective of regional labour markets. Capital cities such as Sydney, are made up of a number of SA4s (15) that can be aggregated to capture entire cities.

Source: ABS cat. no. 1270.0.55.005, *Australian Statistical Geography Standard (ASGS): Volume 5 — Remoteness Structure*, (July 2011);
ABS (2014) *Australian Statistical Geography (ASGS)*, (viewed 07 October 2016), http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Statistical+Geography+Standard+(ASGS)

Experimental estimates of Gross Regional Product

Research relating to GRP within Australia has generally been confined to the national and State levels, reflecting the availability of official data at these levels. Some estimates of sub-State GRP have been developed by private consulting firms. However, these estimates are generally proprietary products and not publicly available.

This section describes the methodology applied to estimate GRP, and discusses the resulting estimates.

Deriving the experimental estimates

The methodology used to derive the experimental estimates of GRP is based on the work of Queensland Treasury and Trade, which produces GRP estimates for regional Queensland.[112]

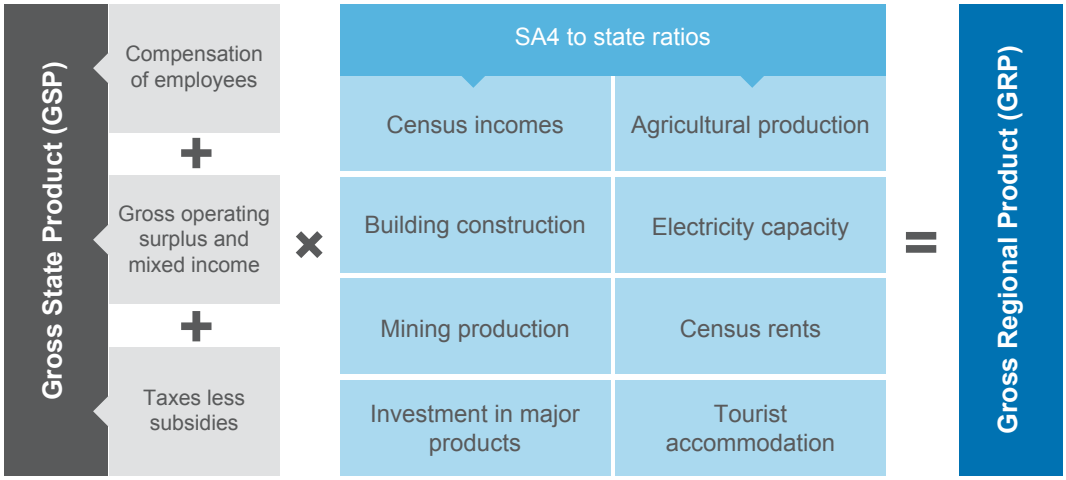
Estimates of GRP are derived from the 2014–15 Gross State Product (GSP) of each State and Territory (published in the State National Accounts[113]), and based on the income approach of measuring GSP. The income approach is the sum of incomes earned through the production of goods and services in each industry, in each State and Territory. The components of the income approach are:

- Compensation of Employees (incomes earned by employees and the self-employed)
- Gross Operating Surplus and Mixed Income (which includes business profits and imputed rental income through the ownership of dwellings)
- Taxes less subsidies.

To allocate GSP to regions, Queensland Treasury and Trade used an apportioning approach to estimate each SA4's share of GSP.[114] Derived SA4-to-State ratios apportioned each component of GSP to SA4s. A similar approach is used to derive the estimates presented in this chapter.

Figure 7.4 provides a brief summary of the methodology, and includes sources used to derive SA4-to-State ratios. A more detailed explanation of the approach used to estimate GRP (including limitations that should be considered when using these results) is included in Appendix 7.1.

Figure 7.4: An apportioning income approach to produce experimental estimates of GRP



Notes: Based on Queensland Treasury and Trade methodology.

Source: Department of Industry, Innovation and Science

[112] A detailed description of Queensland Treasury and Trade's methodology can be found at http://www.qgso.qld.gov.au/products/reports/experimental-estimates-grp/
[113] ABS cat. no. 5220.0, table 2 to 9, *Australian National Accounts: State Accounts*, (2014–15)
[114] Refer to Box 7.1 for a detailed description of SA4 regions.

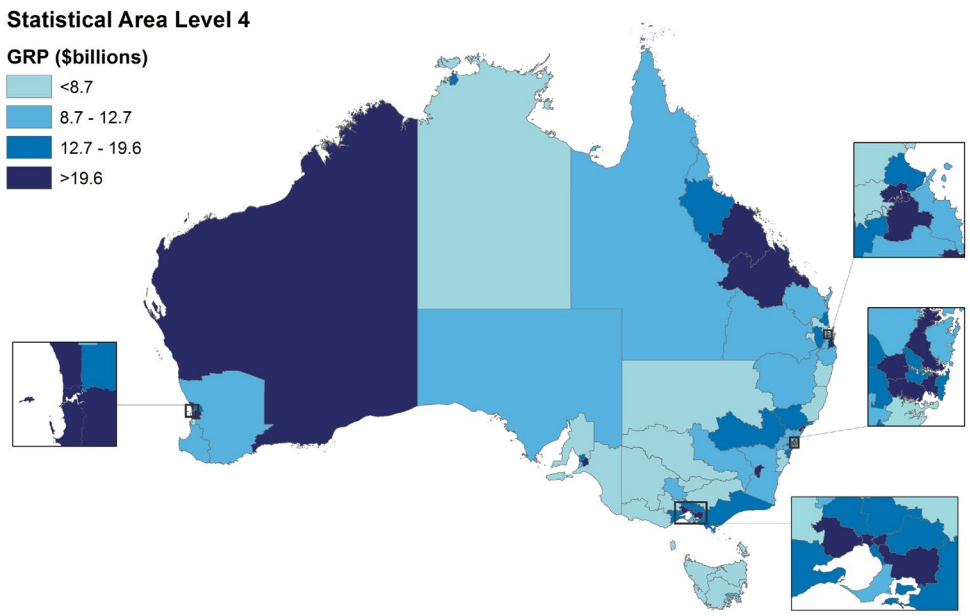
Experimental estimates of GRP

The experimental estimates of GRP provide insight into the distribution of economic activity across Australia:

- More than two-thirds (68 per cent) of Australia's economic activity is generated within less than one per cent of Australia's land area — in Australia's capital cities.
- A further eight per cent of Australia's economic activity is from the Western Australia Outback and Queensland's Bowen Basin.[115]
- The remaining 24 per cent of economic activity occurred outside capital cities, the Western Australia Outback and Bowen Basin, despite being home to around 31 per cent of Australia's population.

Figure 7.5 shows the results of the experimental estimates of GRP across Australia. GRP tends to be higher in capital cities (which can be attributed in part to their larger workforce and industry composition), and in mineral resource-rich regions such as the Bowen Basin and Western Australia Outback, which includes the Western Australia Goldfields and the Pilbara.

Figure 7.5: Gross Regional Product by Statistical Area Level 4, 2014–15



Notes: Based on Queensland Treasury and Trade methodology.

Source: Department of Industry, Innovation and Science experimental estimates

Figure 7.5 also highlights the limitations of using SA4 boundaries for this analysis. Ideally, GRP would be estimated for each labour market in Australia. However, many SA4s are clearly larger than labour markets. For example, the Western Australia Outback region encompasses a large amount of the State in terms of land area. However, in terms of economic activity a large proportion of this is likely to be occurring in the relatively small areas of the Pilbara and the Western Australia Goldfields further to the south.

Table 7.1 lists the top 15 SA4s in terms of GRP per capita, while Table 7.2 lists the 15 SA4s reporting the lowest GRP per capita. From Table 7.1 it is evident that regions with a high mineral resource base and large workforce tend to perform best in terms of GRP per capita estimates. These two factors are explored in more detail in the next section.

[115] The Bowen Basin is defined to encompass the SA4 regions of Mackay and Fitzroy.

Table 7.1: SA4s reporting highest Gross Regional Product per capita, 2014–15, ranked high to low

Rank	*SA4 Name*	*State or Territory*	*GRP ($billions)*	*Population ('000)*	*GRP per capita ($)*	*Workforce ('000)*	*Largest employing industry (May 2015) (per cent of total regional employment)*	
1	Sydney — City and Inner South	NSW	129	310	412,000	180	Professional, Scientific & Technical Services	(19.3)
2	Western Australia — Outback	WA	85	230	363,000	140	Mining	(16.9)
3	Perth — Inner	WA	45	180	251,000	100	Professional, Scientific & Technical Services	(18.0)
4	Brisbane Inner City	QLD	59	260	232,000	150	Professional, Scientific & Technical Services	(17.6)
5	Melbourne — Inner	VIC	124	600	206,000	340	Professional, Scientific & Technical Services	(18.5)
6	Queensland — Outback	QLD	11	90	119,000	50	Mining	(18.5)
7	Mackay	QLD	21	180	113,000	100	Mining	(12.4)
8	South Australia — Outback	SA	9	90	106,000	40	Agriculture, Forestry & Fishing	(19.6)
9	Adelaide — Central and Hills	SA	31	300	104,000	160	Health Care & Social Assistance	(16.2)
10	Darwin	NT	14	140	100,000	80	Public Administration & Safety	(16.0)
11	Sydney — Ryde	NSW	18	180	97,000	90	Professional, Scientific & Technical Services	(16.6)
12	Sydney — North Sydney and Hornsby	NSW	41	420	97,000	230	Professional, Scientific & Technical Services	(19.1)
13	Fitzroy	QLD	23	240	96,000	120	Construction	(11.5)
14	Australian Capital Territory	ACT	35	390	89,000	210	Public Administration & Safety	(29.8)
15	Northern Territory — Outback	NT	9	100	86,000	50	Public Administration & Safety	(19.0)

Notes: Figures have been rounded.

Source: ABS cat. no. 3235.0, *Population by Age and Sex, Regions of Australia*, (2015); ABS cat. no. 6291.0.55.003 RQ1, *Labour Force, Australia, Detailed, Quarterly*, (August 2016); Department of Industry, Innovation and Science experimental estimates

Table 7.2: SA4s reporting lowest Gross Regional Product per capita, 2014–15, ranked low to high

Rank	*SA4 Name*	*State or Territory*	*GRP ($billions)*	*Population ('000)*	*GRP per capita ($)*	*Workforce ('000)*	*Largest employing industry (May 2015) (per cent of total regional employment)*	
87	Moreton Bay — South	QLD	6	190	30,000	100	Health Care and Social Assistance	(10.9)
86	Moreton Bay — North	QLD	7	240	31,000	110	Retail Trade	(13.1)
85	Melbourne — North East	VIC	16	500	32,000	250	Health Care and Social Assistance	(12.2)
84	Adelaide — South	SA	12	360	33,000	170	Health Care and Social Assistance	(16.3)
83	Melbourne — West	VIC	24	730	34,000	360	Retail Trade	(11.1)
82	Mornington Peninsula	VIC	10	290	34,000	140	Retail Trade	(14.3)
81	Adelaide — North	SA	15	420	35,000	190	Health Care and Social Assistance	(14.9)
80	Mandurah	WA	4	100	35,000	40	Construction	(16.2)
79	Logan — Beaudesert	QLD	11	320	36,000	120	Manufacturing	(13.1)
78	Sydney — Inner South West	NSW	21	580	36,000	270	Retail Trade	(11.6)
77	Mid North Coast	NSW	8	210	36,000	90	Health Care and Social Assistance	(15.8)
76	Sydney — Sutherland	NSW	8	230	37,000	120	Health Care and Social Assistance	(12.6)
75	Tasmania — South East	TAS	1	40	37,000	20	Agriculture, Forestry and Fishing	(16.2)
74	Sydney — Outer South West	NSW	10	260	38,000	130	Retail Trade	(11.9)
73	Central Coast	NSW	13	330	38,000	150	Health Care and Social Assistance	(15.1)

Notes: Figures have been rounded.

Source: ABS cat. no. 3235.0, *Population by Age and Sex, Regions of Australia*, (2015); ABS cat. no. 6291.0.55.003 RQ1, *Labour Force, Australia, Detailed, Quarterly*, (August 2016); Department of Industry, Innovation and Science experimental estimates

Factors influencing performance

Research establishes a large number of factors associated with regional performance. Aiello and Scoppa explored why labour productivity and total factor productivity differed across Italian regions. Their research highlights the importance of infrastructure and the enforcement of property rights for explaining regional differences.[116]

The OECD also examined the main determinants of regional growth. Their research explored the relationship between GRP per capita growth and a number of explanatory variables. The results showed that population density, specialisation and diversity were all positively associated with GRP per capita growth.[117] Other research also highlights the importance of knowledge intensity, which includes factors such as human capital, skills, and research and development activity.[118]

The remainder of this section discusses some of the key factors identified in the research that are associated with regional performance. The experimental estimates of GRP per capita are considered in light of each factor to better understand what drives regional performance. It is important to note that this discussion relates to the relationship between GRP per capita and key factors, and is not claiming any causation.[119]

Agglomeration

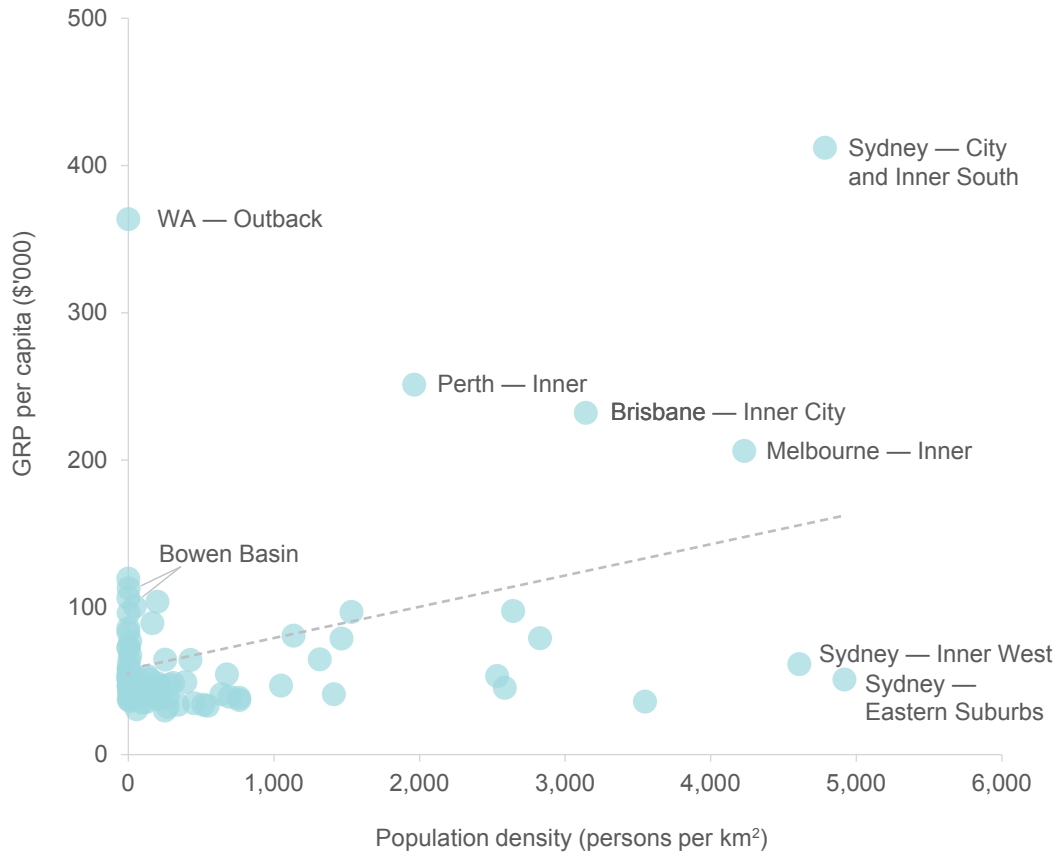
'Agglomeration' refers to the concentration of people and industry within a region. Agglomeration makes economies of scale available that improve the efficiency of production and reduce the cost of producing each unit of output (including transportation costs), creating more competitive firms. Considering these aspects, agglomeration should be important to a region's overall competitiveness.

Population density, which measures the average number of people per square kilometre for a given region, can be used as a proxy for regional agglomeration. The greater the density, the more people per square kilometre. This indicator is a good measure of agglomeration (scale), as businesses and markets concentrate around the location of people.[120]

Consistent with the findings of Aiello and Scoppa, Figure 7.6 shows that regions with higher estimates of GRP per capita tend to be those with greater population density.[121] These regions have advantages in terms of proximity to markets and supply networks, concentration of businesses, and access to labour. This translates to greater efficiencies and higher GRP per capita on average.

[116] Aiello & Scoppa (2000) Uneven Regional Development in Italy: Explaining differences in productivity levels, *Giornale degli Economisti e Annali di Economia*, 60(2), pp. 11–16
[117] OECD (2009) *How Regions Grow: Trends and Analysis*, OECD publishing, p. 101
[118] Department of Industry, Innovation and Science (2015) *Australian Industry Report*, Canberra, p. 138
[119] Endogeneity and multicollinearity exist in this analysis. These issues will be examined in closer detail in future work.
[120] Swanepoel J A and Harrison A (2015) The business size distribution in Australia, *Department of Industry, Innovation and Science research paper*, Canberra, p. 2
[121] Aiello & Scoppa (2000) Uneven Regional Development in Italy: Explaining differences in productivity levels, *Giornale degli Economisti e Annali di Economia*, 60(2). The authors used population density as an indicator of economics of agglomeration, their results show there is a positive effect on regional productivity from agglomeration economies, p. 17

Figure 7.6: Population density and GRP per capita, 2014–15



Source: ABS cat. no. 3218.0, *Regional Population Growth, Australia*, (2014–15); Department of Industry, Innovation and Science experimental estimates

Of course performance in some regions is not associated with agglomeration. As seen in Figure 7.6 and Table 7.1, these are primarily regions with high concentrations of mineral resources (Western Australia Outback and Bowen Basin). In these regions, a large value of economic activity is associated with a small labour force. These results suggest that both agglomeration and natural endowments (particularly mineral resources) are important for regional performance.

