



Cities in Transition: Changing Economic and Technological Processes and Australia's Settlement System

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Contents	Page
Preface	5
Abstract	7
1 Technological change, societal transitions and the changing space economy	7
1.1 Pre-industrial era	7
1.2 Industrial era	7
1.3 Informational era	8
2. Australia's changing urban hierarchy	12
2.1 Population-based indicators	12
2.2 Network-based indicators	12
2.3 Place-based indicators	13
2.3.1 Human capital	13
2.3.2 Urban infrastructure	16
2.4 Economic base	16
2.5 Industry, employment and income	18
3 Intra-metropolitan restructuring	21
3.1 The inner city	21
3.1.1 Re-urbanisation	24
3.2 Suburbanisation, commuting and self-organising urban systems	26
4 Conclusions and reflections	26
4.1 Social polarisation	26
4.2 Winner and loser regions/groups	26
4.2.1 Winners	26
4.2.2 Losers	27
4.2.3 Improving winners	27
4.2.4 Improving losers	27
4.3 Spatial and temporal implications	28
4.4 Future options	28
Endnotes	29
References	30
Appendix 1: Assignment of ASIC industry groups to basic /non-basic	33
Appendix 2: Indices of self-containment for Australia's capital cities	35

List of Figures

Figure 1: Technology transitions and the changing space economy	9
Figure 2: Melbourne's evolving structure	10
Figure 3: Number of people earning over \$50 000 in 1991	20
Figure 4: Percentage of workforce employed in 'producer services'	25
Figure 5: Growth by occupations in the city core and elsewhere from 1981 to 1991	25
Figure 6: Space shrinking impacts of high speed ground transportation	29

List of Tables

Table 1: Transition to an information society	8
Table 2: Employment trends by major industry sector 1954–91: Major urban centres	11
Table 3: Share (%) of international telecommunications activity: Australia's major urban centres	13
Table 4: Spatial concentration of high speed data lines in 1990	14
Table 5: Location of Australia's largest corporations, 1982–90	15
Table 6: Human capital indicators for Australia's major urban centres	16
Table 7: Basic: non-basic ratios for employment by urban region, 1991	17
Table 8: Industry and employment changes to urban Australia	18
Table 9: Actual and adjusted employment growth by industry from 1981 to 1991	19
Table 10: Actual and adjusted employment growth by occupation from 1981 to 1991	20
Table 11: Destination of workforce by industry in 1991 (Australia's major urban areas)	21
Table 12: Growth in the frequency of destinations by industry from 1981 to 1991	22
Table 13: Destination of workforce by occupation in 1991 (Australia's major urban areas)	22
Table 14: Growth in the frequency of destinations by occupation from 1981 to 1991	23
Table 15: Frequency of destinations by income class in 1991	24

Preface

Australia: State of the Environment 1996 (the first ever independent and comprehensive assessment of the state of Australia's environment) was presented to the Commonwealth Environment Minister in 1996. This landmark report, which draws upon the expertise of a broad section of the Australian scientific and technical community, was prepared by seven expert reference groups working under the broad direction of an independent State of the Environment Advisory Council. While preparing the report, the former Department of the Environment, Sport and Territories, on behalf of the reference groups, commissioned a number of specialist technical papers. These have been refereed and are now being published as the State of the Environment Technical Paper Series. Reflecting the theme chapters of the report, the papers relate to human settlements, biodiversity, the atmosphere, land resources, inland waters, estuaries and the sea, and natural and cultural heritage. The topics covered range from air and water quality to sea grasses and historic shipwrecks.

Abstract

During the latter decades of the 20th century there has been an increasingly rapid transformation of cities which will continue into the 21st century. It will ultimately represent a transition at least as profound as that of earlier societal shifts such as that from an agrarian to an industrial society. The present transition is to an informational society. Key drivers, as with previous societal shifts, have been primarily associated with revolutionary technological and economic change—although clearly there are other dynamics at work (see, e.g., Newton and Bell 1996; Birrell et al. 1995).

The focus for this paper is on those technological and economic forces which are impacting upon Australia's settlement system and, in particular, its major cities. In a mature information society it will be possible for a city's economic growth to occur without necessarily being accompanied by population growth. This results from the fact that information-intensive industries, unlike their more labour-intensive counterparts of earlier eras, are not limited in their growth and development by the confines of a local labour market or by a local market catchment area associated with sales.

Following an introductory section which places the current societal transition in historical context, focus shifts to an examination of the changing urban hierarchy within Australia, where cities such as Sydney and Melbourne can be increasingly differentiated from their counterparts in other States in respect of their network-based, as opposed to population or place-based, development. Attention then shifts to a consideration of intrametropolitan restructuring, where a major turnaround can be identified in the concentration of manufacturing versus information (producer services) industries.

1 Technological change, societal transitions and the changing space economy

The major changes in settlement patterns throughout human history have resulted from technological changes and their translation in some cases, via new transportation and communications systems, planning systems, work systems, and so on, into new sets of space relations. This is particularly obvious when focus is upon key societal epochs and their stereotypical characteristics.

1.1 Pre-industrial era

The development of tools for agriculture enabled the first permanent settlements and development of towns. For protection, the settlements were concentrated and often contained within walls, with primary production occurring in the surrounding fields. Movement was by foot and the spatial scale of development was influenced by the distance and time taken to move within the town or to walk to work in

the fields. What manufacturing and service activities there were, were conducted within the settlement and often as cottage industries. Urban form was essentially contained in a residential sense, but dispersed in terms of the bulk of employment location. Infrastructure networks were minimal.

1.2 Industrial era

The industrial revolution caused a major change in urban scale, form, activities and lifestyle, and consequent settlement patterns. The substitution of mechanical force and fossil energies for human labour and craftsmanship led to mass production of goods, a centralised concentration of production activities, and the need for mass transport of the increased labour concentrations involved. There were changes in employment conditions to formal or rigid employment practices. Rail transport enabled the growth of larger cities and their suburbs. In this case employment was concentrated in the city core and residential areas were more dispersed. The city was essentially single-centred with radial, fixed rail

transport reinforcing the concentration of employment in the core.

1.3 Informational era

The development of telecommunications, information technologies and fast transport and the shift to an information economy is producing further changes in scale and form including reversal of certain previous trends. Industries, particularly manufacturing, are moving to the suburbs for increased space and access to arterial roads, freeways, interstate highway networks, transport hubs, component suppliers and low income labour. Services, particularly consumer services, are expanding and following people into the suburbs. Retail activities are also moving to the suburbs. Back offices of larger companies are similarly moving to cheaper space and less congested roads and streets in suburban areas. Some activities such as producer services, which are information intensive services such as those provided by managers, administrators and the professions, are concentrating in the cores of the major cities, with major corporate headquarters and/or offices of overseas firms.

Thus, each industrial transition has seen an increase in urban scale and population, a reversal of urban form (in some instances) and employment location, a change in the dominant transport mode, and a change in the level of formality of employment conditions. These transitions are listed in Table 1, and the associated archetypal spatial forms are represented in Figure 1.

An interesting feature is that the time people are prepared to spend in travelling to and from work has remained essentially invariant throughout. According to Marchetti (1992) it is an instinctive or anthropological human characteristic. With essentially constant travel time budgets (on average, 30 minutes commuting either way between residence and workplace) the size of the city has been influenced by the distance which can be travelled within that time budget. Thus, with each transition, an increase in travel speed has been provided by new technology and this has facilitated an increase in urban scale, with transition from walking city to transit city to automobile city to telematic city. Further substitutions of destination and route as well as mode have helped maintain these travel time budgets as city size has increased.

Table 1: Transition to an information society

Transition factor	Societal transitions		
	Agricultural →	Industrial →	Informational
Industry location	Dispersed	Centralised	Centralised with decentralisation
Industrial process	Handcraft	Mass production	Flexible specialisation
Economic engine	Human muscle	Machines	Human knowledge
Product	Customised	Uniform	Personalised
Work conditions	Informal	Formal	Team
Dominant mode of interaction	Face-to-face	Hierarchical line management	Information networks
Type of information transfer at work	Verbal	Paper	Electronic
Market orientation	Local	National	Global
Commuting pattern	Dispersed	Focussed	Dispersed
Transport network	Minimal grid/ribbon	Radial	Extensive grid
Transport mode	Private, walk	Public rail	Private, car

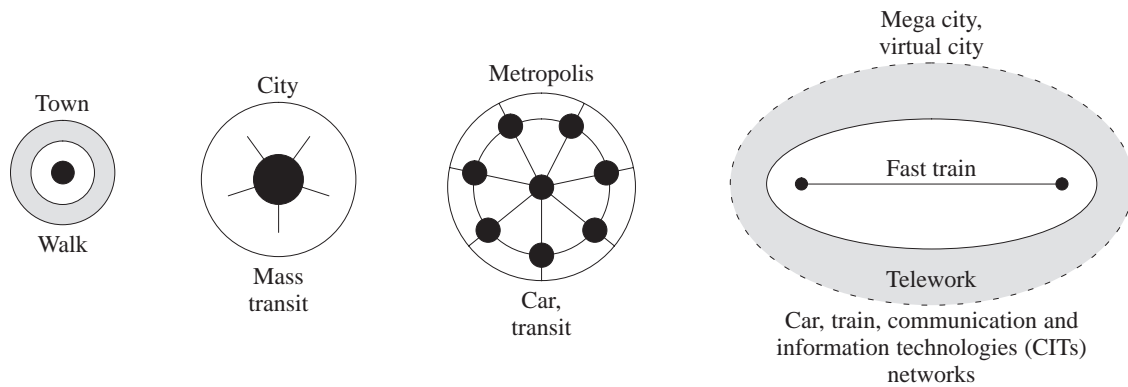


Figure 1: Technology transitions and the changing space economy

Five key global transport infrastructure networks (and their associated secondary networks) can be identified which have led to long periods of economic expansion and urban development. These are (after Richardson 1991): canals (turnpikes), railways (streets), seaports (water, gas, telegraph), highways (electricity, radio, telephone) and airports (telecommunications, computers—an important infrastructure in its own right). The latest era is envisaged to span a period from the 1980s through to the mid- 21st century. Each generation of infrastructure has provided new opportunities for restructuring space. Consequently, they are also associated with distinctive urban forms, all of which are in evidence to a greater or lesser extent in cities such as Sydney and Melbourne (viz, the high density walking city—typically the historic cores of modern cities; the transit city with its radial train and tram networks and associated residential development; the automobile city and its extensive low density suburbs; and the edge cities—the emerging polynucleated structures of the mega cities, where key commercial–industrial nodes emerge to rival the

historic CBDs see Figure 2).

