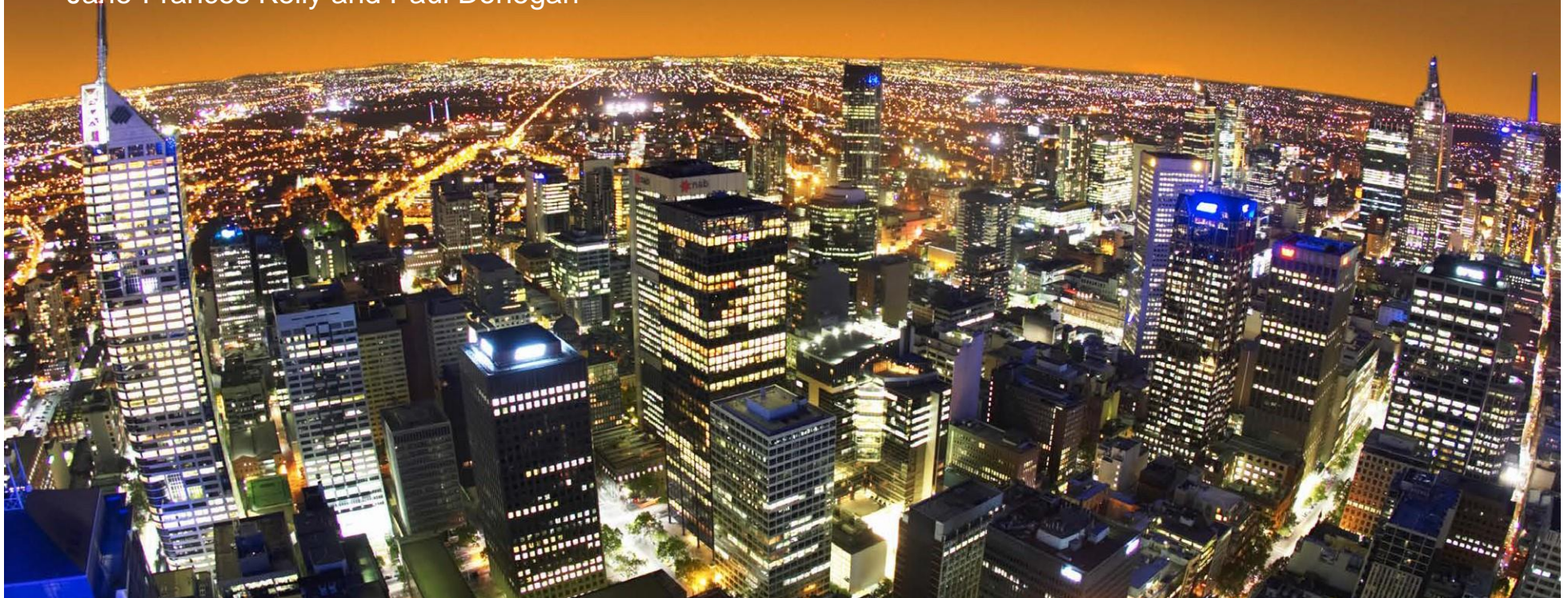


July 2014

Mapping Australia's economy

Cities as engines of prosperity

Jane-Frances Kelly and Paul Donegan



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This report was written by Jane-Frances Kelly, Grattan Institute Cities Program Director and Paul Donegan, Grattan Institute Senior Associate, Cities. Cameron Chisholm and Matthew Oberklaid provided extensive research assistance and made substantial contributions to the report.

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Overview

Eighty per cent of the value of all goods and services produced in Australia is generated on just 0.2 per cent of the nation's land mass – mostly in cities. Today, cities are the engines of economic prosperity. But the concentration of highly productive activity in city centres presents challenges for policymakers. Too many workers live too far away to fulfil our cities' economic potential.

This report maps the Australian economy by the location of economic activity, defined as the dollar value of goods and services produced by workers within a particular area. It finds that economic activity is concentrated most heavily in the central business districts (CBDs) and inner areas of large cities. The CBDs of Sydney and Melbourne – just 7.1 square kilometres in total – generated \$118 billion in 2011-12, almost 10 per cent of all economic activity in Australia, and more than three times the contribution of the entire agriculture sector.

The intense economic contribution of CBDs occurs partly because of the concentration of jobs in these areas. But CBD businesses are also much more productive on average than those in other areas. Inner city areas and secondary commercial hubs, such as those around large cities' airports, also tend to be more productive than other locations.

For example, in 2011-12 the Sydney CBD produced \$64.1 billion worth of goods and services: about \$100 for every hour worked there. Employing only 13 per cent of Sydney's workforce, this small area generates almost a quarter of the value of the Greater Sydney economy. Parramatta, often said to be Sydney's second CBD, generated only \$68 for each hour worked, and its total of

\$6.8 billion was about a tenth of the value generated in the CBD.

There is a reason intense economic activity is concentrating in CBDs and inner suburbs. Many businesses in these areas provide highly knowledge-intensive and specialised services such as funds management, insurance, design, engineering and international education. These businesses depend on highly skilled workers, and locating in the heart of large cities gives them access to the largest possible pools of them. Proximity to suppliers, customers and partners also helps businesses to work efficiently, to generate opportunities and to come up with new ideas and ways of working.

Knowledge-intensive activity is present in all sectors, including manufacturing and mining. Perth is home to more than a third of Western Australian mining jobs, including accountants, administrators, geologists and specialist engineers.

In the early 20th century one in three workers were employed in primary industry and almost half of the population lived on rural properties or in towns of less than 3,000 people. By 1960 manufacturing had grown to make up almost 30 per cent of GDP and employ one in four Australians, with a big presence in suburban areas. But today the small areas that generate most value are often a very long commute from the fast-growing outer suburbs in which many Australians live. If the prosperity that comes from knowledge-intensive activity is to be widely shared, governments need to enable more people to live closer to these areas, and to improve road and public transport networks so that they better connect employers and workers.

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1 The evolution of Australia's economy

1.1 Introduction

Australia's economic activity is measured through the National Accounts compiled by the Australian Bureau of Statistics (ABS). Since nationwide aggregates provide only a broad and shallow understanding of what is happening in the economy, the ABS also breaks down its national figures – such as gross domestic product (GDP) – by state and by industry.

Yet even these targeted figures do not give us a full understanding of what is happening in the economy. Categorising economic activity by industry tells us nothing about the kinds of activities taking place within each. A geographic breakdown of GDP by state and territory still only provides a very broad understanding of where economic activity is occurring.

Businesses choose where to operate for good reasons – to them, location and geography really matter. So in order to better understand the Australian economy in the 21st century, there is much to be gained from a detailed analysis of where economic activity actually takes place. This is why official economic statistics in the United States and much of Europe, for example, are broken down into individual cities.¹ Official statistics in Australia do not do this.²

¹ See, for instance, Bureau of Economic Analysis (2013); Eurostat (2014)

² Although the Australian Bureau of Statistics has been developing the Statistical Spatial Framework (SSF) in order to better integrate geospatial information with economic data. See Australian Bureau of Statistics (2014b)

It is also important to understand where economic activity occurs *within* cities. For example, government policy and investment decisions in transport, housing and land use help to shape how and where people live, where businesses locate, and how the economy functions. These decisions should be informed by the best possible evidence, including a good understanding of the spatial dimensions of the economy.

Since European settlement, the driving force behind the Australian economy has constantly evolved – from agriculture and primary production, to manufacturing in the 20th century, to today's knowledge-intensive economy. Similar shifts have occurred across the developed world.

Each of these kinds of economic activity has a geographic dimension. Agriculture and primary production almost exclusively occur in rural and regional Australia. The suburbs of many Australian cities grew hand-in-hand with manufacturing. Knowledge-intensive businesses – which are the most productive today – tend to cluster and thrive in the centres of large cities.