Specialisation

Similar to agglomeration, specialisation can also create economies of scale where industrial specialisation lowers the cost of production. For the purposes of this chapter, regional specialisation occurs when employment is concentrated in a small number of industries.

The Herfindahl Index is a commonly accepted measure of market concentration and specialisation.[122] The index takes into account the relative size and distribution of firms in a market, and reveals to what extent a given region is specialised or diversified.

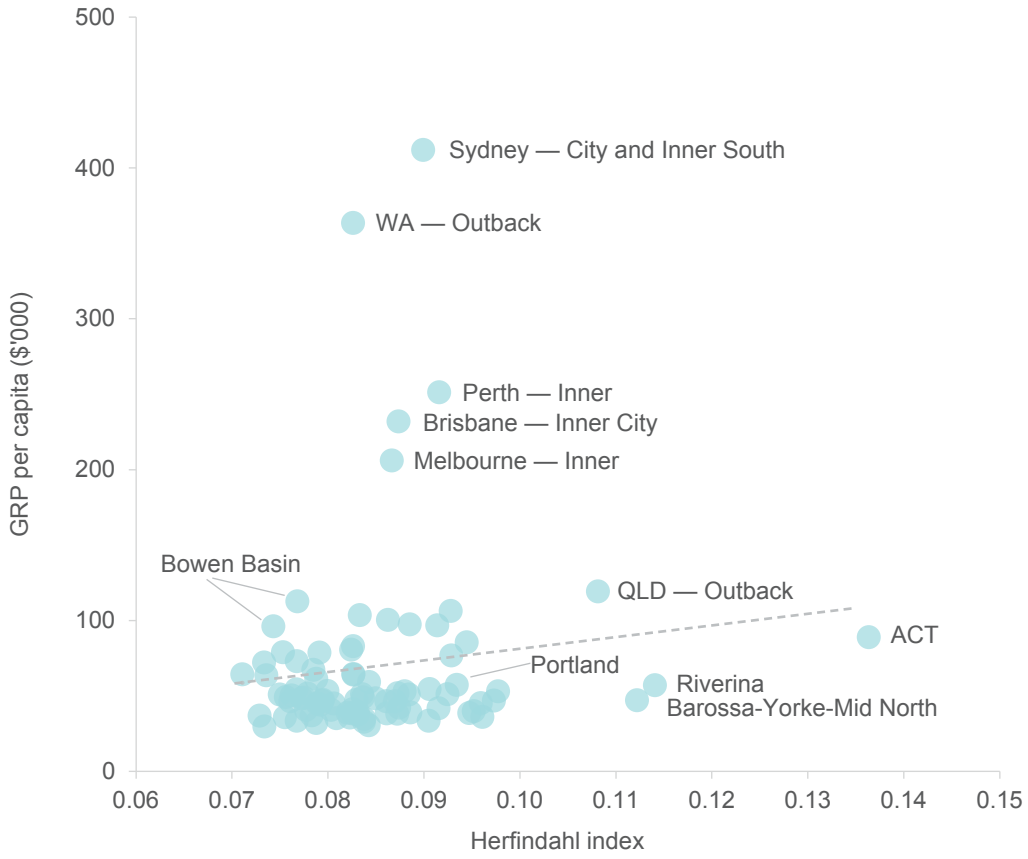
Here, the index is used as a measure of industry concentration across regions. The Herfindahl Index is calculated by squaring the employment share for each of the 19 Australia New Zealand Standard Industry Classification (ANZSIC) divisions within a given SA4, and then summing the resulting numbers. The index value ranges between 0 and 1, increasing with the degree of regional concentration and specialisation, and reaching the upper limit of 1 when all employment is in one industry.

[122] Zizi Goshin et al, *Regional Specialization and geographic concentration of industries in Romania*, viewed 19 October 2016 http://www.asecu.gr/files/RomaniaProceedings/27.pdf

Figure 7.7 shows GRP per capita plotted against regional Herfindahl Indices. The results show a positive relationship between GRP per capita estimates and industry concentration.

Despite this, research suggests that specialisation in (or relying on) natural endowments may leave individual regions vulnerable to environmental and economic shocks to their endowments — both positive and negative.[123] In 2014–15, the mineral rich regions of the Bowen Basin, Outback Western Australia and Outback Queensland reported higher estimates of GRP per capita compared to the regions of Portland, Riverina and Barossa, which have relatively high concentrations of employment in Agriculture, Forestry & Fishing. This reflects relatively high mineral commodity prices. If mineral commodity prices were to change markedly, so would the results of these regions.

Figure 7.7: Herfindahl Index and GRP per capita, 2014–15



Source: ABS cat. no. 6291.0.55.003, *Labour Force, Australia, Detailed, Quarterly*, (August 2016); Department of Industry, Innovation and Science experimental estimates

Infrastructure

Infrastructure connects regions to markets, improves the efficiency of production, and contributes to productivity by reducing costs.

The various categories of infrastructure include:

- transport
- communications
- public utilities
- education

[123] Houghton K (2011) *Characteristics of Economic Sustainability in Regional Australia*, ANU discussion paper prepared for HC Coombs Policy Forum, p. 6

- health services
- tourism and entertainment facilities.

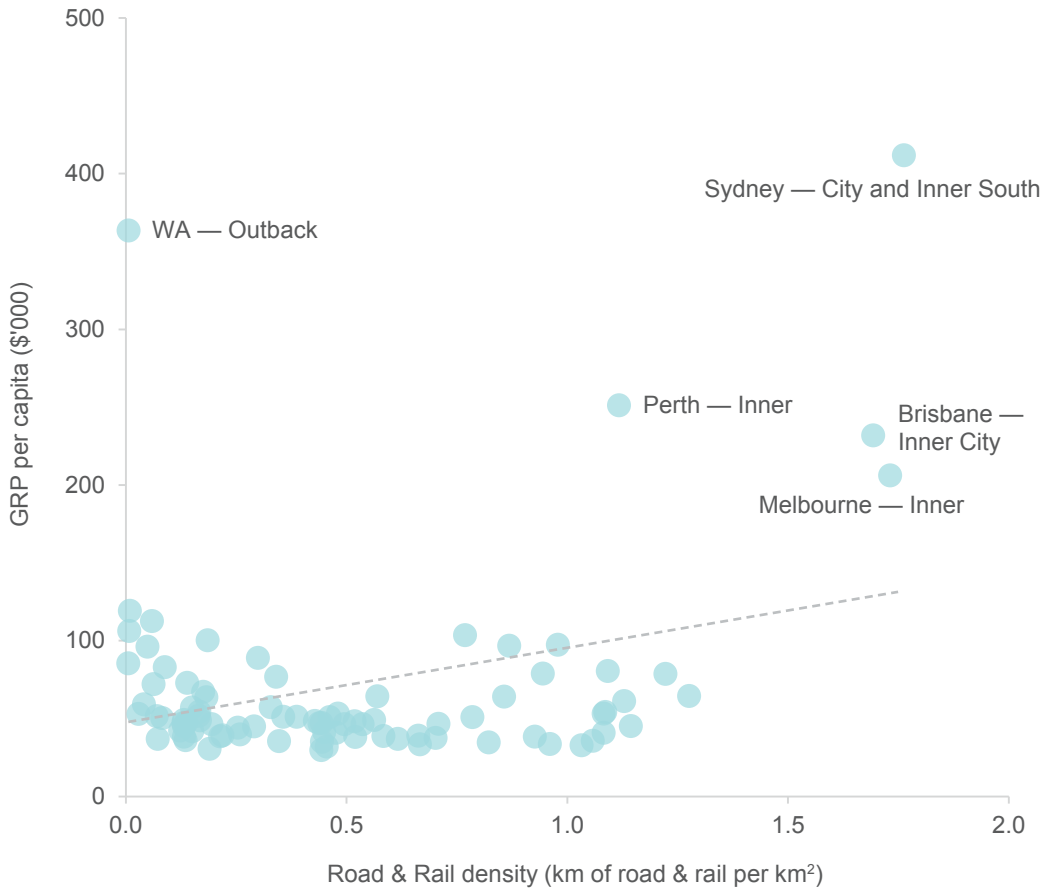
It is difficult to capture all infrastructure within a region in one variable. For these reasons, this analysis uses kilometres of sealed roads and rail per square kilometre as a proxy for infrastructure, along with ports.[124]

Road and rail

Road and rail are essential infrastructure for moving people and goods within and across regions. Road infrastructure is flexible and cost efficient for distributing goods. Roads also allow residents to travel for employment. Australia has far greater kilometres of road infrastructure compared to rail. The majority of rail infrastructure is located in remote and regional Australia, as rail provides cost-efficient transport for long distances, particularly when moving bulk commodities from mining regions to market.[125]

The variable used to capture road and rail infrastructure is a measure of density. Similar to population density, road and rail density measures the average kilometres of sealed road and rail per square kilometre, for a given region. Figure 7.8 shows that regions with higher densities in road and rail generally have higher GRP per capita.

Figure 7.8: Road and rail density (2006) and GRP per capita, 2014–15



Source: Geoscience Australia, *GEODATA TOPO 250K Series 3*; Department of Industry, Innovation and Science experimental estimates

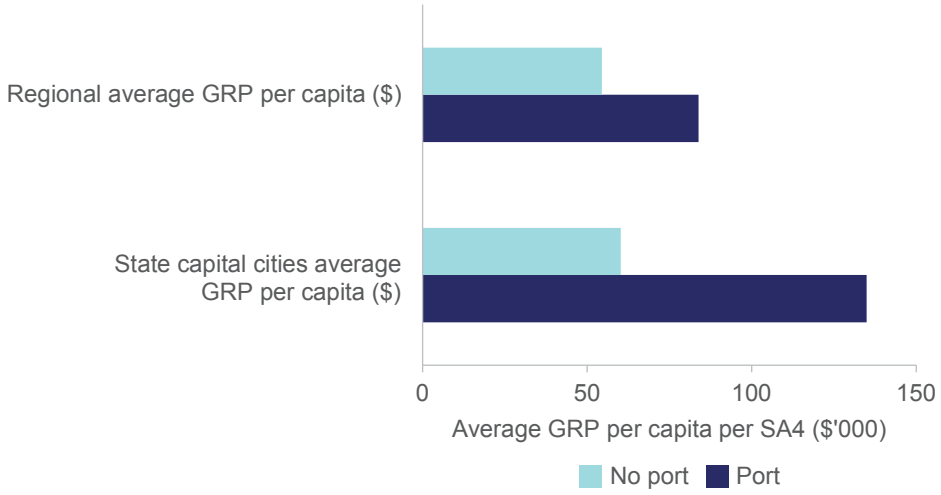
[124] Sealed roads only includes major roads, for example highways. The variable excludes suburban streets.
[125] Department of Infrastructure, Transport, Regional Development and Local Government (2009) *Road and rail freight: competitors or complements?,* viewed 10 October 2016, p. 1, https://bitre.gov.au/publications/2009/files/is_034.pdf

Ports

Ports are important infrastructure for regions. Unlike roads and rail, ports connect Australia to international markets and attract industry to regions. However, not all regions have the ability to host a port. In addition to constructed improvements, the infrastructure requires access to a suitable coastline — a natural endowment not available in all regions.

Figure 7.9 shows average GRP per capita for regional Australia and State capital cities that do or do not have a port. Similar to road and rail, it is evident that ports are associated with higher GRP per capita estimates regardless of whether they are located in capital cities or regional areas.

Figure 7.9: Port locations and average GRP per capita, 2014–15



Source: Bureau of Infrastructure, Transport & Regional Economics custom request; Department of Industry, Innovation and Science experimental estimates

Structural change

Structural change is typically defined as shifts in the distribution of output, investment and employment across industries or regions. The drivers of structural change are many and varied. Examples include technological advances, changes in demographics and consumer preferences, domestic policy reform, and international developments, such as increased import competition from emerging economies. These in turn affect the relative prices of goods and services in the economy, as well as inputs (such as land, labour and capital) used to produce these goods and services.[126]

Australia's economy has been transitioning away from goods-producing industries for quite some time.[127] This has resulted in an overall decline in goods producing employment (such as manufacturing), with a concurrent rise in services industries. Other regions to experience structural change over the past decade include those heavily influenced by the mining boom and changes to the terms of trade and Australian dollar.

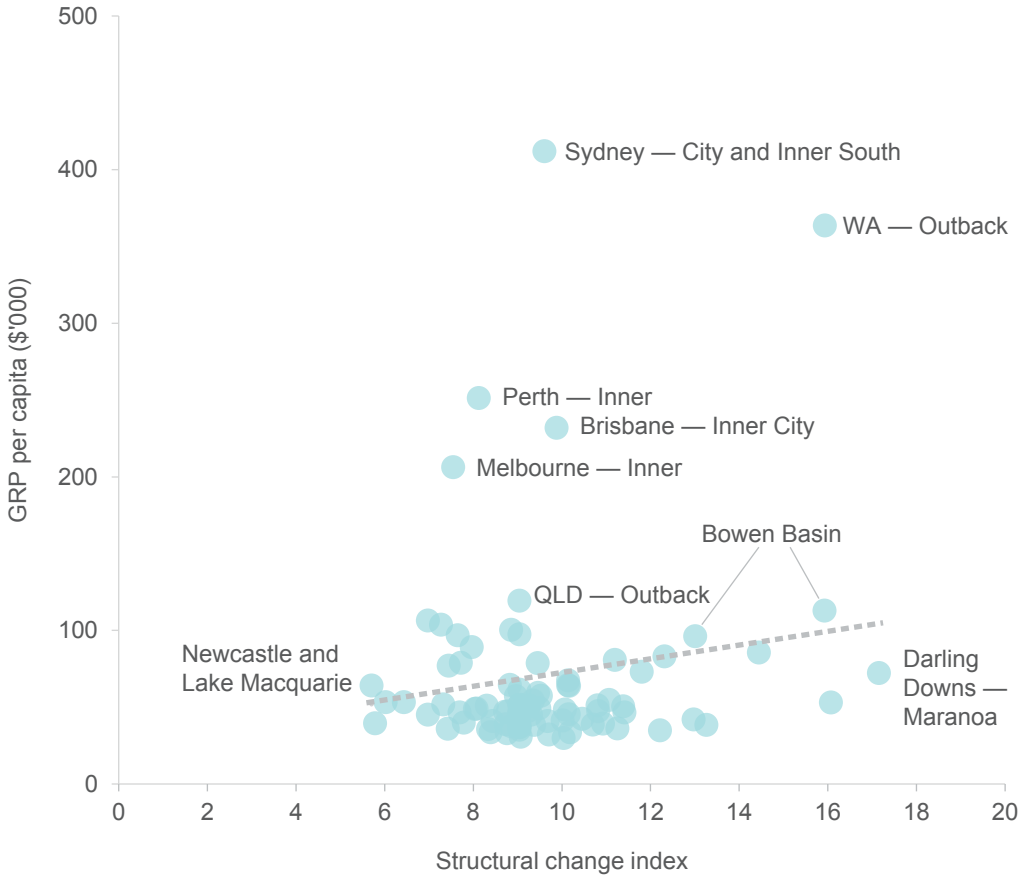
The structural change indices in Figure 7.10 are constructed using a methodology developed by the Productivity Commission.[128] The index measures the extent of change in industry employment within regions. A high structural change index shows a region whose industry employment mix has undergone a large amount of change over the time period.

Figure 7.10 shows the relationship between GRP per capita and the structural change index in each region over a 10-year period. Over this time, large changes in a region's

[126] Department of Industry, Innovation and Science (2014) *Australian Industry Report,* Canberra, p. 72
[127] Goods producing industries include Agriculture, Forestry & Fishing, Mining, Manufacturing, Electricity, Gas, Water & Waste Services, and Construction.
[128] Productivity Commission (2013) *Looking Back on Structural Change in Australia: 2002–2012*, *Supplement to Annual Report 2011–12*, Canberra, pp. 155–159

industry employment mix (high structural change index) has a positive association with GRP per capita. This suggests regions respond to changes in conditions, to achieve optimal allocation of resources. This result would imply that timely adjustment is important for regional competitiveness and performance.[129] Structural change can also have negative consequences for individual regions (particularly those not ready to transition), but overall structural change is positive for the economy.[130]

Figure 7.10: 10-year structural change index and GRP per capita, 2004–05 to 2014–15



Source: ABS cat. no. 6291.0.55.003, RQ1, *Labour Force, Australia, Detailed, Quarterly*, (February 2016); Department of Industry, Innovation and Science experimental estimates

Government assistance and policies that attract investment, employment and commerce to lagging regions is a viable strategy. It allows these regions to play economic catch up and better adapt to structural change. Impact analysis of such government assistance is critical in benchmarking policy efficacy. Box 7.2 highlights ongoing research within the OCE on the South Australian Innovation and Investment Funds (IIFs). It also summarises the conceptual issues and data challenges inherent in this analysis.

[129] Department of Industry, Innovation and Science (2014) *Australian Industry Report,* Canberra, p. 72
[130] Ibid p. 73

Box 7.2: Assessing the impact of South Australian Innovation and Investment Funds on business performance

Temporary government assistance that allows vulnerable regions to cope with and adjust to structural change is a feature of industry policy in many economies around the world. A notable form of regional assistance in Australia has been the Innovation and Investment Funds (IIFs). The key aims and objectives of these funds are contextual and varied. Common refrains include creating sustainable and durable employment opportunities, encouraging private investment in regions, and diversifying the regional industrial base.

