A COMPARATIVE STUDY OF METROPOLITAN MULTI-NUCLEATION
SUBURBAN CENTRES AND COMMUTER FLOWS WITHIN THE METROPOLITAN AREAS OF ATLANTA, USA, AND MELBOURNE, AUSTRALIA

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The suburbanization of various functions has generated “Suburban Downtowns” or typical “Edge Cities” in Atlanta, Georgia, USA. On the other hand, Melbourne, the capital city of the state of Victoria, Australia, has managed to control its suburban centres. The CBD in Melbourne still retains comprehensive central functions for the metropolitan area, but large scale shopping malls have also been developed in the suburbs. The regional structures of these two metropolitan areas, prima facie, seem different. However, in this paper, we would like to highlight a common feature present in both areas, based on our examination of commuter flows. This phenomenon involves an interdependent, cross-suburb flow structure, which is emerging in many urban areas in the 21st century.

1. INTRODUCTION: CHANGING URBAN STRUCTURES

The classical conceptualisation of metropolitan areas focuses on a mono-centric nodal region exhibiting strong centripetal characteristics with the aim of understanding and planning modern urban areas which have rapidly expanded. Nevertheless, recent research on multi-nucleation or suburban downtown developments in major metropolitan areas in North America and Japan (Fujii, 1990; Hartshorn and Muller, 1989; Fujii and Hartshorn, 1995; Shearmur and Coffey, 2002) suggests the emergence of a more complex functional region characterized by interdependency rather than hierarchy. The suburbanization of various kinds of central functions that have generated “Suburban Downtowns” including headquarter offices as well as high-order retail activity and high-rise office buildings in Atlanta, Georgia, USA provides an example of this change.

These suburban centres began to appear in major American metropolitan areas around 1990. They changed the spatial structure of metropolitan areas to a multi-nucleated one. However, the realms around these downtowns in a metropolitan area (Hartshorn and Muller, 1989) do not exhibit independence but various integrating flows between them (Fujii and Hartshorn, 1995; Sultana, 2002).

In major Japanese metropolitan areas, interdependent flows between suburbs have also increased. These ties are hidden behind strong centripetal flows to the central city (Fujii, 1990). But nowadays, the numbers of commuters to the central city are decreasing even in the Tokyo metropolitan area as Tani (2002) has shown in his analysis. Suburban connections are being reinforced by the drastically changing social situation in Japan, involving the declining birthrate and aging population.
It is this functional region composed of interdependent flows between realms or suburbs that is common to metropolitan areas in both the US and Japan. This new millennial regional concept was born in the same way as the nodal region developed in the 20th century. In addition, this new point of view is also important for the current urban policy emphasis on compact cities. Metropolitan areas should be thought of as new urban areas that include compact cities. People living in these areas have a high mobility rate and place various demands on the centres. The macro-regional structure created by these compact cities is therefore very crucial.

From this perspective, Melbourne, Australia provides a very interesting urban structure. Of course, American and Australian cities have similar historical and cultural backgrounds, and the populations of Atlanta and Melbourne are also similar. The population of the Atlanta Metropolitan Area in 2000 was 4.1 million and that of Melbourne in 2001 was 3.4 million.

However, Melbourne has saved its tram system and developed its commuter railroad network. The CBD of Melbourne still provides the comprehensive central functions for the metropolitan area, though large scale shopping malls have also been developed in the suburbs and many people drive to their jobs or shopping destinations. Melbourne has tried to control the development of suburban centres with metropolitan planning tools. We examine and compare the urban structures of both metropolitan areas in detail beginning in the next section.

2. DOWNTOWNS AND COMMUTING FLOWS IN THE ATLANTA REGION

The employment concentrations in the FIRE (Finance, Insurance, and Real Estate) grouping in the Atlanta region are shown in Figure 1. This map also indicates the locations of CBD and suburban downtowns (Fujii and Hartshorn, 1995) which include Buckhead/Lenox, Perimeter, and Cumberland. The FIRE sector includes several important downtown functions. The map demonstrates that these activities are multinucleated in the Atlanta Region. The “Edgeless” urbanization described by Lang (2003) can be found in the North Fulton area. Table 1 shows the trend in total employment in these downtowns. The CBD, the original Downtown of Atlanta, remained the largest employment centre in the region until 1990. Perimeter, the new suburban downtown located at the northern junction of radial expressway and the circular beltway, topped these downtowns including the CBD in employment in 2000 (Table 1). The FIRE sector includes the important downtown functions. The map demonstrates that these activities are multinucleated in the Atlanta Region.