The latest logistical revolution we are now beginning to experience embodies growth in information processing and communication capacity and their convergence; an expansion of the knowledge base; and further improvements to the air transport system. These are the technologies which are fundamental to the continued growth of all sectors of the economy and in particular the information sector.

The increased importance of information to urban and regional economies is evident from the continued growth of the information sector in the economic base of all major metropolitan areas in Australia (Table 2). Their transformation has been one from centres of production and distribution of material goods, to centres of information exchange, service production and consumption as well as manufacturing. The evolution to a service- and information-oriented society should continue to stimulate demands for telecommunications and high-speed transport infrastructures given that information is a key factor in production across all sectors of the economy.



Figure 2: Melbourne’s evolving structure

Melbourne as walking city is restricted primarily to the ‘golden mile’—the dense rectangular set of grids which comprise the present day CBD and an area around which residential reurbanisation has come to be centred in the 1990s. Melbourne as ‘transit city’ is defined by the rail and tram networks which were radial and supported an industrial city where manufacturing was centrally located. The ‘automobile city’ (post 1940) saw residential and industrial development extend in all directions beyond the borders of that part of Melbourne illustrated above. Radial freeways currently link major suburban clusters (viz. Waverley, Dandenong, Doncaster, Keilor—nascent ‘edge’ cities, awaiting the emergence of an orbital road system) with the city centre. In large cities such as Melbourne the multi-modal/information city is emerging where travel times to work from fringe to CBD exceed long established accepted norms. A set of distinct sub-centres begins to emerge, connected into metropolitan, national and global markets via electronic superhighways, but maintaining a large degree of self-sufficiency within their immediate urban region—see Newman et al. (1996).

Table 2: Employment trends by major industry sector 1954–91: Major urban centres

Urban centre	1991 Population ('000)	Industry sector (% persons employed)						Employment to population ratio
		Manufacturing		Services		Information		
		1954	1991	1954	1991	1954	1991	
Sydney	3698	37	14	41	39	20	39	0.44
Melbourne	3153	40	18	39	37	19	37	0.44
Brisbane	1327	28	13	46	40	23	39	0.43
Adelaide	1062	36	15	43	36	18	39	0.43
Perth	1197	25	11	50	40	22	39	0.42
Newcastle	432	41	15	39	40	12	33	0.39
Canberra	315	6	3	34	29	55	60	0.50
Wollongong	239	45	20	34	36	9	33	0.39
Gold Coast	274	13	9	59	50	17	31	0.38
Hobart	185	26	11	46	37	25	43	0.41
Geelong	152	46	22	39	38	12	32	0.39
Townsville	115	23	8	54	40	20	44	0.44
Darwin	77	6	5	48	39	40	46	0.46
Toowoomba	83	25	12	32	41	38	38	0.39
Launceston	94	30	14	49	40	18	34	0.40
Ballarat	82	37	14	41	38	18	40	0.36
Cairns	84	21	8	57	49	16	34	0.43
Australia		28	13	39	38	17	36	0.42

ASIC classification: Information sector (communications, finance, property, business etc., public administration, R&D community services).

Source: Newton (1995).

Indeed, Goddard (1989, cited in Hepworth 1989, p. xvi) argues that it is more appropriate to our understanding of the evolution of industrial activity to recognise that manufacturing and service sectors are becoming increasingly dependent on effective information management. The information sector grows as it services the information production, processing and distribution needs of other sectors as well as generating growth in its own right via the commercialisation of information and communication technologies and their infrastructures. As the Office of Technology Assessment study (1990, p. 112) also notes: ‘...as

productive processes become increasingly complex in advanced industrial societies, the largest reserve of economic opportunities will be in organising and coordinating productive activity through the process of information handling’.

With few exceptions, the trend appears to be that urban centres with a higher than (national) average involvement in the information economy also enjoy higher than average economic health, as measured by the employment to population ratio, recognised as one of the best available measures of economic well-being of a metropolitan area (Drennan 1989).

2. Australia's changing urban hierarchy

The question this raises is whether information-intensive industries are concentrating to a greater extent in some Australian urban centres as compared to others, creating what Moss (1988) terms a new urban hierarchy, where utilisation of new information and communication “infrastructures” are higher than would be expected on the basis of traditional indicators such as population size or number of business establishments.

2.1 Population-based indicators

Concentrations of population reflect those areas which are favoured for any combination of three key factors: their attractiveness as places to live (i.e. amenity), their attractiveness as places to work and their attractiveness as places to visit. To these we must also add, for those for whom locational choice is restricted, places which are attractive for their (lower) cost of living (for a recent discussion of Australian demographic trends see Newton and Bell 1996).

Research by O'Connor and Stimson (1995) suggests that many economic activities no longer rely on a local population base to the same extent as they did in the past. Population and place-based measures of economic performance need to be augmented by interaction and network-based indices. Population and place-based indicators can be most closely aligned to rural industries, many of the lower-skilled and more labour intensive manufacturing industries, personal services (which embrace much of the tourism activity) and social or community services industries. Information-intensive industries, in contrast, are not limited in their growth and development by the confines of a local labour market nor by a local market catchment area.

2.2 Network-based indicators

Modern telecommunications and very high speed transportation (air, rail) have created **global markets** for an increasing range of economic activities, especially those which could be classed as high order producer services (and the high order producer services tend to be located in the major national and

international cities—see Stanback 1995). That is, services can be provided (and billed) by firms in virtually any urban centre in Australia to a customer located on any continent. Likewise, a firm can electronically import the labour it needs from outside its traditional labour market catchment area in order to function effectively and efficiently. Many examples of this are becoming commonplace. They include software engineering, architectural and engineering design services, telemarketing, media services (e.g. writers, editors etc.), financial and insurance services, legal and accounting services, telemedicine, open education and learning and so on—in short, virtually any ‘symbolic analyst’ class of activity. Consequently, **a city may now have economic growth without necessarily having population growth.** This occurs primarily through transport and communications networks and their utilisation by a region's population.

Given that there is now universal access, at least within Australia's urban centres, to a wide range of ‘mature’ telecommunication products and services (e.g. the public switched telephone network and its related voice and data services, cellular mobile, ISDN, international direct dial etc.) it is important to explore whether there exists any spatial variation in patterns of utilisation of such telematic and network services. Research undertaken by Newton (1991, 1995) reveals that several of Australia's urban centres have levels of utilisation well above that which might be expected on the basis of their size of population or business base alone (see Table 3). For example, Sydney generates by far the greatest volume of international communications, with an almost 50% share of business traffic among the top 20 cities. Melbourne, Cairns and the Gold Coast are the only other cities which have a share equal to or above that which their location in the urban hierarchy would suggest. (The concentration of business traffic from Cairns and the Gold Coast could be tourism-based.) This reflects a concentration of information-intensive industries and information workers in these regions as well as globally-oriented economic activity.

The current pattern of demand for high speed data networks is also centred most strongly in Sydney and Melbourne (see Table 4).

Table 3: Share (%) of international telecommunications activity: Australia's major urban centres

Urban centre	Population share (1991)	Outgoing business IDD share (1992)
Sydney	28.3	46.3
Melbourne	25.2	25.9
Brisbane	10.4	7.0
Perth	9.3	8.4
Adelaide	8.7	4.1
Canberra	2.5	1.9
Newcastle	2.4	0.5
Gold Coast	2.1	2.2
Wollongong	1.9	0.3
Central Coast (NSW)	1.8	0.3
Hobart	1.2	0.4
Geelong	1.2	0.5
Townsville–Thuringowa	0.9	0.3
Toowoomba	0.7	0.1
Darwin	0.6	0.5
Launceston	0.6	0.1
Ballarat	0.6	0.1
Cairns	0.6	1.0
Bendigo	0.5	0.1
Rockhampton	0.5	0.1
Total	100.0	100.0

Source: Newton (1995).

The higher concentrations found outside the central cores in Sydney and Melbourne reflect the existence

of suburban concentrations of information-intensive industry not evident to the same degree in the other State capitals (discussed in a subsequent section). The CBD concentrations in all States reflect the telecommunications intensity demanded of head-office control functions associated with the locations of Australia's top corporate headquarters and government departments (see Table 5) and the associated high level producer services.

There appears to be some evidence in the USA that information and communication technologies (ICTs/CITs) are changing the face of national settlement systems (Moss 1988), yet in the UK they appear to be reinforcing the old order (Goddard 1990). In Australia, ICTs appear to be producing a possible bifurcation in Australia's urban hierarchy, when other than traditional population or place-based measures are used as indicators. There are clear signs that Sydney is assuming world city status—harnessing information and computer technologies to comparative advantage as well as being the key international gateway for airline traffic (Newton 1995; O'Connor 1995). Melbourne is struggling to keep pace with Sydney, yet is clearly in second place and is maintaining its ascendancy over the remaining capital cities.

2.3 Place-based indicators

A variety of place-based indicators, other than population and employment, can be employed to assess the ranking or 'performance' of an urban centre. For the most part they relate to either physical capital (urban infrastructure) or human capital indicators. Together they help define the economic base of an urban centre.

2.3.1 Human capital

Research undertaken in Australia (e.g. Willoughby 1995; McKinsey 1994) and overseas (Maillat 1991; Saxenian 1991) highlights the increasing significance of human capital, and more widely the innovative milieu of a region, to its economic competitiveness and well-being.

Table 4: Spatial concentration of high speed data lines 1990

Locality	Number of services/ lines	Percent of State total	High speed lines* (% of total)	Share of business establishments (%)
NSW			46.1	35.5
Sydney CBD	1819	46		
Remainder Sydney	1989	50		
Remainder NSW	169	4		
Total	3977			
ACT	531			
Victoria			33.5	25.8
Melbourne CBD	1943	59		
Remainder Melbourne	1288	39		
Remainder Victoria	48	2		
Total	3279			
Queensland			6.3	18.2
Brisbane CBD	455	74		
Remainder Brisbane	125	20		
Remainder Queensland	37	6		
Total	617			
WA			7.0	8.8
Perth CBD	548	80		
Remainder Perth	91	13		
Remainder WA	44	7		
Total	683			
SA			6.8	8.9
Adelaide CBD	525	78		
Remainder Adelaide	130	19		
Remainder SA	15	3		
Total	670			
Tasmania			0.3	2.8
Hobart CBD	17	50		
Remainder Hobart	2	6		
Remainder Tasmania	15	44		
Total	34			
Australia Total	9791			

Note: * Lines operating at 48 Kbps and 2 Mbps.

Source: Telecom Australia.

