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Abstract

Decentralised urban growth has been pursued as a policy aim for sometime as a means to reduce travel demand and improve sustainability. A great deal of emphasis has been on developing work places in outer and middle suburbs in Australian cities aimed at reducing the mono-centric nature of cities. Given the concerns over sustainability, adaptation to climate change, urban development and transport systems are crucial issues in modern Australian metropolitan planning. Most current planning strategies argue for mixed land uses promoting housing and employment in cities at higher densities.

Empirical evidence of employment distributions in Australian cities suggests that the inner city, in particular the central business district, continued to grow in size and diversity of employment. Middle and outer regions of cities mainly consist of residential developments with negligible employment thus accentuating the need for commuting to the inner city. This trend has to be halted if not reversed if our cities are to become more sustainable with decreasing reliance on private transport. This paper will present the empirical evidence of employment distribution in the Adelaide metropolitan region based on analysis of the 'Working Population Profile' published for the first time by the Australian Bureau of Statistics as part of Census 2006. This paper will present the existing pattern of employment distribution and outline possible opportunities for achieving decentralised urban development and sustainability.

Introduction

Sustainability has become the foundation for almost all economic thinking nowadays. Among the many definitions of sustainability the definition by the World Commission on Environment and Development (WCED, 1987) often referred to as the Brundtland report is the most frequently utilised. Among the many issues that dominate the policy arena few issues are more closely related to urban and regional planning than the need for reduction in one's ecological footprint, energy conservation, ecological conservation, reduction in the use of private automobiles vis-a-vis carbon emissions; all being directly related to the kind of city planning we ought to have. We are living in a world in which oil prices keep setting records, and one in which the idea that global oil production will soon peak is rapidly moving from being a fringe belief to mainstream assumption.

There have been many news stories recently about Australians who are changing their behaviour in response to expensive oil and they are switching to public transit. However, the level of impact associated with this change is minimal; for example, some major public transit systems are excited about ridership gains of 5 or 10 percent. Nonetheless fewer than 10 percent of Australians take public transit to work, so this surge of riders takes only a relative handful of drivers off the road. Can we also drive less? Yes — but getting there will be a lot harder. Any serious reduction in Australian driving will require more than this: it will mean changing how and where many of us live. It is the kind of neighbourhood in which people do not have to drive a lot, but it is also a kind of neighbourhood that barely exists in Australia, even in large metropolitan areas like Sydney or Melbourne. Also, in the face of rising oil prices, has left many Australians stranded in suburbia utterly dependent on their cars.

Changing the geography of Australian metropolitan areas will be hard in the short run. Urban development is a long term process and every action in land use planning has a time lag before we see the benefits. Long after today's economic crisis and serious policy debates on sustainability and green energy, millions of Australians will still be living in suburbs built when oil was cheap and affordable and green emissions and global warming were not on policy agenda.

It is hard to justify transit systems unless there is sufficient population density, yet it is hard to persuade people to live in denser neighbourhoods unless they come with the advantage of transit access. Despite gentrification that has taken place in some inner cities, it will be hard to shake the longstanding Australian association of higher-density living with poverty and personal danger (Troy, 2000). An inherent difficulty in all policy assessments of this nature is the definition of the 'counter-factual' case, ie, what would have happened in the absence of the policy initiative being assessed.

We are heading for a prolonged era of scarce, expensive oil; Australians will face increasingly strong incentives to start living in high-density, high-amenity housing. Australia's ecological footprint (7.7 global hectares per person) is somewhere between the third highest (after USA and Kuwait) in the world (Global Footprint Network & the University of Sydney, 2005; WWF, 2006) and (7.6 global hectares per person) the fourth highest in the world (Curnow, 2000).

Australia is a highly urbanised country with an estimated population of 21.64 million in 2008 (ABS, 2009). Net overseas migration contributed about 62 percent of population growth last

year; even the slow growing cities like Adelaide and Hobart have recorded a sizable increase in population. Life expectancy is increasing and as of now Australia has the second highest life expectancy of average 81 years. Our population is ageing and it is predicted that by 2050 the percentage of the population aged 65 and over will increase from the current 12% to about 31%.

Adelaide is the capital city of South Australia. It is a low density city, with a population of 1.1 million people in 2006. South Australian government planning strategy is based on a population projection of 2.0 million for the state (Government of South Australia, 2007). Relative to other mainland Australian states, South Australia has experienced relatively low rates of population growth, about 6000 to 10,000 per year.

