

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?



Compare
GRP vs known factors,
that influence regional
performance

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

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

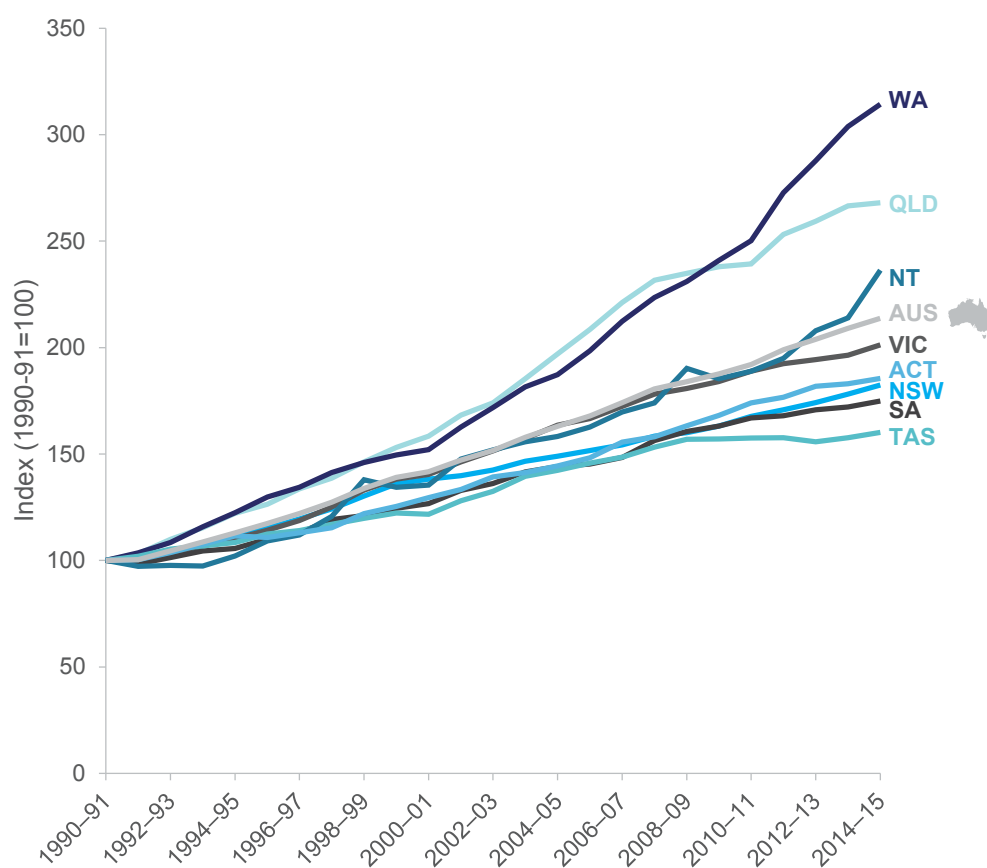
Figure 7.1 shows the uneven performance of Australia's States and Territories, over the past 25 years in terms of output. Although all States and Territories experienced positive growth, not all of them followed the same growth trajectory. During this period, the resource-intensive States of Queensland 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.