1.2 Gold and fleece

The discovery of gold in the mid-19th century transformed the Australian economy. In just 20 years the population grew from 430,000 to 1.7 million.³

³ Wells (2007)

Aside from this first – and biggest – mining boom, agriculture dominated the early Australian economy. Shortly after Federation, in 1906, almost half of Australia's population of four million lived on rural properties or in small towns of fewer than 3000 people. Many of these would have been market towns serving the agricultural economy. Only about one in three Australians lived in a city of at least 100,000 people.⁴

The legacy of our historical dependence on the bush is powerful. In 1901 one in three Australian workers was employed in agriculture, forestry, fishing or mining.⁵ Australian ingenuity – including inventions such as the stump-jump plough – made our farmers some of the most productive in the world. We depended on wool as our main export until well into the 20th century. Men working in primary production came to define what it was to be Australian.

But we are no longer a nation of farmers, graziers, shearers and drovers. The days of “riding on the sheep's back” are long gone. Wool is now less important as an export, even if the phrase still evokes a sense of the importance the agricultural industry had to the country's wealth. While the agricultural sector is still a big exporter, today it employs only three per cent of the Australian workforce and contributes only two per cent of GDP.

1.3 Manufacturing and the suburbs

After World War II manufacturing rose to become Australia's dominant industry. At its height, in around 1960, manufacturing

⁴ Australian Bureau of Statistics (2000)

⁵ *Ibid.*

employed more than a quarter of the workforce, and accounted for 29 per cent of GDP.⁶

The rise of manufacturing also contributed to rapid growth in the economy. The decade from 1960 to 1970 saw Australia's real GDP per person grow by more than 35 per cent.⁷

With the rise of the manufacturing industry after World War II, Australia's prosperity shifted to our big cities, and often to their suburbs. Many people migrated there from rural areas. By the end of Robert Menzies' term as Prime Minister in 1966 more than three in five Australians lived in cities of more than 100,000 people.

The manufacturing industry greatly influenced the layout of cities. Many manufacturers needed large amounts of land, so located their factories where it was plentiful and affordable.⁸ Suburbs away from city centres had far lower rents and less congestion, making them attractive locations.

Postwar growth in car ownership made possible the shift to a manufacturing economy with a strong suburban presence. By the end of World War II, one in five trips was made by car. The equivalent figure was four in five trips by the 1980s.⁹

‘It is easy to forget just how liberating the car was,’ say planning and economics experts Marcus Spiller and Terry Rawnsley. ‘It

⁶ Australian Bureau of Statistics (1961); Milne (2010)

⁷ World Bank (2014). In contrast, the decade from 2000 to 2010 saw real GDP per capita grow by 17.3 per cent.

⁸ Troy (1995)

⁹ Cosgrove (2011), p. 19

delivered an enormous boost to productivity' by giving people access to a wider selection of jobs. 'Skills were better matched to industry needs and workers acquired new skills more rapidly, simply because of the mobility offered by the car.'¹⁰

Car ownership and dispersed employment opportunities enabled many people to build houses in what were then outer suburbs of Australia's cities. Owning a detached house on a quarter acre block came to be known as the "great Australian dream".

Growth in the manufacturing industry eventually began to decline as a proportion of the Australian economy. In the last 20 years, the number employed in manufacturing has broadly stood still as the nation's economy and population have grown. By 2011 manufacturing employed nine per cent of the workforce and accounted for about seven per cent of GDP.¹¹

1.4 Mining – back out of the city?

The mining boom has been pivotal to Australia's economic growth over the past decade.¹² Yet it is worth putting mining's importance to the economy into context. Since Federation in 1901, mining has never produced more than ten per cent of GDP.¹³ Today the industry employs about two per cent of the Australian workforce.¹⁴ It is much less important to the economy now than manufacturing was in the 1960s.

¹⁰ Spiller and Rawnsley (2012), p. 145

¹¹ Australian Bureau of Statistics (2011); Australian Bureau of Statistics (2013)

¹² Minifie, *et al.* (2013)

¹³ Batellino (2010)

¹⁴ Australian Bureau of Statistics (2011)

While Australia's natural resource deposits are typically in remote areas, workers in cities make a critical contribution to the industry's success. For instance, in Western Australia, where the most productive mining regions are located, more than one third of people employed in mining work in Perth.¹⁵ Many of these workers are highly skilled engineers, scientists, production managers, accountants, and administrators.

1.5 Today's economy

Today the Australian economy is no longer driven by what we make – the extraction and production of physical goods – but rather by what we know and do. Like other advanced economies around the world, our economy is continuing to become more knowledge-intensive, more specialised and more globally connected.¹⁶ As with other periods in our economic evolution, this kind of economy has implications for what happens where.

This report aims to show just that, by analysing the geographic distribution of economic activity. Chapter two investigates how economic activity is distributed, first for Australia as a whole, and then for each of Australia's four largest cities, which together account for 61 per cent of the economy. Chapter three identifies where in Australia's cities workers are most productive and why, and discusses the implications of these results for Australia's economy and the future of our cities. Chapter four outlines the implications of these findings for governments, and suggests how data might be collected in future.

¹⁵ *Ibid.*

¹⁶ Kelly, *et al.* (2013)

Box 1: Why this report analyses some cities in more detail than others

City-level data that is collected across the whole of Australia tends to be compiled by state and territory capital city.¹⁷ This reflects current government structures, which themselves reflect historical settlement patterns.

However, such statistical practices can be misleading about the nature and location of Australia's population and economy today. For example, Hobart and Darwin each host less than a twentieth of Sydney's population.

Similarly, a peak body representing Australian cities, the Council of Capital City Lord Mayors, sees the Lord Mayor of Adelaide (City of Adelaide population: 19,638) sit alongside the Lord Mayor of Brisbane (City of Brisbane population: 1,041,839). Other than the City of Brisbane (where local governments were amalgamated in 1925), most Australian Lord Mayors have jurisdiction over just a small fraction of their greater city's populations.

¹⁷ See, for instance, Australian Bureau of Statistics (2014a)

2 Where is economic activity happening?

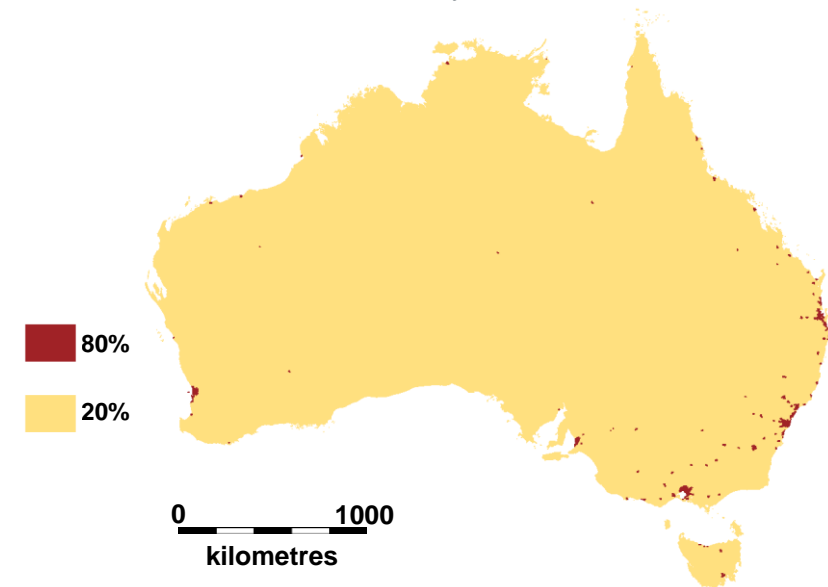
This chapter shows where economic activity – the dollar value of goods and services produced by workers – occurs in Australia. It breaks economic activity for the 2011-12 financial year into small areas with an average population of about 10,000.¹⁸

When broken down in this way, it is not surprising to find that most economic activity occurs in cities. Most of the population lives in cities, and cities are critically important to the economy. About 75 per cent of Australians live in cities of more than 100,000 people, which together generate 77 per cent of economic activity in Australia.

Figure 1 shows that most economic activity is located in and around Australia's largest cities. The map divides Australia into small areas, colour-coded according to their level of economic activity per square kilometre. The red areas on the map together produce 80 per cent of economic activity, yet account for only 0.2 per cent of Australia's land mass. The yellow areas produce the remaining 20 per cent.