Table 5: Location of Australia's largest corporations, 1982–90

Location	Distribution of headquarters (per cent)			
	Top 500 companies		Top 100 companies	
	1982	1990	1982	1990
Sydney	46.0	45.6	52.0	54.0
Melbourne	31.8	28.6	40.0	33.0
Brisbane	5.4	6.8	4.0	3.0
Adelaide	6.0	6.4	2.0	4.0
Perth	5.0	6.6	1.0	4.0
Newcastle	0.2	0.2		
Canberra	0.6	0.6	1.0	
Wollongong		0.2		
Gold Coast		0.4		
Hobart	0.6	0.6		
Geelong				
Townsville	0.2			
Darwin		0.4		
Toowoomba		0.2		
Launceston	0.2	0.2		
Ballarat				
Cairns				
Rockhampton				
Bendigo	0.2			
Other urban centres	1.0	1.6		
Overseas		0.6		2.0
Location not identified	2.8	1.0		
Total Australia	100.0	100.0	100.0	100.0

Source: Australian Business; Riddell's *The Business Who's Who of Australia* (1990).

Two indicators are employed here to assess the human capital of Australia's major urban areas (Table 6). The first assesses the capacity of the population for engaging in that class of work classed by Reich (1992) as symbolic analyst (or producer services) activities—essentially the information-intensive jobs, be they in manufacturing, public service, construction, finance etc. The *Index of Education and*

Occupation classifies communities on the basis of their citizens' level of educational achievement and class of work. An urban centre with a high score on this index would have a high concentration of persons with higher education or undergoing further education, with people being employed in the higher-skilled occupations rather than being labourers or unemployed.

Table 6: Human capital indicators for Australia's major urban centres

Urban centre	Index of economic resources	Index of education and occupation
Sydney	1060	1042
Melbourne	1044	1036
Brisbane	1021	1007
Perth	1030	1012
Adelaide	999	1008
Newcastle–Hunter	994	964
Canberra	1113	1145
Wollongong–Illawarra	990	981
Hobart	984	1016
Gold Coast–Moreton	980	953
Geelong–Barwon	989	994

Note: The *Index of Economic Resources* reflects the income and expenditure of families in an area (e.g. income, rent, home ownership) as well as non-income assets such as dwelling size and number of cars. The *Index of Education and Occupation* classifies communities on the basis of levels of educational achievement and class of work. Each Index has been designed to have a national average of 1000 and a standard deviation of 100.

Source: Australian Bureau of Statistics (ABS) (1994).

The first index, that of economic resources, reflects the income as well as non-income assets of households in a region. In a sense it reflects the relative opportunities that residents of particular areas have, via their level of economic well-being, to pursue activities which require purchase of such things as education, and new skills, new (and relatively expensive) information and communication technologies, and the relative freedom to explore their applications in new and interesting ways.

Together, the two indices provide a powerful indicator of the 'strength' of human capital in a region and the abilities of a population to **utilise** the resources (natural, technical infrastructure, etc.) of their region to advantage.

For the most part, the indices reveal that there are only five cities with above (national) average levels of human capital, headed by Canberra and followed by

the four largest cities. Sydney and Melbourne are distinguished with strong showings on both indices, whereas Brisbane and Perth have a relatively lower human skills base compared to their economic resources base. This can be expected to be reflected in the types of industry attracted to the various capital cities, with Sydney, Melbourne and Canberra being better placed, other things being equal, to attract the information-based, knowledge-intensive activities compared with the other urban centres¹.

2.3.2 Urban infrastructure

The availability of suitable, economically priced floorspace is another key factor in the ability of urban centres to compete with one another for the location of business. The ability of private developers to forecast future demand has often been lacking and is reflected in periods of boom and bust (undersupply/oversupply) in capital city office construction in particular. State governments also play an often contentious role in supporting the construction of new office buildings via their role as major consumers of CBD floorspace². Taking a 15-year perspective, O'Connor (1994) has documented the pattern of construction of new office and new factory space in each State, revealing the continued dominance of NSW and Victoria (Sydney and Melbourne). Only in relation to hotel construction does Queensland reveal its strength, underpinned as it is by growth in tourism.

2.4 Economic base

Economic base analysis has been developed as an indicator of that proportion of a city or region's economic activity that is 'exported' to customers located outside their region. Some regional economists (see Goodall 1972, p. 238) have argued that the 'basic' or 'export' industries (see Appendix 1) are fundamental to the growth of urban areas:

..... the current growth rate of an urban area is explained more by export sector growth than any other single factor. Export activities provide a means of payment for goods and services an urban area cannot produce for itself. Some export industry is necessary in every urban area to pay for the foodstuffs that must be imported. Export activities also support service activities, the latter forming the endogenous sector of the urban economy.

Almost a quarter century later, the growth of a services economy—where households are

increasingly ‘contracting out’ more services such as cleaning, cooking, gardening, child care, and personal care, where export-oriented firms are concentrating increasingly on their ‘core’ business and contracting out services, where there has been a boom in tourism (both domestic and international), creating a demand for ‘local’ personal services, and where State welfare is providing a much more significant contribution to a region’s income than, say, in the 1950s and 1960s—has necessarily changed the significance attached to basic: non-basic ratios as an indicator of a region’s economic performance. Nonetheless, the analysis of 1991 Census data for Australia’s major urban centres is revealing, and confirms other, independent indicators discussed earlier (see

Table 7). Only three Australian cities have basic: non-basic ratios greater than unity. Of these Canberra is highest, as befits its nation-serving role. Sydney and Melbourne have similar ratios, reflecting their key roles in both the national and global economies. Among the lowest ratios are Gold Coast (0.53) whose industry base is primarily oriented towards serving the needs of the ‘local’ population, albeit being boosted by tourism³. Cairns’s basic/non-basic ratio likewise is low. The smaller provincial cities of Ballarat, Bendigo and Rockhampton have low levels of ‘basic’ activity, indicating that their economies are concerned primarily with serving the immediate hinterland.

Table 7: Basic: non-basic ratios for employment by urban region, 1991

Region	Proportion of workforce employed in non-basic industries ^(a)	Proportion of workforce employed in basic industries ^(b)	Basic/non basic ratio
Sydney SD	0.49	0.51	1.05
Melbourne SD	0.49	0.51	1.05
Brisbane SD	0.53	0.47	0.89
Perth SD	0.54	0.46	0.84
Adelaide SD	0.53	0.47	0.90
Newcastle SSD	0.53	0.47	0.88
Canberra SD	0.43	0.57	1.35
Wollongong SSD	0.50	0.50	1.00
Greater Hobart SD	0.55	0.45	0.82
Gold Coast City SSD	0.65	0.35	0.53
Geelong SSD	0.54	0.46	0.87
Townsville/Thuringowa SSD	0.55	0.45	0.83
Cairns SSD	0.60	0.40	0.68
Greater Launceston SSD	0.57	0.43	0.75
Darwin SD	0.52	0.48	0.90
Ballarat SSD	0.62	0.38	0.60
Rockhampton SSD	0.61	0.39	0.64
Bendigo SSD	0.62	0.38	0.61

a. Relates to the class of industries which predominantly serve the needs of local industries or populations.

b. Relates to industries where goods or services are created in one region for consumption or use in another.

Table 8: Industry and employment changes to urban Australia

Employment category	Employment 1981	Employment 1991	Absolute growth	Percentage growth
Extractive industries	50 925	49 377	-1 548	-3.0
Transformative industries	1 017 906	914 015	-103 891	-10.2
Distributive industries	927 646	1 115 941	188 295	20.3
Producer services	369 942	560 046	190 104	51.4
Social services	743 078	969 171	226 093	30.4
Personal services	176 978	276 362	99 384	36.0
Total	3 286 475	3 884 912	598 437	18.2

Source: Gipps et al. (1997).

A related study which compared Sydney and Melbourne with south-east Queensland (Birrell et al. 1995) across a range of demographic, social and economic indicators (e.g. incomes; social security beneficiaries; industry of employment; construction activity; population profile) concluded that:

There appears to be no positive relationship between population-induced city growth and either per capita affluence or the advance of internationally competitive industries in the three urban areas under discussion. The recent slow-down in Sydney's population growth to 0.6 per cent per annum between 1991–1994 (compared with 2.9 per cent in SEQ) appears to have had no negative effects on Sydney's advance as the locus of internationally-competitive activities. This implies that international competitiveness and increased affluence appear to be decoupled from population growth. (p. 60).

2.5 Industry, employment and income

One of the corollaries of the transition from an industrial to an informational society is that the dominant new technologies—information and communication—are providing opportunities for the growth of new classes of work (occupation) and new

businesses (industries). Foremost among these are what Reich (1993) has termed the symbolic analysts, who trade in the manipulation of information in its various forms (data, words, aural and visual). They have been referred to by others as information intensive services or producer services, and embrace occupations such as managers, administrators and professionals.

It is this class of work that has grown most rapidly within Australia's urban areas over the decade 1981–1991 (see Table 8); namely an over 50% increase, compared with declines in the 'blue collar' jobs. The financial remuneration associated with the symbolic analysts is typically superior to that of the routine and in-person service workers in industry segments classed as extractive (agriculture, mining etc.), transformative (construction, manufacturing etc.), distributive (transport, retailing etc.), social services and personal services.

Table 9 reveals the shifts that have taken place in employment⁴ by industry, across Australia's major capital cities between 1981 and 1991. Each 'cell' in Table 9 contains a second number, which is the difference between the actual employment for that occupational group in the city concerned and an expected employment level.

Table 9: Actual and adjusted employment growth by industry from 1981 to 1991

Industry sector	Brisbane	Sydney	Melbourne	Adelaide	Perth	Total actual employment growth
Extractive	67	-2829	-1573	-2005	2383	-3957
	-643	-526	583	-1605	2191	
Transformative	7 674	-74972	-81 182	-14440	-4479	-167 399
	6 985	407	-12 159	2896	1871	
Distributive	36 788	32692	42037	6318	20137	137 972
	-3 770	1428	16224	-8528	-5354	
Producer services	27 615	68400	52445	17101	18434	183 995
	-6 158	11462	2672	-2422	-5554	
Social services	47 516	53756	51454	20652	31564	204 942
	2 341	-3993	1725	-1196	1123	
Personal services	18 397	28314	24821	9788	12946	94 266
	1 221	-952	-775	-213	719	
Not classifiable	16 093	16161	12571	19637	16140	80 602
	25	-7826	-8271	11067	5004	
Total actual employment growth	154 150	121 522	100 573	57 051	97 125	530 421

Note: The upper number in each cell is the actual growth for the combination of industry and city. The lower number is the actual growth less a reference value, which adjusts for the growth of the city and changes in overall employment in that industry group from 1981 to 1991.

Source: Gipps et al. (1997).