In the metropolitan Adelaide Statistical Division in recent years (2000 – 2005) around 50% of new housing comes from broad acre 'greenfields' development and 50% from development in existing areas, including redevelopment such as apartments, demolition and replacement of houses and resubdivision of existing suburban allotments (Government of South Australia, 2007, p.23).

A fleet of 810 buses operate in the city, and in the financial year 2006/ 07 there were 49.4 million journeys by public transport involving 65.0 million boardings, with 51.0 million boardings on bus services. Around 5% of weekday journeys in Adelaide are made on public transport (Bray & Wallis, 2008).

The structure of our cities ie the location of housing and work places and the overall distribution of land uses, is the legacy of the past more notably traceable to the suburbanisation and housing policies after the World War II. As Troy (2000) puts it, "the highly centralised radial structure of the cities inherited from the 19th century was ... entrenched in the plans drawn up to regulate and direct the post-war growth." The 'Australian dream' of home ownership may have been influenced and encouraged by housing policies and strong post-war migration pursued by erstwhile governments; the urban sprawl and suburbanisation of our major cities was not a deliberate urban planning approach followed in the past or the present. Some authors argue that metropolitan planning in Australia is directed towards managing and limiting the outward growth of cities (Birrell, O'Connor et al., 2005; Forster, 2006; Troy, 2000).

Housing and home ownership has dominated an overarching issue not only in urban planning but also in many other arenas of public policy, notably transport and infrastructure planning, land management and construction. For example Newman and Kenworthy (2002; 1989), among others, have analysed urban travel and carbon emissions across a range of cities in Australia, Europe and the US and argued for a coordinated approach to transport-land use integration and decentralisation of employment in cities. Integrated land use and transport planning has, since the 1960s, been a well researched field (Alonso, 1964; Anas, 1998; Anas, Richard, & Small, 1997; Chapin & Kaiser, 1979; Echenique et al, 1995; Geertman & Eck, 1995; Harris, 1996; Harris & Ullman, 1945). Integration of land use and transport aimed to minimise travel demand and decentralise employment within urban areas was not seriously pursued in Australia. Even though metropolitan strategy plans like Melbourne 2030 and the Adelaide Strategy emphasise the need for self containment of urban districts with respect to jobs and services, implementation of these policies were far from satisfactory to make integrated development.

The revival of sustainability in urban planning and housing encompass many closely related issues such as energy efficient housing, reduction in carbon emissions, alternative energy and eventually reduction in travel demand and the need to continue the use of cars. Transit oriented development is one such initiative which is becoming a favoured option (Government of Western Australia, 2006, 2008, Renne, 2005).

The question that arises most forcefully now concerns the nature of urban and regional planning and whether it needs to be changed.

Employment Structure in Adelaide and South Australia

The employment data used in this study is the Working Population Profile (WPP) 2006 published by the Australian Bureau of Statistics (ABS, 2008) as part of 2006 census of population and housing. For the first time Australian Bureau of Statistics has released employment statistics based on work places compiled at Journey to Work Travel Zones. In previous census, employment statistics were published based on place of residence which did not permit location of jobs. WPP enables analysis of employment by location and it enables the mapping of location and types of jobs over the country. Two types of employment statistics are available in WPP, namely employment by ‘occupation types’ and employment by ‘industry sector’. For example, a manager of a shopping centre is classified as ‘manager’ under occupation type employed in ‘retail trade’ sector. Occupation closely relates to education, skills and capabilities of people and it reflects vast variations in wages and income. Employment statistics by occupation types and industry sector serve the increasing needs of policy analysis at the macro level and disaggregated spatial analysis for urban and regional planning.

The overall picture of employment by occupation types is depicted in Table 1. The Adelaide Statistical Division (ASD) comprises of the entire metropolitan area of Adelaide and some rural areas, with about two thirds of the population of South Australia living in the ASD. The employment statistics includes both full-time and part-time employment in various occupation categories. At the state level about 42% of population of all age groups is employed either full-time or part-time.

“Insert Table 1 here”

Number of jobs in urban Adelaide and predominantly rural remainder of the state reflect the urban rural division of employment. A large percentage of employment in the ‘professionals’ and ‘clerical and administrative’ occupations in the ASD distinguish the urban economy with the rest of the state. About one fifth (21.7%) of total jobs in South Australia is in the professionals category which is the largest single category of jobs. Managers and clerical and administrative workers constitute 28.9% jobs. The percentage of labourers is significantly higher in the regional and rural areas outside ASD.

