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1. Knowledge city; 2. Knowledge-based development;
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Measuring the concentration of the knowledge-based economy in central Sydney in 1996 - 2006

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Structured Abstract

Purpose – The purpose of this paper is to measure to what extent the knowledge-based economy is concentrated in Central Sydney and how this concentration has changed.

Design/methodology/approach – I use the Location Quotient (LQ) tool to analyse the Australian census employment data by place of work in Central Sydney compared to Metropolitan Sydney in 1996-2006 to find the industries which are concentrated in Central Sydney and categorise which industries fall in the knowledge-based economy.

Originality/value – This paper provides an empirical study which systematically examines the knowledge-based economy concentrated in Central Sydney by analysing the employment data by place of work. The findings testify and support related theories and researches which address the same issue from other approaches.

Practical Implications – The data results and findings can be easily translated into future urban strategy and policy on how to better position Central Sydney’s competitive position in regional, national and international contexts as a knowledge-based economy hub.

Keywords – knowledge-based economy, concentration, Central Sydney

Paper type – Academic Research Paper

1 Introduction

Sydney is Australia’s top global city positioned in a global urban hierarchy as measured and ranked in an increasing number of global city literatures from the 1990s until now (Beaverstock, Taylor, & Smith, 1999; Friedmann, 1986, 1995; GaWC, 1998, 2009; Godfrey & Zhou, 1999; MasterCard Worldwide, 2008). Saskia Sassen, the author of the term ‘global city’ defines a global city’s status as its capacity to provide ‘producer services’ of financing, banking, accounting, advertising, marketing and management consultancy and argues that these complexes of knowledge-based economy activities are usually located in CBDs of a few global cities (Sassen, 1995, 2001). This theorisation of global city and its knowledge-based economy concentrated in central city area applies to Sydney too. Some researchers have tried to verify Sydney’s status as a global city and the concentration of producer services and ‘financialisation’ of employment in Central Sydney (Baum, 1997; Daly & Pritchard, 2000; O’Connor & Stimson, 1995; O’Neill & McGuirk, 2003; Searle, 1996, 1998b, 2008). However, it is important to empirically examine how the knowledge-based economy has been concentrated in Central Sydney compared to Metropolitan Sydney in a comprehensive and systematic manner.
This paper seeks to address such an issue. In order to measure to what extent the knowledge-based economy is concentrated in Central Sydney and how this concentration has changed, I use the Location Quotient (LQ) tool to analyse the Australian census employment data by place of work in Central Sydney compared to Metropolitan Sydney in 1996-2006 to find the industries which are concentrated in Central Sydney and categorise which industries fall in the knowledge-based economy. This paper provides an empirical study which systematically examines the knowledge-based economy concentrated in Central Sydney by analysing the employment data by place of work. The findings testify and support related theories and researches which address the same issue from other approaches. The data results and findings can be easily translated into future urban strategy and policy on how to better position Central Sydney’s competitive position in regional, national and international contexts as a knowledge-based economy hub.

2 Method

I used the Location Quotient (LQ) analysis to measure the employment concentration in Central Sydney in relation to Metropolitan Sydney in 1996-2006. LQ analysis is widely used ‘to identify the concentration of an industrial sector in a local economy relative to a larger reference economy’ (Edward Blakely & Bradshaw, 2002, p. 122). Employment is the most used variable in LQ analysis which defines a ratio of employment shares: the local industry’s share of total local employment compared with the industry’s employment share in a wider reference region (regional, national, or even international) (Klosterman, 1990). An LQ > 1 indicates a higher than average degree of specialisation in that sector locally compared with the reference region, and is interpreted as an indicator of concentration and competitive advantage (Spencer, Vinodrai, Gertler, & Wolfe, 2010).