This adjusted or expected employment level relates to the share of employment which a city could anticipate having based on the size of the city and the employment in that occupational group over all cities combined. If actual employment is greater than the expected value then the occupational/employment group is relatively more common in that city. If actual employment is less than the expected value then the occupational group is under-represented in that city. The industry sectors to have lost employment across the five major cities are the extractive and transformative sectors—primarily the latter. Melbourne, with a larger manufacturing base than the other cities (also, see Table 2), has been hardest hit

from the latest recession, shedding more jobs in both absolute and relative terms. The positive growth in Brisbane's transformative sector is primarily due to the high level of construction activity, linked to the high rate of population growth in south-eastern Queensland. Of major significance is the disproportionate share of growth in distributive and producer services employment captured by Sydney and Melbourne at the expense of the other capitals. This provides yet further evidence that **Sydney and Melbourne constitute the principal engines of the national economy**—and is reflected in the relative variations in income distribution between the capital cities (see Figure 3).

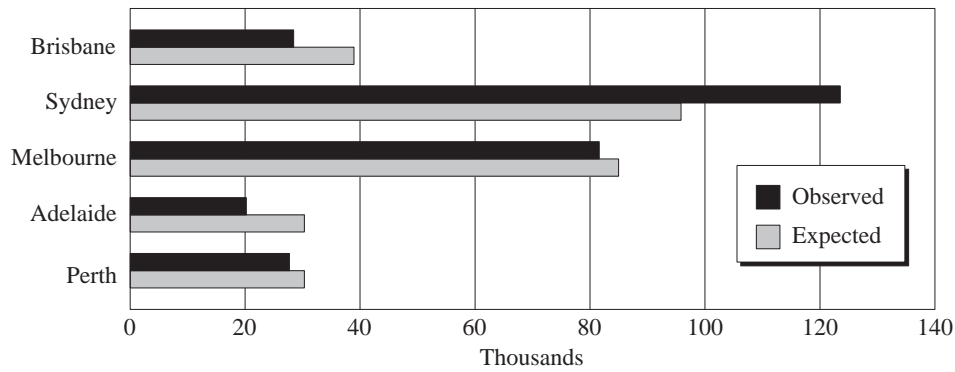


Figure 3: Number of people earning over \$50 000 in 1991

Source: Gipps et al. (1997).

Data presented in Table 10 continue to build this picture. Firstly, at a national level there is substantial loss of jobs in what could be classed as the ‘industrial’ sector—tradespersons, as well as equipment operators, drivers and labourers. By comparison, job growth has been concentrated most strongly in the information-intensive segments of the labour market, the managers, professionals and paraprofessionals,

the jobs associated with the ‘cognitive elite’ within contemporary society (Herrnstein and Murray 1994)—the best educated, the best paid. And it is here, yet again, that Sydney and Melbourne capture the largest share of growth in the jobs which direct the levers of change in the modern economy—the managers, administrators and professionals.

Table 10: Actual and adjusted employment growth by occupation from 1981 to 1991

Occupation sector	Brisbane	Sydney	Melbourne	Adelaide	Perth	Total actual employment growth
Managers, administrators & professionals	65 622 -2 450	145 587 20 255	120 607 10 615	27 391 -14 408	35 284 -14 011	394 491
Para-professionals	18 504 -307	32 443 -1 233	30 710 1 191	9 964 -1 365	15 251 1 714	106 872
Tradespersons	-6 068 -4 808	-47 096 3 655	-43 320 3 032	-12 856 -861	-6 258 -1 018	-115 598
Clerks, sales & personal services	44 085 1 323	11 341 -10 523	18 770 1 711	16 685 3 604	29 771 3 886	120 652
Operators, drivers, labourers & related	12 289 7 166	-54 867 -5 934	-59 550 -14 421	-3 364 7 014	4 669 6 175	-100 823
Not stated	19 718 -923	34 114 -6 219	33 356 -2 128	19 231 6 017	18 408 3 253	124 827
Total actual employment growth	154 150	121 522	100 573	57 051	97 125	530 421

Note: The upper number in each cell is the actual growth for the combination of occupation and city. The lower number is the actual growth less a reference value, which adjusts for the growth of the city and changes in overall employment in that occupational group from 1981 to 1991.

Source: Gipps et al. (1997).

Table 11: Destination of workforce by industry in 1991 (Australia's major urban areas)

Industry sector	Worked at home	City core	Local area	Other metropolitan	Total actual work trips to all destinations
Extractive	12747 10828	7379 -6038	18020 3067	11231 -7856	49377
Transformative	36305 774	145440 -102922	303670 26868	428600 75280	914015
Distributive	33090 -10290	254207 -49024	361956 24002	466688 35312	1115941
Producer services	33423 11652	259631 107451	111992 -57614	155000 -61490	560046
Social services	20634 -17041	304950 41600	285310 -8196	358277 -16364	969171
Personal services	14820 4077	84028 8933	95567 11873	81947 -24883	276362
Total actual work trips for each destination	151019	1055635	1176515	1501743	3884912

Note: The upper number in each cell is the observed number of journey to work trips made to that destination by workers in the industry concerned in 1991. The lower number is the observed number of trips less an expected value, which adjusts for the growth of the industry group and changes in overall trips to that generic destination across all cities from 1981 to 1991.

Source: Gipps et al. (1997).

3 Intra-metropolitan restructuring

In the sections which follow we present empirical evidence related to recent changes in the distribution of economic activity within Australian cities. In a search for generic trends related to metropolitan restructuring, data are aggregated across all Australian capital cities, permitting sub-system analyses to be undertaken in relation to key spatial units such as city and suburbs, home, local area, core, etc.

3.1 The inner city

Perhaps the most striking change over the decade 1981 to 1991 has been the growth of producer services (again, see Table 9)—finance, property and business services—and their capacity to select the most favourable locations in the cores of the major cities (Tables 11 and 12). One attraction is the location of company headquarters and regional offices of overseas-based firms in these centres. Another is the presence of major nodes on international networks

and yet another is the quality of environment and urban amenity for the attraction and retention of a highly skilled and highly paid work force.

Only about 30% or less of jobs remain in the central city and these are increasingly in corporate centres, producer services or personal services—and government. In these central cores the numbers of managers, professionals and paraprofessionals (and women workers) are increasing and other occupational groups are decreasing (Tables 13 and 14).

The importance of physical propinquity for the higher order producer services firms is due to the fact that they are primarily involved in undertaking non-routine work for a range of corporate clients, who tend to be inner-city based (refer to case studies of corporate–producer services linkages in Melbourne; Newton 1995). Under these circumstances, face-to-face contact retains its importance in conceptualising, refining, interacting and reporting on key accounts.

Table 12: Growth in the frequency of destinations by industry from 1981 to 1991

Industry sector	Worked at home	City core	Local area	Other metropolitan	Total actual growth in work trips to all destinations
Extractive	-6374	384	2708	1734	-1548
	-6291	3092	2583	616	
Transformative	7766	-80047	-28124	-3486	-103891
	12257	-6087	-8539	2370	
Distributive	2197	-31960	90608	127450	188295
	-4711	-41450	22760	23401	
Producer services	13009	60212	45104	71779	190104
	5783	25175	-16784	-14174	
Social services	4232	41856	67914	112091	226093
	-4227	13803	-9227	-349	
Personal services	974	24521	41370	32519	99384
	-2811	5466	9207	-11863	
Total actual growth in work trips for each destination	21804	14966	219580	342087	598437

Note: The upper number in each cell is the observed growth for the industry and destination over the decade. The lower number is the observed growth less an expected value, which adjusts for the growth of the industry class and changes in overall trips to that generic destination across all cities from 1981 to 1991.

Source: Gipps et al. (1997).

Table 13: Destination of workforce by occupation in 1991 (Australia's major urban areas)

Occupation sector	Worked at home	City core	Local area	Other metropolitan	Total actual work trips to all destinations
Managers, administrators & professionals	61463	329450	229622	380239	1000774
	21190	58306	-73700	-5796	
Para-professionals	4103	97297	67234	119246	287880
	-7482	19301	-20019	8200	
Tradespersons	15126	90396	198558	234564	538644
	-6550	-55541	35302	26789	
Clerks, sales & personal services	60836	398238	389363	453474	1301911
	8445	45506	-5230	-48720	
Operators, drivers, labourers & related	14188	132997	288021	305083	740289
	-15603	-67572	63648	19527	
Total actual work trips for each destination	155716	1048378	1172798	1492606	3869498

Note: The upper number in each cell is the observed number of trips made to that each day by workers in the occupational group concerned in 1991. The lower number is the observed number of trips less an expected value, which adjusts for the growth of the occupational group and changes in overall trips to that generic destination across all cities from 1981 to 1991.

Source: Gipps et al. (1997).

Table 14: Growth in the frequency of destinations by occupation from 1981 to 1991

Occupation sector	Worked at home	City core	Local area	Other metropolitan	Total actual growth in work trips to all destinations
Managers, administrators & professionals	15721 -52	126448 46113	91547 -35619	162125 -10441	395841
Para-professionals	1602 -2652	27253 6352	24462 -10079	53548 6379	106865
Tradespersons	1970 4833	-47919 -2744	-2986 10195	-18318 -12284	-67253
Clerks, sales & personal services	6481 597	-63343 -53869	93575 33374	116871 19898	153584
Operators, drivers, labourers & related	-4302 -2726	-39573 4148	971 2130	8703 -3552	-34201
Total actual growth in work trips to each destination	21472	2866	207569	322929	554836

Source: Gipps et al. (1997).

Note: The upper number in each cell is the observed growth for the occupation and destination over the time period. The lower number is the observed growth less an expected value, which adjusts for the growth of the occupational group and changes in overall trips to that generic destination across all cities from 1981 to 1991.

Clerks, sales and personal services are the next most central occupation groups and operators, drivers, labourers and tradespersons are substantially more dispersed, for example, in the middle and outer suburbs and growth corridors. However, the spectrum is narrower than for industry classes, reflecting the mix of occupation groups in each industry class.

Managers/administrators and professionals and paraprofessionals also had large increases in employment growth over the decade; clerks etc. grew and operators declined, but were more stable, and tradespersons reduced substantially in numbers.

There is a very significant spatial variation in relation to income by job location (Table 15). The highest income jobs (over \$50000) are the most centrally located. Each succeeding lower-income job class is located at an increasing mean distance from the city centre so that mean incomes decrease with distance

from the city centre.

Over the decade 1981–91, including the period 1986–91, the number of people residing in the inner city declined, largely as a result of smaller household size. There is evidence, however, that this population decline has been arrested and a gain has occurred in some inner areas over the last year of this period, and the gain has continued since that time (Newman et al. 1996). Certainly, inner city housing development has seen strong growth in this period although it may now be in over supply—in Melbourne at least—in the short term. This growth is a trend that could continue with the changing economic base of central cities, changing household size and composition and demographic change, leading to a better balance of jobs and workers in the inner city and the potential for a greater level of self-containment of commuting and other trips. (Self-containment relates to the proportion of the population who live and work in the same area.)