Figure 1: Economic activity in Australia is concentrated in and near cities

80-20 distribution of economic activity, 2011-12



¹⁸ These areas are defined by the ABS as 'Statistical Areas Level 2', or SA2. Our measure of "economic activity" largely corresponds with Gross Value Added, as measured by the Australian Bureau of Statistics (ABS) in the National and State Accounts. But these ABS measures are not broken down into geographic areas smaller than whole states. More detail on the methodology employed in this report is provided in the Appendix.

Australia's largest cities are each critical to their respective state's economic performance, accounting for at least half the economic activity in their state. Sydney produces 73 per cent of all economic activity in New South Wales. The equivalent figure for Melbourne is 81 per cent and for Adelaide 79 per cent, as Table 1 shows. Even with Western Australia's booming mining sector, Perth produces much more than the rest of the state. Brisbane generates only slightly more economic activity than the rest of Queensland. But the region of South East Queensland, which also includes the Gold Coast and the Sunshine Coast, is responsible for around two thirds of the goods and services produced in Queensland.

Even regional economic activity and growth is tied to relative proximity to these large cities. Regions within 150 kilometres of these largest cities are typically growing much faster than more distant regions.¹⁹

Table 1: Each state's economy is driven by its largest city

Economic activity, 2011-12

(percentage of state economy in parentheses)

New South Wales			
Sydney: \$274.5b (73%)		Rest of NSW: \$101.6b (27%)	
Victoria			
Melbourne: \$216.3b (81%)		Rest of VIC: \$51.4b (19%)	
Queensland			
Brisbane: \$124.9b (52%)		Rest of QLD: \$113.9b (48%)	
South East Queensland: \$158.0b (66%)		Rest of QLD: \$80.8 (34%)	
Western Australia			
Perth: \$136.6b (64%)		Rest of WA: \$76.9b (36%)	
South Australia			
Adelaide: \$60.4b (79%)		Rest of SA: \$16.2b (21%)	
Other states and territories			
TAS:	\$20.4b	NT:	\$16.0b
		ACT:	\$28.7b

¹⁹ Daley and Lancy (2011)

2.1 Within metropolitan areas, economic activity is heavily concentrated

Economic activity in Australia is concentrated in and around large cities. But it is not distributed evenly within cities. Central business districts (CBDs) are especially important: they represent substantial concentrations of employment, and even more intense concentrations of economic activity. They are vital to the economy of Australia's large cities, and hence to the national economy.

Maps on the following pages show the geographic distribution of economic activity across each of Australia's four largest cities – Sydney, Melbourne, Brisbane and Perth – in the 2011-12 financial year.

In all these cities, the CBD produces much more than any other area. The gaps between these highly productive areas and other parts of cities are vast. Although less than 8 per cent of Australia's working population is employed in the CBDs of Sydney, Melbourne, Brisbane, or Perth, these areas together account for almost 15 per cent of Australia's economic activity – more than any single industry.

In the larger cities of Sydney and Melbourne, ensuring an adequate supply of centrally located land for knowledge-intensive businesses to expand has been important in sustaining growth. The intensely productive areas of North Sydney, and Docklands and Southbank in Melbourne, have been critically important.

Most cities also contain some centres of economic activity, such as secondary business districts or industrial centres, outside of the CBD. Examples include Parramatta in Sydney, Dandenong in

Melbourne, Rocklea in Brisbane and Osborne Park in Perth. Most cities see heightened levels of economic activity around their airport, with many freight-related jobs.

In each city, intense economic activity is concentrated in a small number of areas. Most parts of Australia's cities produce relatively low levels of economic activity, despite substantial populations. Many people live in these areas of low economic activity and commute to work in other employment centres. The production that takes place in these areas typically involves population-serving activities, such as teaching, health care and retail, that occur wherever people live. These jobs and businesses play an important role meeting the needs of local communities. And since these areas are numerous, their economic activity aggregates to a substantial proportion of overall metropolitan activity. But they are less likely to generate economic activity through selling goods and services to other parts of the city, the nation or the world.

We now examine where economic activity is generated in each of the four cities studied in this report.

Sydney

Figure 2 shows that the Sydney CBD, including Haymarket and The Rocks, produces much more than any other small area in Greater Sydney. In 2011-12, it produced \$64.1 billion of economic activity – 23 per cent of the metropolitan area's economy – despite containing only 13 per cent of the two million-strong workforce. This was a higher level of production than any other small area in Australia.

The area with the next highest level of economic activity is North Sydney, which produced \$10.2 billion. As with the CBD, this commercial area is dominated by professional and financial services. A number of large insurance and financial services companies built their headquarters or large offices in North Sydney in the mid-20th century, combining the benefits of then relatively affordable land with proximity to the CBD.²⁰

Sydney's "global arc", extending from areas directly south of the CBD (including Sydney Airport) through to the North Shore then west to Macquarie Park, encompasses a number of areas with high levels of economic activity. They include Mascot near the airport (\$3.7 billion), Pyrmont and Ultimo (\$5.8 billion), St Leonards (\$4.4 billion), and Macquarie Park (\$7.8 billion).

Away from the global arc, the western hub of Parramatta (\$6.8 billion) and adjacent Homebush Bay (\$4.2 billion) are the most prominent secondary centres of economic activity. These areas produce much less than the Sydney CBD, but are much more economically active than most areas. Areas to the southwest produce relatively low levels of economic activity.

²⁰ Masson (2010)

Figure 2: Economic activity is most intense in Sydney's CBD and around the "global arc"

Economic activity by location, 2011-12

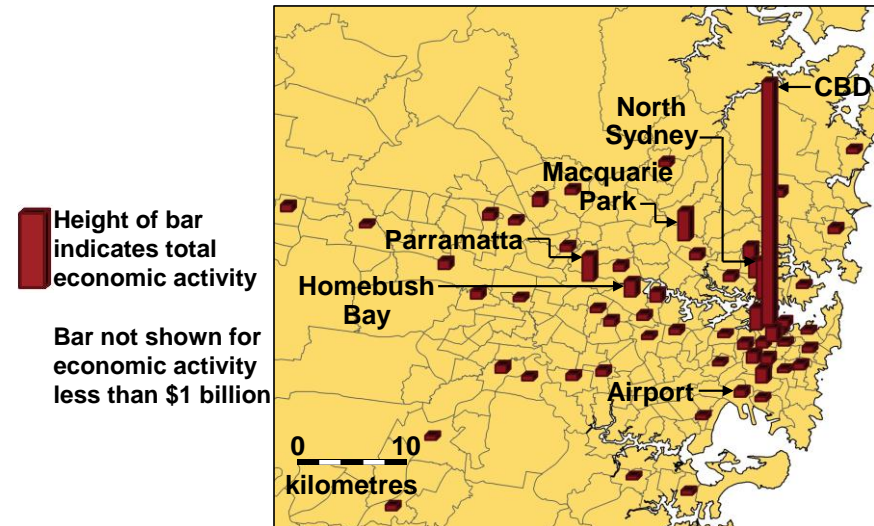


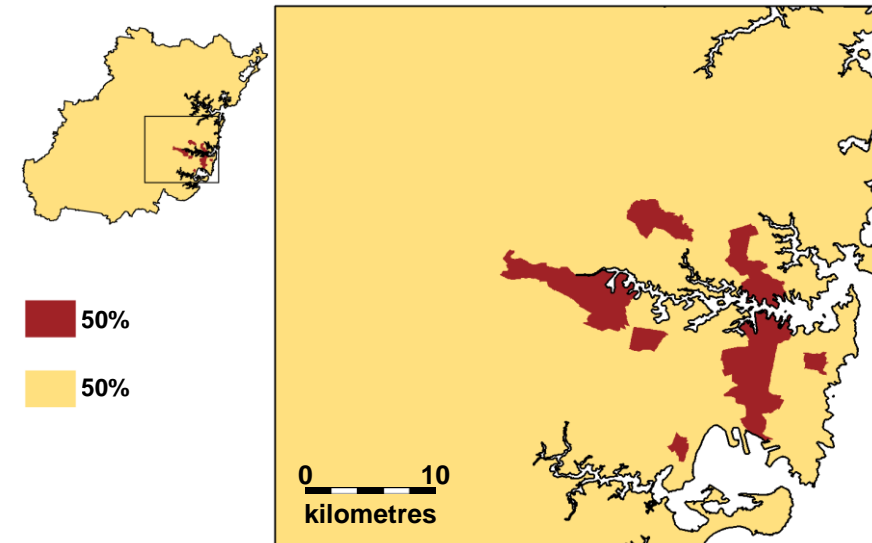
Figure 3 illustrates further just how concentrated Sydney's economic activity is. The areas with the highest intensity of economic activity per square kilometre are shaded red. Areas producing the remaining 50 per cent of economic activity are shaded yellow.