A number of things to note: first, out of a total of approximately 658,000 jobs, the greatest percentage of them is within the Adelaide Statistical Division (ADS), about 71.5%. Of those, the highest represented are professionals followed by clerical and administrative workers within the ADS and, managers followed by labourers outside the ADS.

The percentage of managers between those within the ASD and outside is significantly different. Approximately 18% of the population outside the ASD are managers, whereas 11.9% of the population are managers within the ASD. One can speculate that the higher

proportion of managers outside the ASD might be due to the dual role of farmer/farm manager being designated within the census as 'manager'. However, this would need to be investigated further before one can make any real assumption for why there are so many more, by percentage, managers outside the ASD.

The high number of professionals and clerical and administrative workers within the ASD can easily be explained due to the centralisation of employment associated with these job categories. That is, many organisations locate their main offices close to governmental administrative centres for efficiency and convenience, and typically as the metropolitan area is close to major facilities such as air/sea ports, public transport and information technology infrastructure; this leads to a higher concentration of employment close to such facilities.

It is also interesting to note that the distribution of technical and trades jobs is consistent between both ASD and non-ASD zones, being within approximately four and a half percent of one-another. This suggests that the level of demand for technical/trades people is consistent within any given population.

A number of factors affect employment and its spatial distribution. Australia has been experiencing some of the worst droughts in the recorded history. For the last seven years large parts of Australia has received meagre rainfall and the impact of prolonged and severe drought is causing many farmers and pastoralists to leave their industry; many of them in a financially critical state. A recent article in *National Geographic* on the precarious situation of farming communities in Australia comments:

Adlington has put his own family acreage up for sale. "Haven't had one person look at it," ... Holding his wife's hand, tears leaking out of his eyes, the farmer manages to get out the words: "I have absolutely nothing to go on for." The woman says she checks every couple of hours to make sure her husband is not lying in his orchard with a self-inflicted gunshot wound in his head. When the meeting is over, the counselor adds their names to a suicide watch list. (Draper, 2009, p. 24).

We are witnessing one of the worst droughts in history. There is no doubt that farmers and pastoralists pushed out of rural and agricultural regions will move elsewhere in search of livelihoods. There is no reliable study as yet on the precise nature of jobs losses and where farmers might relocate. A slow but steady rural to urban migration is plausible. Once moved out of farms it is not always easy to go back to farming when the drought eventually ends. It appears that large parts of South Australia as in other states are in the cusp of a painful structural change. The impact of internal migration will be eventually felt in towns and cities. Migration per se is not an issue but farmers and pastoralists with the given nature of skills in farming will not easily fit in jobs requiring different types of skills.

Industry of employment

As stated earlier, 42% of people of all age groups is employed either full-time or part-time time. It is a record in itself that the state never in the recent past has witnessed a low gross unemployment rate of slightly under 4%. Table 2 depicts employment by industry sectors in ASD. Manufacturing, health care and social assistance and retail trade accounts for slightly over one third of total jobs. Adelaide being a second order city in the urban hierarchy has relatively smaller percentage of employment in Financial & insurance services and the Information media & telecommunications sector. Unlike Sydney or Melbourne, Adelaide is

not among the global cities which attract large number of jobs in such sectors (Forster, 2006; Shearmur & Coffey, 2002).

“Insert Table 2 here”

The employment pattern is by no means static or accidental. Adelaide has witnessed some major job losses since 2007 onwards which is not depicted in the above table. Closure of the Mitsubishi car manufacturing plant at Tonsley lead to a loss of over 1700 direct jobs and unaccounted number of jobs in car parts industry, though some of which were located in Victoria and elsewhere outside the state. Also two major white goods manufacturing plants (of Electrolux household appliances) have moved their production out of Australia to South East Asia resulting in the loss of over 2000 jobs. The decline of manufacturing appears to be occurring across the board in many high-wage countries including Australia. Economic policies and urban planning has to reconcile with these global changes. Health care and social assistance is slowly growing to become the largest sector. It is plausible that demographic ageing occurring all over Australia will change the age structure of population. It is predicted that by 2050 people aged 65 and above will constitute 31% population (Government of South Australia, 2004). An ageing population will lead to more jobs in health care and social assistance. During the buoyant economic growth from 2000 through 2006 Adelaide and South Australia has witnessed simultaneous growth and decline of jobs in different industrial sectors. Employment in construction and mining has grown while manufacturing declined drastically. A comparison of employment by industry across all major cities in Australia would be interesting but it is outside the scope of this paper.