Since 1999, the Australian government has introduced a number of IIFs. Generally the trigger for the announcement of an IIF has been the closure of a large employer or other drastic change to an important industry. For example, the Structural Adjustment Fund for South Australia (SAFSA) was announced in May 2004 in response to the closure of the Mitsubishi plant in Lonsdale South Australia.

The Office of the Chief Economist at the Department of Industry, Innovation and Science is currently conducting a pilot study on South Australian IIFs. The objective of the study is to assess the impact of participation in these funds on firm performance measures such as growth in employment.

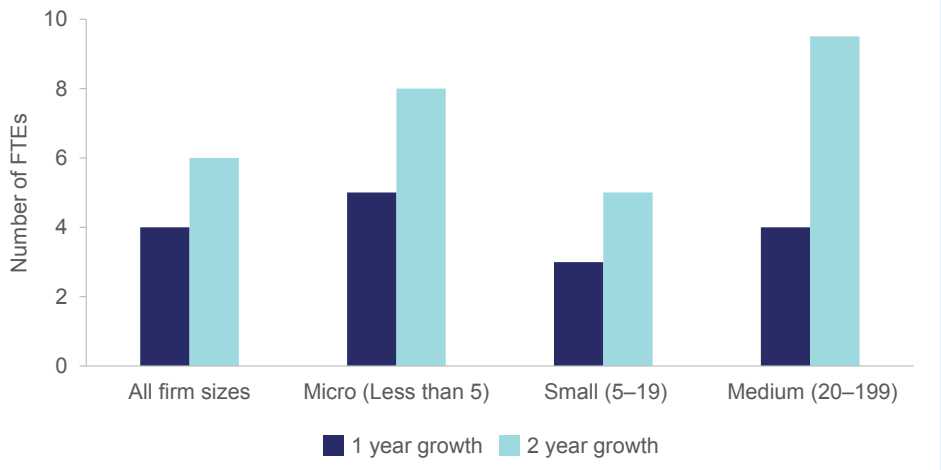
The Business Longitudinal Analytical Data Environment (BLADE) has made this new type of programme impact analysis possible. BLADE consists of information on Australian firms from existing ABS survey products, as well as financial and tax data on all Australian firms from Pay As You Go (PAYG), Business Activity Statements (BAS) and Business Income Tax (BIT) statements.

The pilot study links South Australian IIF programme data to BLADE. The linked dataset includes data on South Australian IIF participant firms and South Australian firms outside the programme. Once linked, each IIF participant firm is matched with at least three non-participant South Australian firms. Firms are matched on employment size, four-digit ANZSIC class, exporter status, and time periods. This method of matching allows a reliable counterfactual to be drawn.

'Counterfactuals' are defined as outcomes in business performance indicators such as employment, turnover, investment, etc. in the absence of a policy. In other words, how would the outcome of businesses that received assistance as part of IIFs compare to those of similar businesses that did not receive assistance?

The matched firms are then analysed to determine the Average Treatment Effect (ATE). Figure 7.11 reports the ATE in the change in full-time equivalent (FTE) employment. The length of the bars depict the additional impact on FTE (employment) in South Australian firms that participated in IIFs relative to the counterfactual. Across all firm sizes and even when controlling for firm size differences, additionality can be observed that persisted beyond the first year.

Figure 7.11: Growth premium in Full-Time Equivalent (FTE) (average treatment effect)



Source: Department of Industry, Innovation and Science (2016)

Preliminary empirical findings suggest that in terms of the change in employment the impact of participation in the IIFs on South Australian firms was positive, but modest relative to the cost of these programmes. An OCE research paper that discusses the research design, key findings and limitations of the project is forthcoming.

Knowledge intensity

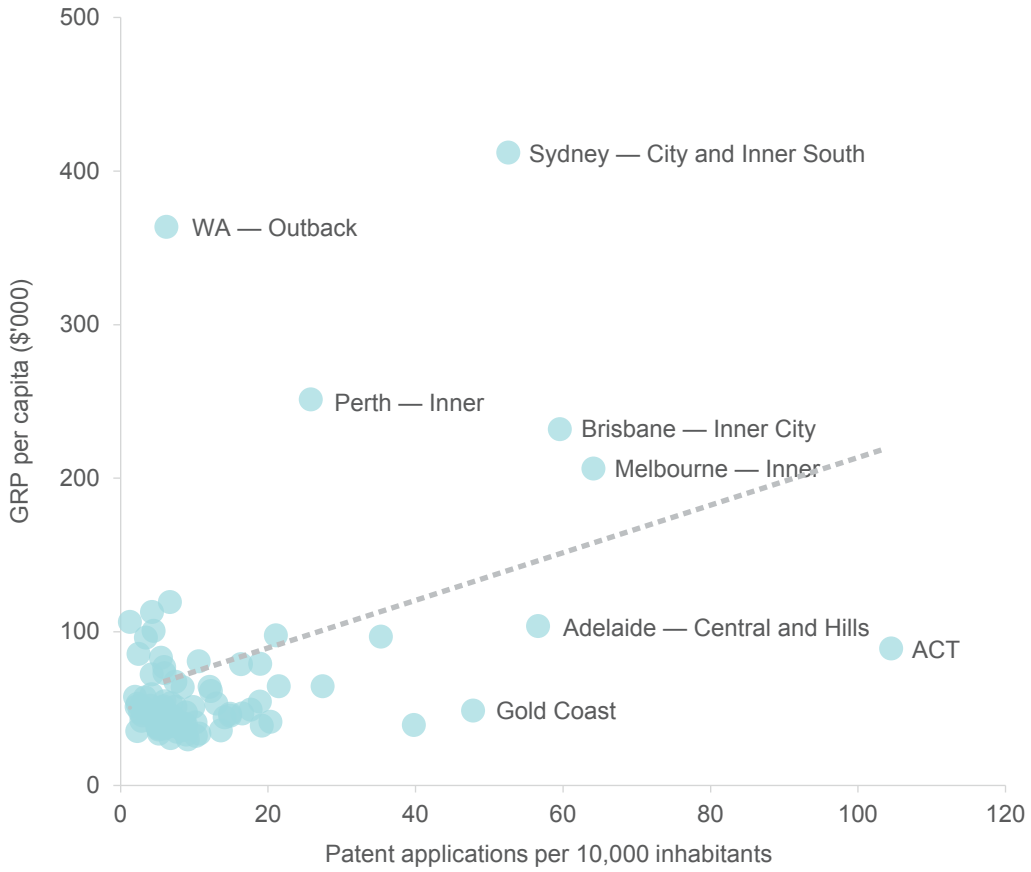
Research shows that knowledge intensity is a key driver of productivity and economic growth.[131] As industries transition, workers need to acquire the skills to adapt to improvements in technology, knowledge and innovation.

A variety of indicators are linked to knowledge intensity. These include business expenditure on research and development, human capital and innovation, among many others. For the purposes of this chapter, patent applicants per 10,000 inhabitants is used as a proxy for knowledge intensity. Patenting activity reflects a certain level of innovation, investment in research and development, and technological change.

As expected from the research, it is evident from Figure 7.12 that those regions with greater patent applicants tend to have higher estimates of GRP per capita. While patent applicants is only one indicator of knowledge intensity, analysis of several other indicators such as business expenditure on R&D (research and development) and human capital (not shown) display similar results.

[131] Department of Industry, Innovation and Science (2015) *Australian Industry Report*, Canberra, p. 138

Figure 7.12: Patent applicants per 10,000 inhabitants and GRP per capita, 2014–15



Source: Intellectual Property Government Open data (2015) *IPGOD — 102*; Department of Industry, Innovation and Science experimental estimates

Regional statistics database

Accompanying this chapter is the release of an interactive mapping tool containing key regional statistics, including the experimental estimates of GRP. It is a self-service tool that allows users to select a region or industry and collect relevant data. It can be found at https://industry.gov.au/Office-of-the-Chief-Economist/Publications/AustralianIndustryReport/Industry-Innovation-Map.html.

The OCE intends to continue to improve the experimental estimates of GRP (e.g. exploring methods to account for income transfers between regions) as the new Census is released and changes over time are examined. The analysis will also be extended to quantify drivers of performance and growth in regions.

Appendix 7.1: Experimental estimates methodology

The experimental estimates of GRP are derived from the 2014–15 GSP of each State and Territory, published in the State National Accounts.[132] These experimental estimates are based on the income approach of measuring GSP.

An apportioning approach is used to estimate each SA4's share of GSP. Derived SA4-to-State ratios apportion each component of GSP to regions. The sum of all components across all industries, plus taxes less subsidies, makes up GRP.

Compensation of employees

The data used to calculate the SA4-to-State ratios came from the *2011 Census of Population and Housing*.[133] For all States and Territories, Compensation of Employees was apportioned to SA4s by industry using 'employee not owning business' (by place of work) weighted by individual income ranges for each SA4.

Gross Operating Surplus and Mixed Income

SA4-to-State ratios for apportioning Gross Operating Surplus and Mixed Income (GOSMI) differed across the 19 ANZSIC divisions. The default data source used to apportion GOSMI across SA4s was industry total employment (by place of work), weighted by individual income ranges for each SA4 from the 2011 Census of Population and Housing.[134]

Where industry-regional datasets were available, they were used to calculate SA4-to-State ratios.[135] The industry-regional datasets used were:

- Agricultural, Forestry & Fishing — ABS, *Value of Agricultural Commodities Produced,* Australia, 2014–15, cat. no. 7503.0
- Mining — Data on mining production from the AME group
- Electricity, Gas, Water & Waste services — ESSA, Electricity Gas Australia, 2015, Appendix 1 Power stations in Australia 2013–14
- Construction — ABS, *Building Approvals*, Australia, Feb 2016, cat. no. 8731.0; Deloitte Access Economics 2014–15 Major projects
- Accommodation & Food services — ABS, *Tourist Accommodation*, 2014–15, Cat. No. 8635.0
- Information Media & Telecommunication — *2011 Census of Population and Housing*, combination of total employment weighted by individual income ranges and population shares
- Health Care & Social Assistance — *2011 Census of Population and Housing*, combination of total employment weighted by individual income ranges and population shares.

[132] ABS cat. no. 5220.0, table 2 to 9, *Australian National Accounts: State Accounts*, (2014–15)
[133] Queensland Treasury and Trade, *Experimental Estimates of Gross Regional Product 2000–01, 2006–07 and 2010–11*, p. 68, http://www.qgso.qld.gov.au/products/reports/experimental-estimates-grp/
[134] Ibid pp. 68–70
[135] Industry-regional datasets are based on those used by Queensland Treasury and Trade. Queensland Treasury and Trade, *Experimental Estimates of Gross Regional Product 2000–01, 2006–07 and 2010–11*, p. 69, http://www.qgso.qld.gov.au/products/reports/experimental-estimates-grp/

Ownership of Dwellings

Ownership of Dwellings GOSMI for each State and Territory was apportioned to SA4s using SA4-to-State shares of total dwellings weighted by median rent from the *2011 Census of Population and Housing*.[136]

Taxes less subsidies on production

Taxes less subsidies on production was allocated to industries at the State level using Total Factor Income (TFI) shares.[137] SA4-to-State ratios of industry TFI apportioned taxes less subsidies to regions.

Limitations of experimental estimates

As these are the first iteration of experimental estimates, they should be used with caution. *2011 Census* ratios may not capture changes in regional or industry compositions that have occurred since 2011.

Head office effects have not been fully accounted for when calculating the experimental estimate of GRP. Head office effects refers to the recording of business data (such as profit) in capital cities where head offices are located, rather than in the region where the economic activity occurred.

Head office effects are more prevalent for some industries than others (e.g. Mining). To account for head office effects, industry-regional-specific datasets were used when possible to try and apportion production back to the region where it occurred. In addition, when calculating SA4-to-State ratios from the Census, 'place of work' data was used to try and capture economic activity where it was occurring, rather than where the individuals earning the incomes lived.

[136] Ibid p. 70

[137] Ibid p. 70. State industry Total Factor Income is published in the State National Accounts. Total Factor Income is the summation of Compensation of Employees and Gross Operating Surplus and Mixed Income.

8 Industry Growth Centres: challenges and opportunities

Demonstrating how Industry Growth Centres are working to address challenges to further growth at the sector level by improving competitiveness, productivity and innovative capacity.

Industry Growth Centres have been established in high potential industry sectors with competitive strengths

Working to address challenges to further grow their sectors to drive competitiveness, productivity and innovation

Helping Australia transition to smarter, higher value and more export focused industries

Skills

Growth Centres have identified business management, marketing, business regulation and the skills for the jobs of tomorrow as skills deficiencies in their sectors

Exports

Growth sectors are more export oriented compared to other Australian sectors (the all-industries benchmark) but there are still significant opportunities to increase exports

Regulation

Some regulations are necessary. However, excessive regulation (both Government and self-imposed) can be a challenge to further growth

Collaboration

Firms in growth sectors are more collaborative compared to other Australian sectors (the all-industries benchmark) but Australian sectors don't do as well compared to international comparisons

To achieve further growth, Industry Growth Centres are focusing on increasing collaboration,commercialisation, exports, workforce skills and optimising the regulatory environment in their industry sectors

The Industry Growth Centres

- Advanced Manufacturing
- Food and Agribusiness
- Medical Technologies and Pharmaceuticals
- Mining Equipment, Technology and Services
- Oil, Gas and Energy Resources
- Cyber Security

The Australian Government is refocusing its industry policy to drive innovation and entrepreneurship, not dependence on handouts and protection. As part of this endeavour, it has established Industry Growth Centres (IGCs) — independent, industry-led, not-for-profit companies that work with identified sectors to improve competitiveness, productivity and innovative capacity to increase growth.

There are currently five Industry Growth Centres in operation:

- The Advanced Manufacturing Growth Centre (AMGC) which is developing an internationally competitive, dynamic and thriving Australian Advanced Manufacturing sector.
- Food Innovation Australia Ltd (FIAL), which foster commercially driven collaboration and innovation in the Australian Food & Agribusiness sector.
- MTPConnect which aims to accelerate the rate of growth of the medical technologies, biotechnologies and pharmaceuticals sector to achieve greater commercialisation and establish Australia as an Asia-Pacific hub for Medical Technology and Pharmaceutical (MTP) companies.
- METS Ignited, the IGC for the Mining Equipment, Technology & Services (METS) sector, who seeks to strengthen Australia's position as a global hub for mining innovation, and, enhance the global competitive advantage of the Australian METS industry.
- National Energy Resources Australia (NERA) which was established to maximise the value to the Australian economy by having an energy resources industry that is globally competitive, sustainable, innovative and diverse.

A sixth Growth Centre relating to cyber security (not covered in this chapter) was announced as part of the Australian Government's *National Innovation and Science Agenda* on 7 December 2015.[138]

These five sectors of competitive strength[139] and one sector of strategic importance were identified by the Government as being well positioned to take advantage of emerging opportunities and showing strong potential for further growth. These growth opportunities were discussed in Chapter 3 of the *Australian Industry Report 2014*.

This chapter discusses the challenges and opportunities facing five of the industry growth sectors, and their endeavours for improvement across the four main objectives of the IGCs. To achieve further growth, the IGCs will focus on:

- Improving engagement between research and industry as well as within industry, to achieve stronger research coordination and collaboration and stronger commercialisation outcomes
- Enhancing management capability and workforce skills
- Improving capabilities to engage with international markets and global supply chains
- Identifying regulations that are unnecessary or over-burdensome and suggesting possible reforms.

[138] Commonwealth of Australia (2015) Department of the Prime Minister and Cabinet, *National Innovation and Science Agenda*

[139] Competitive strength refers to an advantage over competitors by offering consumers greater value through cheaper prices or by providing benefits and services that justifies the higher price. Competitive strengths can include not only lower costs, but also value differentiation such as brand, reputation for quality and reliability, innovative features, world leading technology and pre and post-sale customer support (adapted from the draft AMGC Sector Competitiveness Plan).

This chapter draws on consultations with these Growth Centres, their Sector Competitiveness Plans, and *Business Characteristics Survey* data for 2013–14 to summarise further growth challenges and identify some of their work in overcoming these issues.

Industry Growth Centres and competitiveness

Improving the international competitiveness of Australia's industry sectors will increase demands for exports, increase economic growth, and create jobs in those sectors. The Growth Centres are addressing competitiveness challenges at the sector level where economic growth can be maximised. Box 8.1 provides an overview of the initiative.

Box 8.1: Industry Growth Centres initiative

The Australian Government's *Industry Innovation and Competitiveness Agenda*, released in October 2014, identified five initial key industry sectors as areas of competitive strength in the Australian economy.

The Government is investing $250 million over four years from 2016–17 in IGCs that are aimed at driving excellence in Australian industries, rather than dependence, to create an economy that ensures Australia's ongoing prosperity.

The initiative is a new approach to industry policy. It aims to build capability and stronger industry systems at the sectoral level through a collaborative, industry-led approach. The IGCs are not-for-profit organisations, led by a strategic board of industry experts who will oversee their operation. Similar growth sector initiatives have been successfully implemented in other countries including the United States of America (Small Business Administration Regional Cluster Initiative), the United Kingdom (Catapult Centres) and Canada (Business-Led Networks of Centres of Excellence).

The IGCs focus on addressing challenges at the sector level and complement other government initiatives focused on improving capabilities at the firm level, such as the Entrepreneurs' Programme. The IGCs are helping align industry- and innovation-related policy and programmes, including Cooperative Research Centres (CRCs); the Australian Research Council Industrial Transformational Research Programme, and other initiatives under the National Innovation and Science Agenda.