Half of Sydney's economic activity is generated on land totalling less than one per cent of the Greater Sydney area (inset Figure 3). These most productive areas include most of the global arc, Parramatta and Homebush Bay.

While the red areas on the map are responsible for half of Sydney's economic activity, the same areas house less than 10 per cent of Sydney's population. The population is much more dispersed across the metropolitan area.

A similar pattern is present in other large cities: around half of all economic activity takes place in a small proportion of the metropolitan area, largely concentrated around the CBD.

Figure 3: Half of Greater Sydney's economic activity is generated on less than one per cent of its land mass²¹
50-50 distribution of economic activity, 2011-12



²¹ "Greater Sydney" encompasses the whole area outlined at top left, as per the ABS definition.

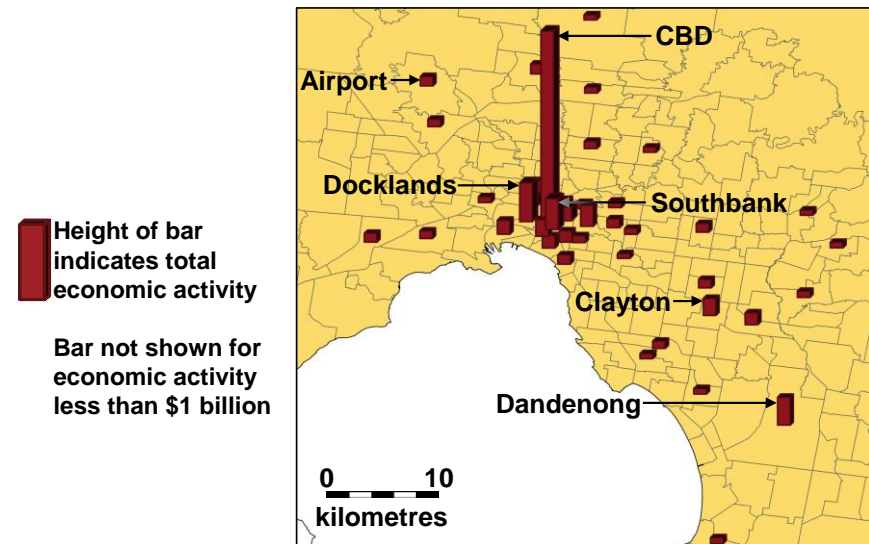
Melbourne

The CBD produced \$39.2 billion in 2011-12, far more than any other part of Greater Melbourne. The figure is \$53.9 billion if Docklands (\$8.2 billion) and Southbank (\$6.5 billion) are incorporated into an extended CBD, reflecting recent urban renewal and the expansion of CBD businesses into these areas.

Inner areas such as Richmond (\$4.4 billion), South Melbourne (\$3.5 billion) and the industrial area around Port Melbourne (\$2.9 billion) have higher levels of economic activity than do most of Melbourne, though they trail the CBD by a long way.

Away from the CBD, Dandenong (\$5.9 billion), Clayton (\$3.6 billion), and Melbourne Airport (\$2 billion) are secondary centres of economic activity. As Figure 4 shows, economic activity is much less intense in most other parts of Melbourne.

Figure 4: Economic activity is most intense in inner Melbourne
Economic activity by location, 2011-12



Brisbane

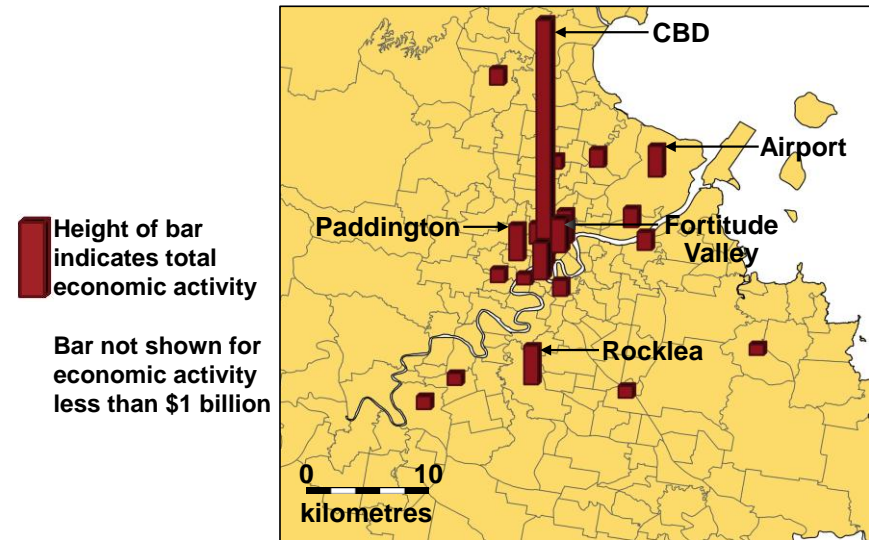
Brisbane's CBD produced \$23.7 billion in 2011-12, much less than its Sydney and Melbourne counterparts. This CBD figure is lower partly because Brisbane has fewer people working in its CBD – less than half the Sydney CBD workforce. It is also lower because highly productive knowledge-intensive businesses are less likely to find Brisbane as attractive a location as Sydney or Melbourne, since Brisbane represents a smaller market to serve and offers a smaller pool of workers to recruit from. The four largest banks each have their head office in either Melbourne or Sydney, for instance.

Nevertheless, as Figure 5 shows, the Brisbane CBD still produced more than six times that of the next most productive area in Greater Brisbane. These include secondary centres of economic activity such as Rocklea and Acacia Ridge (\$3.7 billion), and Brisbane Airport (\$3 billion). There is also a cluster of areas with high levels of economic activity near the CBD, including South Brisbane (\$3.5 billion), Paddington (\$3.4 billion) and Fortitude Valley (\$3.2 billion).

As with other cities, most parts of Brisbane generate much less economic activity, despite substantial resident populations.

Figure 5: Economic activity is most intense in and around Brisbane's CBD

Economic activity by location, 2011-12



Perth

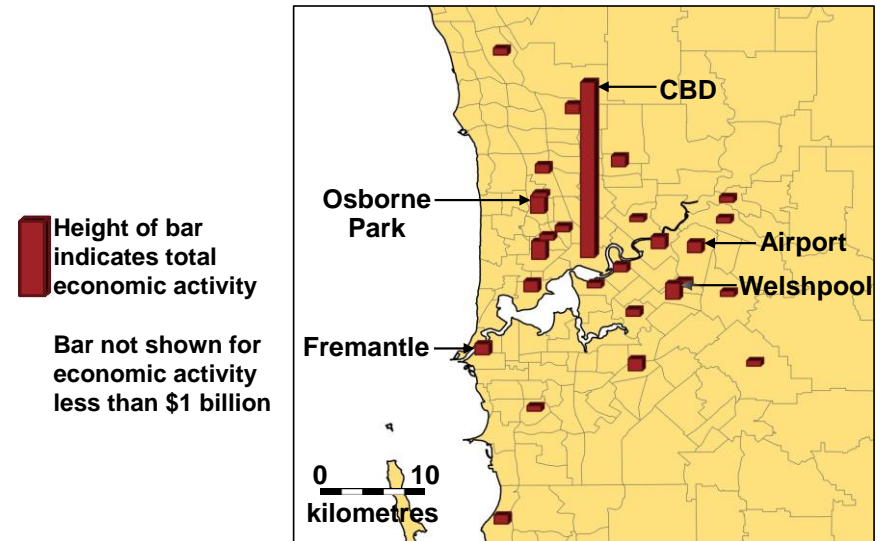
Perth's CBD generated \$40.7 billion of economic activity in 2011-12, far more than any other part of the city. (This is much higher than the equivalent figure for Brisbane – partly because of the intense impact of the mining boom in Western Australia, and partly because the Perth CBD is four times the area of the Brisbane CBD). Figure 6 shows that no other area within Greater Perth produced anywhere near this figure.