The reader should be reminded that the ongoing economic situation since the onset of the global financial crisis in mid 2008 has resulted in large job losses in many countries including Australia. Unemployment rate in South Australia has since climbed to 5.2% in mid 2009. Yet the impact of the global financial crisis is relatively less severe in Australia than say in the US and UK and most of the OCED countries. None of our major banks have catastrophically failed and we have not seen large number of subprime mortgage defaults and foreclosures. This is not to say we are insulated from the global trends but we are in a better position than many countries. Export of minerals and coal has slumped simultaneously and the drop in mineral prices has impacted perhaps major mineral exporting states such as Western Australia and Queensland. Economic stimulus programmes and infrastructure projects initiated by the federal government is essentially to reduce the impact of the financial crisis. It is, however, too early to speculate on the pace of economic recovery and business confidence which underpins investments in industries and services and eventually employment.

Occupation types

The spatial distribution of employment in urban areas is of major interest to urban planners in achieving balanced distribution of housing and employment. Some industries, however, require unique locations and transport connections which cannot be replicated everywhere. For example, ship building and petrochemical storage requires proximity to port and transshipment facilities and by the very nature of its requirements, it cannot be easily replicated as, say, retail trade. Similarly some types of jobs periodically shift from place to place depending on the market demand. Building construction jobs is a typical example of ‘portable’ types of jobs which move from place to place depending on where construction takes place.

Typically all industry sectors include different types of occupations to varying degrees. The classification of employment by industry sector and occupation type provides insights into the predominant types of occupations in various industries. Table 3 depicts top three occupation types in various industry sectors in ASD in 2006.

“Insert Table 3 here”

As one immediately notices, the distribution of occupations to industries is not unexpected. Certainly the high ranking of managers in Agriculture, Forestry and Fishing may appear to be counter intuitive, however in the context of our earlier speculation this would seem readily explainable.

Professionals rank highest within the state, followed by clerical and administrative workers. These occupation types are either ranked highest or second highest: for professionals, they are in six out of 20 of the available categories and similarly clerical and administrative workers where they are in the top two ranks in nine out of 20 of the available categories.

The location of the jobs associated with these occupations tends to be located within the metropolitan area. That is, the industries in which they are ranked highest and second highest are generally located within the metropolitan area: for example the utilities industries, financial, public administration, etc, are traditionally headquartered within the CBD of any major city. Historically this is reasonable given that when settlements are established, these facilities and services need to be established to service the settlement. If the settlement grows into a city, regional capital etc, then the centralised location of these industries is generally the place they first started. That is, a regional centre will have an established utilities services facility, where satellite settlements will rely on this regional centre for such services, and the regional centres themselves would rely on regional/jurisdictional capitals.

Spatial distribution of employment

Australian cities are highly urbanised, low density and have high levels of home ownership. Car dependence in Australia is one of the highest in the world (Parliament of Victoria, 2005). Although the concern for compact cities has been raised from time to time the suburbanisation trend has not declined. Per capita consumption of resources, as expected, is very high by international standards and Australia has the fourth largest ecological footprint of 7.6 global hectares per capita preceded only by the United States and Kuwait (Curnow, 2000). The State government plans to increase the population of South Australia to 2.5 million by 2050. Since the bulk of population growth is confined to Adelaide’s metropolitan area, it is likely that Adelaide has to accommodate at least a million additional people. The demand for housing is not merely a function of the population; household size and internal migration also influence housing demand (Hugo, 2005, 2006; Mueller & Tighe, 2007). Population growth in Australia currently stands at 1.3% and is among the highest in OECD countries. It is also equal to the overall rate of global population growth (Hugo, 2005).

There has been lot of discussion in government, business and academic circles on housing affordability and housing demand. The ongoing first homeowner grant by the federal and state governments is an example of the emphasis placed on housing. Planning policy documents dwell at length on the quantum of housing demand in the medium and short term and how and where it will be provided in urban areas. Regrettably employment, land and infrastructure required for promoting the fair distribution of employment in cities is seldom on the policy agenda. This is not to say that the debates about sustainability, carbon

reduction, smart growth, and transit-oriented developments closely relate to location of jobs in urban areas and how jobs and housing should be integrated to achieve sustainable outcomes do not occur. Integrated landuse planning and landuse transport linkages were not new; there is substantial amount of literature on this field including some of the classic studies of Alonso (1964), Anas (1998; 1997), Echenique (1995) and Harris (1996).