Source: Department of Industry, Innovation and Science (2016)
http://www.industry.gov.au/industry/Industry-Growth-Centres/Pages/default.aspx

A note on definitions

How growth sectors are defined is an important but contentious issue. Previous editions of the *Australian Industry Report* have attempted to draw a line around growth sectors using the ABS' *Australia New Zealand Standard Industry Classification* (ANZSIC). The appeal of this approach is that it provides consistency with ABS data and allows for an analysis of each sector's economic performance.

However, no growth sector sits neatly within the ANZSIC classifications. These definitions have been used only as a best available approximation.

In an effort to improve the measurability of the sectors the department has been working to improve how the sectors are defined. For example, together with the AMGC, the department commissioned AlphaBeta and McKinsey & Company to develop a more robust definition of the Advanced Manufacturing sector. A summary of this work is presented in Box 8.2.

This work is ongoing and is not yet complete. The ABS data presented in this chapter is consistent with the definitions presented in the *Australian Industry Report 2015.*

Box 8.2: Advanced Manufacturing: It's what you do AND the way that you do it

Tarah Barzanji — Engagement Manager, AlphaBeta

The current definition of IGCs is based on ANZSIC Manufacturing classes that demonstrate high R&D intensity and high skill use. However, many firms outside these so-called 'advanced' sub-industries also use highly skilled workers, cutting edge processes and unique business models. And many manufacturing firms within the ANZSIC classes are not particularly advanced in their production processes, knowledge intensity or business models.

When it comes to manufacturing, being 'advanced' can still be about 'what' you make, but is increasingly becoming more about 'how' you make it. AlphaBeta and McKinsey & Company undertook a study to understand the characteristics of advanced manufacturing firms, where 'advanced' was defined not by the firms' products, but by their success in creating sustainable competitive advantage through high productivity and product 'value'. By analysing the characteristics of the most productive and profitable manufacturing firms in a 3,000-firm global dataset, the study found that top performers exhibit a set of common characteristics (see Figure 8.1).

The world's most productive manufacturing firms are more likely to exhibit:

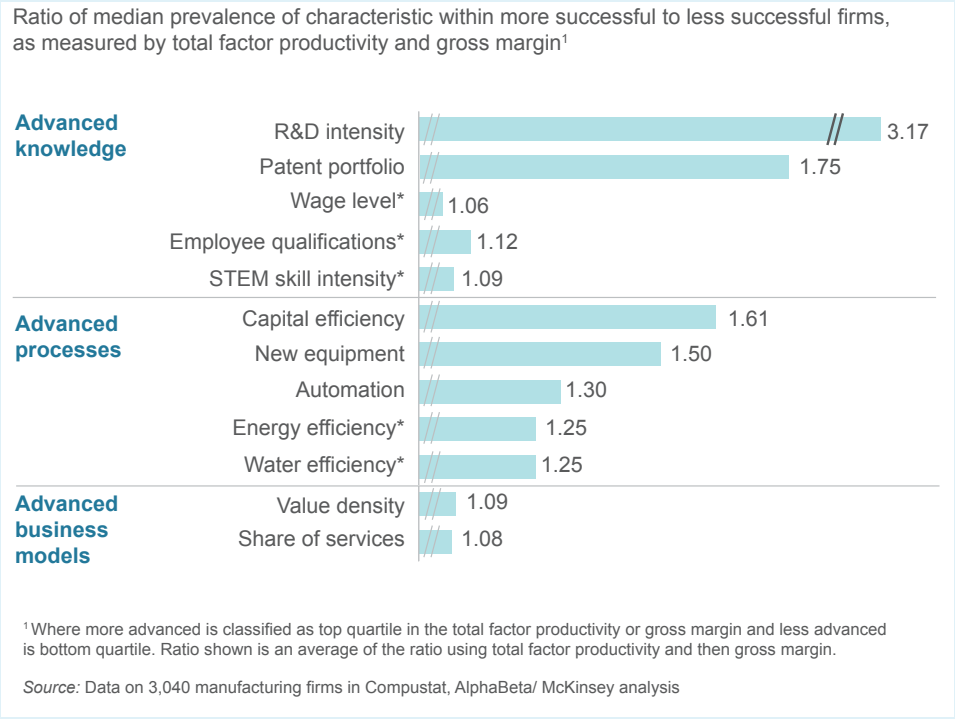
- Advanced knowledge such as high investment in R&D, patents, wage levels and employee qualifications. For example, top global manufacturers have an R&D intensity of more than three times larger than that of bottom quartile performers and nearly two times the patent portfolio.
- Advanced processes such as automation, high levels of capital investment and process improvement. For example, top global manufacturers have equipment that is 1.5 times younger than bottom quartile performers and are 1.6 times more capital efficient.
- Advanced business models such as high levels of 'servitisation' (high share of services in revenue) or strategies to find niche markets.

These characteristics provide an alternative definition of what it means to be a more 'advanced manufacturer', based more on inputs than outputs. Tracking these characteristics in Australian data will help us understand how every part of Australian manufacturing is advancing.

The department and the Growth Centre can use this definition to focus government and industry efforts to help Australian manufacturers advance their knowledge, processes or business models. Using this definition, it will be possible to measure whether Australian manufacturing is 'advancing' in terms of increases in R&D intensity, STEM qualifications in the workforce, and share of services in revenue.

Some other IGCs are also exploring strengthening definitions to more accurately reflect their sectors.

Figure 8.1: Top global manufacturing firms exhibit advanced knowledge, processes and/or business models



[1] Where more advanced is classified as top quartile in the total factor productivity or gross margin and less advanced is bottom quartile. Ratio shown is an average of the ratio using total factor productivity and then gross margin.

Source: Data on 3,040 manufacturing firms in Compustat, AlphaBeta/ McKinsey analysis

Source: AlphaBeta
Tarah.Barzanji@alphabeta.com

Increasing collaboration and commercialisation

Collaboration refers to participation in joint projects with other businesses or organisations (including wider parts of the business enterprise group). It helps firms gain a marketplace advantage, and supports growth by:

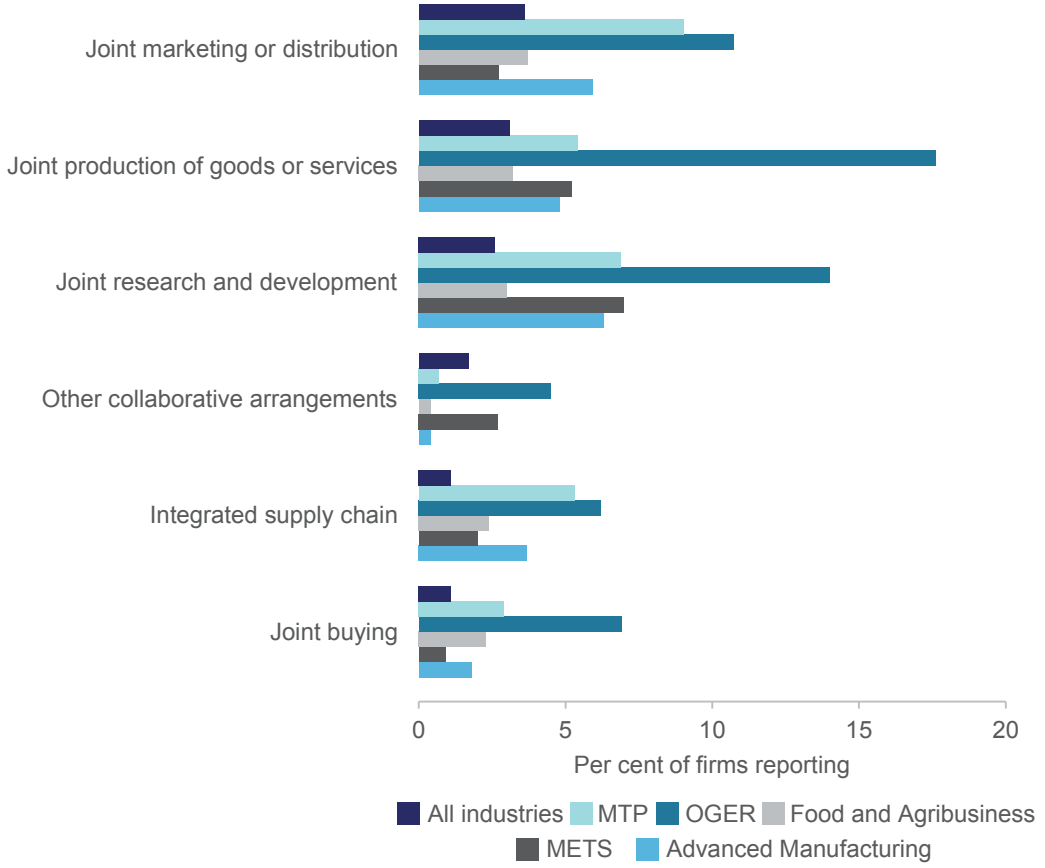
- helping firms reach critical mass to achieve cost saving measures such as R&D, joint buying or production of goods and services, joint marketing and distribution
- encouraging idea sharing (to improve ways of doing things) and encourages joint ventures (domestically and internationally) to achieve success where it would not have been possible otherwise.

The IGCs will increase engagement between industry and research institutions as well as within industry to achieve stronger commercialisation outcomes. Data show that while growth sectors in Australia are more collaborative compared to other sectors of the Australian economy, Australian industry is generally less collaborative compared to international benchmarks. For example, OECD results show Australia's collaboration performance to be below the OECD average, particularly between business and research institutions.[140]

[140] Department of Industry, Innovation and Science (2016) *Australian Innovation System Report 2015*, Office of the Chief Economist, p. 124

ABS data show that Oil, Gas and Energy resources (OGER) firms were particularly active across the recorded six types of collaboration arrangements. But on the whole, all growth sectors collaborated well when compared to other sectors of the economy (the all-industries benchmark).[141] Figure 8.2 reflects ABS data and shows the proportion of firms per growth sector reporting different types of collaborative arrangements in their firms.

Figure 8.2: Collaborative arrangements by sector, 2013–14



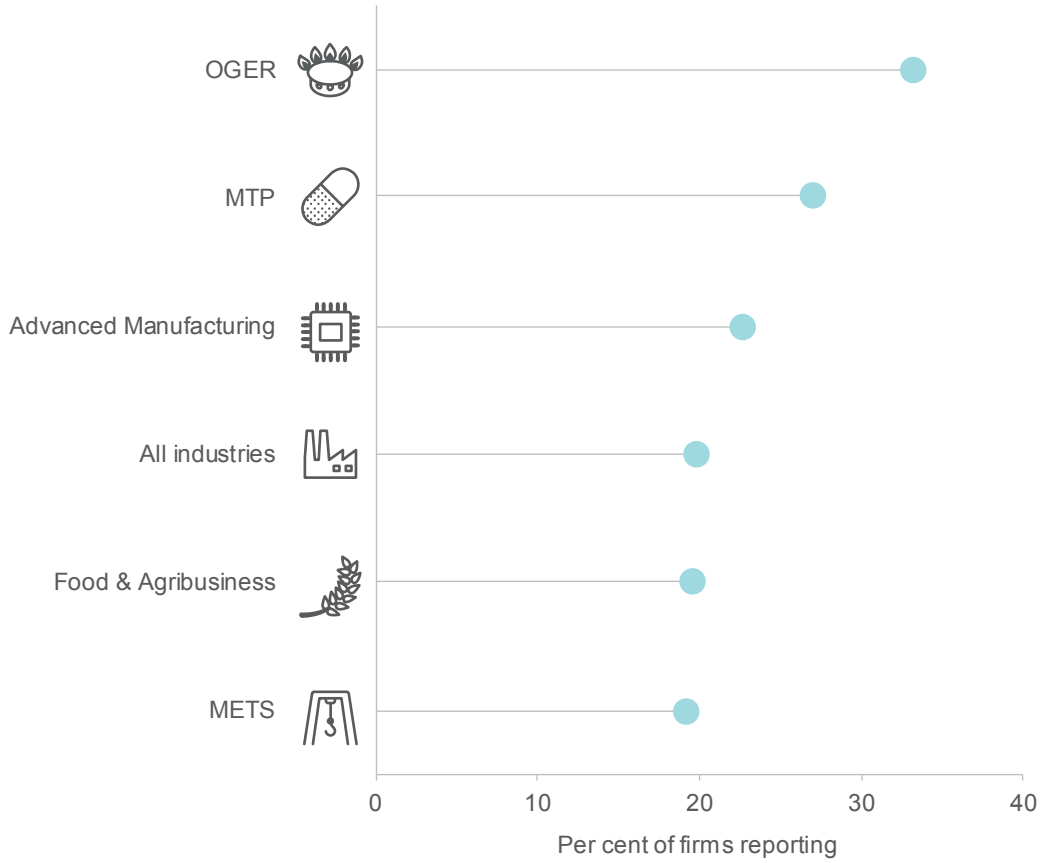
Notes: Figure shows the proportion of firms per growth sector reporting having undertaken different collaborative arrangements. Figure ordered by the all-industries benchmark (most reported collaborative arrangements to least reported).

Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 2

Innovative firms in three of the five growth sectors were more innovative than innovative firms in other sectors of the economy. Figure 8.3 shows the proportion of innovative firms that collaborated for the purposes of innovation.

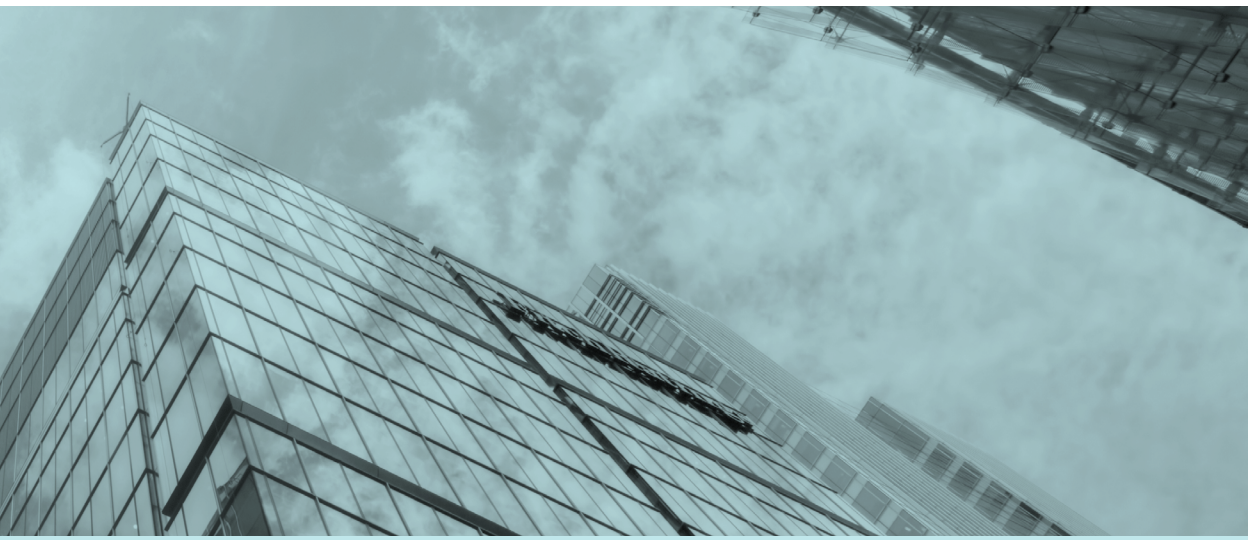
[141] Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 2

Figure 8.3: Innovation-active businesses that collaborated for the purpose of innovation, 2013–14



Notes: Figure shows the proportion of innovative firms per growth sector that collaborated for the purposes of innovation.

Source: ABC cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 12



In addition to collaboration, commercialisation is also important to growth. It paves the way for new products and services, and increases export opportunities, which results in not only higher sales but also more jobs. Commercialisation also benefits firms selling or leasing new products and has a flow on effect to the broader economy through firms using new products.

Australian enterprises are innovative by OECD standards.[142] However, this innovation does not always translate well into product commercialisation. Some positive commercialisation trends exist in the publicly-funded research sector, particularly with respect to Intellectual Property (IP) licencing and research collaborations and contracts with industry. Some areas are not improving such as start-up company creation and invention disclosures.[143]

The data show good levels of collaboration. But there is still room for improvement. While each growth sector is unique and faces different challenges and opportunities, the IGCs have identified several common areas for improvement at the firm and sector level (see Table 8.1).

[142] Department of Industry, Innovation and Science (2016) *Industry Monitor 2016*, Office of the Chief Economist, p. 21

[143] Total invention disclosures and number of start-up companies have both declined. In 2014 there were 1,133 invention disclosures, a decline of 20 per cent from 2013. The number of start-up companies reported in 2014 is also substantially lower compared to previous years — 26 in 2013 and 22 in 2012. In 2014, there was a 30 per cent decrease in the value of equity holdings in start-up companies by research organisations compared to 2013. However, the 2014 equity holdings figures are broadly similar to 2012 data. Source: Australian Government (2016) *Summary of Selected National Survey of Research Commercialisation (NSRC) Survey* metrics for 2012, 2013 and 2014.