The clustering of economic activity around the CBD is somewhat less intense in Perth than in other large Australian cities. Nonetheless other productive areas that are relatively nearby include Subiaco (\$4.2 billion) and the Osborne Park industrial area (\$4.0 billion).

Areas such as Canning Vale (\$2.8 billion), Perth Airport (\$2.5 billion) and Fremantle (\$2.5 billion) are also substantial centres of economic activity. Almost all other parts of Perth produced less than \$1 billion.

Figure 6: Perth's CBD produces far more than any other part of the city

Economic activity by location, 2011-12



3 Which locations are most productive and why?

The intensity of economic activity is much higher in CBDs, in part because they are employment centres. But this is not the only reason. Labour productivity – economic activity per hour worked – is higher in CBDs and inner city areas than in other parts of cities.²² Areas with relatively high levels of economic activity and employment also tend to be relatively productive per working hour.

Maps on the following pages show how labour productivity varied across the metropolitan areas of Sydney, Melbourne, Brisbane and Perth in the 2011-12 financial year.²³

CBDs and inner city areas are especially productive. The CBDs of Sydney, Melbourne, Brisbane, and Perth have a labour productivity level much higher than the average worker across the whole of those cities.

Most other areas with lots of economic activity – such as secondary commercial hubs and around airports – also tend to have higher labour productivity than the average for the city they are in. But their labour productivity is typically not nearly as high as in the CBD and inner city areas.

Labour productivity levels do not vary much among other parts of cities beyond CBDs, inner city areas, and secondary commercial

hubs and industrial centres. This is not surprising. The production that takes place in these areas is typically due to activities supporting the local population – jobs such as teachers, GPs, nurses and shop assistants. The respective wages for these and similar jobs tend not to vary greatly between locations.

²² Labour productivity is defined by the ABS in the same way, see Australian Bureau of Statistics (2006)

²³ Small areas with fewer than 1000 workers are shown on the maps as 'insufficient data'.

Sydney

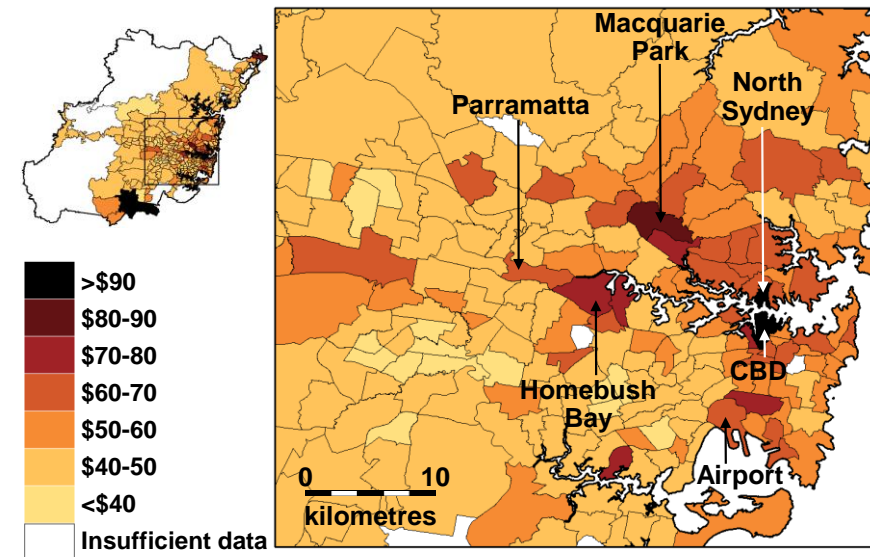
The Sydney CBD generated \$100 of economic activity per working hour. This is much higher than the average level of economic activity per working hour across Greater Sydney, which is \$61 per hour.

Figure 7 shows that most areas around the global arc are also highly productive. North Sydney produced \$91 per hour, Macquarie Park \$81 per hour, and Pyrmont and Ultimo \$79 per hour.

Further west, Parramatta produced \$68 and Homebush Bay \$72 per working hour. These labour productivity levels are above the Sydney average, and above those in most Eastern Suburbs, North Shore and Northern Beaches areas. But they are well below the CBD and parts of the global arc.

Elsewhere labour productivity is relatively uniform. Two out of three areas in Greater Sydney produced less than \$50 per hour.

Figure 7: Sydney's global arc is highly productive
Economic activity per working hour, 2011-12



Melbourne

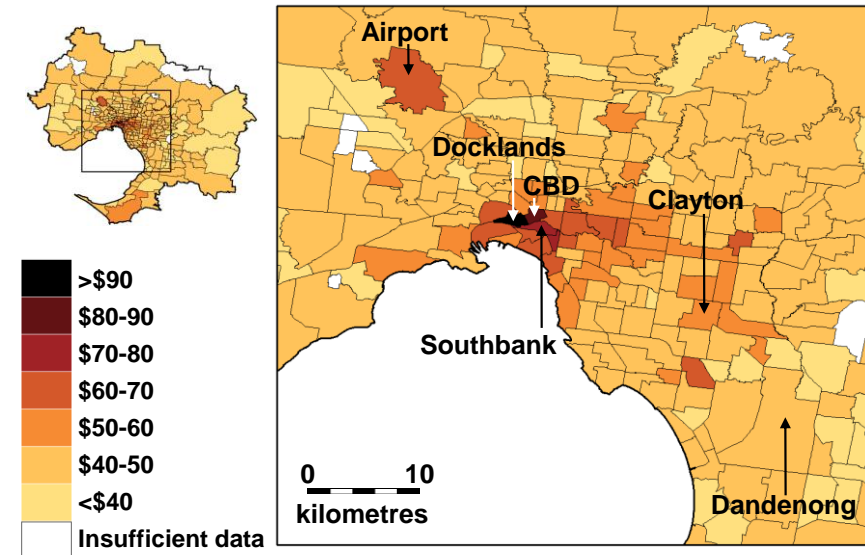
The areas with high levels of labour productivity in Melbourne are heavily concentrated in and around the CBD. Workers in the Melbourne CBD (including Docklands and Southbank) produced \$87 per hour, much higher than the city-wide average of \$53 per hour.

As Figure 8 shows, other inner city areas also have high labour productivity, particularly to the east of the CBD. They include South Yarra (\$71 per hour), Albert Park (\$68 per hour), South Melbourne (\$66 per hour), St Kilda (\$66 per hour), Richmond (\$62 per hour) and Abbotsford (\$62 per hour).

Melbourne Airport produced \$63 per working hour, but otherwise few secondary areas have relatively high labour productivity. The secondary business district of Dandenong generates a lot of economic activity, but its labour productivity was only \$44 per hour, below the city-wide average.

Labour productivity is otherwise very similar across the rest of Melbourne. Around four out of every five areas produced less than \$50 of economic activity per working hour.

Figure 8: Melbourne's CBD and the inner east are most productive
Economic activity per working hour, 2011-12

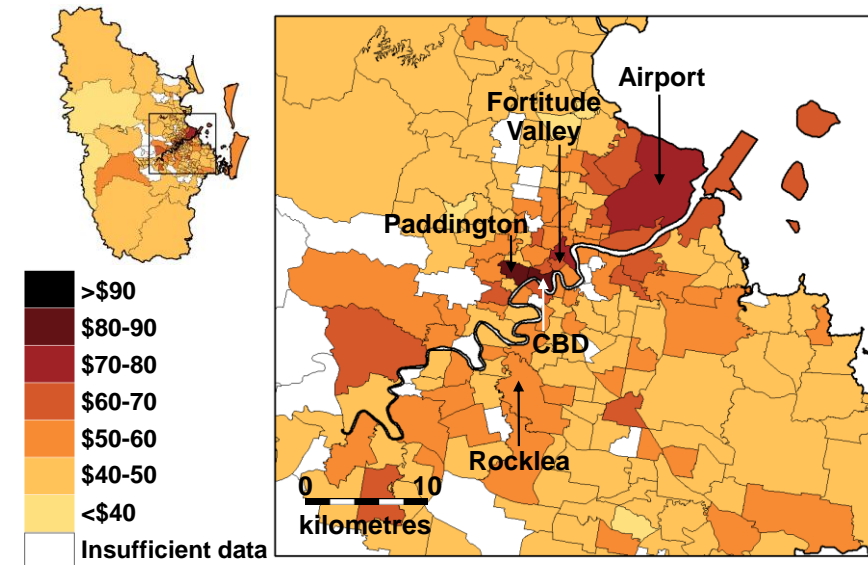


Brisbane

The Brisbane CBD is a little less productive than Sydney and Melbourne's CBDs, producing \$82 per hour in 2011-12, the same as the inner area of Paddington. Nonetheless, this is well above the Greater Brisbane average of \$56 per hour.