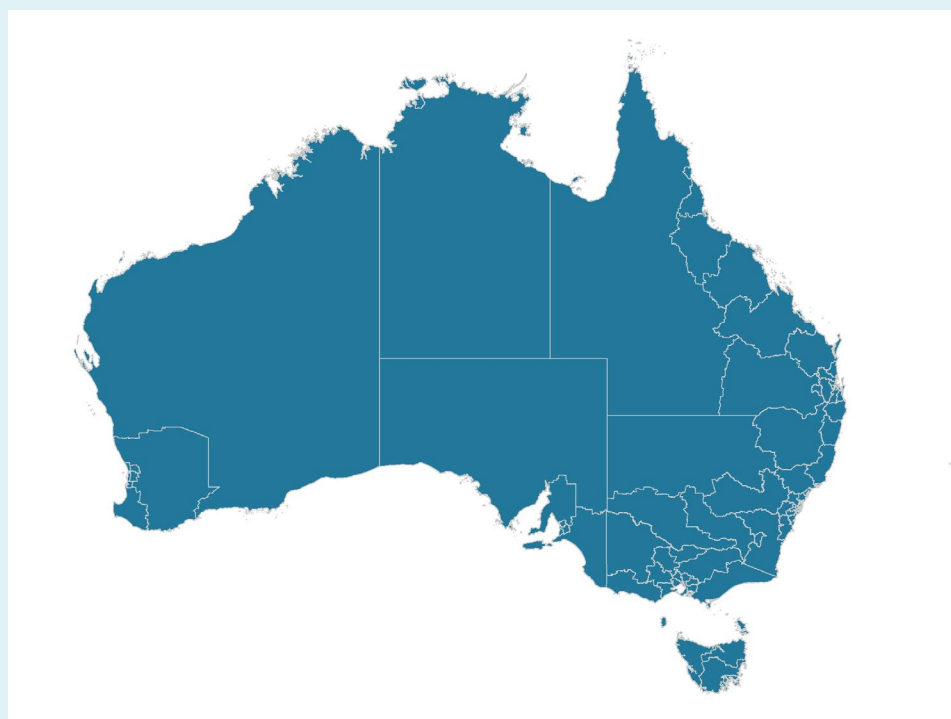
¹¹¹ ABS cat. no. 6291.0.55.003, EQ3, *Labour Force, Australia, Detailed, Quarterly*, (May 2016)

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 Standard (ASGS)*, (viewed 07 October 2016),
[http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Statistical+Geography+Standard+\(ASGS\)](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

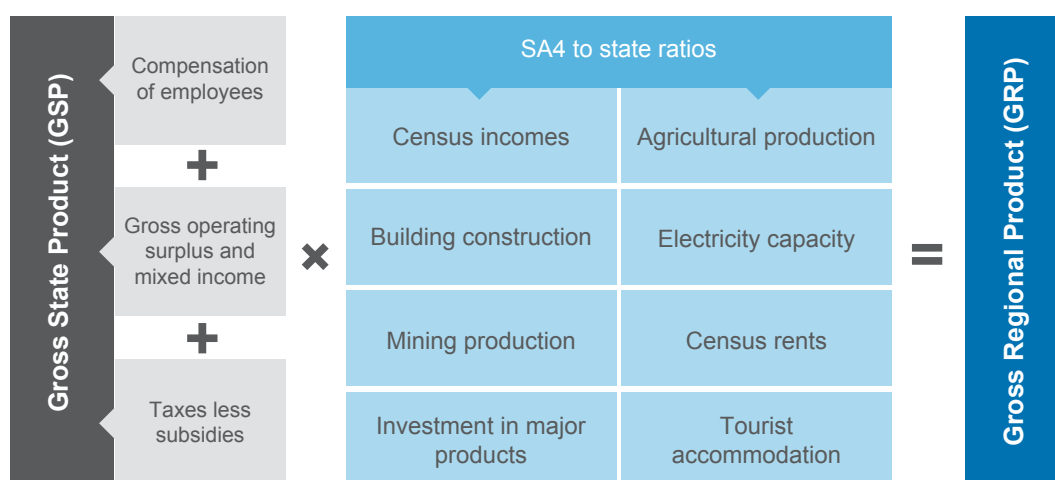
Estimates of GRP are derived from the 2014–15 Gross State Product (GSP) of each State and Territory (published in the State National Accounts¹¹³), and based on the income approach of measuring GSP. The income approach is the sum of incomes earned through the production of goods and services in each industry, 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.