Table 8.1: Challenges to growth relating to collaboration and commercialisation

Lack of collaboration for the purposes of commercialisation
A common view was that Australia needs to become more effective in translating research into the commercialisation of new products and services. It is widely accepted that Australian firms are innovative, but may not be successful when it comes to bringing a new product or service to market. According to MTPConnect, achieving this requires collaboration across the full value-chain, from research through to commercial marketing and sales of products. Once a product or service is commercialised, AMGC also noted the importance of engaging in iterative developments, constantly improving products and services through collaboration with customers, leading again to research and commercialisation.
Commercial pressures
Slowing global demand leads buyers to reduce spending, which places pressure on firms' profit margins.[a] For example, FIAL, MTPConnect and METS Ignited noted how buyers (including large supermarket chains, pharmacists, hospitals and miners) were putting pressure on supplier profits, especially in times of an economic downturn. NERA also noted that slowing global demand for key resources put pressure on the sector to identify and implement productivity and efficiency measures as the sector transitions from construction to production. These conditions can lead to fewer collaboration and commercialisation activities (e.g. research, development and marketing). In good economic times, there may be a lack of collaboration because there is little imperative to work with others. But collaboration in difficult economic times can be just as challenging as buyers are pressured to reduce costs which affects supplier prices. This tension between buyers and suppliers can make collaboration between them difficult. Focusing more on product differentiation and value propositions such as quality, performance, on time delivery and the after sales experience may help to avoid some of the issues of competitive pricing.
Other firms as a threat
Some firms see other firms as a threat, rather than as a potential partner. While the market is competitive and firms compete against each other, collaboration can provide an alternative knowledge base and potentially benefit all participants. For FIAL, collaborating on a unified marketing and messaging strategy when targeting international markets (but still using separate branding in the domestic market) is an example of collaboration that would benefit competitors. (Refer to Table 8.3 International Markets for further discussion on collaboration on branding).
Securing funds for commercialisation[b]
It can be difficult to demonstrate that a new product works prior to securing commercialisation funds. METS Ignited highlighted the difficulty of getting proof of concept funding for new products. This is because miners may be reluctant to interrupt production for METS firms to undertake proof-of-concept trials. Difficulty in securing funding for commercialisation leads to latent growth — products that have been developed but are waiting to be funded. This is particularly true of smaller firms which typically have less access to capital. There may also be a lack of investment ready firms — firms that are developing new products, but are not attractive to investors due to a poor business proposition or an inability to show a well-defined commercial opportunity.
Risk aversion and lack of demand for new products
Entrepreneurial ideas may be discouraged, especially in bigger firms. NERA noted that the bigger the firm, the more risk averse they tend to be and processes are often in place to remove risk-tolerant outliers (despite this being where new ideas are generated). Likewise, according to METS Ignited, procurement processes often lead to risk aversion, with some miners preferring to stick with old but proven technology and products, resulting in a lack of customer demand for new products.[c]

Lack of early collaboration
Collaboration at both the pre-feasibility and feasibility phase of a project is important. METS Ignited noted that once a new mine is built, it is costly to incorporate new technology. So it is crucial that METS firms engage early in the project to get the best chance of incorporating their product into mine operations.
Research undertaken and industry needs
While Australia has top class researchers, a possible mismatch was identified between research being undertaken and the needs of customers in industry. The AMGC noted the potential for researchers and industry to work together more closely to better target applied research to areas that could be commercialised and to provide solutions for customer problems.

Notes: (a) ABS data show that lower profit margins to remain competitive was listed in the top three barriers to performance by firms in all five growth sectors. Thirty-four per cent of Advanced Manufacturing firms reported this barrier — followed by Medical Technologies & Pharmaceutical firms at 32 per cent. Source: ABS cat. no. 8170.0 — *Characteristics of Businesses in Selected Growth Sectors*, table 14.
(b) When reporting a lack of access to additional funds as a barrier to business performance, all five growth sectors either met or exceeded the all-industries benchmark (other sectors of the Australian economy). Between 16 and 23 per cent of firms in the five growth sectors reported this barrier. In relation to barriers to innovation, lack of access to additional funds was listed in the top two barriers to innovation by all five of the growth sectors. Source: ABS cat. no. 8170.0 — *Characteristics of Businesses in Selected Growth Sectors*, tables 13 and 14.
(c) A lack of customer demand for goods or services was reported in the top two barriers to business performance in all but one growth sector (Food & Agribusinesses, which reported lack of customer demand for goods and services in the bottom three barriers). Twenty seven per cent of Advanced Manufacturing and Mining Equipment, Technology & Services firms and 23 per cent of Medical Technologies & Pharmaceuticals firms reported this barrier. In relation to barriers to innovation, four of five growth sectors (excluding Food & Agribusiness) reported uncertain demand for goods and services in the top three barriers to innovation. Advanced Manufacturing firms had the highest percentage of firms who reported that uncertain demand affected innovation, (23 per cent of respondents), and were almost twice as likely to experience this barrier compared to the all-industries benchmark. Source: ABS cat. no. 8170.0 — *Characteristics of Businesses in Selected Growth Sectors*, tables 13 and 14.

Actions to address challenges

The Industry Growth Centres initiative is still in its early days. However, the IGCs have already begun to address these challenges and see results. For example, FIAL uses the Collaborative Circles process (developed by the Hargraves Institute), to facilitate workshops for large and small businesses to collaborate and overcome technical challenges by sharing ideas, advice and connections. As of September 2016, 175 participants have identified average savings of $116,000 by sharing business-to-business ideas, advice and connections. One workshop resulted in several larger manufacturers offering to combine packaging orders with an SME attending the workshop. That SME now has access to cost-effective packaging through economies of scale.

METS Ignited and AMGC have signed memorandums of understanding (MOU) with the CRC for Optimising Resource Extraction (CRC ORE) and the CRC for Innovative Manufacturing respectively to encourage industry-focused research. The AMGC has also established two advanced manufacturing collaboration hubs to stimulate industry collaboration and announced co-funding for the Advanced Fibre Cluster in Geelong.

Collaborating more on R&D activities will allow resource companies to achieve efficiencies and will help assist Australian firms integrate into global supply chains. According to NERA, as the mining investment boom wanes and firms struggle with profitability, it has become more important to increase collaboration. Many resources firms lack understanding of the capabilities and capacities of Australian firms. Increased collaboration between resource companies and Australian firms (especially SMEs) will provide a clearer understanding of these abilities and improve Australian firms' ability to access global supply chain opportunities and improve Australian firms' ability to access global supply chains.

FIAL noted that government funding (such as the CSIRO Innovation Fund) and funding for collaborative projects through the Growth Centres could target collaboration between researchers and industry.

The IGCs will advocate for a greater portion of research spending to target applied research that has commercialisation potential and solves existing industry problems. Through their *Industry Knowledge Priorities* (which set out the industry research needs and commercialisation opportunities in each sector), The IGCs will recommend where research should be undertaken. They will work with the Government's Accelerating Commercialisation programme to support commercialisation investment in each growth sector as well as the Innovation Connections programme to identify opportunities to work with research organisations to test and develop new ideas. R&D investment that is more focused towards commercial outcomes would also help achieve higher commercialisation rates.

In relation to common branding and marketing, FIAL is leveraging the experience and collateral of Austrade, State and regional organisations to develop a library of imagery and messaging for industry-wide use. Creating common marketing tools will help the sector collaborate on building a more unified approach when engaging with international markets.

MTPConnect noted that some universities had specific staff to connect with industry, which works well. Undertaking internship programmes or exchanges between researchers and industry to share skills and information was also suggested to improve collaboration.

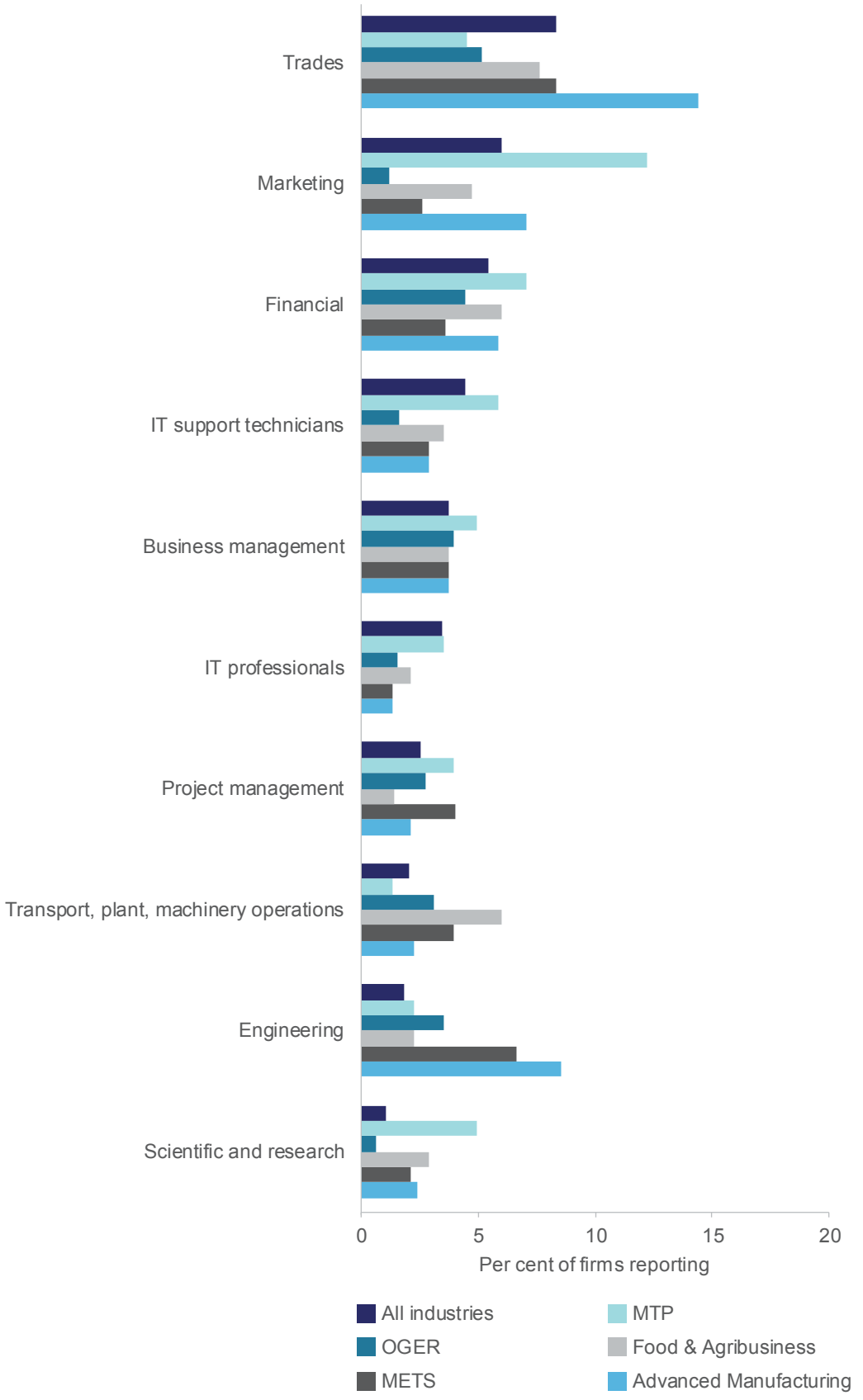
Enhancing management capability and workforce skills

Another objective of the IGCs is to address management capability and future workforce skill needs. This is important for growth as business leadership and a highly skilled workforce can drive productivity growth and innovation, and facilitate new market entry.

Trades and financial skills were among the top skills deficiencies for most of the growth sectors and business management skills were reported in the top half of skills gaps for all growth sectors.[144] Figure 8.4 reflects ABS data and shows the proportion of firms per growth sector that report skills shortages in certain areas.

[144] Four of the five growth sectors cited trade skill shortages or deficiencies as their biggest skill shortage area in undertaking core business activities. Advanced Manufacturing firms were most likely to be affected by this shortage (14 per cent of respondents). The Medical Technologies & Pharmaceuticals sector reported marketing as their biggest skills shortage. Advanced Manufacturing and Mining Equipment, Technology & Services firms listed engineering skills as their second largest skills shortage for their industries. Oil, Gas & Energy Resources and Medical Technologies & Pharmaceuticals firms reported financial skill shortages as their second largest shortage. Food & Agribusinesses reported financial skills along with transport, plant and machinery operations as their second most prevalent skill shortage areas. Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 16.

Figure 8.4: Skills shortages or deficiencies in undertaking core business activities by sector, 2013–14



Notes: Figure shows proportion of firms per growth sector reporting a skills shortage or skills deficiency used or needed by businesses in undertaking its core business activities. Figure ordered by all-industries benchmark (highest skills shortage areas to lowest).

Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 16

The IGCs have also identified the following common skills that are needed to improve competitiveness and growth (see Table 8.2).

Table 8.2: Challenges to growth relating to skills gaps or deficiencies

Business management and leadership skills[a] (particularly in SMEs)
Business management and leadership skills are important for competitiveness as all elements of a business need to be brought together, often with limited resources. For example, owner-managers need to have a broad range of skills, which can be difficult to acquire with few or no staff. METS Ignited provided the example of some small family firms not recognising the need to supplement their skills with outside management expertise. Or being reluctant to bring in outside expertise when they do recognise the skills gap. For the AMGC, improving business management skills could mean more firms transitioning from lower value added activities (such as traditional manufacturing) to higher value added activities (such as design, branding, marketing and pre- and after-sales services). Most firms in the Food & Agribusiness sector, are non-exporting and further improvement in business management skills could lead to exporting status.
Business development skills[b]
Business development skills such as marketing, branding and sales are important for growing a firm. FIAL and METS Ignited specifically mentioned a lack of sales and marketing skills in their sectors, particularly in smaller, family-owned businesses. Many SMEs lack the business development skills to successfully launch products into the market or to gain sufficient customer exposure to their products. Differentiating a product based on brand rather than price will also ensure Australian firms are more competitive internationally. MTPConnect noted that global sales and marketing capabilities are essential to achieving a return on the development costs of a product, leading to many Australian medical technology and pharmaceutical firms striking IP licensing deals with larger global players.
Business regulatory skills
Firms need a solid understanding of regulations such as competition and consumer laws, environmental legislation, import and export regulations and financial reporting requirements. Without it, a firm will struggle to comply properly with those regulations and may have difficulty growing the business. In particular (as noted by MTPConnect), skills gaps exist in the areas of regulatory knowledge of overseas systems and market access. The cost of this gap was noted by FIAL, who provided examples of firms not using efficient export pathways (geographical routes).
Skills for the jobs of tomorrow
It is difficult to predict the exact skills that will be needed for emerging industries. However, the jobs of the future will almost certainly require a highly skilled workforce, including skills that can take advantage of technological changes and big data analytics. Some sectors have the skills required for today, but lack the skills needed in the near future. These include data and predictive analytics and digital capabilities. According to NERA, some resource firms currently have access to large quantities of data, but do not know what they want from the data or what problems it could help solve.

Notes: (a) Interestingly, the data contrasts this view, with ABS data showing only 4 per cent of Advanced Manufacturing, Food & Agribusiness and Mining Equipment, Technology & Services firms reporting business management skills shortages, not even making the top three shortages in those sectors. This discrepancy

may be due to the large number of small family run business owners who do not see a management skills shortage or deficiency in their business, where one actually exists. Medical Technologies and Oil, Gas & Energy Resources also recorded low values of firms reporting a shortage of business management skills. MTPConnect and Oil, Gas & Energy Resources agree with these results, they are not seeing a significant skills deficit in these sectors. Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 16.
(b) ABS data somewhat supports FIAL's claim that there is a skills deficit in the Food & Agribusiness sector, with marketing reported as the fourth highest skills shortage (out of 10). However, the ABS data for the Mining Equipment, Technology & Services sector does not support the view of a marketing skills shortage in the sector, listed eight out of a possible 10 skills shortages. The data show Medical Technologies & Pharmaceuticals firms reported marketing as their biggest skill shortage with 12 per cent of respondents experiencing this skill shortage area. Seven per cent of Advanced Manufacturing firms reported this skills shortage, the third highest in their sector. Only 1 per cent of Oil, Gas & Energy Resources firms reported a marketing skills shortage. Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 16.

The IGCs are helping to develop the business capability and management skills of their sectors. FIAL has created three online directories to help businesses identify technical capabilities and training courses. The directories help businesses find the information they need reducing search transaction costs.

METS Ignited supported the Mining Equipment, Technology & Services Innovation Mentoring Programme in collaboration with Austmine to develop the skills required for innovators to succeed in today's fluid market environment.

Growth Centres suggested that increasing awareness of the need to improve management capability skills (especially for SMEs) and bringing in external talent would also help to increase the skills available to a firm.

Universities and Vocational Education and Training organisations have a role to play in equipping employees with the skills for the jobs of tomorrow such as data analytics. METS Ignited will work with TAFE and university networks to develop certificate programs for METS SMEs in skills gap areas such as marketing and sales, business development, partnering and collaboration and finance and capital markets.

NERA will work on addressing training and education needs to ensure the industry is prepared for the production phase, particularly in maintenance and technical operational knowledge.

The IGCs will also work with government skills programmes such as the Industry Skills Fund to help firms identify skills needs. Besides funding employee training, the Business Management element of the Entrepreneurs' Programme aims to devise strategies for business improvement.