Figure 9 shows that other areas of high labour productivity are somewhat more dispersed from the CBD than in Melbourne. They tend to be located close to the Brisbane River, for example South Brisbane (\$65 per hour), Fortitude Valley (\$64 per hour), and Bowen Hills (\$77 per hour). The area around Brisbane Airport (\$71 per hour) is also quite productive. However, more than two out of every three areas produced less than \$50 per hour.

Figure 9: Areas close to the Brisbane River are most productive
Economic activity per working hour, 2011-12



Perth

Perth generated slightly higher levels of economic activity per hour than the other large cities analysed. Figure 10 shows that a number of areas produced more than \$100 per hour, and the average worker produced \$76 per hour.

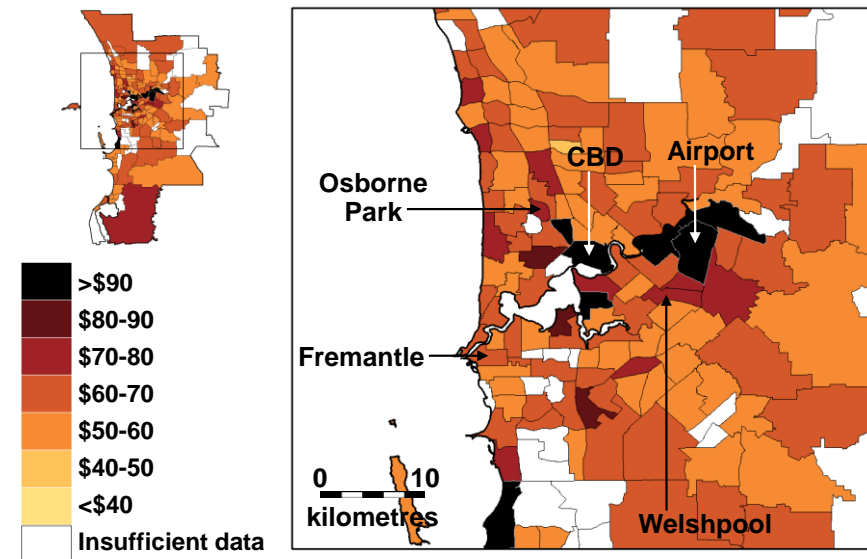
This appears to be due to the mining boom. While mining is not a big employer, it generates high levels of output and pays higher wages than other industries. For example, Perth's CBD produced \$124 per hour, the highest level of any CBD in the country. But if workers employed in the mining industry are excluded, the area's labour productivity drops below \$90 per hour.

Income generated through the mining boom has also raised the wages of other industries, especially services. People with higher incomes are then willing to pay more for the services they use, and the cost bases of many services have also been driven up. (Box 2 outlines this phenomenon in more detail).

Despite a somewhat more even geographic distribution of labour productivity in Perth than in other large cities, the areas that generated more than \$80 per hour are mostly in the inner city. The area around Perth Airport is one exception. It is also possible that productivity figures may be inflated in some areas by highly paid fly-in fly-out mining workers who work at multiple sites and so report their primary place of work as their home address.

Despite productivity levels much higher than the other major cities analysed, only around one in six areas of Greater Perth produced more than \$70 per hour.

Figure 10: Perth's CBD is highly productive
Economic activity per working hour, 2011-12



Box 2: The higher cost of a Perth cappuccino

Economic activity per hour generated across Perth is higher than in other cities. Yet the high incomes on offer also tend to drive up the prices faced by consumers.

Products traded within Australia, such as televisions or computers, will generally be similarly priced across cities. Services that are harder to trade between cities – dental care, for example – will tend to vary more in price.

Similarly, the average price of a cappuccino is reported as higher in Perth than in other large cities, though the product is similar.²⁴

Economic activity is measured according to the price consumers pay for goods and services. This means a cappuccino in Perth is considered to contribute more to the Australian economy than does a Melbourne cappuccino.

Consequently, while comparisons among different areas within a city are meaningful, it is harder to compare different cities. The measures of economic activity per working hour do not take into account cost of living differences. Even the ABS's key measure of inflation – the consumer price index – allows for comparisons *within* cities over time but does not enable comparisons *between* cities.²⁵

²⁴ Gilkatho Cappuccino Price Index (2014)

²⁵ Waschka, *et al.* (2003)

3.1 Why are cities and CBDs more productive?

Two critical questions arise from the findings of this report:

- Why are cities more productive than most other parts of Australia?
- Why are CBDs and inner city areas more productive than most other parts of the cities in which they are located?

The reasons for both phenomena are closely related. Concentrations of activity – whether across the country as a whole or within cities – offer big economic benefits. Businesses are more productive when they interact with larger numbers of customers, suppliers, competitors and partners, and when they can do so more frequently and closely. Employers are more productive when they have a larger pool of employees to draw on. Employees with a larger choice of potential employers are more likely to develop and make the best use of their skills. They also typically have better chances to be re-employed quickly if they lose their job.

3.2 Businesses benefit from the choice of employees that cities offer

Having a wider range of potential employees to choose from means that businesses are more likely to find the person who is the best fit for the job. This makes them more productive.

The more highly skilled and specialised a job, the greater the need to find the best person to fill it. This is especially important

when the work involves knowledge, expertise, judgment and learning.

These kinds of jobs are increasingly prevalent as Australia's economy becomes more knowledge-intensive. Knowledge-intensive jobs often involve coming up with new ideas, solving complex problems, or finding better ways of doing things.

New ideas might mean developing new products that better meet customers' needs, managing people better within an organisation, or simply getting furniture buyers to assemble it themselves. This latter idea has enabled IKEA to sell goods at much lower prices than it otherwise could have.

Knowledge-intensive jobs are vital to the modern economy. They drive innovation and productivity, and are a critical source of employment growth. In the last 15 years there has been much higher growth in high-skilled, compared to low-skilled, employment. Grattan's 2013 report, *Productive Cities*, explored these trends in greater detail.²⁶

Knowledge-intensive activities are not confined to jobs in services. They are also increasing within industries such as mining and manufacturing. Advanced manufacturing is increasingly customised. Innovative technology and work practices mean that the Australian mining sector leads the world in many aspects of extracting mineral deposits.

3.3 Cities enable businesses to be productive, with the greatest benefits in CBDs and inner areas

Cities offer businesses a rich ecosystem of customers, suppliers, partners and competitors, enabling them to work with and learn from each other. Being close to suppliers, customers and rivals helps businesses generate new business opportunities and ideas for products and services, and better ways of working. These transfers of expertise, new ideas and process improvements that occur through interactions between businesses are often known as knowledge spillovers.

Within cities, CBDs and inner city areas offer the most opportunities for face-to-face contact among workers, promoting knowledge spillovers. Knowledge spillovers often occur through combining and recombining knowledge to come up with new products and ways of working. Workers build on each other's thoughts, jointly solve problems, and break through impasses. Trust is essential, and these kinds of complex conversations are best had in person. High speed broadband and other advances in communication technologies will never completely replace the importance of face-to-face contact. For example, the importance of face-to-face contact helps explain why financial service businesses still concentrate their headquarters in just a few streets of large cities, despite their operations being highly digitised.

Large cities also offer employers deeper pools of potential employees to choose from than other locations. CBDs and inner city areas tend to be centrally located and enjoy good transport connections, so they almost always give businesses access to the

²⁶ Kelly, *et al.* (2013)

largest number of potential employees in a city. This is vital to businesses doing highly skilled, specialised work.