After we proposed this type of regional structure in the first half of the 1990s, Lang (2003) pointed out the phenomenon of “Edgeless” urbanization in the latter half of the 1990s. That kind of urbanization can be found in the North Fulton area (Figure 1) of the Atlanta Region, one of the fastest growing areas in population and employment. We can note many office buildings dispersed there but no high-rise structures because of safety issues and the independent LAN system from other offices in smaller office buildings. This suburb has a very low density and is a typical example of dispersed development.
The dispersal of these functions, from the CBD to suburban downtowns, can be clearly seen.

Source: Atlanta Regional Commission

Figure 1: Job concentrations for the FIRE Sector in the Atlanta Region (2000)
The dispersal of these functions, from the CBD to suburban downtowns, can be clearly seen.
Source: Atlanta Regional Commission
Table 1 shows that downtown functions are differentiated in each downtown. The CBD is no longer the major retail centre in this region. The CBD is now a government employment centre and a service activities node, including convention activities and higher education. The Lenox suburban downtown started as a typical suburban mall and is now the largest retail centre in the region. Perimeter, the largest suburban downtown, has more employment than the CBD. It is also the centre of service and FIRE sector employment. It has many headquarter offices of service firms such as United Parcel Services. This differentiation of functions, as a result, generates an inter-dependency among the downtowns and cross flows of people between them.

<table>
<thead>
<tr>
<th>Employed persons</th>
<th>CBD</th>
<th>Buckhead / Lennox</th>
<th>Perimeter</th>
<th>Cumberland</th>
<th>Total of Atlanta region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>98,266</td>
<td>44,636</td>
<td>86,562</td>
<td>67,680</td>
<td>1,426,000</td>
</tr>
<tr>
<td>2000</td>
<td>105,971</td>
<td>64,154</td>
<td>131,994</td>
<td>100,227</td>
<td>1,991,500</td>
</tr>
<tr>
<td>Increase rate (%)</td>
<td>1.08</td>
<td>1.44</td>
<td>1.52</td>
<td>1.48</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Table 1  Downtowns in the Atlanta Region
Source: Atlanta Regional Commission

Commuters living in a suburban Census Tract 101.02, indicated by the circle, in the northern suburb show various destinations (Figure 2). The destination tracts which ranked in the top group are the origin tract, Perimeter (the largest suburban downtown next to the origin tract), Buckhead/Lenox office and retail centre, and a tract located in North Fulton, the edgeless suburb. The CBD also has many commuters from this tract. This is a good illustration of the cross commuting flows in multi-nucleated urban areas. Such urban areas in the 21st century are no longer separated and self-contained.

Commuters living in a suburban Census Tract 101.02, indicated by the circle, in the northern suburb show various destinations (Figure 2). The destination tracts which ranked in the top group are the origin tract, Perimeter (the largest suburban downtown next to the origin tract), Buckhead/Lenox office and retail centre, and a tract located in North Fulton, the edgeless suburb. The CBD also has many commuters from this tract. This is a good illustration of the cross commuting flows in multi-nucleated urban areas. Such urban areas in the 21st century are no longer separated and self-contained.
Figure 2 Destinations of Commuting Flows from a Suburban Tract in Atlanta
The tendency for residents to commute to a wide variety of destinations is very much in evidence.
Source: United States Department of Transportation, 2000 – Census Transportation Planning Package 2000
3. COMMUTING FLOWS IN MELBOURNE

Melbourne in Australia shows a very interesting urban structure from this point of view. The Atlanta Metropolitan Area showed a very high population increase of 38.9% between 1990 and 2000. This growth rate is second only to the high rate of Phoenix (45.3%) in the US for Metropolitan Areas above the population of 3 million. Melbourne also grew rapidly. The population increase was 11.4% from 1991 to 2001. In addition, the population of Melbourne in 1991 was 3,022,000, almost the same as that of Atlanta in 1990, which was 2,960,000.