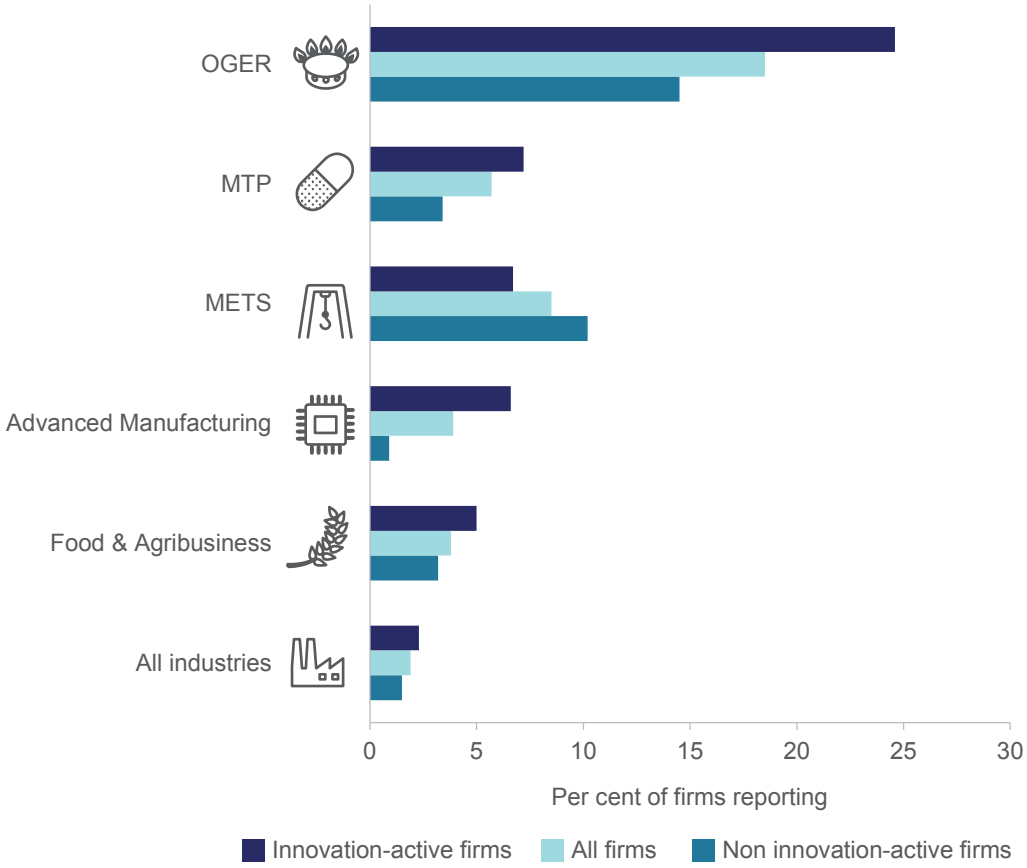
Improving access to global supply chains and international opportunities

Growth sectors are more export-oriented than other sectors of the Australian economy.[145] However, the IGCs noted there was an opportunity to improve international market access, and further increase exports. Exporting and participating in global supply chains provides access to additional customers.

Australian firms are not alone in trying to access opportunities in foreign markets and compete against foreign firms vying to break into supply chains. However, with a number of Free Trade Agreements now in force (including with Korea, Japan and China), Australian firms have better access to important markets and an improved competitive position for their exports.

Figure 8.5 shows the proportion of firms per growth sector whose main source of income comes from overseas. Figure 8.6 shows the proportion of firms per growth sector that received any income (regardless of amount) from directly exporting goods and/or services.

Figure 8.5: Firms with main source of income from overseas, 2013–14

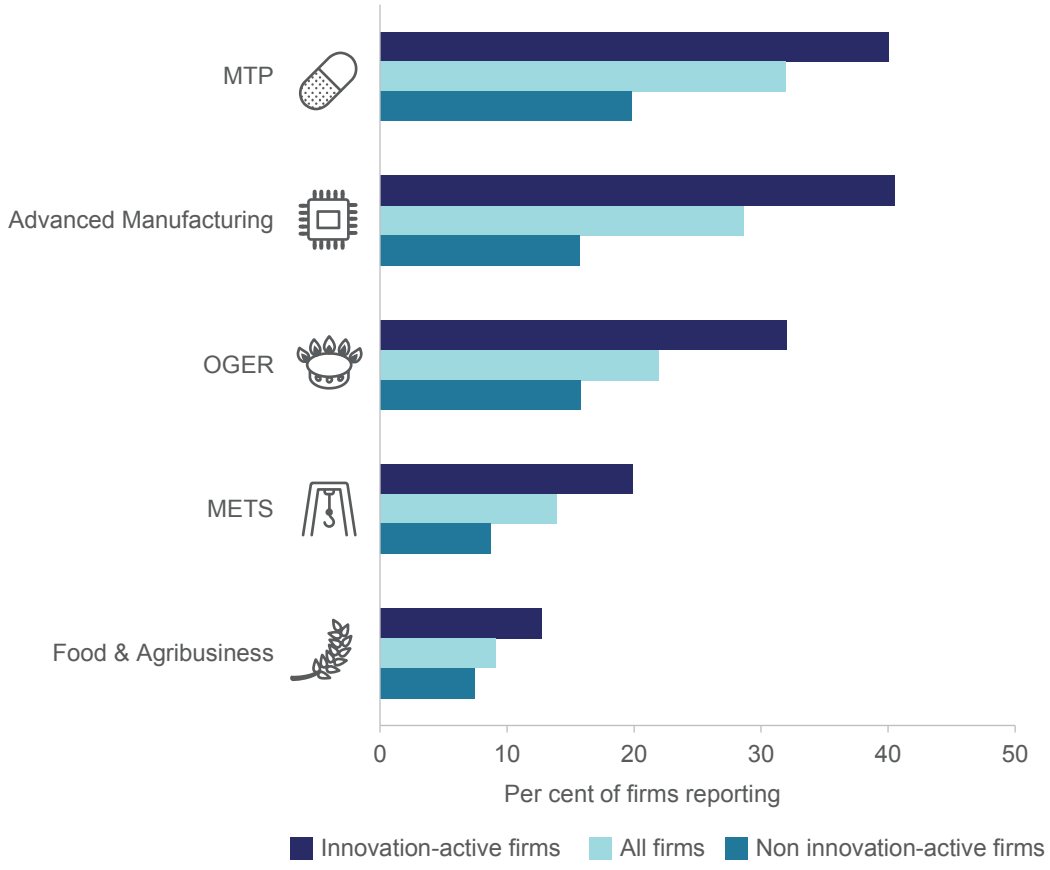


Notes: Figure shows proportion of firms per growth sector whose main source of income came from overseas. Figure is ordered by innovative-active firms (most reported to least reported).

Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 5

[145] ABS data show that all five growth sectors reported higher percentages of firms whose main source of income came from overseas, compared to the all-industries benchmark. The Oil, Gas & Energy Resources sector had the highest percentage of firms earning their main source of income from offshore (19 per cent of respondents), followed by the Mining Equipment, Technology & Services sector (9 per cent of respondents). Innovative firms in all growth sectors were more likely to receive their main source of income from overseas than non-innovative firms except for Mining Equipment, Technology & Services. In relation to firms that earned some income from exports (regardless of amount), the sectors with the highest percentages of respondents with some income from exports were Medical Technologies & Pharmaceuticals (32 per cent) and Advanced Manufacturing (29 per cent). Innovative firms were also more likely to earn some export income than non-innovative firms in every growth sector. Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, tables 4 and 5.

Figure 8.6: Income received from exports, 2013–14



Notes: Figure shows proportion of firms per growth sector that received any income (regardless of amount) from directly exporting goods and/or services. Figure ordered by innovation-active firms (most reported to least reported).

Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 4

During consultation, the IGCs raised the following common challenges to accessing international markets (see Table 8.3).

Table 8.3: Challenges to growth relating to accessing international markets

Difficulties accessing global supply chains and competition from foreign firms
Local firms may find it difficult to access global supply chains because they are often competing against large, well-established foreign firms. FIAL noted that in the food industry, around 40 firms supply more than 80 per cent of the food consumed in Australia, with most of these firms being multinationals such as Kellogg's. Similarly, METS Ignited raised the difficulties for METS firms accessing the global supply chains of tier 1 miners. These firms have to compete against large, established foreign owned METS firms such as Caterpillar. Targeting lower-tier opportunities may provide more opportunities which may then lead to opportunities in higher tiers.
Many Australian firms lack global scale
SMEs are often successful domestically, but need to grow to compete internationally. Scale helps firms improve capital efficiency and reduce costs. Scale can be achieved by expanding the business, arranging mergers and joint ventures, or collaborating with other firms. Any consolidation of firms to achieve scale needs to be undertaken within the bounds of competition policy. However, achieving global scale in Australia is not feasible for the pharmaceuticals and biotechnologies sub-sectors of the Medical Technologies & Pharmaceuticals sectors. The domestic market represents less than two per cent of the global market and so is not large enough to support a high number of firms. For this reason, pharmaceuticals and biotechnologies firms work closely with overseas firms to achieve global scale.
Lack of a unified, cohesive Australian brand overseas
Some IGCs raised concerns about the lack of unified branding of Australian sectors to international markets. Too many Australian brands can result in a lack of focus and confuse overseas markets. An ad-hoc and fragmented approach to marketing, and too many brands representing Australia overseas were put forward by the IGCs as potential problems. FIAL counted a large number of brands representing Australia, States, regions and industries in the Food & Agribusiness industry.
Lack of exporting plans
An export strategy ensures a firm: ■ acts on well-researched information ■ has analysed and assessed the best options ■ has the resources to become a viable exporter ■ creates confidence with lenders ■ understands competitive pressures ■ plans to maintain and increase its market share.[(a)] FIAL estimates that roughly three quarters of exporting firms in the sector do not have an exporting plan. According to the AMGC, many firms have an Australian focused mindset without sufficient consideration given to developing products and services for export markets.
Behind the border restrictions
Different foreign markets have different rules and requirements that can be complex to navigate. MTPConnect highlighted restrictions in foreign markets for Australian firms, such as the requirement to work with wholly government-owned firms through joint ventures. Navigating foreign IP systems can also increase the difficulty of doing business, especially protecting IP in a joint venture context. While these kinds of restrictions and requirements are part of doing business internationally, they do present additional challenges for exporting firms.

Notes: (a) Austrade (2006) *Guide to Developing an Export Strategy*

The IGCs have identified possible solutions to these issues, and are working to smooth the path for firms to access international markets and global supply chains.

For example, FIAL piloted workshops with the Export Council of Australia and industry to tailor content and delivery that will help businesses develop export strategies and marketing plans. It also created an online searchable tool to connect Australian export ready companies with international buyers. The eCatalogue currently profiles more than 700 Australian export-ready companies and 1,100 international buyers.

FIAL noted that the industry could promote a unified brand and marketing approach when selling overseas while maintaining different marketing strategies and brands for the domestic market (i.e. compete domestically and collaborate internationally). FIAL coordinated the 'Australia' stand at Gulfood 2016 (an international food trade show), showcasing food products from across the country. This was the first time Australia was represented at Gulfood as a unified brand on a single stall with representation from four State Governments. FIAL facilitated more than 675 supplier connection requests at the show, and a further 150 connections after the event.

AMGC will work with its sector to not just compete on price, but also to offer the customer a competitive product using value differentiation through:

- product quality (design and technology)
- reliability and reputation (on time and in full delivery)
- flexibility
- safety and transparency
- service support (pre- and post-production).

According to MTPConnect, Australian firms that are developing business plans and international engagement strategies need access to information on market opportunities. Understanding the requirements for doing business offshore can be challenging. The IGCs will work with Austrade and other organisations such as the Export Council of Australia to help firms understand these requirements, and help develop export plans and provide export training.[146]

The recent establishment of an IP Counsellor in China may help firms navigate the Chinese IP system. The IP Counsellor will not only provide Australian businesses with expert guidance on protecting and enforcing IP in China, but also give confidence to Chinese manufacturers and consumers about the value of innovative Australian products.

The Government is also working to reduce 'behind border' and technical restrictions through Free Trade Negotiations and can help the Growth Centres implement solutions to address 'behind border' restrictions.

Finally, The IGCs will work with the Entrepreneurs' Programme initiatives such as the Supply Chain Facilitation to connect firms with both existing and new markets.

[146] For instance, FIAL has commenced a joint project with the Export Council of Australia.

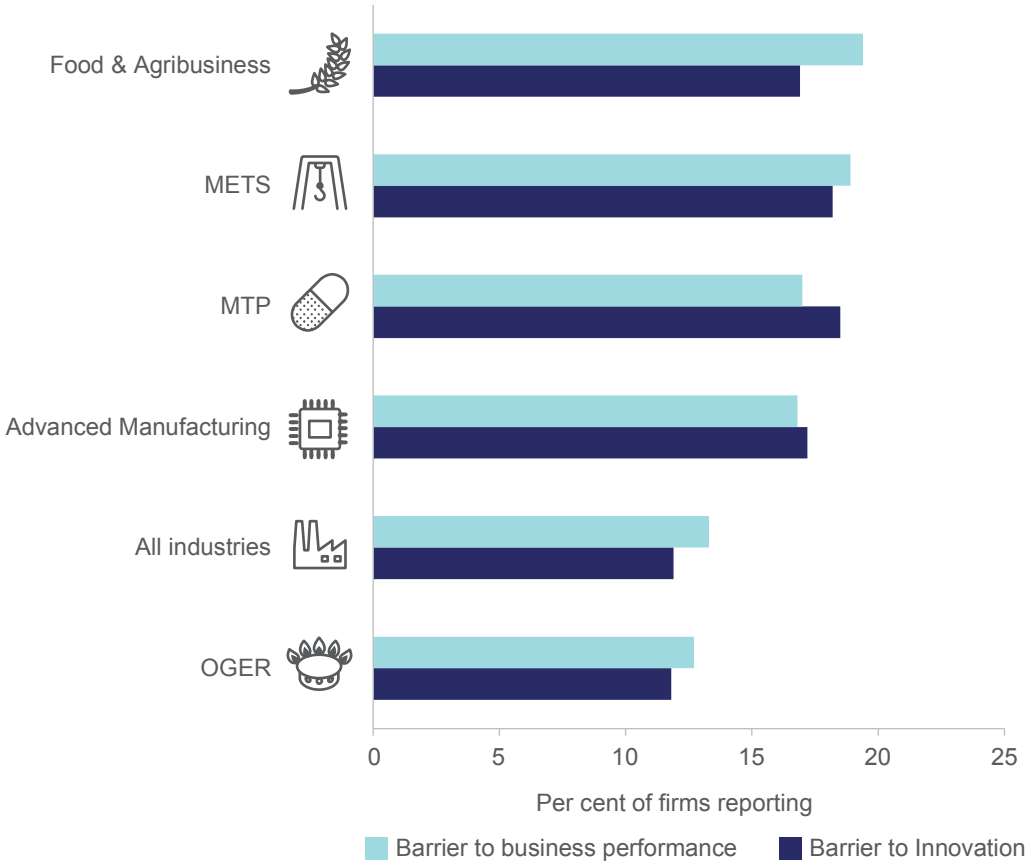
Optimising the regulatory environment

Some regulations are necessary to protect people and the environment, to correct market failures, and to ensure smooth market operation. However, some regulations place requirements on firms that are disproportionate to the benefit provided. In these situations, regulations may negatively affect further development.

Regulatory reform is the final key objective of the IGCs in improving the competitiveness of sectors. Regulation and its impact on Australian businesses was explored in detail in Chapter 3 of the *Australian Industry Report 2015*.

Firms in all growth sectors report government regulations and compliance as either on par with/or more of a barrier to growth than the all-industries benchmark. Figure 8.7 shows firms in growth sectors reporting government regulations and compliance as a barrier to business performance and innovation.[147]

Figure 8.7: Government regulations and compliance as barriers to performance and innovation, 2013–14



Notes: Figure shows proportion of firms per growth sector reporting that government regulations and compliance were a barrier to performance and innovation in their firm. Figure ordered by government regulations and compliance as a barrier to business performance (most reported to least reported).

Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, tables 13 and 14

In consultations with the Growth Centres, the following regulatory issues were raised (see Table 8.4).

[147] ABS data show that between 17 and 19 per cent of firms in four of the five growth sectors reported government regulations and compliance as a barrier to business performance, surpassing the all-industries benchmark. Oil, Gas & Energy Resources firms saw this as less of an issue, with 13 per cent responding, on par with all-industries. In relation to barriers to innovation, between 17 and 19 per cent of Advanced Manufacturing, Mining Equipment, Technology & Services, Food & Agribusiness and Medical Technologies & Pharmaceuticals firms rated Government regulations and compliance as a barrier to innovation, above the all-industries benchmark. Oil, Gas & Energy Resources firms rated this barrier on par with all-industries (12 per cent). Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, tables 13 and 14.

Table 8.4: Challenges to growth relating to regulatory issues

Harmonisation of standards[a]
The way standards are referenced in regulation across Australian jurisdictions lacks harmony. In addition, there are cross-jurisdictional issues relating to the implementation of national regulations. NERA and METS Ignited provided examples of different workplace health and safety (WHS) regulations in different States and Territories, resulting in firms needing to provide multiple WHS briefings at different mine sites. Other examples include different jurisdictional requirements for trades licencing, electrical safety and fire protection. Internationally too, there are a vast range of country-specific standards and regulations. This results in Australian suppliers having to re-design products and services for overseas markets. For example, some METS products exported to the United States require the use of certain input components. That means METS suppliers need to import those components from the United States to use in their products before they can export the product. Much of the equipment used in the global oil and gas industry is engineered to industry-specific standards such as the American Petroleum Institute standards which means Australian suppliers need to undertake additional design, testing and compliance certification.
Inter-business regulation
Much of the red tape firms deal with is self-imposed by industry. A 2016 report by Deloitte stated that self-imposed regulations cost $134 billion per year in compliance costs.[b] By comparison, public sector regulations impose $67 billion per year in compliance costs.[c] In the food industry, supermarkets often require suppliers to meet private quality assurance standards. Some firms are subject to more than 100 compliance audits, collectively costing the firm more than $1 million per year. While this partly results in Australia's excellent reputation for food production, there must be a balance between ensuring food safety and an appropriate amount of regulation.
Policy stability
Uncertainties about policy consistency can negatively affect firm investment. The IGCs agreed that consistency, persistency and the coordination of policy in areas such as tax incentives, IP laws and grant funding were important for growth. Stability in these areas gives firms confidence to invest in commercialisation, collaboration, skills and pursuing international markets. It also assures firms that they can engage in growth activities knowing the rules and requirements are likely to remain somewhat consistent.
User pays model
Government policy is to apply a cost recovery model for services where appropriate. Growth Centres reported that some firms perceive user pays models, such as those administered by Austrade and the Therapeutic Goods Administration (TGA), as a disincentive to seek advice and approvals seeing the fees as being disproportionate to the gain. However, there may be a lack of visibility regarding the fees charged and the range of services covered by those fees. For example, the fees TGA charge cover a range of services that extend beyond advice and approvals of medicines. The fees also cover compliance, pharmacovigilance activity, adverse-event monitoring and ensuring medicines and medical devices are constantly monitored to ensure risks to the Australian public are proactively managed. Before an application will be processed, the TGA charges application fees that are dependent on the risk and complexity of the product. Their fees can range from $0 to more than $230,000, with the highest fees limited to a small percentage of applications.