By locating in CBDs and inner city areas, large numbers of knowledge-intensive service businesses demonstrate that they consider these benefits outweigh the higher rents, traffic congestion and parking costs inevitable in these central locations.

Of course, more than nine of every ten jobs are outside major CBDs. Dentists, child care workers and hairdressers will always be needed wherever people live. Affordable land and good links to freeways, ports and airports are typically important for freight businesses. Nonetheless, all these kinds of work are becoming increasingly skilled and specialised, with greater use of technology. As this occurs, the imperative for employers to have the best possible choice of employees will continue to become more intense across the economy.

3.4 Employees also benefit from the opportunities available in large cities

Large cities offer employers knowledge spillovers and a large potential workforce. They also offer substantial benefits to employees. Indeed there are good economic reasons why most Australians live in cities. They offer people opportunities to get a job, to build their skills, to get a better job, and to bounce back if they lose their job.

The job market in Sydney, for example, is extremely diverse. Cleaners, plumbers, manicurists, scientific researchers and senior executives of multinational companies can all find plenty of job opportunities. If it's possible to do something for a living in

Australia, there's a very good chance it can be done in Sydney. Cities give people more choices.²⁷

Sydney's job market is also very large. Two million people work for many employers: sole traders; small, medium and large businesses; charities and government agencies. If a business fails, a worker has a good chance of finding an alternative job nearby, often in a similar role. If an employer loses staff or wants to expand, a deep labour market makes it easier to recruit.

The number and diversity of skilled and knowledge-intensive jobs in cities – especially large ones – also give people an incentive to train, develop their skills and become more productive.

3.5 But too many workers live too far from jobs

CBDs need access to deep labour pools. Grattan's 2013 *Productive Cities* report analysed the connections between workers and jobs in Sydney, Melbourne, Brisbane and Perth. It found that residential patterns and transport systems mean that CBD employers have access to only a limited proportion of workers in metropolitan areas. Perhaps more worryingly, many workers, particularly in outer suburbs, only have access to a small proportion of jobs across the city.

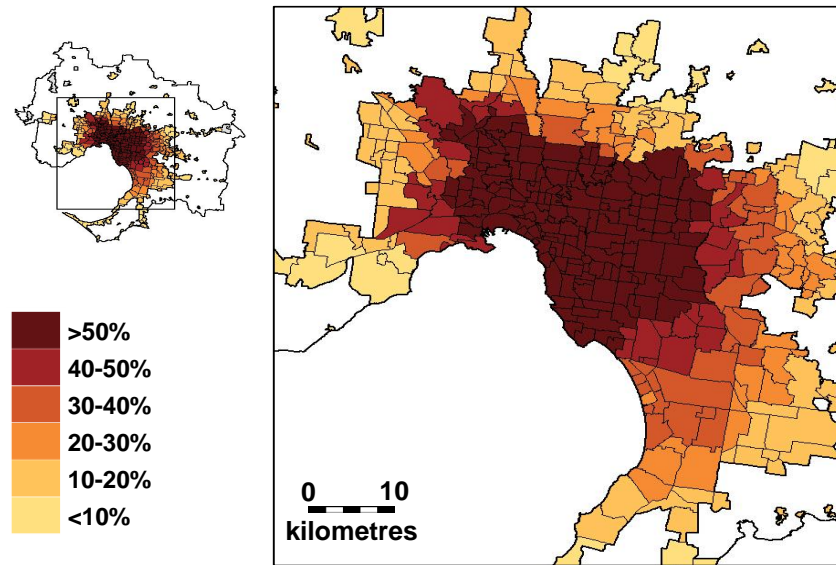
Of course, all jobs are accessible if employees commute for long enough. Yet few people are willing to spend more time commuting than they have to. Given current travel patterns in Australian

²⁷ Of course, the promise of a large choice of potential employers is only realised for employees if they can access job opportunities in a reasonable commute time. See *ibid.*, pp. 28-31

cities, job access was mapped for 45 minutes by car, and 60 minutes by public transport. In all four cities, there is a distinct advantage in proximity to the city centre and the proportion of jobs that can be accessed declines markedly with distance. For example,

Figure 11 shows that in some outer suburban growth areas of Melbourne just 10 per cent of Melbourne's jobs can be reached within a 45 minute drive (lightest shaded areas).

Figure 11: Access to jobs falls away in Melbourne's outer suburbs
Percentage of jobs that can be reached in 45 minutes by car, Melbourne, 2011



Source: SGS Economics and Planning using Strategic Travel Model supplied by the Victorian Department of Transport

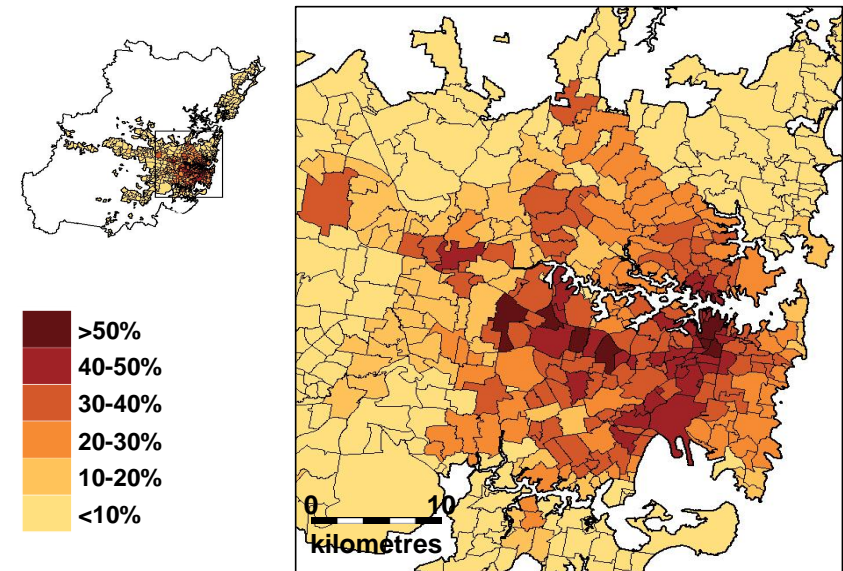
Brisbane has a similar access profile to Melbourne by car, while access in Perth is better. Access by car in Sydney, however, is more limited.

If work journeys are made by public transport, however, then access to jobs is much lower in all four cities and the advantage of proximity to the city centre is much more pronounced. This is most evident in Sydney, where large parts of the city are essentially cut off from good access to jobs even after travelling for an hour, as shown in

Figure 12.

Figure 12: Access to jobs by public transport is poor in many parts of Sydney

Percentage of jobs that can be reached in 60 minutes by public transport, Sydney, 2011



Source: SGS Economics and Planning using Strategic Travel Model supplied by the NSW Bureau of Transport Statistics

If current settings remain unchanged, Australian cities are likely to continue to spread outwards, further increasing the distance between where many people live and the most productive parts of large cities, with implications for both productivity and opportunity.

4 Conclusion

The vast majority of economic activity takes place in Australia's large cities. And within these cities, economic activity is heavily concentrated.

Australia's cities are the backbone of our economy, with CBDs and inner city areas critically important to the nation's prosperity. Their predominance reflects the economy's evolution from one based on primary industry, then manufacturing, then increasingly knowledge-intensive services.

This report provides a snapshot of the spatial distribution of economic activity in Australia based on the 2011 Census and 2011-12 State Accounts.

Spatial perspectives on the economy are comparatively underdeveloped in Australia.²⁸ Statistical agencies in Europe and the US report gross value added for metropolitan areas.²⁹ It would be valuable to policymakers and to business if the ABS were to do something similar for Australia's large cities.

Many policy decisions, such as building a road or a hospital, have a spatial dimension. But their impacts on particular areas are not always well understood, in part because they are not always easy to assess. For instance, the economic impacts of major infrastructure projects tend to be poorly evaluated. So are interventions to ease the pain of economic adjustment in

particular areas – following a factory closure, for example.³⁰ Spatial models of the economy could be used to assess the impact of these kinds of interventions.