Table 15: Frequency of destinations by income class in 1991

Income class	Worked at home	Local area	Other metropolitan	City core	Other/not stated	Total actual work trips to all destinations
Over \$50000	7970 -2245	40936 -33708	95895 -2170	109882 43137	21084 -8010	275767
\$30001-\$50000	20232 -15056	194806 -63043	371928 33173	293940 63375	71705 -28798	952611
\$16001-\$30000	50537 -19626	517374 4688	694460 20909	457576 -0860	174144 -25687	1894091
Less than \$16000	77484 35355	405798 97956	321389 -83045	183619 -91649	149017 29028	1137307
Not stated	6687 1572	31483 -5893	32460 -16643	19418 -14003	48035 33467	138083
Total actual work trips for each destination	162910	1190397	1516132	1064435	463985	4397859

Source: Gipps et al. (1997).

Note: The upper number in each cell is the observed change for income and destination over the time period, and the lower is the discrepancy with the growth that would be expected in the absence of any interaction between income and destination.

3.1.1 Re-urbanisation

The most specialised urban activities, producer services and corporate control, are paying the highest incomes and the highest rents and appear to be attracted to central city locations (although even here, selectivity is evident). Consumer services, on the other hand, appear to be attracted to their markets, these are following people into the suburbs and locating largely in suburban centres and edge cities.

Manufacturing (particularly the larger plants), on the other hand, has had its specialised service activities largely outsourced and corporate control separated from the routine, automated and largely deskilled production processes. These routine processes are seeking locations with low factor costs, that is, low land costs at the urban periphery with access to arterial and ring roads, interstate highways, other (supplier) manufacturing centres, and transport hubs and gateways.

Government policy of consolidation or containment may have the effect of increasing these factor costs by increasing land prices; and reducing available sites

for routine production processes, for innovative milieux, and for innovative, integrated residential, commercial, recreational and environmental areas which would be attractive to non-routine new information and knowledge-based activities and skilled personnel.

While most new home construction is at the periphery of urban development, there has been significant redevelopment activity both in the urban core and in inner and middle suburbs—particularly in the 1990s (as outlined above). Higher density developments in outer suburbs are also beginning in some areas but in a fragmented manner. In line with the higher incomes near the centres of cities the residential developments in these areas also cater largely for these high-income groups.

City core destination jobs are increasingly being occupied by managers, professionals, and paraprofessionals. Use of public transport by these groups—with core destinations—is also increasing. However, city core destinations are decreasing for all other groups. Use of public transport is also decreasing for all other groups.

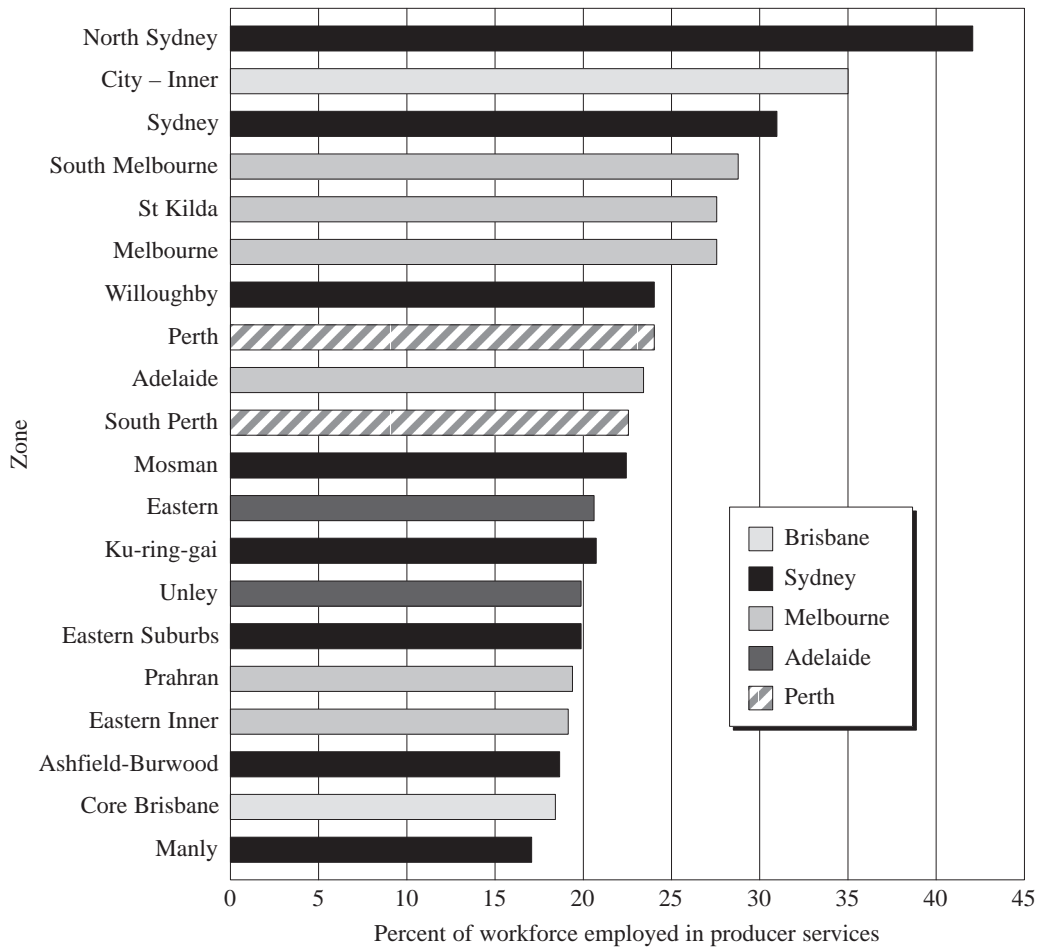


Figure 4: Percentage of workforce employed in 'producer services'

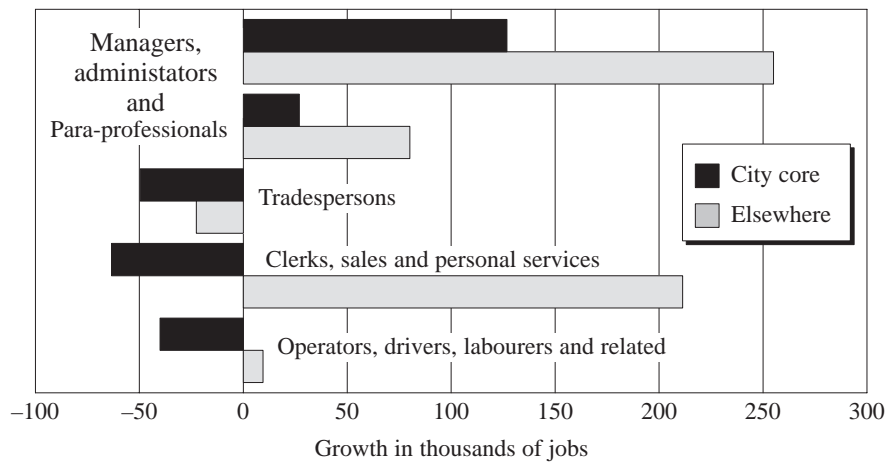


Figure 5: Growth by occupations in the city core and elsewhere from 1981 to 1991

3.2 Suburbanisation, commuting and self-organising urban systems

The increasing number of suburban employment destinations is another feature of the past 10–15 years. Over 70% of jobs are now in the suburbs and many commuting trips have both origin and destination in the same zone.

The degree of self-containment of commuting in the various areas in terms of residential location and also in terms of employment location is shown in Appendix 2. Discrete outer areas such as Geelong and Gosford Wyong are highly self-contained on both measures. Inner areas with high job densities are highly self-contained in terms of residences but not in terms of jobs. In general it is the outer areas which are most self-contained. This means that they tend to operate as a cluster of single-centred cities whereas the middle and inner suburbs tend to operate more as multi-centred cities with the CBD the main attraction in the inner areas and core. Thus the pattern changes from dominantly single-centred to multi-centred to a cluster of single centres with distance from the CBD.

4 Conclusions and reflections

4.1 Social polarisation

The industrial changes outlined above, including the impacts of new information and communication technologies, have had two paradoxical effects. At the national level there has been a levelling of income between cities with the increasing integration of production and distribution with information and communication technologies; and the wider spatial organisation of activities and markets that this has created. Comparison of household expenditure surveys (Gipps et al. 1996) shows that apparent income differentials between cities have reduced to about half what they were a decade or two ago. On the other hand, within cities, income differentials have increased as a consequence of the industrial changes outlined above.

As well, there has been an increase in specialisation of activities of the innovative, non-routine type: corporate control, producer services, industrial design and R & D, that is, the knowledge-based activities commanding high incomes and high amenity environments.

Routine activities have been largely automated or deskilled with the introduction of information technologies into the process (flexible specialisation, production and distribution on demand, etc.). Thus, the labour- and skill-intensive manufacturing tasks have been replaced with low-skill work or abolished altogether, resulting in job loss.

The growth in service industries of the ‘high touch’ type—tourism, accommodation, eating out, entertainment, recreation—has provided service jobs to compensate in part for the loss of skilled blue-collar jobs, but the incomes offered in this sector are substantially lower.

There has been similar job loss in middle management with lack of suitable compensating employment and incomes.

As a consequence there is an increasing polarisation of incomes between the (high tech) non-routine knowledge-intensive information industries on one hand and the (high touch) routine, service and remaining manufacturing tasks on the other. The resulting employment and income differentials, their increases over the decade, and their spatial locations over the metropolitan area are described in a report and thesis by Gregory and Hunter (1995) and Raskell (1995). Thus, whereas income differentials between cities have halved over a period of a decade and a half, the income differentials within the metropolitan area have increased accordingly over a similar period.

4.2 Winner and loser regions/groups

4.2.1 Winners

In the transition to an information-based economy operating on global networks of telecommunications and fast transport, the major concentrations of activity are at nodes of this network. Thus the winners are firstly the global cities at global network nodes, such as New York, Tokyo and London, and also the regional or national cities at the next level in the hierarchy of nodes, and this includes Sydney as well as Singapore, Hong Kong, Los Angeles, and San Francisco. Within Australia, the other major mainland capital cities, and particularly Melbourne, are also winning in terms of attraction of company headquarters or the higher-level producer services with higher income jobs.

These global and regional or national cities at global network nodes are more likely to be successful if they

have high urban amenities and quality environments to attract both the specialist service activities and their skilled work forces. The presence of knowledge centres—R & D and universities—are a further attraction to these areas for new and innovative technology-based industries.