Geographically Central Sydney and Metropolitan Sydney are respectively represented by Sydney Local Government Area (LGA) and Sydney Statistical Division (SD) defined by the Australian Bureau of Statistics (ABS) for statistical data purposes. The locations and comparisons of Sydney LGA and Sydney SD are as follows:

![Figure 1. Maps of Sydney LGA and Sydney SD](Source: ABS)
Table 1. Specifications of Sydney LGA and Sydney SD

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Sydney LGA</td>
<td>29 Km²</td>
<td>180,474</td>
<td>357,767</td>
</tr>
<tr>
<td>Sydney SD</td>
<td>12,428 Km²</td>
<td>4,148,570</td>
<td>1,736,824</td>
</tr>
<tr>
<td>LGA’s Share in SD</td>
<td>0.23%</td>
<td>4.35%</td>
<td>20.6%</td>
</tr>
</tbody>
</table>

Source: ABS

The implementation steps of the research include:

1. I collected the 1996 and 2006 census data on industry of employment for Sydney LGA and Sydney SD obtained from the ABS. The census data is based on place of work and collected by two digit industry subdivisions in the Australian and New Zealand Standard Industrial Classification (ANZSIC) 1993.

2. I calculated the LQs for all the industry subdivisions in Sydney LGA in 1996 and 2006 by the equation:

\[ iQ_t = \frac{a_t}{e_t} + \frac{E_t}{E_S} (a_t = \text{employment in industry subdivision } i \text{ in Sydney LGA}, \ E_t = \text{employment in industry subdivision } i \text{ in Sydney SD}, \ E_S = \text{total employment in Sydney SD}). \]

3. I selected the industry subdivisions with \( LQ > 1 \) in 2006, and respectively calculated the selected industry subdivisions’ employment changes and LQ changes in 1996-2006.

4. I displayed the results in three modes to interpret to what extent knowledge-based economy was concentrated in Central Sydney:
   - Mode 1: All concentrated employments of industries are listed according to their LQs in 2006 as in any normal LQ analysis (displayed in Table 2);
   - Mode 2: All concentrated employments of industries are plotted in a diagram measuring employment shares, LQs and employment changes developed by Information Design Associates with ICF Kaiser International (1997) and ICF Consulting (2000). This diagram simultaneously conveys information about the sizes of employments of industries, the employment changes, and the LQs for industries in Central Sydney by aligning employment changes along the horizontal axis, aligning LQs along the vertical axis, and plotting individual industries with ‘bubbles’ proportional to the numbers of their employments (displayed in Figure 1);
   - Mode 3: All concentrated employments of industries are plotted in a diagram measuring employment shares, LQs and LQ changes developed by Hu (2009). The Relative Share Matrix diagram simultaneously conveys information about the sizes of employments of industries, the LQ changes, and the LQs for industries in Central Sydney by aligning LQ changes along the horizontal axis, aligning LQs along the vertical axis, and plotting individual industries with ‘bubbles’ proportional to the numbers of their employments (displayed in Figure 2).

5. I interpreted the displayed data results to find to what extent knowledge-based economy is concentrated in Central Sydney and what the practical implications can be drawn.

3 Results

Of the total 69 industry subdivisions by the ANZSIC 1993, 16 industry subdivisions had LQs more than 1 and employment share more than 1 per cent in 2006 in Sydney LGA. That is to say, these 16 industries are concentrated in Central Sydney compared to Metropolitan Sydney measured by employment. The analysis is focused on these 16 industry subdivisions.
The 16 subdivided industries are mostly services industries and are categorised into three broad groups depending on the nature of the services: commercial services; public and infrastructure services; and cultural and media services (see Table 2). The commercial services refer to the highly specialised services for business activities (finance, insurance, business, and property services). The cultural and media services are those services which are informing, educating and entertaining people. The public and infrastructure services refer to the government administration and urban supporting services such as transport, communication and amenities (accommodation, cafes and restaurants). The commercial services group, the cultural and media services group, and the public and infrastructure services group respectively account for 42 per cent, 7 per cent, and 22 per cent of total employment in Central Sydney in 2006. In total the three concentrated industry groups account for around 71 per cent of Central Sydney’s total employment. Table 2 sequences the concentrated industry subdivisions according to their LQs in 2006 from the highest to the lowest. The commercial services are the most concentrated in Central Sydney, especially in finance and insurance services. The other two groups of services do not indicate very impressive degrees of concentration over other services.