In spite of its rapid growth, Melbourne has maintained its tram system and developed a commuter railroad network. The CBD of Melbourne still has the most comprehensive array of central functions in the metropolitan area. Table 3 shows that the “Melbourne-Inner” district (CBD) attracts 10.1% of all commuting flows in the Melbourne Statistical Division. The second rank destination is “Melbourne-Remainder” which has 7.2%. The largest destination in the suburbs is Kingston-North which has only 4.2%.

<table>
<thead>
<tr>
<th>SLA of Work Destination (More than 30,000)</th>
<th>Number of Commuters</th>
<th>Method of Travel to work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Car</td>
</tr>
<tr>
<td>Melbourne (C) - Inner</td>
<td>146,153</td>
<td>29.7%</td>
</tr>
<tr>
<td>Melbourne (C) - Remainder</td>
<td>103,847</td>
<td>56.7%</td>
</tr>
<tr>
<td>Kingston (C) - North</td>
<td>61,080</td>
<td>81.0%</td>
</tr>
<tr>
<td>Port Phillip (C) - West</td>
<td>46,254</td>
<td>68.0%</td>
</tr>
<tr>
<td>Knox (C) - North</td>
<td>38,216</td>
<td>76.9%</td>
</tr>
<tr>
<td>Monash (C) - Waverley West</td>
<td>38,019</td>
<td>81.2%</td>
</tr>
<tr>
<td>Gr. Dandenong (C) - Dandenong</td>
<td>34,839</td>
<td>83.6%</td>
</tr>
<tr>
<td>Hume (C) - Broadmeadows</td>
<td>34,286</td>
<td>84.7%</td>
</tr>
<tr>
<td>Monash (C) - South-West</td>
<td>34,220</td>
<td>79.3%</td>
</tr>
<tr>
<td>Yarra (C) - North</td>
<td>33,084</td>
<td>65.3%</td>
</tr>
<tr>
<td>Gr. Dandenong (C) Bal</td>
<td>32,234</td>
<td>83.9%</td>
</tr>
<tr>
<td>Maribyrnong (C)</td>
<td>30,136</td>
<td>77.7%</td>
</tr>
<tr>
<td><strong>Total of Melbourne SD</strong></td>
<td><strong>1,441,633</strong></td>
<td><strong>68.1%</strong></td>
</tr>
</tbody>
</table>

Car includes passengers etc.
Public Transportation includes Tram and Bus, Train and Bus, Car and Train/Tram/Bus/Ferry, and Other Public transport.
Melbourne SD: Statistical Division 205
SLA: Statistical Local Area

Table 3: Modes of Commuting, and Major Destinations, in the Melbourne Statistical Division

Such data demonstrates a very centripetal spatial structure in the Melbourne Metropolitan Area compared to the Atlanta Metropolitan Area. Regarding its retail structure, for example, many large shopping centres with department stores are indeed located in the suburbs. As shown in Atlanta and in metropolitan areas in Japan (Fujii, 1990; Fujii and Hartshorn, 1995), manufac-
turing or retail have suburbanized, following population, earlier than other functions. Main office functions remain in CBD. The case of Atlanta in the year 2000, however, illustrated a highly suburbanized structure where suburban downtown, Perimeter, got twice the CBD’s number of FIRE employees (Table 2). This seems a very independent suburb – a multinucleated structure.

By contrast, Melbourne has attempted to control the growth of its suburban centres through metropolitan planning. In Melbourne, the “District Centres” of the metropolitan plan in the 1980s (McLoughlin, 1992) and the “Activity Centres” in the current Melbourne 2030 plan (Department of Infrastructure, 2002), including traditional town centres, are maintained. They are connected by public transportation routes such as trams, suburban railways and buses. Regulation of new commercial facilities is also important. Moreover, in the current Melbourne 2030 planning scheme, even large shopping malls are incorporated into the Activity Centres. The characteristics of suburban centres in Melbourne are examined further in a separate paper by Yamashita et al 2006, published in this issue of Applied GIS.

Turning now to commuting patterns in the Melbourne Metropolitan Area, Table 3 shows the scale of each of the suburban centres as a destination of journey to work, and the mode of commuting to the centre. Inner Melbourne draws, of course, the most commuters and the remainder area of Melbourne City ranks second. Other than these, Kingston is the biggest suburban centre. Kingston North SLA is a southern municipality 20 km from Melbourne. In Kingston, people are mainly engaged in trade, production or transportation. It has the largest shopping centre and the highest number of manufacturing jobs of any suburban municipality, providing 25,000 jobs.