Notes: (a) All growth sectors ranked adherence to standards in the bottom three barriers to innovation. Seven per cent of Medical Technologies & Pharmaceuticals firms reported standards as a barrier and this was the highest amongst the growth sectors. Source: ABS cat. no. 8170.0, *Characteristics of Businesses in Selected Growth Sectors*, table 13.
(b) Deloitte (2014) *Getting Out of Your Own Way*, p. 35
(c) Ibid

The IGCs are working to overcome these challenges. For example, NERA is working to better align standards used in the oil and gas industry in Australia with international best practice, and across jurisdictions in Australia.

AMGC and Standards Australia are participating in the Prime Minister's Industry 4.0 Taskforce. The Industry 4.0 initiative, a collaboration between government and industry in Germany and Australia, is considering a range of issues relevant to the transition to tomorrow's industries, including standards, research and innovation, network security, legal frameworks and workforce impacts.

FIAL is undertaking a Food Safety Auditing Project in partnership with the Australian Food and Grocery Council and major retailers to address the cost, frequency and unnecessary duplication of food safety audits in Australia.

METS Ignited is involved in a project on interoperability standards across the minerals value chain, focused specifically on surface mining equipment. It is expected to lower entry barriers and reduce development costs for third-party vendors and providers.

The TGA is consulting with a number of groups (including MTPConnect) around a model to better support how SMEs navigate regulatory processes.

Some IGCs held the view that some regulations provided benefits for the sector and that Australia's regulatory regime is a competitive strength for Australian sectors that have a reputation for adhering to high quality standards.

For example, the food industry enjoys a good reputation overseas for safe, high quality products. For the two resources growth sectors (METS and OGER) environmental regulations and local industry participation requirements can provide projects with a social license to operate. (These regulations and requirements ensure that Australian firms have opportunities to tender for work on projects.)

These are areas of strength for Australia and Australian resource projects are generally regarded as best practice when it comes to minimising environmental impacts. This is a competitive strength for Australia and the IGCs will explore opportunities to export this know-how.

The Government is also pursuing regulation reform through business simplification. It will simplify the way firms do business by reducing overlapping approvals between jurisdictions, and creating seamless mechanisms for interacting with governments such as one-stop shops. This will allow firms to focus on growing their business, providing jobs and increasing investment.

Governments have international obligations that encourage the use of international standards wherever appropriate. Recently-signed Free Trade Agreements attempt to build on these obligations by further reducing 'behind border' restrictions through harmonising the use of international standards in regulation.

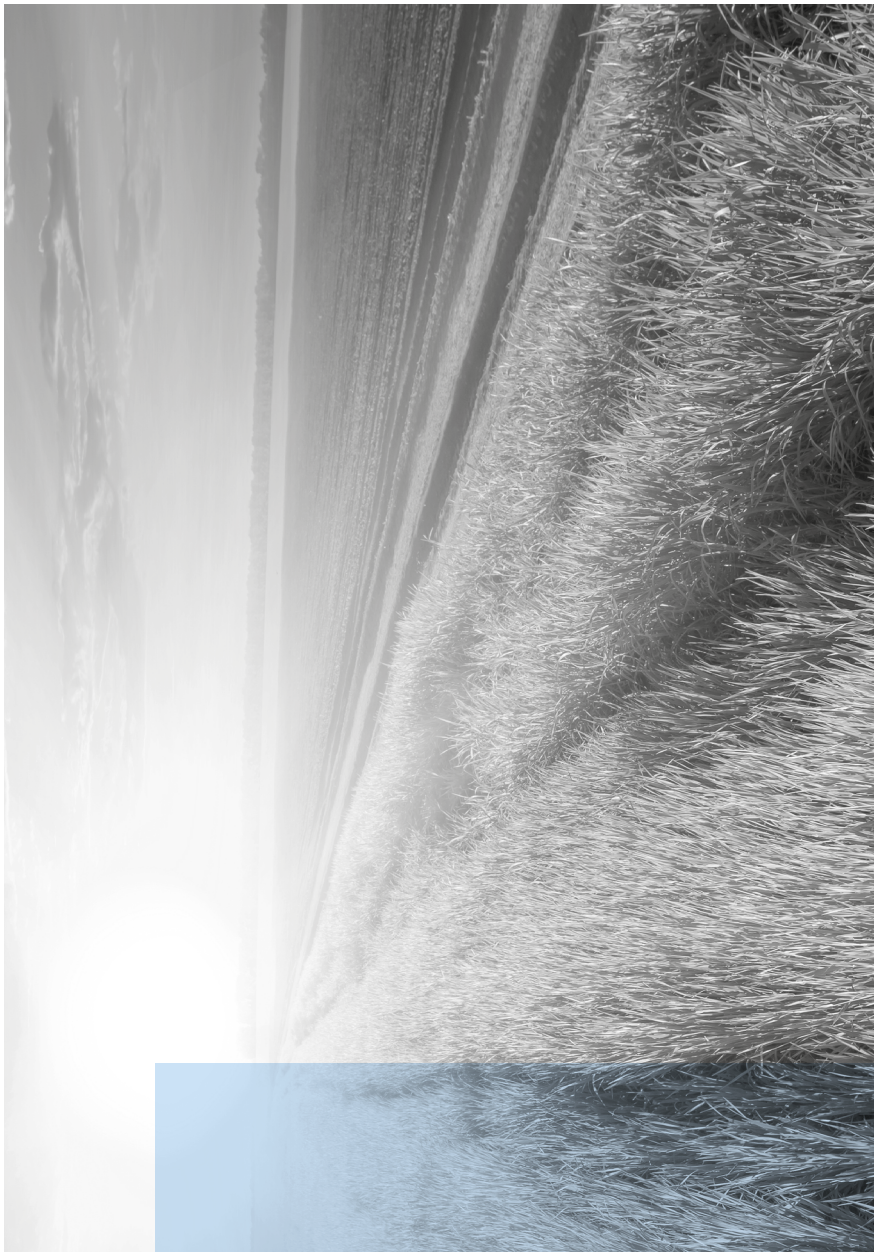
Summary

A number of common themes emerged across the Industry Growth Centers. These are summarised in Table 8.5.

Table 8.5: Summary of findings

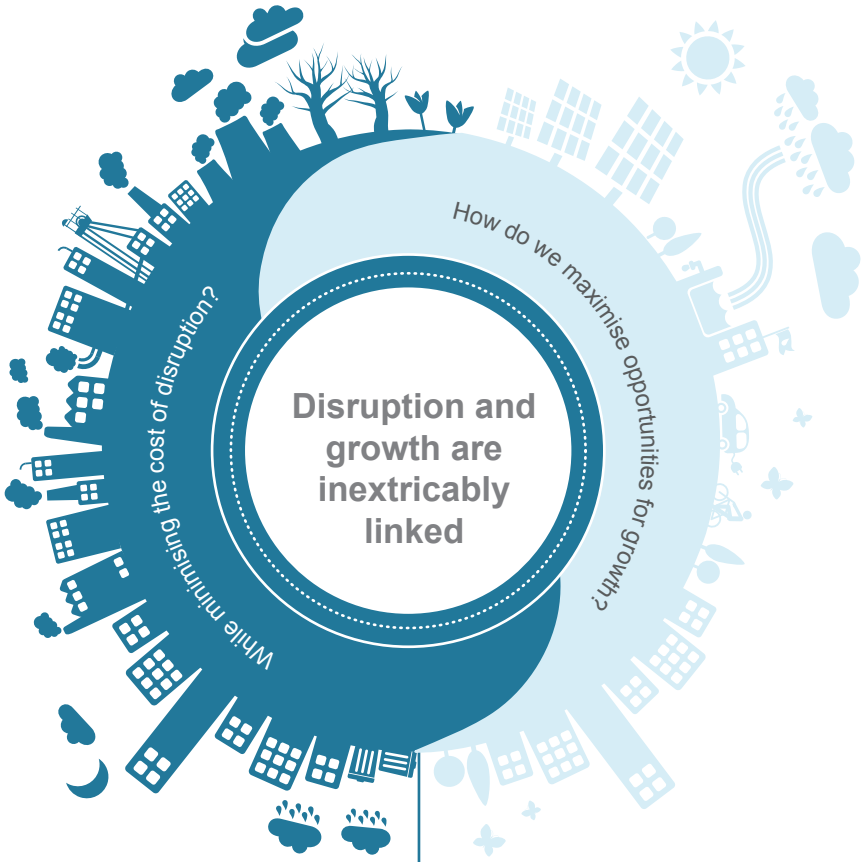
Objective	*Finding*
Increasing collaboration and commercialisation	Australia's growth sectors are good at collaborating compared to other sectors in our economy. But international comparisons against other countries suggest they need to improve. There is also a lot of room for improvement with rates of commercialisation. The IGCs identified common challenges to further growth in their sectors: ■ lack of early collaboration ■ commercial pressures and difficulty in securing funds for commercialisation activities ■ viewing other firms as a threat rather than opportunity to collaborate ■ risk aversion to new innovation ■ mismatches between research being undertaken and the research needs of industry. The IGCs noted how R&D investment largely drives commercialisation and innovation, and the importance of moving away from undirected R&D towards investment with more commercial potential.
Enhancing management capability and workforce skills	While data show gaps in trades and financial skills, the IGCs are focused on addressing the following skills gaps to achieve further growth: ■ business management ■ business development (e.g. marketing) ■ regulatory skills ■ skills for the jobs of tomorrow. Business management skills gaps were particularly common in SMEs. The increasing need for a highly-skilled workforce where Australia has a competitive cost advantage will be an important focus for the IGCs.
Improving capabilities to engage with international markets and global supply chains	The IGCs commonly note the following challenges in accessing international markets: ■ difficulties accessing international supply chains ■ lack of scale of Australian firms ■ lack of common branding ■ lack of exporting plans ■ a limited understanding of 'behind border' restrictions of doing business in that country.

Objective	*Finding*
Identifying regulations that are unnecessary or over-burdensome	Common regulatory issues impeding growth noted by the IGCs include: ■ a lack of consistency of regulation (particularly inter-jurisdictional requirements) ■ inter-business regulation ■ policy stability and regulatory settings ■ the user-pays model. The Government has a role to play in reducing unnecessary regulation and supporting and expediting the work of the Growth Centres. Ultimately, the IGCs are best placed to address challenges to growth at the sector level. They will address issues affecting growth, as outlined in each sector's Competitiveness Plan. The IGCs will achieve success by getting sectors to work smarter and more collaboratively with each other to succeed in new markets. They have begun addressing these challenges, and early results are starting to emerge.



9 Enhancing Australia's competitiveness

A look at 'creative destruction' — the symbiotic nature of growth and displacement — and the role that industry policy plays in managing this process.



Industry policy in a modern economy

1. Target economic growth and productivity improvements
2. Accurate diagnosis of the problem
3. Maximise additionality and spillovers
4. Sector and technology neutrality
5. Support resources, not firms
6. Structural problems require structural solutions
7. Industry policy should be industry led
8. Articulate clear benchmarks and criteria for success and failure
9. Support is temporary

'Competitiveness' is a somewhat sweeping term, it means different things to different people. For a business, being competitive means being able to survive in the marketplace. For an economy, competitiveness refers to the ability to generate economic growth and improved living standards.

This report has explored some of these perspectives in an effort to support policymakers in designing and implementing industry policy in the future.

Competition leads to new products and processes, greater efficiencies and greater value. But it also causes disruption and structural change. The consequence of a fiercely competitive, global market place can be seen in every Australian industry — from agriculture, to manufacturing, to mining, to services.

For policy makers, the key question is about how to maximise economic growth, while minimising the economic costs of this disruption.

The feature article below discusses the role of industry policy in the modern economy. It has been written with Martin Baily from the Brookings Institution and draws on research commissioned by the department about policies to enhance Australia's innovation, productivity and competitiveness. That report is available from https://www.brookings.edu/research/policies-to-enhance-australias-growth-a-us-perspective/, and the key findings are as follows.

- Competitive markets provide the pressure that forces companies to change their ways of doing business and move towards best practices. Established industries in Australia should be exposed to best practice competition.
- Avoid regulation that restricts competition, or that prevents the transformation of an industry into a more productive format.
- Good industry policy encourages and supports innovation and can help develop the companies and industry segments of the future. Good policy provides support for knowledge creation and to overcome market failures.
- High quality efforts by business, academic and government researchers in Australia have identified industries and industry segments where Australia is building global advantage.

The feature article builds on this research and identifies nine principles to assist policy makers faced with the dilemma of encouraging innovation and growth, while managing the costs of adjustment and loss.

Feature article: Principles for industry policy in a modern economy

With Martin Baily — Senior Fellow, Brookings Institution

Economists use the term 'creative destruction' to describe the mechanism through which new products and processes replace the old. Coined by Joseph Schumpeter in the 1940s, the term describes how the market economy evolves, and reminds us that disruption and growth are inextricably linked.

Schumpeter writes:

> *The opening up of new markets, foreign or domestic, and the organizational development from the craft shop to such concerns as U.S. Steel illustrate the same process of industrial mutation… that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.*[148]

Overall, creative destruction is a positive force on the economy. When firms and individuals innovate in pursuit of a competitive advantage they contribute to productivity and economic growth. In the long run, this drives structural change and improvements in the standard of living.

Growth, however, cannot be achieved without disruption, and the realities of this process can be severe. Entrepreneurs succeed by taking market share away from incumbents. Technology lowers the cost of production by taking the place of workers. Investors that choose to invest in one sector choose not to invest in another. Consumer preferences wax and wane, and so do their consumption patterns.

The economic viability of an entire region can be put at risk when it is too reliant on a particular business or industry. The closing of a large plant can trigger the direct loss of jobs followed by a decline along the supply chain, as well as for supporting services such as grocery stores or dentists. Retrenched workers may find the values of their homes have fallen at the same time as they are struggling to retrain or obtain alternative employment at anything close to the same wage level.

For policymakers, creative destruction is a double-edged sword, and managing creative destruction is easier said than done. Structural change generates pressure to support declining companies and mitigate the negative impact on workers. Governments are often called upon to intervene and dampen the effects of market forces.

Modern industry policy seeks to facilitate growth through competitive markets, a well-functioning innovation system and effective regulation. To this end, industry policy complements a range of economic and social policies including education, employment, trade, competition and science. This article provides some insight about how industry policy can be used to effectively manage this tension. It begins with a discussion about structural change and industry policy, and then proposes some key principles that policy makers should follow in its application of industry policy.

[148] Schumpeter J (1942) *Capitalism, Socialism, and Democracy,* Taylor & Francis, p. 83

Structural change in Australia

Structural change occurs in response to movements in relative prices. As the relative price of goods, services, and inputs, such as land, labour and capital move, so do the patterns of production and consumption. This results in a constant flow of resources around the economy as firms and workers attempt to realise opportunities when and where they arise.

Driving forces

Structural change is driven by a number of forces. The first is technology. Technology has had a transformative impact at every point along the supply chain. Examples include:

- advances in communications and data transfer technologies on global commerce
- robotics and automation on the production process
- computerised stock management systems and storage and delivery costs
- online retailing and the consumer interface.

A second force is globalisation. Globalisation has been facilitated and accelerated through policy and technology. Policy changes have reduced barriers to trade, capital flows and labour mobility, allowing markets to become increasingly interconnected. Technology has accelerated globalisation by reducing transport costs, and improving communication and information flows.

Third, consumer preferences. The Australian population is becoming larger, older and richer. Over the past four decades, the population has grown by nearly 9 million persons. The median age has increased by close to 10 years and per capita incomes have doubled.[149] These changes have had significant impacts on what Australian consumers demand — and consequently what market opportunities exist for business. In particular, this explains the increased demand for healthcare services, luxury goods and leisure activities.

And finally, government policies have been instrumental in triggering structural change. The competition reforms in the 1990s — reforms aimed at increasing the participation rate, trade liberalisation, changes to education policies and support for science and innovation — have each left a permanent mark on the Australian economic landscape. The implementation of efficient regulatory regimes and the erosion of protectionist policies over time have freed the economy to react to competitive forces and reallocate resources to their most productive uses. This has resulted in higher incomes, lower prices, greater choice and opportunities across the economy.

The nature and pace of future structural change is difficult to predict. However, it is reasonable to expect that the long-run drivers of change will continue. For example, population ageing, globalisation and technology advances are unlikely to cease or reverse any time soon. Rapid economic growth across Asia and the rise of its middle class will continue to provide investment and export opportunities for Australian businesses.

Structural change is both inevitable and a significant challenge. Without structural change, economies cannot respond to changes in relative prices, and therefore cannot achieve optimal allocation of resources.[150] Structural change supports growth in new sectors and markets, creates new high paying jobs and makes the economy better off.