Thus the winners in the sense of capacity to choose the best location within and between cities are the producer services, particularly the most specialised, serving company headquarters and offices of overseas firms. These company headquarters and national offices of overseas firms are further winners, along with their high income staff. Managers, professionals and paraprofessionals are well represented among their staff. Males are over-represented among these high income earners, but females are increasing in numbers, including in the central city. Central city workers have the highest incomes and access to radial public transport and to high-amenity inner-city residential locations. Specialist skilled workers and knowledge workers are among the better off group.

4.2.2 Losers

Among the losers from the viewpoint of (less) income and access to specialised services are smaller towns, inland cities (except Canberra) and smaller cities. Also losing are the suppliers of labour and materials to manufacturing industries which are now producing with a smaller workforce and less material input, but utilising information technology and producing a wider variety of products with less waste and emissions, that is, leaner and cleaner and with higher quality products. Blue collar workers, unskilled and semi-skilled, operators and tradespersons, are in less demand—about a 15% reduction over the decade 1981–91. The ‘high touch’ service activities such as accommodation, tourism, etc. also provide comparatively lower-paid jobs.

The unemployed and under-employed are further losers in the restructuring of Australian industry, along with those forced into early retirement through this process. The rural areas are also suffering from more competition in markets which are increasingly global in nature, from climate variability and from inefficiency of port operations.

4.2.3 Improving winners

Among those apparently gaining most from the transition to an information economy are producer services where employment has increased by over 50% over the decade, and firms have located in the most accessible positions in the city. Personal services have grown even faster but from a smaller base and reflect lifestyle changes over the period. Among occupations, numbers of managers, professionals and paraprofessionals have increased substantially, over 50% in the decade, although there is a possibility that some people’s classifications have changed with the outsourcing of service activities and down-sizing of larger firms. Some such changes may also have occurred after 1991.

Information and knowledge workers and their industries have generally gained from the transition to an information-based economy. Private transport has gained from the dispersal of jobs from the central city and from public transport nodes.

4.2.4 Improving losers

Female workers have increased in numbers with the shift to an information and knowledge-based society but their participation rates and particularly their incomes are still substantially below those of males. Their time commitment is also apparently higher as indicated from their smaller commuting time budgets (Gipps et al. 1997).

Coastal towns, particularly in resort areas, are enjoying higher population growth rates but much of this growth involves the retired and unemployed making moves on the ‘consumption’ grounds of lower living costs, warmer climates and more pleasant environments, not accompanied by matching industrial growth. Job growth is generally in the lower income service activities associated with tourism and social services. It is, in a sense, a downward economic and social escalator with virtually no upward escalator for return—with both inter-regional and inter-generational consequences.

The public transport system is gaining custom from managers, professionals and paraprofessionals with inner city jobs but is losing patronage of almost all other groups, with a net loss of travellers overall.

4.3 Spatial and temporal implications

The implications of these changes appear to be a greater polarisation of the population between those with information and knowledge-based skills which are in demand and those less skilled and caught up in the deskilling of some jobs and the elimination of others with the introduction of information and communication technologies, that is, between those at the upstream end contributing to or utilising these technologies, and those affected by them on the downstream end.

These changes have regional implications in that the most specialised services with the highest incomes are locating in the centres of the largest cities on international and national network nodes. Smaller cities and parts of large cities with a manufacturing or less specialised production base are suffering from deskilling and job loss. The migration of the young, skilled employed to the larger cities of Sydney and Melbourne and the movement of the retired and unemployed to smaller centres, such as on the coast or in the hills, on the consumption grounds of lower living costs and a more pleasant climate and environment, is accelerating these spatial differences. Even where there is tourism growth the employment opportunities in smaller cities are largely in the lower paid, 'high touch' service industries.

The longer term implications are that wider employment opportunities are not available in these regions and the young are forced to move to gain education, skills and employment (with little financial support for this process) or to continue to live in these areas where employment and training opportunities are substantially less.

In effect, 'two Australias' are developing: the major cities with higher level employment opportunities for information and knowledge workers, and the remainder of the nation where these opportunities are

substantially less or do not exist. It remains to be seen if the confluence of telecommunications and computing can create jobs at a faster rate than they are being lost as well as creating a broader spatial organisation of activities to encompass these less advantaged areas within our cities and settlements.

4.4 Future options

New technologies such as fast rail and/or periodic telecommuting would allow even longer trips and possibly the development of new conurbations associated with fast transport routes (Figure 6). For example, future development of high speed rail links between Melbourne and provincial cities such as Geelong, Ballarat, Bendigo, Seymour and Warragul would transform these rural centres into the equivalent of present day middle ring Melbourne suburbs where 30-minute journey times to work would typically be the norm. By so doing, the intervening green belts could be preserved while providing country living options to city-based workers and providing a much needed boost to the economies of the 'provincial' cities including the attraction of information industries (having been transformed into integral parts of the capital's economic 'engine'). Europe provides a pointer to some of the possibilities. Some centres of intensive agriculture, such as wine producing areas in southern France (e.g. Montpellier), lost out to new industrial centres during the industrial age, but have improved their position in the present transition because their high quality environment and fast rail access has attracted knowledge-based industries (Harding et al. 1994; Brotchie 1996). Previous industrial centres have suffered reversals of fortune in this same way (the so-called rust belt in the USA, Europe and Australia) whereas cities which were also knowledge/information, and market centres and/or centres of administration (e.g. Boston, USA) have successfully made the transition to the information age.

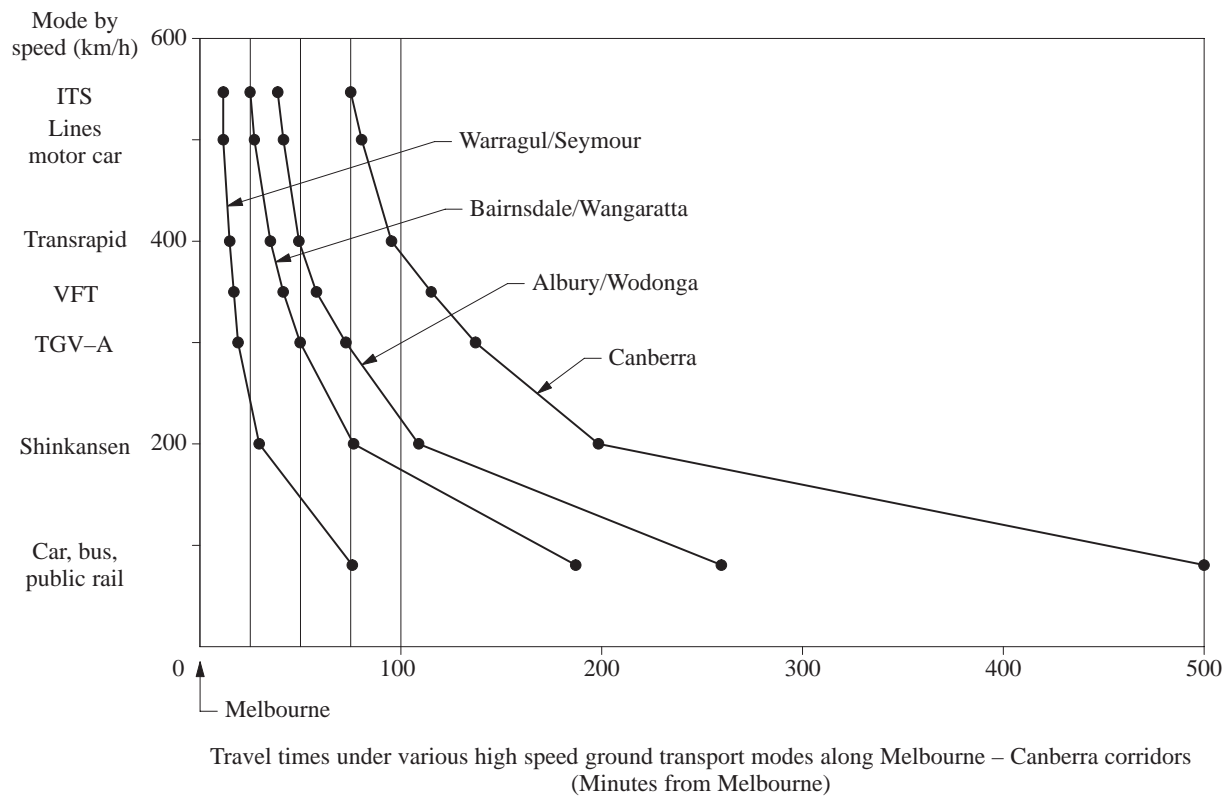


Figure 6: Space shrinking impacts of high speed ground transportation

Telecommuting and faster public and private travel would enable further flexibility of location and travel arrangements. Cleaner, information-based industries are enabling closer integration of employment, residential and recreational activities, providing the potential conditions for shorter commuting and recreational trips (Newton et al. 1994). Teleworking, teleshopping, teletraining and tele-entertainment offer the possibility of shorter and less frequent trips and use of lower energy modes—electric vehicles, walking and cycling—in futures which constrain transport energy use.

Endnotes

1. What cannot be predicted is the outcome of an increasing level of competition between the State governments/State capitals to attract significant new businesses to their territory via a mix of inducements, including taxation, provision of infrastructure, floorspace etc. Recent examples include: Sydney luring British Telecom to Sydney from Singapore as a base for its Asia-Pacific headquarters (*The Age*, 2 Dec. 1994); also the location of American Express's regional

headquarters in Sydney in June 1995, primarily for 'human capital' reasons.

2. Robinson (1995) reports that: "The Grollo group plans to build the world's tallest office building in Melbourne—nearly twice as high as the Rialto tower in Collins Street. The group's chief executive, Mr Bruno Grollo, told *The Sunday Age* that the group wanted to build a gold-colored skyscraper more than 120 storeys tall, possibly on the old Commonwealth site owned by Hudson Conway, opposite the Exhibition Gardens. He said the Premier, Mr Jeff Kennett, had told him that the State Government could help by providing Public Service tenancies to fill office space in the building." (P. Robinson, "City Super-Tower Plan", *The Age*, 1 January 1995).
3. The relatively recent emergence of tourism as an industry raises an issue with regard to the adequacy of the basic/non-basic classification in capturing industries that are 'export' earning for a region.
4. This material is drawn from a much larger study of change in patterns of industry and residence in Australia between 1981 and 1991 (by Gipps et al. 1996).