Regarding modes of travel, trips to Melbourne-Inner using various kinds of public transportation make up more than 50%. The total share of trips by public transportation in the Melbourne area is only 11.4%. Commuting trips by car predominate all over the metropolitan area, including Melbourne City outside Melbourne-Inner.

Frankston West SLA, a municipality about 40km south of the Melbourne CBD, has a commuting rate of 7.1% to the whole of Melbourne City. Many more workers (39.0%) commute inside Frankston City itself. Kingston, mentioned above, attracts 13.7% of the total workers living in Frankston. This commuting pattern, on the whole, is similar to that of “Labour-sheds” found in 1971 (O’Connor and Maher, 1979).

As to the mode for journeys to workplaces in Kingston North, 84.4% are by car and only 5.4% are by public transportation. On the other hand, 63.3% of commuter trips from Frankston to Melbourne-Inner are by public transportation. These shares of public transportation are much higher than those noted in Table 3, which indicates average flows in this metropolitan area.

The reason is that Frankston West SLA has a terminal for the suburban train route directly to the Melbourne CBD. The share by car, which is 24.1% to Melbourne-Inner and around 55% to other areas of Melbourne, is nevertheless high. Additionally, one third of public transportation is by park and ride. The data demonstrates that a high ratio of commuting to Melbourne, even from suburbs with railway lines, is by car.

Monash, located 35km south-east of Melbourne CBD, has an 18% rate of employment commuting to Melbourne City, 60% of which is by public transportation, including 19% using a park and ride service. Over one third (31.4%) of workers who reside in Monash commute inside this city, and 57-80% of their journeys to work are in cars.
The central city, or CBD, has a very strong labour shed attracting workers from all over the metropolitan area. But beneath these centripetal flows, cross commuting by car is also spread all over the area. Commuting inside one suburban city is approximately 30–40% even in suburban job centres such as Monash or Kingston. As a result, about half of commuting flows are inter-suburban cross commuting.

Commuters to Melbourne City by public transportation account for only 7.6% and those by car are also 8.6% of total commuting flows in the metropolitan area. This pattern is very similar to that found in Japan. Major metropolitan areas in Japan also seem to show strong centrality of CBD supported by suburban railway system. Inter-suburban flows by car, however, are large and increasing as a whole (Fujii 1990).

### 3.1 SPATIAL PATTERNS OF COMMUTING

Let us now examine the spatial pattern of commuting in the Melbourne Metropolitan Area. Figure 3 and Figure 4 show the job locations of managers, administrators, and professionals working in offices, similar to the FIRE (finance, insurance, and real estate) classification system, which was used in the Atlanta case study. The central concentration of employment in Melbourne, even excluding the inner city area, is very large.

However, suburban concentrations are also found, especially in the southeastern suburbs. In Figure 3, a large suburban accumulation of managers and administrators is found in Kingston North SLA, in the southeastern suburbs, as well as in Melbourne. Figure 4 also illustrates suburban accumulations in the southeastern suburbs in addition to Melbourne. Those accumulations comprise the unique socio-spatial structure of the Melbourne Metropolitan Area. In addition, even office activities show this feature of suburbanization in the Melbourne Metropolitan area, despite the fact that we cannot find large suburban office centres like those found in Atlanta.

We do find some major destinations of this kind of worker in Table 4. In this table, SLAs are shown only if they have 2000 or more Managers and Administrators, or 5000 or more Professionals – about 15% of total employment in each case. Melbourne-Inner, the CBD, is the largest destination. But in the suburban area, the number of workers in Kingston North SLA is almost half that of the CBD. This SLA, in which industrial development or suburbanized offices are identified, is the largest suburban agglomeration of managers and administrators. On the other hand, Monash South-West SLA is the largest suburban concentration for commuting by professionals. The table also shows that other eastern municipalities, such as Waverley or Whitehorse, have large numbers of professional workers.
Despite the large suburban accumulation found in the SLA of Kingston North there is actually very little relationship between Principal Activity Centres and employment patterns.

Again, although there are some suburban accumulations in the southeastern suburbs, there is actually very little relationship between Principal Activity Centres and employment patterns.