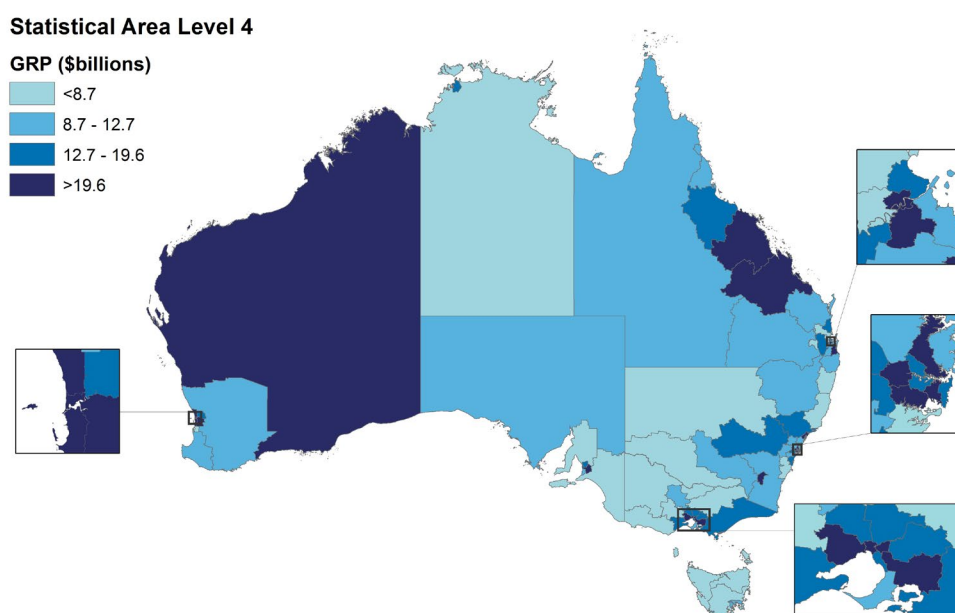
Experimental estimates of GRP

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

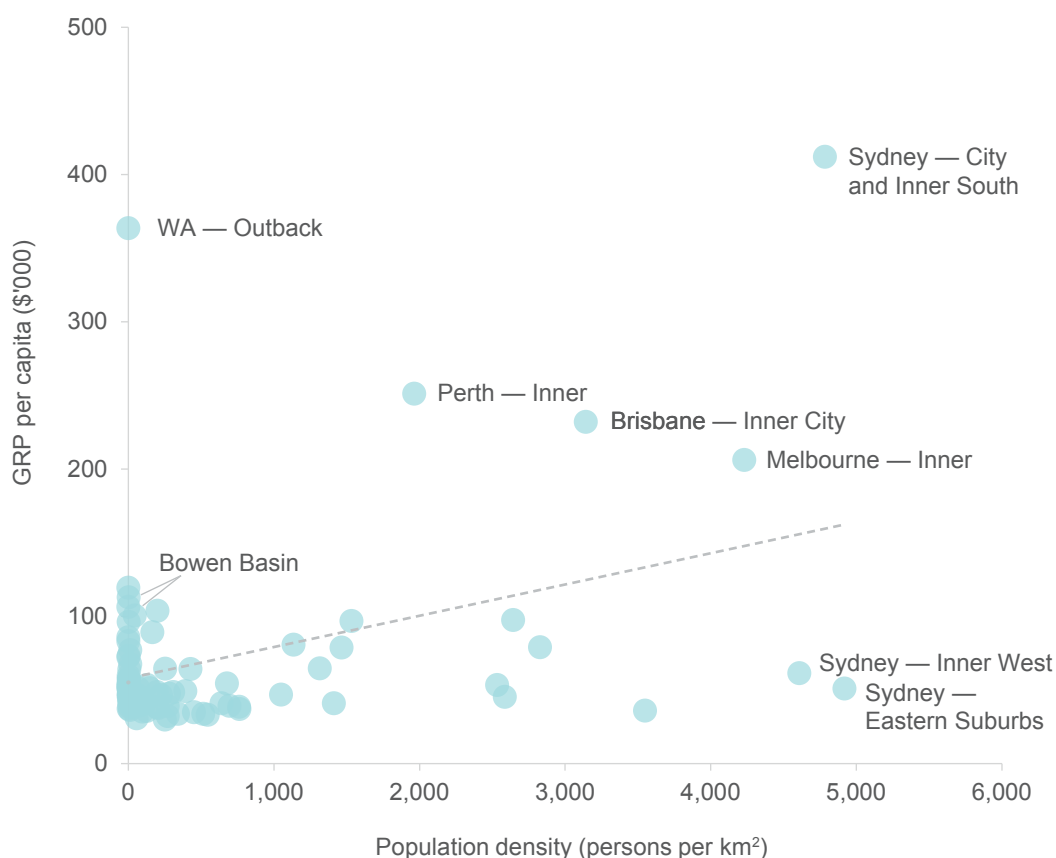
¹¹⁸ Department of Industry, Innovation and Science (2015) *Australian Industry Report*, Canberra, p. 138

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.