Figure 1 below depicts the distribution of total jobs within the Adelaide Statistical Division. It is seen that vast majority of jobs are located in and around the Adelaide CBD. Adelaide CBD has about 20% of the total jobs in ASD. This is not surprising given that the city has grown from the centre and government, financial and administrative jobs have traditionally been located in the CBD. It should be noted, however, the sprawl that took place starting the end of Second World War has led to vast expansion of urban area predominantly consisting of housing. Urban expansion has not been hand in glove with growth of jobs in outer and urban periphery. This has led to undesirable travel patterns for work and other purposes in Adelaide and perhaps all Australian cities. A striking feature of the persistence of this pattern of growth is not only that it continues to exist, but that the serious public attention it gets, when it gets any at all, is distinctly divided.

The distribution of jobs by occupation and industry of employment show some variations in terms of dispersal. But due to lack of space they are not included in this paper. From our earlier discussion, this can be seen as historical insofar as, as the city has grown, organisations would have started by establishing themselves in or close to the CBD. This centrality also demonstrates that suburbs in the city's extremities are primarily residential; that is, the population in these suburbs are more likely to travel into work either by private vehicle or public transport and their work related trips distances are higher than those living nearer the CBD.

Given the need to reduce Greenhouse Gas (GHG) emissions, and to move to a more sustainable outcome for our cities, this centralisation of jobs increases the need for the population to travel. The decentralisation of employment can occur: organisations which have substantive roles which can be performed regardless of location should be encouraged to do so.

Naturally, this is not always the case, so there will still be some level of centralisation; nonetheless, there are opportunities to create sub-metropolitan hubs which will allow employees to travel to these 'closer' locations which provide the necessary infrastructure for business, but at the same time a reduced requirement for travel.

“Insert Figure 1 here”

It is seen in figure 2 that 50% of total jobs are located within a radius of 17 km from the city centre which also happens to be the geographical centre of Adelaide metropolitan area. Even though in North South direction the city stretches around 75 Kms the outlying parts of the city hardly consist of any significant employment. On the other hand, it should be noted that majority of new housing construction takes place at the periphery. Current thinking towards transit oriented developments and carbon reductions strategies should reconcile with the existing spatial distribution of jobs and requires to be addressed in a holistic way through landuse policies at the metropolitan level to leverage the dispersal of jobs.

“Insert Figure 2 here”

Thus, we can confidently suggest that the number of jobs decrease as the distance from the CBD increases and we can say that the distribution of jobs is not necessarily dependent on the location of the population in each Statistical Local Area (SLA).

Employment dispersal

As stated in previous sections, the employment distribution is skewed towards city centre and inner city while outer areas devoid of substantial employment. Table 4 depicts the sensitivity of total employment in various journey to work zones in ASD. The regression of total employment over working age population (age 15 and above) and average travel distance to city centre reveals a weak relationship. Only 25.85% variations in employment is explained together by the size of working population and distance from the city centre. Stated otherwise, about 75% of job distribution owes to factors other than population and distance. A detailed analysis of employment distribution and sensitivities to other factors such as land use mix, land values is outside the scope of this paper. However, the central point is clear i.e. population distribution does not have lead to distribution of jobs.

“Insert Table 4 here”

Locations of employment by occupation types help assess the sensitivity of employment with respect to distance to city centre and the size of working population in various zones within the metropolitan Adelaide. The correlation coefficient between occupations type and the two variables is presented in table 5.

“Insert Table 5 here”

In general the correlation coefficients reinforce the earlier findings that distribution of employment less sensitive to distance and population size. Employment in other services category has the highest coefficient of 0.218 which is not very significant. On a relative basis employment in ‘construction’, ‘wholesale trade’, ‘retail trade’ and ‘health care and social assistance’ categories show some noticeable correlation to distance and population. In other words, these three occupation categories have some natural tendencies to come up irrespective of distance from the city centre.

It confirms our earlier discussion by demonstrating that the correlation between occupation type and distance from the city centre, given the population in a given SLA is not strong. It also shows how population location is not an indicator of employment within an industry group for any given SLA.

Conclusion

In this paper, we have shown how in the Australian city of Adelaide, being typical of many Australian cities, has employment centralisation and housing decentralisation. Specifically, we have shown empirical evidence of employment distribution in Adelaide and that it suggests that the inner city, in particular the central business district, continues to grow in size and diversity of employment; that the middle and outer regions of the city mainly consist of residential developments with negligible employment thus accentuating the need for commuting to the inner city.