<table>
<thead>
<tr>
<th>SLA of Work Destination</th>
<th>Total Employment</th>
<th>Managers and Administrators</th>
<th>Professionals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melbourne (C) – Inner</td>
<td>146,135</td>
<td>15,465</td>
<td>44,386</td>
</tr>
<tr>
<td>Melbourne (C) – Remainder</td>
<td>103,856</td>
<td>10,225</td>
<td>35,958</td>
</tr>
<tr>
<td>Kingston (C) – North</td>
<td>61,123</td>
<td>6,239</td>
<td>7,311</td>
</tr>
<tr>
<td>Port Phillip (C) – West</td>
<td>46,226</td>
<td>6,322</td>
<td>12,393</td>
</tr>
<tr>
<td>Knox (C) – North</td>
<td>36,190</td>
<td>3,207</td>
<td>6,424</td>
</tr>
<tr>
<td>Monash (C) – Waverley West</td>
<td>38,018</td>
<td>3,697</td>
<td>7,199</td>
</tr>
<tr>
<td>Gr. Dandenong (C) – Dandenong</td>
<td>34,840</td>
<td>3,053</td>
<td>5,306</td>
</tr>
<tr>
<td>Hume (C) – Broadmeadows</td>
<td>34,278</td>
<td>3,008</td>
<td>4,587</td>
</tr>
<tr>
<td>Monash (C) – South-West</td>
<td>34,255</td>
<td>2,733</td>
<td>9,132</td>
</tr>
<tr>
<td>Yarra (C) – North</td>
<td>33,108</td>
<td>3,202</td>
<td>9,303</td>
</tr>
<tr>
<td>Gr. Dandenong (C) Bal</td>
<td>32,244</td>
<td>2,979</td>
<td>3,987</td>
</tr>
<tr>
<td>Maribyrnong (C)</td>
<td>30,164</td>
<td>2,151</td>
<td>5,536</td>
</tr>
<tr>
<td>Darebin (C) – Preston</td>
<td>28,067</td>
<td>2,011</td>
<td>4,891</td>
</tr>
<tr>
<td>Yarra Ranges (S) – South-West</td>
<td>27,298</td>
<td>2,433</td>
<td>4,374</td>
</tr>
<tr>
<td>Melbourne (C) – S’bank-D’lands</td>
<td>27,171</td>
<td>2,736</td>
<td>6,496</td>
</tr>
<tr>
<td>Frankston (C) – West</td>
<td>25,905</td>
<td>1,642</td>
<td>5,068</td>
</tr>
<tr>
<td>Whitehorse (C) – Box Hill</td>
<td>24,509</td>
<td>2,035</td>
<td>7,178</td>
</tr>
<tr>
<td>Stonnington (C) – Prahran</td>
<td>23,004</td>
<td>2,086</td>
<td>5,639</td>
</tr>
<tr>
<td>Banyule (C) – Heidelberg</td>
<td>22,890</td>
<td>1,505</td>
<td>6,735</td>
</tr>
<tr>
<td>Yarra (C) – Richmond</td>
<td>22,162</td>
<td>2,361</td>
<td>5,640</td>
</tr>
<tr>
<td>Boroondara (C) – Hawthorn</td>
<td>21,406</td>
<td>2,401</td>
<td>6,435</td>
</tr>
<tr>
<td>Glen Eira (C) – Caulfield</td>
<td>18,846</td>
<td>1,462</td>
<td>5,397</td>
</tr>
<tr>
<td>Port Phillip (C) – St Kilda</td>
<td>18,171</td>
<td>1,813</td>
<td>5,104</td>
</tr>
</tbody>
</table>

**Total of Melbourne SD**

|                | 1,441,722 | 126,476 | 313,232 |

In this table only SLAs of Work Destination are shown that have 2000 or more Managers and Administrators, or 5000 or more Professionals. 2000 and 5000 are about 15% of each total employment.

SLA: Statistical Local Area
Melbourne SD: Statistical Division 205

*Table 4* Major Destinations of Managers, Administrators and Professionals in Melbourne

Source: Australian Bureau of Statistics (2001) – *Census of Population and Housing*
Figure 3 shows the independent concentrations of Managers and Administrators around Kingston North SLA. Kingston North has a very remarkable concentration of managers and administrators as Table 4 indicates. On the other hand, we find continued expansion of professionals’ work places from the CBD (Figure 4). Some SLAs in the southeastern suburbs have almost the same scale as the agglomerations of professionals in Monash SLA. The difference of spatial pattern in these office occupations can be seen in Figure 3 and Figure 4.