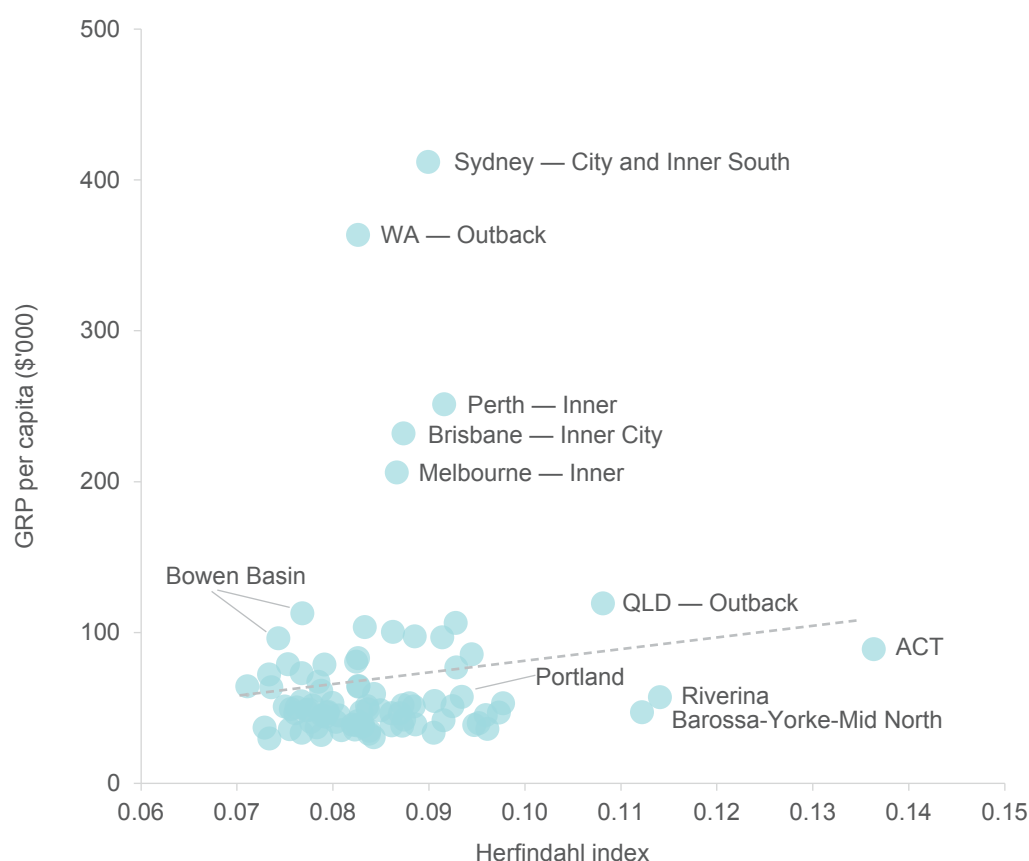
Here, the index is used as a measure of industry concentration across regions. The Herfindahl Index is calculated by squaring the employment share for each of the 19 Australia New Zealand Standard Industry Classification (ANZSIC) divisions within a given SA4, and then summing the resulting numbers. The 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.