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[149] Committee for Economic Development of Australia (CEDA) (2015) *Australia's future workforce*

[150] See, for example, Department of Industry, Innovation and Science (2014) *Australian Industry Report 2014,* Chapter 2

However, for a number of reasons, resources are sometimes slow to adjust. Workers in particular take time to respond to changes in relative wages. The difficulties of relocating and reskilling can pose as a significant barrier, which can lead to unemployment and other inefficiencies such as idle machinery and equipment. Ensuring adjustment is efficient and timely is crucial for dynamic efficiency — where resources are efficiently allocated over time.

Industry policy is a powerful tool that governments use to help address structural change issues. The next section provides a definition of industry policy and provides a framework for thinking about its guiding objectives.

Industry policy

Unlike most other economic policies, there is little agreement about how industry policy is defined in the box below. Some describe industry policy in active terms, as a purposeful and deliberate attempt to shape the economy. Others describe industry policy as more facilitative — where good industry polices are those that support the functioning of markets.

Definitions of industry policy

'Industrial policies are concerned with promoting industrial growth and efficiency.' (OECD, 1975)

'Industrial policy may be generally defined as any government measure, or set of measures, to promote or prevent structural change.' (Curzon-Price, 1981)

'....the term industrial policy indicates the relationship between business and government on a microeconomic level...' (Wachter and Wachter, 1981)

'....everything which is useful to improve growth and competitive performance.' (Adams and Klein, 1983)

'Industrial policy... means government policy aimed at or motivated by problems within specific sectors.' (Tyson and Zysman, 1983)

'Industrial policy means the initiation and co-ordination of governmental initiatives to leverage upward the productivity and competitiveness of the whole economy and of particular industries in it.' (Johnson, 1984)

'Industrial policies refer to those policies intended to affect in some ways manufacturing or service industries.' (Graham, 1986)

'....a wide-ranging, ill-assorted collection of micro-based supply initiatives which are designed to improve market performance in a variety of occasionally mutually inconsistent ways.' (Geroski, 1989)

'Industrial policy is an attempt by a government to encourage resources to move into particular sectors that the government views as important to future economic growth.' (Krugman and Obstfeld, 1991)

Industrial policy is one 'aimed at particular industries (and firms as their components) to achieve the outcomes that are perceived by the state to be efficient for the economy as a whole.' (Chang, 1994)

Industrial policy 'can be defined as any policy affecting the allocation of resources to industry and in this sense embraces both macroeconomic policy ... as well as the more traditional areas of microeconomic policy.' (Sharp, 1998)

Industrial policy is 'every form of state intervention that affects industry as a distinct part of the economy.' (Foreman-Peck and Frederico, 1999)

Narrow view: 'Restrict attention to policies that target particular firms and industrial sectors.' Broad view: 'any policy that shapes or influences the competitiveness of a country's firms and industries.' (Beath,2002)

'...restructuring policies in favour of more dynamic activities generally, regardless of whether those are located within industry or manufacturing per se.' (Rodrik, 2004)

Industrial policy is 'the activity which creates a favourable environment for European business in general, the manufacturing sector and its industries in specific.' (Aiginger and Sieber, 2005)

'Industrial policy refers to a set of measures taken by a government and aiming at influencing a country's performance towards a desired objective.' (Pitelis, 2006)

Source: Warwick K (2013) Beyond Industrial Policy, *OECD Science, Technology and Industry Policy Papers,* p 15

Neither view is necessarily more correct. Rather, these differences likely reflect how the emphasis of industry policy has developed over time. Historically, industry policy offered a suite of policies and programmes that sought to directly improve the viability of those industries under stress. In Australia, much of the structural adjustment in the 1980s and 1990s for example was due to policy decisions of the government. Microeconomic reforms, competition policy, the removal of tariffs and trade barriers, the floating of the Australia dollar and deregulation meant that some activities were no longer viable under heightened levels of competition.

The importance of opening up markets and letting competitive forces work. The driving force behind structural change today is the recognition of the value of the market — providing general assistance, but in a way that is market driven.

At its broadest, industry policy can be used to describe any type of intervention or government policy that attempts to improve the business environment or alter the structure of economic activity toward sectors, technologies or tasks.[151] Notably, while it is useful to have a well-understood definition of industry policy, the utility of that definition is somewhat limited by its inclusiveness. Indeed it may be more useful to think about what industry policy is trying to achieve. Specifically:

- What is the nature of the problem that industry policy is trying to overcome?
- Is that problem sector-specific, or economy wide?

The first question regards the drivers of industry policy. Here the literature tends to emphasise the industry policy as being driven by either market or non-market forces. The difference is that in the latter, the government assumes a far more active role in shaping the structure and composition of the economy. In the former, the policy seeks to ensure that opportunities are maximised and that industry is not encumbered by supply side constraints.

The second question regards the application of industry policy. Industry policy can be applied either 'vertically' to sectors or 'horizontally' to activities.

[151] Warwick K (2013) Beyond Industrial Policy, *OECD Science, Technology and Industry Policy Papers,* p. 15.

Vertical/sectoral — programmes and policies are focused on specific industries. Traditionally particular weight has been given to the manufacturing sector, but more recently this has been extended to include services, the knowledge economy, and so on.

Horizontal/activities-based — programmes and policies cut across sectors, targeting factor inputs and market failures. The concern here is more about the general economic environment that businesses operate within. Industry policy is used to promote competitiveness and economic growth broadly — specifically not favouring one sector over another.

Figure 9.1: A framework for industry policy

Source: Brookings Institution and DIIS

There is of course, no clear answer to either of these questions. In practice, industry policy is likely to be driven both by market and non-market forces, and have both vertical and horizontal applications. Policy drivers exist along a spectrum — somewhere between mostly policy and mostly market driven. And similarly for its application.

The answers to these questions can be combined in a way that describe industry policy's intent as being either directional, transitional, enabling or facilitative. Each of these approaches is described in Figure 9.1.

Economy-wide

Facilitative

Facilitative industry policy is market led and activity-based. Here, industry policy supports an environment in which competitive firms can prosper. This is achieved by ensuring market and systems failures are overcome, and that supply chains are clear of choke points. How resources respond to structural change is thereafter independent of policy desires.

The majority of the government's current policy measures seem to fall into this category. The R&D Tax Incentive, for example, is a programme designed to address underinvestment in R&D — a problem that exists due to a market failure regarding knowledge spillovers. The programme can be accessed by all firms, subject to eligibility criteria, regardless of industry. The decision about where to invest rests with the firm, and is not guided by government.

Enabling

The intent of industry policy can be considered enabling where it used to raise the economy's overall capability. This approach is policy driven in the sense that it requires the government to invest in the development or maintenance of particular set of capabilities. But is focused on activities rather than sectors.

The government's support for science is an example of industry policy with an enabling intent. This is a strategic investment, aimed at improving the nation's competitiveness in the future. The government's support for science is not aimed at a particular sector, but rather seeks to develop capabilities that can be employed across the economy. In doing so, this alters the set of opportunities available to the economy as it responds to structural change — and therefore also changes the set of possible futures.

In Australia, modern industry policy is increasingly 'facilitative' in nature. Particularly after the economic reforms of the 1980s and 1990s, market forces have been the main drivers of structural change. Successive governments have looked to strengthen how markets operate, and to overcome inefficiencies where they arise. Moreover, it is becoming increasingly less likely that policies seek to favour a sector or technology. Modern industry policy is far more neutral, looking to improve productivity at the firm level, as well as improve system wide failures.

Managing creative destruction with industry policy

Industry policy straddles both sides of the creative destruction coin. Industry policy helps to promote creation by ensuring competitive business environments and through support for science and innovation. Industry policy also helps manage the pains of disruption by helping resources to relocate elsewhere in the economy.

Creative destruction is both powerful and irresistible. Moreover, efforts to curtail its impact or limit its pace can be detrimental to an economy. The extent that industry policy can 'manage' creative destruction, is only likely to be at the margin.

Creation and innovation

Innovative activity has spill-over benefits that accrue to the broader economy and the relationship between innovation and productivity is well established.[152]

Pure scientific research is on one end of a spectrum that stretches through applied research to product development. Pure research is a 'public good' that supports the economy because the knowledge is made available to all. In fact, research done in Australia can positively influence global scientific endeavours, just as Australia benefits from research done in other countries. Government support of pure science is important to ensure the strength of Australia's universities and to make sure our scientists are a part of the global community of researchers. It is important to the economy because companies must be able to take advantage of scientific advances wherever they originate, and that means having access to a strong scientific community in Australia.

Further along the spectrum comes applied research that promises economic payoffs in the foreseeable future. There is an economic motivation for this research to be carried out in the business sector, but there are also important spill-overs that benefit the economy more broadly. The social returns from applied research are greater than those that can be expected to be captured by any single firm that carries it out. This means the incentive for a single firm to conduct such research is muted if their competitors can see the fruits of the research and apply it to their own products or services.

Knowledge is not always as homogenous and instantly adoptable as is assumed by neoclassical approaches. Knowledge is often heterogeneous, context-specific, tacit and 'sticky'. Furthermore, the system of production and innovation is made up of formal and informal networks that may be inefficient in disseminating knowledge across the economy.[153]

A key role for industry policy then, is to overcome 'system failure' and develop networks to maximise the potential of the system at large. Industry policy can be used to solve infrastructural and institutional problems, technological lock-in, path dependency and learning dynamics in the firm, local network and system levels.

Typical policies designed to address these problems include:

[152] See, for example, Department of Industry, Innovation and Science (2015) *Australian Innovation System Report 2015*
[153] Ibid

- incentives and programs to improve collaboration between actors in the innovation system and internationally
- policies to ensure sound framework conditions — stable government funding for education, public research and science infrastructure
- policies to enhance access to finance for firms and entrepreneurs — programs and policies to enhance the innovative capacity of firms
- policies to foster entrepreneurship
- regulation and standards designed to facilitate innovation.

In terms of new-to-market innovations and collaboration on innovation, Australia ranks below the OECD average. Further, expenditure by Australian businesses on research and development is well below the leaders such as Germany, Japan and the United States.

To address this, the Australian Government has announced the *National Innovation and Science Agenda* (NISA), aimed at addressing the gap between the private and the social returns to applied research. The agenda includes more than $1 billion in funding towards some 28 initiatives grouped around culture and capital, collaboration, skills and talent, and government as an exemplar.

Destruction and adjustment

Over the long run, Australia's economy has progressively become more and more service-based. A century ago for example, approximately one in three workers were employed in primary industries. Today, this figure has fallen to less than one in 30. In the 1970s, one in four jobs was in manufacturing. Today it is less than one in 12.

On balance the process is net positive. But that is not the same as saying the process is costless. Where resources are sticky, the economy can be slow to adjust, resulting in prolonged unemployment.

For those regions that rely on one particular industry, structural changes like these can have a significant impact on the local economy. Historically, Victoria and South Australia have relied on a strong manufacturing sector as part of their economic bases. Pockets of Queensland, Western Australia and the Northern Territory are heavily reliant on mining industries. Around the country, agriculture plays a critical role in the performance of many regional communities.

Schumpeter's view of creative destruction implicitly embodied the idea that labour and capital have alternative uses, and would not remain idle in the face of structural change. In practice, some workers who lose their jobs do not have other options anywhere close to where they are located. Especially if they are older, they can find it very difficult to relocate or retrain. They may have a large part of their assets tied up in a home that has lost value when a region's economy declines. There is a significant economic and social cost when resources go unemployed.

An economy can take many paths as it transitions from one state to another. Some paths might be considered 'better' than others, because they are perhaps quicker, require fewer resources, produce more outputs, or result in a preferred destination. Improvements in the efficiency of this transition brings growth in living standards over time. Industry policy can support improvements in dynamic efficiency by:

- helping to repurpose redundant resources
- supporting innovation and entrepreneurship
- investing in and using infrastructure efficiently
- facilitating trade with other countries
- improving physical and human capital investment.

Principles for designing future industry policy

Critics of industry policy are not difficult to find. Policy makers have been criticised for their inability to 'pick winners', the lack of competency and expertise, industry capture, gaming and even corruption.[154]

While there are equally strong retorts, 'good' industry policy should nonetheless be mindful of these pitfalls.

Outlined below are some principles for the design of future industry policy. They have been adapted from Rodrik to fit the Australian context.[155] These principles are intended as a guide only, and there may be compelling specific circumstances where it is sensible to depart from them.

1. **Industry policy should target economic growth and productivity improvements.** The driving objective behind industry policy should be the promotion of economic growth. Policy can seek to achieve this through a number of means — encouraging exports, developing skills or supporting new businesses — but these efforts are means, and themselves the ultimate objective. Any new applications of industry policy should be accompanied by a clear economic case for intervention and supported by a strong evidence base.
2. **Accurate diagnosis of the problem.** For a number of reasons markets may fail to produce the most efficient outcomes. Correcting a market failure can require government intervention, and the nature of the intervention is dependent on the cause of the market failure. Policies and regulations must be able to clearly articulate the problem they are trying to address and an understanding of the relative benefits and costs — including opportunity costs — that might result. Moreover, it is critical that any intervention is implemented in a way that is efficient and welfare-improving.
3. **Maximise additionality and spillovers.** To the greatest extent possible, industry policy should incentivise activities that would not have occurred in the absence of government intervention. The R&D Tax Incentive for example, should aim to encourage additional R&D spending, not subsidise expenditure that would have occurred regardless. In a similar vein, supported activities should have a clear potential for providing spill-overs and demonstration effects. Public intervention can be justified if there are economic activities that are being undersupplied because the private actors are not capturing spill-over benefits.
4. **Sector and technology neutrality.** Industry policy should not seek to favour growth in one sector or technology at the expense of another. Economies do best when they focus on their areas of comparative advantage. Australia is a very large, resource-rich country, with a highly skilled but relatively small work force. This means that while Australia has some natural advantages, there are limits to what can be competitively produced. Attempts to develop new 'strategic' industries or sustain industries in decline can be a very expensive exercise, and not always successful. Accordingly, industry policy should steer away from investments that are sector or technology specific, and focus instead on developing capabilities that can be employed across the economy. Examples include better regulation, the establishment of well-functioning markets, improving managerial capabilities, and the development of core and transferable skills.

   That said, it may be more efficient for governments to focus initiatives on specific sectors of competitive strength and strategic priority to achieve its economic policy goals. Moreover, a sector may have sector-specific market failures that are best solved by sector-specific approaches. The Industry Growth Centre

[154] Rodrik, D (2007) *One Economics Many Recipes,* Princeton, New Jersey
[155] Ibid

Initiative is an example of this. The Initiative is a sector-based mechanism the Government is using to pursue economy-wide objectives relating to collaboration, skill shortages, capability development and better regulation. Businesses generally organise themselves in sectors and this facilitates interaction between business, research institutions and governments.

5. **Support resources, not firms.** The potential for failure imposes a fierce discipline on firms to make smart business decisions. This discipline is undermined when there is a promise of government support and rescue should things turn poorly. The economic costs of a firm going out of business do not relate to the firm, but rather its former employees and assets. Industry policy should seek to ensure that resources can be re-employed in productive sectors as efficiently as is feasible.
6. **Structural problems require structural solutions.** One key question to ask is whether the troubled industry is facing a temporary problem, or whether it has permanently lost the ability to compete in the national or the global marketplace. There is little point trying to 'save' an industry that has no long-term future. There is a strong case for helping workers and their community deal with their adversity, but well-intentioned policies cannot turn back the tide. People may need help to move and find jobs elsewhere. A community may need help in providing services to those who choose to remain. However, it would be a mistake to give up on innovation policies that will help create the industries of the future in order to prop up the industries of the past for a few months or years.
7. **Industry policy should be industry led.** Policy will be most effective when there is a shared sense of ownership between government and industry. Businesses, industry associations and the research community are valuable source of information and intelligence about the realities of the market. Policy solutions should be designed in consultation with these groups to help improve implementation and help direct resources to the core of the problem.
8. **Articulate clear benchmarks and criteria for success and failure.** Industry policy can be an experimental process. Sometimes it is not clear how effective a policy might be. The best answer to this problem is that clear benchmarks be set out from the beginning and the criteria for success or failure laid out. There is merit in trialling new policies before taking them to scale. Clearly articulated success metrics are needed to ensure that policies can be sufficiently evaluated, such that they can then be expanded or terminated as appropriate. Failures can be highly instructive, and can point to directions for future successes.
9. **Support is temporary.** Industries that rely on public support are not sustainable in the long run. While there may be an argument to support an industry in its infancy, or through a period of transition, it should be well understood that support is time limited. Policies that include an explicit sunset clause help to makes this very clear.

Following these principles may be particularly difficult when issues are severe and localised. Their purpose is to provide policy makers with a set of overarching values that embrace structural change as a positive force on the economy. They help to provide consistency and coherency to how industry policy is applied.

Conclusion

Australia has just celebrated its 25th year of consecutive economic growth. The changes to the economy over this period have been dramatic. The economy has become more servitised, it has embraced the internet, and has adjusted to a range of market-embracing policy reforms. While some sectors have ascended, others have declined.

Looking ahead, a wave of new, transformative technologies sits on the horizon. Artificial intelligence, the Internet of Things, additive manufacturing, driverless automobiles, big data and quantum computing each have the potential to significantly change the economy. These technologies are a tremendous economic opportunity. They will also be the source of tremendous disruption.

The economy will continue to change and evolve. Modern industry policy plays an important role in how this occurs. Modern industry policy helps establish a competitive business environment where firms can take advantage of the opportunities before them. It also ensures that those affected by displacement are appropriately supported, and that resources are not left idle and unemployed.

To maximise Australia's economic potential, it is important that industry policy does not seek to minimise disruption. Rather, industry policy must embrace disruption and seek to minimise the economic costs of that disruption.

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