We have argued that this trend has to be halted if not reversed if our cities are to become more sustainable with decreasing reliance on private transport. It will be a costly mistake to ignore the existing spatial distribution of employment in cities while we address sustainability. Renewed concerns over carbon emissions and dependency on oil are likely to prompt increased government-led efforts to reduce travel demand and integrated land use planning.

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Table 1. Distribution of employment by occupation types in Adelaide Statistical Division and the rest of the State of South Australia

Occupation Type	Adelaide SD	%	Rest of SA	%	Total	%
Managers	56251	11.9	33928	18.1	90179	13.7
Professionals	102217	21.7	22115	11.8	124332	18.9
Technicians and trades workers	60425	12.8	32197	17.2	92622	14.1
Community and personal service workers	45269	9.6	16910	9.0	62179	9.4
Clerical and administrative workers	79931	17.0	18237	9.7	98168	14.9
Sales workers	49140	10.4	14700	7.8	63840	9.7
Machinery operators and drivers	27314	5.8	14328	7.6	41642	6.3
Labourers	46712	9.9	33495	17.8	80207	12.2
Occupation inadequately described/Not stated	3753	0.8	1738	0.9	5491	0.8
Total	471012	100	187648	100	658660	100

Source: Authors' analysis of ABS, 2008.

Table 2. Distribution of employment by industry, South Australia, 2006

Industry	Employment	%
Agriculture, forestry & fishing	30601	4.6
Mining	5794	0.9
Manufacturing	85200	12.9
Electricity, gas, water & waste services	7253	1.1
Construction	42983	6.5
Wholesale trade	24970	3.8
Retail trade	78638	11.9
Accommodation & food services	38460	5.8
Transport, postal & warehousing	27288	4.1
Information media & telecommunications	10540	1.6
Financial & insurance services	21617	3.3
Rental, hiring & real estate services	9387	1.4
Professional, scientific & technical services	35563	5.4
Administrative & support services	22081	3.4
Public administration & safety	43918	6.7
Education & training	51244	7.8
Health care & social assistance	83773	12.7
Arts & recreation services	7670	1.2
Other services	25571	3.9
Inadequately described/Not stated	6109	0.9
Total	658660	100

Source: Authors' analysis of *Working Population Profile*, ABS, 2008.

Table 3. Ranking of top three occupation types by industry of employment

Industry	Rank 1 occupation	Rank 2 occupation	Rank 3 occupation
Agriculture, forestry & fishing	Managers	Labourers	Technicians and trades workers
Mining	Machinery operators and drivers	Technicians and trades workers	Professionals
Manufacturing	Labourers	Technicians and trades workers	Machinery operators and drivers
Electricity, gas, water & waste services	Technicians and trades workers	Clerical and administrative workers	Professionals
Construction	Technicians and trades workers	Labourers	Managers
Wholesale trade	Sales workers	Managers	Clerical and administrative workers
Retail trade	Sales workers	Managers	Labourers
Accommodation & food services	Community and professional services workers	Labourers	Managers
Transport, postal & warehousing	Machinery operators and drivers	Clerical and administrative workers	Managers
Information media & telecommunications	Professionals	Clerical and administrative workers	Technicians and trades workers
Financial & insurance services	Clerical and administrative workers	Professionals	Managers
Rental, hiring & real estate services	Sales workers	Clerical and administrative workers	Managers
Professional, scientific & technical services	Professionals	Clerical and administrative workers	Technicians and trades workers
Administrative & support services	Labourers	Clerical and administrative workers	Professionals
Public administration & safety	Clerical and administrative workers	Professionals	Community and professional services workers
Education & training	Professionals	Community and professional services workers	Clerical and administrative workers
Health care & social assistance	Professionals	Community and professional services workers	Clerical and administrative workers
Arts & recreation services	Community and professional services workers	Professionals	Managers
Other services	Technicians and trades workers	Clerical and administrative workers	Labourers
Inadequately described/Not stated	Technicians and trades workers	Labourers	Clerical and administrative workers
Total	Professionals	Clerical and administrative workers	Technicians and trades workers

Source: Authors' analysis of *Working Population Profile*, ABS, 2008.