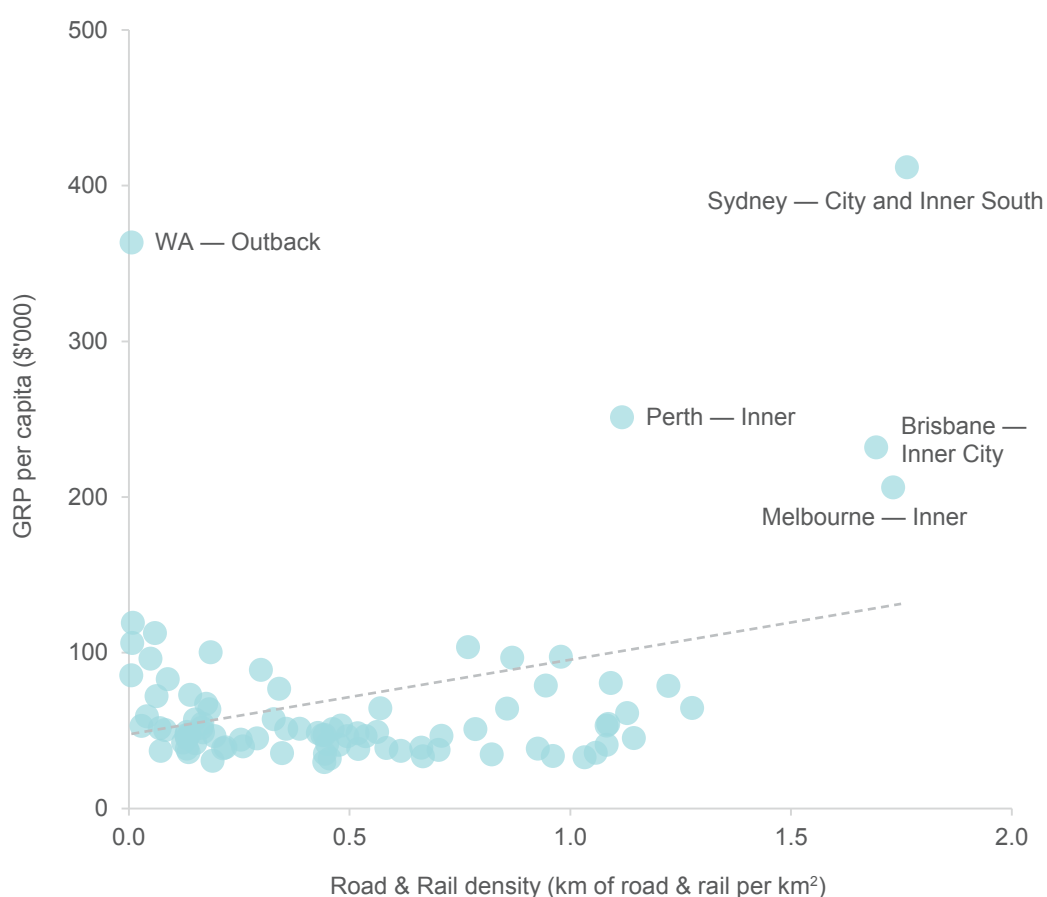
It is difficult to capture all infrastructure within a region in one variable. For these reasons, this analysis uses kilometres of sealed roads and rail per square kilometre as a proxy for infrastructure, along with ports.¹²⁴

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.

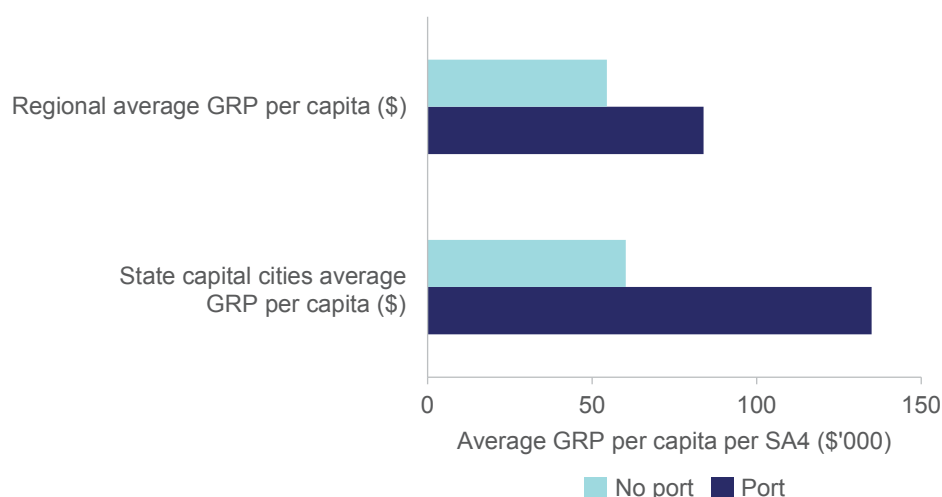
¹²⁵ Department of Infrastructure, Transport, Regional Development and Local Government (2009) *Road and rail freight: competitors or complements?*, viewed 10 October 2016, p. 1, https://bitre.gov.au/publications/2009/files/is_034.pdf