References

- ABS 1985, *Travel to work, school and shop, Victoria, October 1984*, Cat. no. 9201.2, Australian Bureau of Statistics, Melbourne.
- ABS 1992, *Persons employed at home*, Cat. no. 6275.0, ABS, Canberra.
- ABS 1992, Population projections for capital cities, selected outer regions and rest of State—Australia 1990–2001, Canberra, unpub.
- ABS 1993, *CDATA 1991*, ABS, Canberra.
- ABS 1994, *Socio-economic indexes for areas*, Cat. no. 2912.0, Australian Bureau of Statistics, Canberra.
- Allen, P.M., Sanglier, M., Engelen, G. & Boon, F. 1985, 'Towards a new synthesis in the modelling of evolving complex systems', *Environment and Planning B: Planning and Design*, special issue on dynamic systems, vol. 12, pp. 65–84.
- Birrell, R., Newman, P. & Newton, P. 1995, 'Sunbelt–rustbelt revisited: The case of south-east Queensland', *People and Place*, vol. 3, no. 4, pp. 53–60.
- Brotchie, J.F., Batty, M., Hall, P. & Newton, P.W. (eds) 1991, *Cities of the 21st century*, Longman Cheshire, Melbourne.
- Brotchie, J.F., Batty, M., Hall, P. & Newton, P.W. (eds) 1995, *Cities in competition: Productive and sustainable cities for the 21st century*, Longman Cheshire, Melbourne.
- Brotchie, J.F., Gipps, P.G. & Newton, P.W. 1995, 'Urban landuse, transport and the information economy', *Urban Futures*, vol. 17, pp. 37–50.
- Brotchie, J.F., Lesse, P. & Roy, J.R. 1979, 'Entropy, utility and planning models', *Systemi Urbani*, vol. 4, pp. 11–16.
- Brotchie, J.F. 1996, Review 'European cities towards 2000', *Urban Policy and Research*, vol. 14, no. 2, pp. 155–157.
- Bureau of Immigration Research (BIR) 1992, *Australia's population trends and prospects, 1991*, AGPS, Canberra.
- Burke, T., Wulff, M. & Newton, P.W. 1990, 'Australia', in *International handbook of urban policy and practice*, ed. W. Van Vliet, Greenwood Press, NJ.
- CSIRO 1994, *Patterns of business and employment location in Victoria*, Draft report prepared for Victorian Department of Planning and Development and Department of Business and Employment, Melbourne.
- CSIRO 1994, Submission to House of Representatives inquiry into Australia's population carrying capacity, Canberra.
- Drennan, M.P. 1989, 'Information intensive industries in metropolitan areas of the United States of America', *Environment and Planning A*, vol. 21, pp. 1603–1618.
- ESD 1991, *Greenhouse Report 1991*, Ecologically Sustainable Development Secretariat, Australian Government Publishing Service, Canberra.
- Flood, J. 1992, 'Internal migration in Australia: Who Gains, Who Loses', *Urban Futures*, Special Issue No. 5, February.
- Flood, J., Maher, C., Newton, P. & Roy, J. 1991, *The determinants of internal migration in Australia*, Report to the Indicative Planning Council for the Housing Industry, Department of Industry, Technology and Regional Development, Canberra.
- Gipps, P.G., Brotchie, J., Hensher, D., Newton, P. & O'Connor, K. 1997, *The journey to work, employment, and the changing structure of Australian cities*, Research Monograph no. 3, Australian Housing and Urban Research Institute, Melbourne.
- Glieck, J. 1987, *Chaos: Making a new science*, Heinemann, London.
- Goddard, J.B. 1990, *The geography of the information economy*, PICT Policy Research Paper 11, CURDS, November.
- Goodall, B. 1972, *The economics of urban areas*, Pergamon Press, Oxford.
- Gregory, R. & Hunter, B. 1995, *The macro economy and the growth of ghettos and urban poverty in Australia*, Discussion Paper 325, Centre for Economic Policy Research, ANU, Canberra.

- Haken, H. & Portugali, J. 1995, 'A synegetic approach to the self-organisation of cities and settlements', *Environment and Planning Bulletin*, vol. 22, pp. 35–46.
- Harding, A., Dawson, J., Evans, R. & Parkinson, M. (eds) 1994, *European cities towards 2000*, Manchester University Press, Manchester.
- Hepworth, M.E. 1989, 'Wheels and wires: Transport', *Town and Country Planning*, vol. 58, no. 6.
- Herrnstein, R.J. & Murray, C. 1994, *The bell curve*, The Free Press, N.Y.
- Hugo, G. 1996, 'Counterurbanisation', in *Population shift*, eds P.W. Newton & M. Bell, AGPS, Canberra.
- Ironmonger, D. 1990, *Household work*, Allen and Unwin, Sydney.
- Maillot, D. 1991, 'Local dynamism, milieu and innovative enterprises', in *Cities of the 21st century: New technologies and spatial systems*, eds J. Brotchie, M. Batty, P. Hall & P.W. Newton, Longman Cheshire, Melbourne, pp. 265–274.
- Marchetti, C. 1992, *Anthropological invariants in travel behaviour*, International Institute of Applied Systems Analysis, Laxenburg, Austria.
- McKinsey & Company, 1994, *Business investment in regional prosperity: The challenge of rejuvenation*, report to the Department of Housing and Regional Development, Canberra.
- Moss, M. 1988, 'Telecommunications: Shaping the future', in *America's new market geography*, eds G. Sternleib & J. Hughes, Center for Urban Policy Research, Rutgers State University, New Jersey.
- Moss, M. & Carey, I. 1995, 'Information technologies, telecommuting and cities', in *Cities in competition: Productive and sustainable cities for the 21st century*, eds J. Brotchie, M. Batty, E. Blakely, P. Hall & P. Newton, Longman Cheshire, Melbourne.
- Newman, P., Birrell, B., Holmes, D., Mathers, C., Newton, P., Oakley, G., O'Connor, A., Walker, B., Spessa, A. & Tait, D. 1996, 'Human settlements' in *Australia: State of the environment*, 1996, Department of Environment, Sport and Territories, Canberra, pp. 3–1 to 3–57.
- Newman, P.G., Kenworthy, J. & Vintilla, P. 1995, *Can we overcome automobile dependence? Physical planning in an age of urban cynicism*, Institute for Science and Technology Policy, Murdoch University, Perth.
- Newton, P.W. 1995, 'Changing places? Households, firms and urban hierarchies in the information age', in *Cities in competition: Productive and sustainable cities for the 21st century*, eds J.F. Brotchie et al., Longman Cheshire, Melbourne.
- Newton, P.W. & Bell, M. 1996, *Population shift: Mobility and community change in Australia*, AGPS, Canberra.
- Newton, P.W. (ed.) 1993, *Networking CAD: Proceedings of a National Conference on New Application for High Speed Metropolitan and Wide Area Networks in Construction and Manufacturing*, CSIRO Division of Building, Construction and Engineering, Melbourne.
- Nicolis, G. & Prigogine, I. 1977, *Self-organization in non-equilibrium systems: From dissipative structures to order through fluctuations*, Wiley, Chichester.
- O'Connor, K. 1994, *The Australian capital city report 1994*, Centre for Population and Urban Research, Monash University and AHURI, Melbourne.
- O'Connor, K. 1995, 'Change in the pattern of airline services and city development', in *Cities in competition: Productive and sustainable cities for the 21st century*, eds J.F. Brotchie et al. Longman Cheshire, Melbourne.
- O'Connor, K. & Stimson, R. 1995, *The economic role of cities. Economic change and city development in Australia, 1971–1991*, Department of Housing and Regional Development, Canberra.
- Office of Technology Assessment (OTA) 1990, *Critical connections: Communications for the future*, OTA, Washington, DC.
- Newton, P.W. 1991, 'Telematic underpinnings of the information economy', in *Cities of the 21st century: New technologies and spacial systems*, eds J.F. Brotchie, M. Batty, P. Hall and P.W. Newton, Longman Cheshire, Melbourne.

- Raskell P. 1995, Wealth distribution in Australian cities, paper presented at Social Policy Welfare Centre Workshop, Sydney, July.
- Reich, R.B. 1992, *The work of nations*, Simon and Schuster, N.Y.
- Reich, R.B. 1993, *The work of nations: Preparing ourselves for 21st century capitalism*, Simon and Schuster, London.
- Richardson, C. 1991, Some desirable extensions of economic theory, *Economic Papers*, vol. 10, no. 4, pp. 59–69.
- Riley, T. 1996, 'Telecommuting' in *Population shift mobility and community change in Australia*, eds P.W. Newton & M. Bell, AGPS, Canberra.
- Saxenian, A.L. 1991, 'The origins and dynamics of production networks in Silicon Valley', *Research Policy*, vol. 20, pp. 423–437.
- Stanback, T. 1995, 'Putting city–suburb competition in perspective', in *Cities of the 21st century: New technologies and spatial systems*, eds J.F. Brotchie, M. Batty, P. Hall and P.W. Newton, Longman Cheshire, Melbourne.
- TRC 1993, 'Travel time budgets', *TRC News*, Transport Research Centre, Melbourne University, no. 1, p. 5.
- Waldrop, M.M. 1992, *Complexity: The emerging science and the edge of order and chaos*, Simon and Schuster, N.Y.
- Willoughby, K. 1995, 'The local milieux of knowledge-based industries: What can we learn from a regional analysis of commercial biotechnology?', in *Cities of the 21st century: New technologies and spatial systems*, eds J.F. Brotchie, M. Barry, P. Hall and P.W. Newton, Longman Cheshire, Melbourne.

Appendix 1: Assignment of ASIC industry groups to basic/non-basic

The industry codes listed below are drawn from ABS 1993, *Australian and New Zealand Standard Industrial Classification, ANZSIC*, Cat. no. 1292.0, Australian Bureau of Statistics, Canberra. They were assigned by the authors to one of the two categories of basic/non-basic industry (see Table 7, page 17).