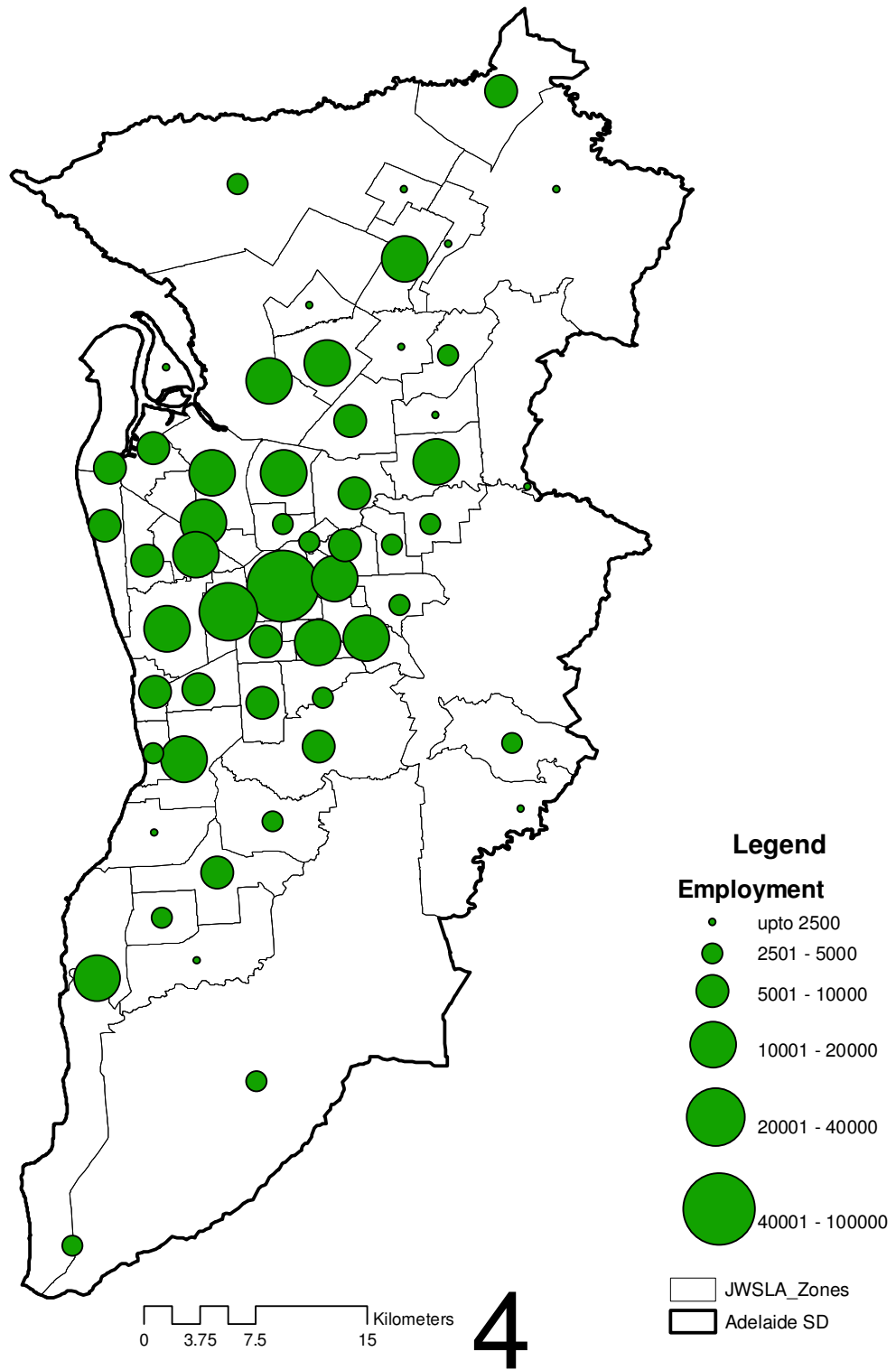


Figure 1. Distribution of employment in Adelaide metropolitan area, 2006
 Source: Authors' analysis *Working Population Profile*, ABS, 2008.