Figure 2 and Figure 3 visually display the results in Table one. Both Figure 2 and Figure 3 provide information of the LQs, employment shares of the concentrated industry subdivisions, but respectively display their employment changes or LQ changes in 1996-2006. They better illustrate how these industries are compared with each other and had changed over the one decade period. Measured by sheer employment shares, top industries in Central Sydney are business services (21 per cent), finance (8 per cent), services to finance and insurance (7 per cent), and accommodation, cafes and restaurants (6 per cent) as contrast to the top industries measured by LQs, which are services to finance and insurance (3.11), insurance (2.80), finance (2.59), and libraries, museums and the arts (2.21). Figure 2 indicates that the majority of the concentrated industries in Central Sydney had employment growth in 1996 and 2006 except for two industries which lost employment numbers modestly. Figure 3 indicates that half of the 16 concentrate industries in Central Sydney increased their degree of concentration by positive LQ changes while the other half industries decreased their degree of concentration by negative LQ changes in 1996-2006. The different patterns of employment changes and LQ changes of the concentrated industries occur because the LQ changes depend on the employment numbers of the industries in Metropolitan Sydney region too. Figure 3 also indicates that industries with higher LQs tend to have positive LQ changes in 1996-2006, denoting that industries in Central Sydney tend to be more and more concentrated on few numbers of industries.
Table 2. Measuring employments of industry subdivisions and their LQs in 1996 and 2006

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</thead>
<tbody>
<tr>
<td>75 Services to Finance &amp; Insurance</td>
<td>12,453</td>
<td>19,429</td>
<td>4.06%</td>
<td>24,528</td>
<td>38,292</td>
<td>6.86%</td>
<td>3.11</td>
<td>-3%</td>
<td>97%</td>
</tr>
<tr>
<td>74 Insurance</td>
<td>10,120</td>
<td>20,304</td>
<td>3.30%</td>
<td>13,070</td>
<td>22,659</td>
<td>3.65%</td>
<td>2.80</td>
<td>12%</td>
<td>29%</td>
</tr>
<tr>
<td>73 Finance</td>
<td>29,675</td>
<td>58,508</td>
<td>9.68%</td>
<td>29,815</td>
<td>55,898</td>
<td>8.33%</td>
<td>2.59</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>92 Libraries, Museums &amp; the Arts</td>
<td>4,818</td>
<td>11,472</td>
<td>1.57%</td>
<td>4,711</td>
<td>10,340</td>
<td>1.32%</td>
<td>2.21</td>
<td>5%</td>
<td>-2%</td>
</tr>
<tr>
<td>62 Rail Transport</td>
<td>2,996</td>
<td>8,547</td>
<td>0.98%</td>
<td>4,966</td>
<td>11,046</td>
<td>1.39%</td>
<td>2.18</td>
<td>24%</td>
<td>66%</td>
</tr>
<tr>
<td>91 Motion Picture, Radio &amp; Television Services</td>
<td>3,319</td>
<td>12,652</td>
<td>1.08%</td>
<td>5,635</td>
<td>13,964</td>
<td>1.58%</td>
<td>1.96</td>
<td>49%</td>
<td>70%</td>
</tr>
<tr>
<td>82 Defence</td>
<td>3,186</td>
<td>11,961</td>
<td>1.04%</td>
<td>4,447</td>
<td>11,262</td>
<td>1.24%</td>
<td>1.92</td>
<td>43%</td>
<td>40%</td>
</tr>
<tr>
<td>78 Business Services</td>
<td>53,668</td>
<td>174,253</td>
<td>17.51%</td>
<td>74,085</td>
<td>211,570</td>
<td>20.71%</td>
<td>1.70</td>
<td>10%</td>
<td>38%</td>
</tr>
<tr>
<td>66 Services to Transport</td>
<td>7,472</td>
<td>18,986</td>
<td>2.44%</td>
<td>7,184</td>
<td>20,966</td>
<td>2.01%</td>
<td>1.66</td>
<td>-16%</td>
<td>-4%</td>
</tr>
<tr>
<td>24 Printing, Publishing &amp; Recorded Media</td>
<td>9,006</td>
<td>32,284</td>
<td>2.94%</td>
<td>10,022</td>
<td>30,526</td>
<td>2.80%</td>
<td>1.59</td>
<td>14%</td>
<td>11%</td>
</tr>
<tr>
<td>81 Government Administration</td>
<td>19,590</td>
<td>49,435</td>
<td>6.39%</td>
<td>21,011</td>
<td>66,326</td>
<td>5.87%</td>
<td>1.54</td>
<td>-23%</td>
<td>7%</td>
</tr>
<tr>
<td>71 Communication Services</td>
<td>11,145</td>
<td>36,849</td>
<td>3.64%</td>
<td>9,395</td>
<td>33,227</td>
<td>2.78%</td>
<td>1.45</td>
<td>-4%</td>
<td>-11%</td>
</tr>
<tr>
<td>57 Accommodation, Cafes &amp; Restaurants</td>
<td>18,580</td>
<td>71,304</td>
<td>6.06%</td>
<td>21,377</td>
<td>81,233</td>
<td>5.98%</td>
<td>1.28</td>
<td>-2%</td>
<td>15%</td>
</tr>
<tr>
<td>96 Other Services</td>
<td>9,831</td>
<td>30,302</td>
<td>3.21%</td>
<td>8,083</td>
<td>35,141</td>
<td>2.26%</td>
<td>1.12</td>
<td>-31%</td>
<td>-18%</td>
</tr>
<tr>
<td>93 Sport &amp; Recreation</td>
<td>3,826</td>
<td>16,813</td>
<td>1.25%</td>
<td>4,368</td>
<td>20,289</td>
<td>1.22%</td>
<td>1.05</td>
<td>-9%</td>
<td>14%</td>
</tr>
<tr>
<td>77 Property Services</td>
<td>5,511</td>
<td>24,610</td>
<td>1.80%</td>
<td>6,597</td>
<td>31,306</td>
<td>1.84%</td>
<td>1.02</td>
<td>-9%</td>
<td>20%</td>
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<td>...</td>
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<td></td>
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</tr>
<tr>
<td>Total</td>
<td>306,469</td>
<td>1,539,593</td>
<td>100.00%</td>
<td>1,376,824</td>
<td>100.00%</td>
<td>1.00</td>
<td>0%</td>
<td>17%</td>
<td></td>
</tr>
</tbody>
</table>