Basic industries

124–196, 204–205, 300–2160, 2163–3620, 4000–4110, 4113–4200, 4248–4710, 4730–4774, 5000–5112, 5114–5121, 5300–5710, 5713–6143, 6150, 6154–6240, 6322–6383, 6388–6389, 7000–7112, 7120–7200, 8142, 8241–8243, 8250, 8252, 8460–8472, 8481, 8493, 9131, 9135–9137, 9142

Non-basic industries

200, 206, 2161–2162, 3700–3702, 4111–4112, 4230–4247, 4720–4728, 4780–4897, 5113, 5122–5200, 5711–5712, 6144, 6151–6153, 6300–6321, 6384–6387, 6390, 7113, 8000–8141, 8143–8240, 8244, 8251, 8300–8400, 8480, 8482–8492, 8494–9130, 9132–9134, 9138–9141, 9143–9400

Appendix 2: Indices of self-containment for Australia's capital cities

Table A: Percentage working and living in same zone—Sydney

Zone	% of total employed in zone working and living in same zone			% of total living in zone working and living in same zone		
	1981	1986	1991	1981	1986	1991
Gosford–Wyong	98.1	97.8	97.9	64.9	63.3	63.4
Sydney	6.1	6.2	7.0	56.2	55.4	55.1
Hawkesbury	75.9	68.7	72.7	50.7	46.9	46.5
Warringah	80.9	79.6	78.1	40.0	40.4	45.6
Blue Mountains	89.8	89.2	90.7	38.8	38.0	40.1
Central Western Sydney	37.2	32.2	30.2	41.5	37.9	39.1
Sutherland	79.8	78.6	79.6	34.6	33.6	36.2
Penrith	60.6	60.2	61.8	36.4	33.3	35.6
Liverpool	45.3	40.2	37.3	31.5	31.6	34.7
Camden	53.0	48.7	50.9	41.6	32.5	32.9
Canterbury–Bankstown	46.6	41.7	42.0	33.3	30.2	32.1
Cambelltown	69.7	66.5	67.7	29.7	28.1	31.5
Wollondilly	74.3	71.3	75.7	40.5	33.1	31.1
Lower Northern (west)	37.8	30.5	32.0	27.4	28.2	30.7
Blacktown	53.2	48.1	48.5	26.3	25.7	29.2
Fairfield	45.6	42.0	43.6	22.1	24.3	28.2
St George	52.4	45.1	49.0	27.2	27.3	27.8
North Sydney	15.9	15.5	15.0	26.1	25.2	27.8
Hornsby	53.5	50.9	49.7	26.8	22.5	27.8
Willoughby	18.3	16.4	16.5	26.2	23.2	27.7
Waverly–Woolahra	53.9	45.8	46.1	23.0	23.9	27.4
Botany	14.2	13.0	11.3	28.6	24.4	27.3
Randwick	51.4	48.6	48.4	23.5	24.1	26.7
Baulkham Hills	48.5	42.9	47.4	20.4	21.3	25.0
Ku–ring–gai	51.0	45.8	46.1	20.1	20.1	23.7
Manly	39.9	37.6	38.3	19.7	19.8	22.4
Concord–Strathfield	16.0	14.9	15.8	22.9	20.2	21.4
Leichhardt	24.5	24.2	26.6	22.5	18.7	20.8
Mosman	39.6	35.5	34.9	16.4	14.6	19.9
Marrickville	24.0	21.6	23.0	18.8	16.4	17.4
Ashfield–Burwood	26.2	20.5	22.4	14.7	16.0	16.3
Drummoyne	31.3	30.1	30.4	14.7	9.3	14.6

Source: ABS (1981, 1986, 1991) Journey to work data.

Appendix 2: Indices of self-containment for Australia's capital cities (cont.)

Table B: Percentage working and living in same zone—Melbourne

Zone	% of total employed in zone working and living in same zone			% of total living in zone working and living in same zone		
	1981	1986	1991	1981	1986	1991
Geelong	97.9	96.7	96.9	79.9	73.9	77.5
Mornington Peninsula Outer	79.2	78.9	80.6	56.1	49.3	54.4
Melbourne	5.7	5.0	4.7	50.5	49.7	46.2
Eastern Outer	59.9	57.3	55.5	32.7	32.7	37.8
Southern Outer	36.5	32.6	30.3	39.7	35.8	37.3
Eastern Fringe	72.5	72.0	75.2	31.9	30.2	33.2
Northern Fringe	48.5	46.5	47.4	30.5	30.7	32.9
Western Outer	55.4	53.6	51.9	33.9	29.6	32.8
Mornington Peninsula Inner	66.8	60.5	57.1	29.8	30.2	31.7
Northern Middle	47.0	41.9	38.7	34.3	31.8	30.8
South Eastern Inner	42.1	36.7	32.5	29.8	30.8	30.7
South Eastern Outer	61.0	61.6	64.3	32.7	24.0	29.3
Western Fringe	68.1	66.0	67.6	29.6	26.7	28.9
Northern Outer	62.8	62.8	64.9	24.6	24.7	28.7
South Melbourne	6.1	5.4	4.8	30.6	25.1	25.3
Western Inner	35.7	29.7	28.6	29.3	26.1	24.6
Eastern Inner	37.5	33.5	33.5	22.5	20.9	24.5
Eastern Middle	43.6	41.6	41.2	22.6	22.4	24.4
Port Melbourne	6.9	5.2	4.6	41.9	28.9	23.7
Southern Inner	42.3	38.9	39.2	21.1	20.4	23.7
Northern Inner	34.2	29.4	25.6	28.5	25.3	23.1
Richmond	13.4	11.6	10.7	27.5	23.0	20.7
Prahran	18.4	15.9	16.6	19.3	17.4	19.0
Collingwood	8.4	6.4	6.2	22.9	17.5	16.6
Fitzroy	10.4	9.1	8.6	17.5	14.3	14.7
St Kilda	25.7	22.0	19.0	11.7	11.3	14.4

Source: ABS (1981, 1986, 1991) Journey to work data.

Appendix 2: Indices of self-containment for Australia's capital cities (cont.)

Table C: Percentage working and living in same zone—Brisbane

Zone	% of total employed in zone working and living in same zone			% of total living in zone working and living in same zone		
	1981	1986	1991	1981	1986	1991
Gold Coast City	11.9	96.9	94.6	3.4	65.7	70.7
Brisbane CBD	0.4	0.1	0.1	35.5	45.8	62.5
Ipswich	81.2	81.9	69.4	56.5	53.6	52.7
Caboolture Pt A	75.9	74.1	82.3	32.5	27.8	39.5
Redcliffe	76.6	70.2	68.1	36.7	36.4	39.3
North Eastern Core	5.7	3.7	3.5	29.4	30.7	35.4
Redland Shire	79.6	76.0	77.9	31.1	30.8	34.2
Southern Outer	37.1	34.4	33.1	33.2	29.7	34.1
Eastern Outer	56.0	50.9	47.8	33.1	32.2	32.8
Northern Outer	48.1	44.2	42.5	30.7	29.9	31.9
Logan City	65.8	64.4	62.7	22.7	25.0	29.5
Western Inner	33.3	30.0	29.1	24.3	23.4	27.6
Western Outer	43.3	42.1	40.8	25.6	24.3	27.1
Albert Shire Part A	32.2	50.5	48.5	34.9	29.3	27.1
Southern Core	12.0	9.8	8.4	29.5	26.1	26.4
Pine Rivers Shire	58.4	56.2	60.2	18.8	20.4	24.5
Northern Inner	39.2	37.5	34.4	21.8	22.4	23.5
Eastern Inner	39.6	37.2	37.7	19.6	19.2	21.4
North Western Core	14.4	11.7	10.4	18.9	18.7	20.7
Beaudesert Shire Part A	38.7	52.8	59.2	9.0	4.3	18.2
Southern Inner	31.1	28.9	27.9	15.5	15.2	17.0
Ipswich–Moreton Part A – B	30.2	18.3	39.9	8.6	10.5	14.7

Source: ABS (1981, 1986, 1991) Journey to work data.

Appendix 2: Indices of self-containment for Australia's capital cities (cont.)

Table D: Percentage working and living in same zone—Adelaide

Zone	% of total employed in zone working and living in same zone			% of total living in zone working and living in same zone		
	1981	1986	1991	1981	1986	1991
Fleurieu	94.5	91.9	92.5	76.2	67.0	63.7
Adelaide	2.8	3.2	3.1	51.1	53.3	52.4
Barossa	88.7	88.6	88.4	62.0	55.2	48.2
Western (North)	50.4	43.0	40.9	43.1	43.6	43.1
Onkaparinga	75.1	79.0	77.0	57.0	46.7	42.2
Southern (remainder)	79.1	77.5	78.0	31.6	31.4	31.4
Elizabeth	31.2	24.6	20.2	28.9	27.3	31.2
Marion & Mitcham	49.0	45.5	43.8	28.2	27.8	28.5
Salisbury & Tea Tree Gully	60.6	60.9	61.7	23.5	24.1	27.8
Eastern (remainder)	23.9	21.5	20.7	21.6	21.9	24.3
Gawler & Munno Para	53.7	58.8	58.7	22.6	21.9	22.0
Western (South)	25.8	22.0	21.1	21.8	20.1	21.7
East Torrens & Stirling	65.5	61.2	59.5	21.7	20.3	21.5
Brighton & Glenelg	34.3	28.4	29.9	18.7	17.4	20.2
Enfield (Part A)	18.7	19.0	17.3	23.4	17.5	18.7
Hindmarsh & Thebarton	7.5	6.5	6.4	22.0	15.7	16.6
Unley	21.9	18.4	18.7	16.7	16.0	15.9
Payneham & St Peters	20.2	18.0	16.1	14.3	13.1	14.2
Campbelltown	47.0	44.5	42.8	14.1	13.5	13.7
Prospect & Walkerville	19.6	17.6	19.1	11.7	11.3	12.4

Source: ABS (1981, 1986, 1991) Journey to work data.

Appendix 2: Indices of self-containment for Australia's capital cities (cont.)

Table E: Percentage working and living in same zone—Perth

Zone	% of total employed in zone working and living in same zone			% of total living in zone working and living in same zone		
	1981	1986	1991	1981	1986	1991
Dale	91.8	89.3	88.9	46.9	45.9	67.5
Kwinana & Rockingham	70.4	68.0	66.2	53.8	45.7	48.8
Perth	14.1	12.5	11.9	46.9	46.2	45.4
Canning & Gosnells	47.9	46.5	45.8	29.9	28.7	33.5
Freemantle	21.9	19.1	19.7	41.1	35.5	32.5
Serpentine–Jarrahdale	57.4	66.0	61.0	33.9	34.3	31.7
Swan	34.4	31.3	31.7	37.0	29.4	28.5
Stirling	52.6	45.6	41.1	25.5	24.3	28.1
Belmont	21.5	16.8	13.0	29.3	26.0	26.6
Central (remainder)	20.3	16.2	17.7	27.0	25.5	26.3
Armadale	71.1	66.0	64.3	23.2	22.5	26.0
Kalamunda & Mundaring	65.7	68.1	71.4	22.9	21.1	24.7
Wanneroo	69.4	71.5	75.2	17.8	18.7	24.3
Melville	46.2	40.9	39.8	19.2	18.9	24.2
Cockburn	42.3	42.0	40.2	22.5	19.4	21.5
Bassendean–Bayswater	38.7	34.6	33.3	21.9	19.6	21.4
Subiaco	10.7	9.1	9.1	19.3	14.0	17.3
Cottesloe & Mosman	33.4	30.0	31.0	14.6	14.4	16.7
South Perth	31.3	24.2	26.5	12.9	11.8	15.5

Source: ABS (1981, 1986, 1991) Journey to work data.