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

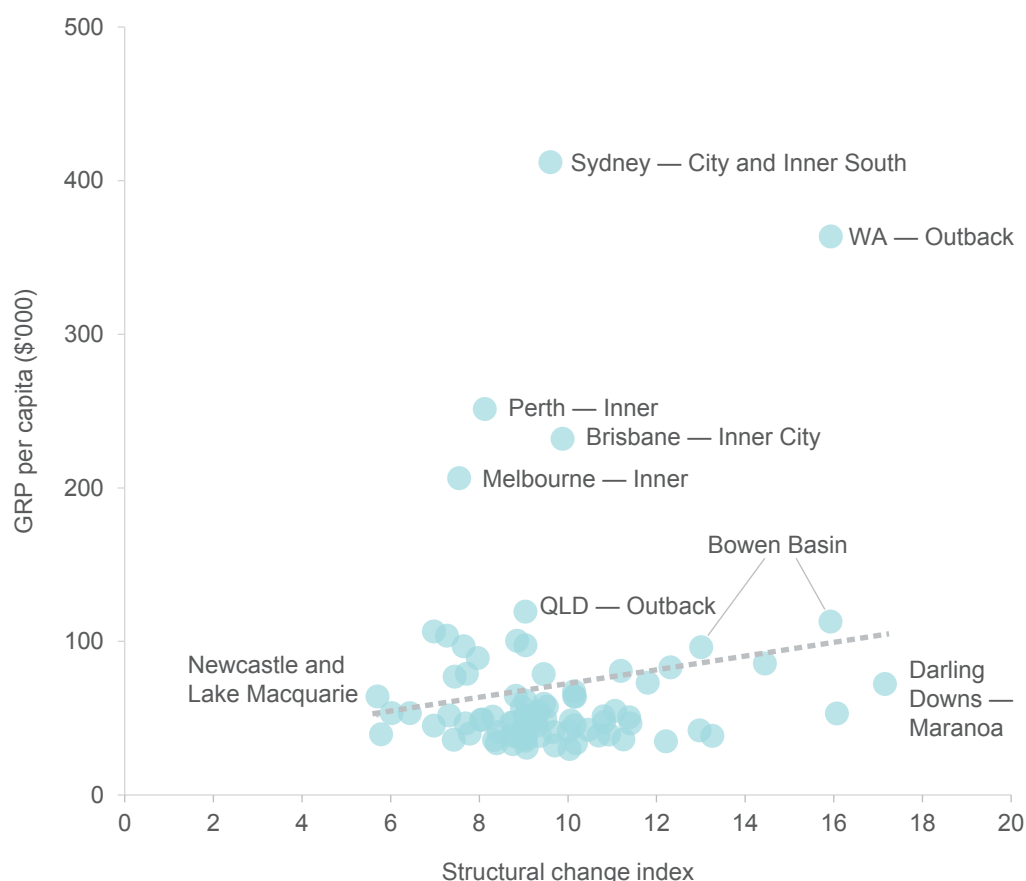
¹²⁶ Department of Industry, Innovation and Science (2014) *Australian Industry Report*, Canberra, p. 72

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.