Note: Commercial services ■; Cultural & media services ●; Public & infrastructure services ◆.
Source: Calculated from ABS census data in 1996 and 2006
Figure 2. Measuring employment shares of industry subdivisions, LQs and employment changes

Source: Calculated from ABS census data in 1996 and 2006
Figure 3. Measuring employment shares of industry subdivisions, LQs and LQ changes

Source: Calculated from ABS census data in 1996 and 2006
4 Discussion

The results of this research show that the knowledge-based economy was further concentrated in Central Sydney in 1996-2006 in two broad categories of industry subdivisions: commercial services; cultural and media services.

Sydney has been a top leader in commercial services in Australia’s urban hierarchy since the 1980s. Sydney was the main urban beneficiary of Australia’s increasingly globalised commodity and financial markets (Searle, 2008) as the central locus of international corporate headquarters and financial offices. By 1988, Sydney had 150 head offices of international institutions (43 in Melbourne) and 155 of the 185 Australian head offices of foreign banks (Daly & Stimson, 1992). In 1997 and 1998, some 61 multinational corporations set up Asia Pacific regional headquarters in Sydney, more than four times the total for any other Australian or New Zealand city (Daly & Pritchard, 2000). Comparing Sydney’s employment structure with overseas cities indicates that Sydney’s performance in finance and business services in the mid 1990s was approaching that of New York and London in the mid 1980s (Searle, 1996). A study done by the accountancy firm Price Waterhouse Coopers in 1998 compares Sydney with seven international cities (New York, London, Frankfurt, Singapore, Atlanta, Vancouver, and Kuala Lumpur) and concludes that Sydney is performing reasonably well across a wide range of measures (Price Waterhouse Coopers, 1998). Hall places Sydney in the ranking of sub-global cities then (Hall, 1995), but other scholars including Searle (1996), O’Connor and Stimson (1995), Lepani (1995), Newton (1995) and Baum (1997) argue that Sydney’s economic characteristics of finance and producer services were indicative of its emergence as Australia’s global city in the late 1980s and early 1990s.