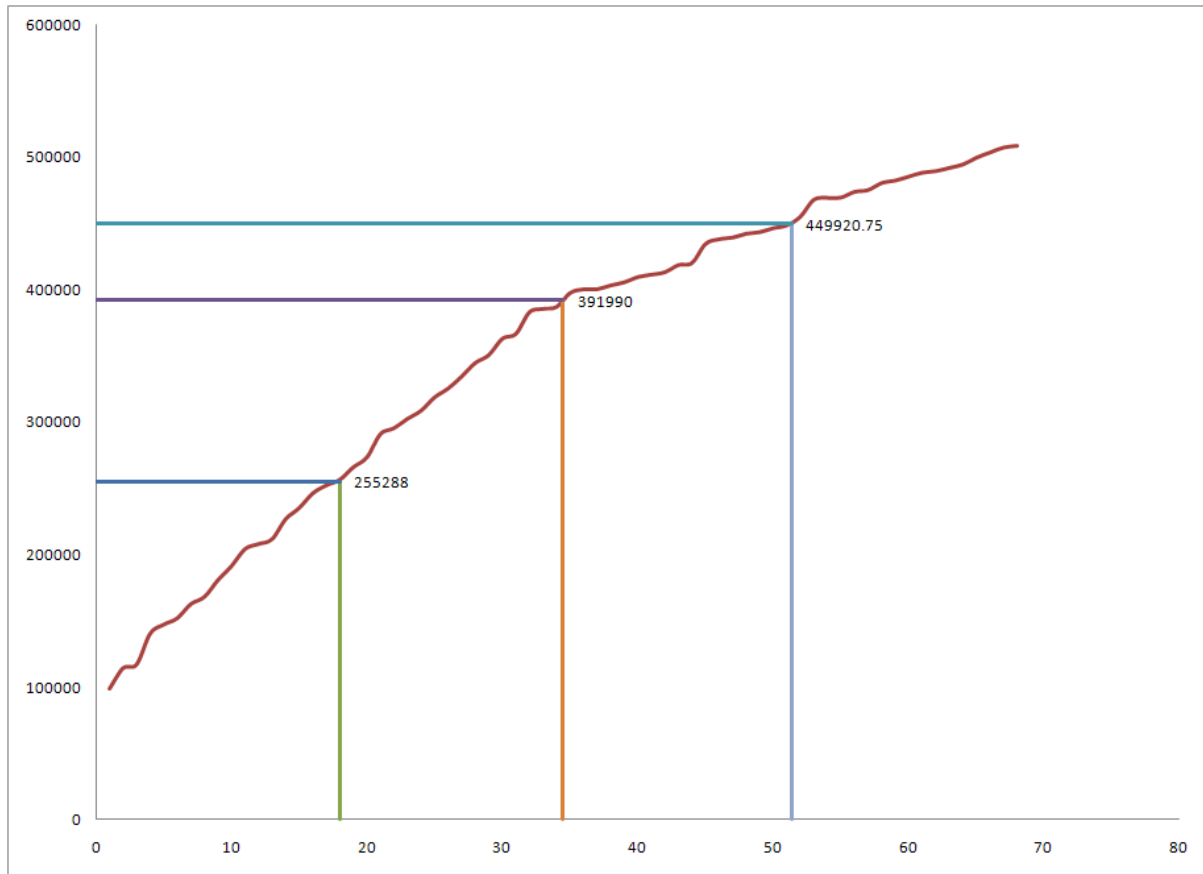


Figure 2. Distribution of jobs in Adelaide metropolitan area based on distance from CBD, 2006

Source: Authors' analysis of *Working Population Profile*, ABS, 2008.

Table 4. Sensitivity of employment distribution

R Square	0.258511787	
	<i>Coefficients</i>	<i>P-value</i>
Intercept	4820.009456	0.014382
Population age 15 and over	0.197802555	0.026359
Distance from city centre	-68.79022933	0.023685

Source: Authors' analysis of *Working Population Profile*, ABS, 2008.

Table 5. Correlation between occupation types and distance from city centre and population, 2006.

No	Occupation type	Distance from city centre	Population 2006
1	Agriculture, forestry & fishing	0.104	0.073
2	Mining	0.052	0.003
3	Manufacturing	0.025	0.017
4	Electricity, gas, water & waste services	0.100	0.000
5	Construction	0.189	0.041
6	Wholesale trade	0.160	0.001
7	Retail trade	0.111	0.084
8	Accommodation & food services	0.069	0.004
9	Transport, postal & warehousing	0.098	0.000
10	Information media & telecommunications	0.077	0.002
11	Financial & insurance services	0.066	0.000
12	Rental, hiring & real estate services	0.110	0.001
13	Professional, scientific & technical services	0.097	0.003
14	Administrative & support services	0.107	0.002
15	Public administration & safety	0.051	0.003
16	Education & training	0.080	0.010
17	Health care & social assistance	0.113	0.009
18	Arts & recreation services	0.077	0.000
19	Other services	0.218	0.022
20	Inadequately described/Not stated	0.173	0.001
21	Total	0.111	0.003

Source: Authors' analysis of *Working Population Profile*, ABS, 2008.