Ultimately, as Australia's economy becomes more knowledge-intensive, location will continue to be an important enabler of productivity for many businesses. A better understanding of the spatial dimensions of Australia's economy will help governments make better infrastructure investments and policy decisions.

4.1 What does this mean for governments?

Governments need to understand and respond to our economy's spatial dimension, including by:

- Enabling people to choose to live in areas with access to large numbers of jobs, thereby also giving employers a wide choice of employees.
- Ensuring transport networks better connect employees with employers, and support connections between businesses and their customers, suppliers and partners.
- Minimising barriers to highly productive activity in CBDs and inner city areas. These include land availability, traffic congestion and public transport access.

These ideas are explored in greater detail in Grattan's 2013 report, *Productive Cities*.

²⁸ There has been an uptick in interest recently – see, for instance, Ellis (2014); SGS Economics & Planning (2014); PwC (2014); *REMPPLAN (2014)*; *.id (2014)*

²⁹ See, for instance, Bureau of Economic Analysis (2013); Eurostat (2014)

³⁰ See, for instance, Daley, *et al.* (2014); Daley and Lancy (2011)

5 Appendix – Methodology

This analysis seeks to break economic activity in Australia into the small areas where the activities take place. At the aggregate level, economic activity is closely related to GDP.

GDP can be calculated using one of three approaches: the production, income and expenditure approaches.³¹ This report employs a hybrid income-production approach.

Census income data are used as a proxy for each individual's economic contribution. However, recognising that production in an industry is only partly reflected in employee remuneration, the Census income figures are then scaled up according to industry of work. Incomes are scaled so that the total economic contribution of each industry matches the figure for that industry in the State Accounts.

The key assumption is that within each industry, a worker's income is proportional to his or her economic activity (on average). For example, a manufacturing worker who earns \$2000 a week is predicted to produce twice as much as a worker in the same industry who earns \$1000 a week.

The scaled incomes are then aggregated for all working individuals within each small area to get an estimate of small area economic activity. Labour productivity is then calculated by dividing each area's economic activity by the total number of working hours in the same area.

³¹ In theory, each approach should yield the same figure, but there are discrepancies in practice.

Data sources

This analysis uses two primary data sources: the 2011 Census of Population and Housing, and the Australian National Accounts: State Accounts, 2011-12.³² The latter show the contribution of each industry to production in each state and territory. The 2011-12 State Accounts were chosen to correspond as closely as possible with the census year.

Three key variables are taken from the Census, with only employed individuals considered. The variables are:

- Individual weekly income, reported within a range. Those reporting a zero or negative income are excluded.³³
- Primary industry of work, measured at the one-digit ANZSIC 2006 level. There are 19 different industries.
- Primary location of work, measured at the Statistical Area Level 2 (SA2). There are 2234 SA2s (including non-mappable areas), with an average population of around 10,000 people.

For each state and territory, the State Accounts report gross value added by industry (at the one-digit ANZSIC level). Gross State

³² Australian Bureau of Statistics (2011); Australian Bureau of Statistics (2013)

³³ Limited data availability makes it necessary to use total income as a proxy for income earned in the primary industry and location of work, even though some of this income is likely to come from other sources.

Product equals the sum of gross value added across industries, plus taxes, less subsidies on products.³⁴

Estimating individual income

Income is reported in ranges, not as a precise figure. This makes it necessary to estimate individuals' actual income within each range. One approach would be to use the imputed medians for each income range published by the ABS. But while these may provide reasonable estimates at the aggregate level, they are likely to introduce a degree of error across different locations and industries. For example, a person earning in the highest income range in the financial services industry is likely to earn more than a person earning in the highest range in the retail industry.

To account for this, we use a predictive technique that fits a smooth curve through the cumulative income distribution implied by the census income ranges.³⁵ This curve is allowed to shift according to a number of different factors, including industry of work (at the two-digit ANZSIC level), occupation, location of work, gender, and education level. The smooth curve is then used to impute a value of income for each individual within their reported income range, based on these factors.

³⁴ Gross State Product also includes the component 'ownership of dwellings' (essentially this is treated as an industry), which is made up of the surpluses accruing to landlords (net rents received), and the surpluses accruing to owner-occupiers (net imputed rent). Because this component is derived from productive capital that does not involve any labour, it is not included in the calculation of economic activity across SA2s.

³⁵ This curve is the log-normal cumulative distribution function. There is evidence that the distribution of income is well-modelled by a log-normal distribution, with the exception of the top 1-3%; see, for instance, Clementi and Gallegati (2005).

Aggregating income by industry and location

Having estimated income for each census individual, the results are aggregated within each area and each industry. This is used to create a table for each state and territory that shows the total income earned in each industry across each SA2:

Table 2: Total income by industry and SA2

SA2: Industry:	Industry 1	Industry 2	...	Total
Area 1	Total income Area1_Ind1	Total income Area1_Ind2	...	Total income Area 1
Area 2	Total income Area2_Ind1	Total income Area2_Ind2	...	Total income Area 2
:	:	:	⋮	:
Total	Total income Industry 1	Total income Industry 2	...	Total income

Scaling income to match industry gross value added

Using the figures published in the state accounts: gross value added by industry in 2011-12 dollars, and the "total" row in Table 2, it is possible to calculate an output-labour ratio for each of the 19 industries. For industry i , this is calculated as:

$$\text{output-labour ratio industry } i = \frac{\text{gross value added industry } i}{\text{total income industry } i}$$

The figures in Table 2 are then scaled by the output-labour ratio of the corresponding industry. These ratios are not much larger than

one for labour-intensive industries such as education and health care. The output-labour ratios of capital-intensive industries such as mining and financial services are typically larger than three.

It could be argued that the allocation of economic activity should take into account where capital is allocated. But sufficiently detailed information along these lines is not available in the Census or any other publicly available small-area geographic survey. In addition, it is important for the methodology to be consistent across different industries, and not treat particular locations or classes of employee any differently.

Once incomes are scaled, the following table is produced:

Table 3: Economic activity by industry and SA2

SA2: Industry:	<i>Industry 1</i>	<i>Industry 2</i>	...	<i>Total</i>
<i>Area 1</i>	Economic activity Area1_Ind1	Economic activity Area1_Ind2	...	Economic activity Area 1
<i>Area 2</i>	Economic activity Area2_Ind1	Economic activity Area2_Ind2	...	Economic activity Area 2
<i>⋮</i>	<i>⋮</i>	<i>⋮</i>	<i>⋮</i>	<i>⋮</i>
Total	Gross value added Industry 1	Gross value added Industry 2	...	Total economic activity

Final adjustments to calculating economic activity

As shown in the final column of Table 3, the sum of economic activity across each industry within each area is equal to that area's total economic activity. However, there are a small number of final adjustments that are made, based on the census data:

- For those reporting 'no fixed address' of work, economic activity is allocated to their place of residence (SA2).
- For those individuals whose reported place of work is 'Capital city undefined', economic activity is allocated across small areas using the distribution of place of work within the same city.
- For those individuals whose reported place of work is 'State/territory undefined', economic activity is allocated across the small areas in their state or territory using the distribution of place of work across the state or territory.

Calculating labour productivity

The census also reports the total number of hours within each SA2. Labour productivity for each SA2 is calculated as economic activity divided by the total number of hours worked. Given the Census understates the total number of hours worked (due to missing or non-responsive individuals), these results are scaled so that the total number of respondents in each state and territory matches the number in the ABS Labour Force Survey (using the average of monthly figures from July 2011 until June 2012).

Methodological comparison to other approaches

Other spatial models of economic activity include SGS Economics & Planning's Australian Cities Accounts, PwC's Australia Uncovered, and REMPLAN's and .id's economic profiles.³⁶

As in this report, most of these models estimate economic activity by taking into account production across industries, and income data from the census. Differences typically come down to the range of data used, and assumptions made about specific industries, for instance allocating production in capital-intensive industries such as mining. Grattan's approach does not make any industry-specific assumptions.

This report maps the geographic distribution of the Australian economy as a whole, including small area estimates of economic activity and labour productivity per working hour. Other approaches enable a greater focus on individual industries or on population and industry dynamics within local areas.

³⁶ SGS Economics & Planning (2014); PwC (2014); *REMPLAN (2014)*; *.id (2014)*

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