Sydney’s status as a financial centre on the Pacific Rim was established in the 1980s. Saskia Sassen defines a global city’s status as its capacity to provide ‘producer services’ such as financing, banking, accounting, advertising, marketing and management consultancy and argues that these complexes of activities are usually located in CBDs of a few global cities (Sassen, 1995, 2001). The results of this research indicating increasing concentration and importance of finance and insurance, and professional and business services in Central Sydney fits into Saskia Sassen’s argument and testifies Sydney’s status as a global city of growing influence. Searle (1998a) investigates changes in producer services location in Sydney based on analysis of four industries of management consultancy, insurance, graphic design and data processing and concludes that ‘globalisation appears to have reinforced the traditional central city focus of Sydney’s producer services sector’ (Searle, 1998a, p. 237). Forrest (1996) examines the spatial clustering of the journey to work in Sydney and points out a decreasing dependence on the central city as a focus of employment other than those employed in the business, finance and information service sector. These researches draw similar conclusion to this research of centralised advanced producer services in central Sydney out of different analytical approaches. It is even argued that the surge of finance-based economic activities in Central Sydney helped sustain Australian economic prosperity in the late 1990s (O’Neill & McGuirk, 2002).

Central Sydney’s growing role as a knowledge economy centre, on the other hand, is seen in its increasing concentration of cultural and media industries in 1996-2006. This is indicative of very significant transformative urban functions in Central Sydney. Other scholars also observe similar patterns in different approaches. Searle and Valence (2005) find an emerging inner Sydney multimedia cluster including graphic design, advertising
and related media. They base their study on an empirical analysis of the multimedia firms’ geographical locations in metropolitan Sydney area and observe the high concentration of the new information industry in central Sydney as part of a shift towards an information economy (Searle & Valence, 2005). These researches highlight Sydney’s concentration of new information industry on a regional base, however, Sydney’s performance deserves an international credit. In the index ranking global cities’ capacity in providing producer services released by the Globalisation and World Cities (GaWC) program at the Loughborough University, Sydney ranked the fifth in advertising performance of major global cities (Taylor, 2008, p. 56). Sydney’s performances in other producer service categories were much less impressive on a global base, including accountancy, banking and financing, insurance, law and management consultancy. Few empirical studies have been made to provide plausible explanation for central Sydney’s rapid and high concentration of new information economy in cultural and media industries. Florida’s (2002, 2005) theory of creative class appears to provide an explanatory framework. The creative workers required by the new information economy are urban lifestyle class (Florida, 2002) and are globally mobile as electronic migrants (E. Blakely, 2001; Florida, 2005). It seems that Sydney’s cityscapes – built, natural, social and cultural cityscapes – are assets of the city’s competitiveness for a creative economy and creative city (Gibson, 2006; Throsby, 2006). But the validity of this causal relationship – simplistic as it is – needs to be verified by very plausible empirical study.

5 Conclusion

In this paper I used the LQ tool to measure to what extent the knowledge-based economy was concentrated in Central Sydney with reference to Metropolitan Sydney and how the concentration of the knowledge-based economy changed in 1996-2006 by using the ABS census data of employment by industry based on place of work. By presenting the results on the LQs, employment shares, employment changes and LQ changes of industry subdivisions (two digit subdivisions by ANZSIC 1993) in Central Sydney, it is found that 1) the majority of the concentrated industries in Central Sydney are knowledge-based services; 2) apart from the public and infrastructure services which support local as well as regional/national economy, the concentrated knowledge-based economy in Central Sydney basically fall into two categories – commercial services, and cultural and media services; 3) the overall degree of the concentration of the commercial services and cultural and media services in Central Sydney has been growing as indicated in the trend in 1996-2006. The findings out of measuring the concentration of the knowledge-based economy in Central Sydney are explained and supported by related theories and researches. The contribution of this research is that it provides an empirical case with systematic statistical examination to illustrate the concentration of the knowledge-based economy in Central Sydney and its longitudinal trend.

References