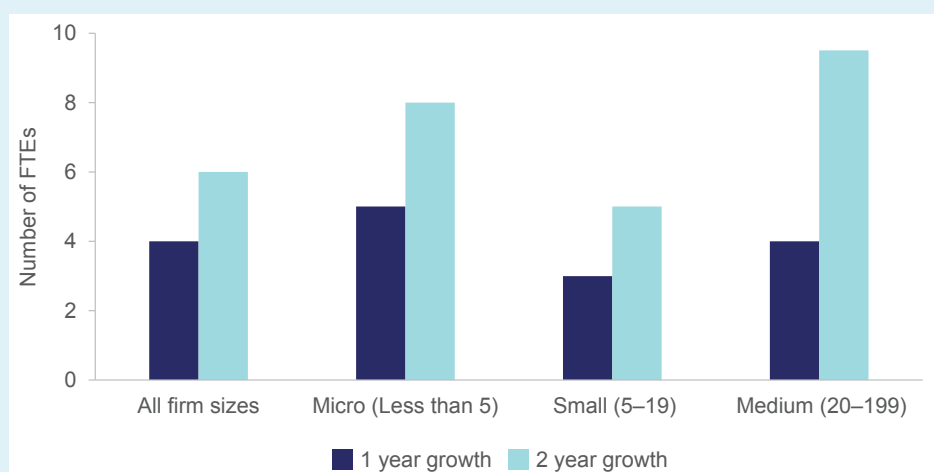
The Business Longitudinal Analytical Data Environment (BLADE) has made this new type of programme impact analysis possible. BLADE consists of information on Australian firms from existing ABS survey products, as well as financial and tax data on all Australian firms from Pay As You Go (PAYG), Business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

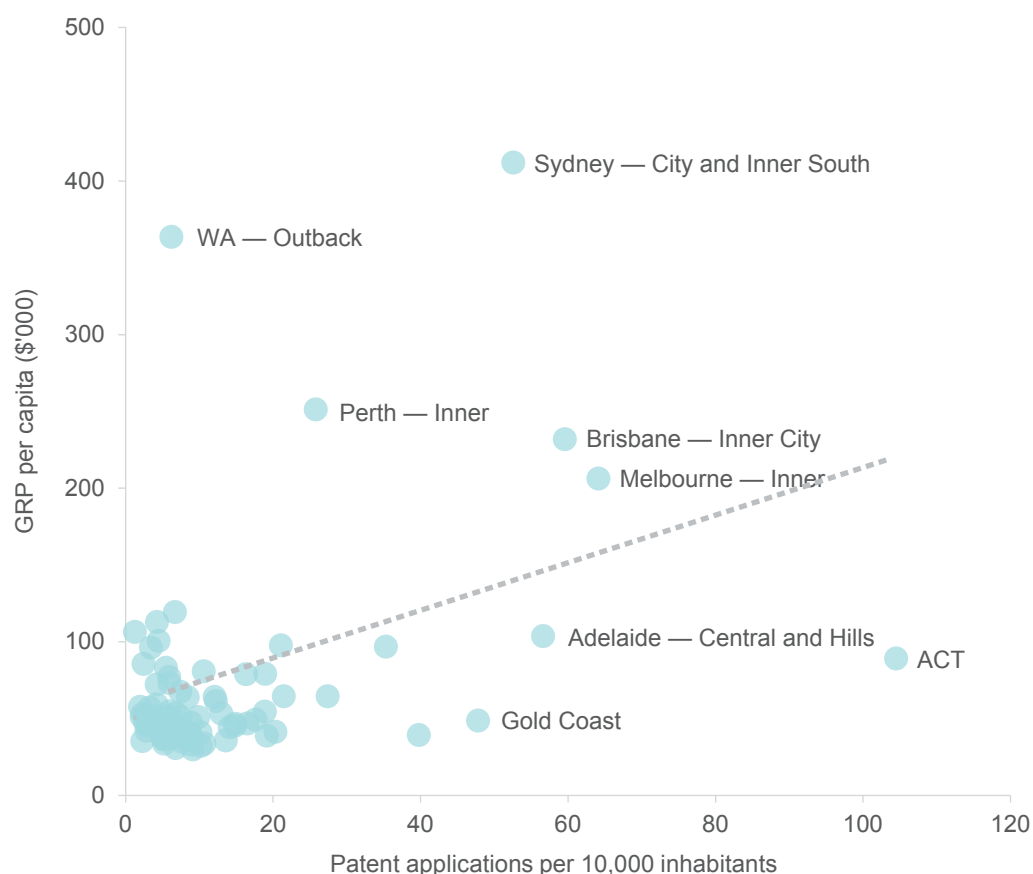
Research shows that knowledge intensity is a key driver of productivity and economic growth.¹³¹ As industries transition, workers need to acquire the skills to adapt to improvements in technology, knowledge and innovation.

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.