Regarding the compact city policy of Melbourne 2030, we have shown the Principal Activity Centres in Figure 3 and Figure 4. However, we cannot determine many relations between these centres and employment patterns. For this, a characterization of each Activity Centre function based on the socio-economic features of the hinterland is needed in order to develop them as job centres.

Figure 5 and Figure 6 show the pattern of commuting flows of different occupations to the two suburban destinations of Kingston and Monash. In figure 5 the classes are 1%, 2%, 3% and 5% of total workers for each destination. The top class SLAs are shown in red, characterized by commuters living in the eastern or south-eastern suburbs. This tells us that the commuting flows overlap and that several commuting flows between suburbs are common. This commuting pattern is supported not by public transportation but by automobiles, as mentioned above.

O’Connor and Healy examined jobs and housing balances in the Melbourne Metropolitan Areas from a similar point of view to this article (Healy and O’Connor 2001; O’Connor and Healy 2004). They concluded that the relationship between jobs and housing was critical for building a sustainable urban area. However, their analysis also focused on the balance between each municipality unit or wider Statistical Divisions. This kind of regional structure is composed of overlapping commuting flows and requires more than just an analysis of job-housing balance (self-containment) in any kind of suburban unit.

The reason for this is that the present suburban commuting flows overlap each other in diverse directions, making them difficult to show using any kind of spatial unit. Current commuting flows spill over wide suburban areas in every direction because of high vehicular mobility. Moreover, the Activity Centres which do not attain prominence within the regional structure need to play a greater role in order to clarify their focus and to unify the area.
Figure 5: Residences of Commuters who work in the Kingston North SLA
This illustrates the overlapping nature of automobile-based, inter suburban commuter flows.
Figure 6 Residences of Commuters who work in the Monash South-West SLA
This further illustrates the overlapping nature of automobile-based, inter suburban commuter flows.
4. CONCLUSION

The CBD of Melbourne still has the most comprehensive array of central functions in the metropolitan area. Its metropolitan area has suburbanized many kinds of functions but still appears to maintain its centripetal metropolitan structure regarding employment or commuting when compared to the Atlanta Metropolitan Area which is obviously multinucleated. We find no large department stores in the CBD of Atlanta now, but large department stores still prosper in downtown Melbourne. Office functions also remain in the Melbourne CBD. Yet in spite of this, cross commuting between suburbs, the regional structure beneath the centripetal commuting pattern, is increasing rapidly and gaining in importance.

In recent research, independent suburbs have been called “Edge Cities” (Garreau, 1991), “Suburban Realms” (Hartshorn and Muller, 1989; Fujii and Hartshorn, 1995) and “self-containment in regions” (Healy and O’Connor, 2001). The term “Suburban Downtowns”, as originally used in Hartshorn and Muller (1989), are the suburban centres in each suburban realm. Independence, or unity as a space, can be examined and indicated from data such as the job-housing balance, commuting trends or shopping flows. Cross flows, however, decrease the effectiveness of such a self-containment concept.

Even if both jobs and houses increase in each suburb, the increase of cross commuting between them makes the unity of each suburb less viable. Additionally, cross commuting by car generates dispersed flows. Their origins, homes, are dispersed in the suburbs, of course, but their destinations, their work places, are also dispersed in the suburbs. Suburban downtowns where functions are concentrated developed in Atlanta in the 1990s. However, dispersed suburbanization, which Lang (2003) calls the “Edgeless City” is again dominating, as discussed above. This suburbanization is the same type as that found in Melbourne. In Melbourne, this dispersed suburbanization without concentration of functions to large suburban cores has generated the dispersed cross commuting noted above, though one function, such as retail, became concentrated. Activity Centres are very important in attempts to control suburbanization, but the effect of their growth as work places is not easy to manage (Birrell et al., 2005).

Thus, dispersed suburbanization and cross commuting flows are common and very fundamental, even in metropolitan areas with different features or social contexts. Central functions locate in very different ways in each urban area, but behaviour patterns of commuting or shopping show similar trends. The central city remains strong in Melbourne, but various cross flows by car occur under its centripetal transit flows.

This kind of cross flow is very critical for urban areas in the 21st century (Davis and Perkins, 1992; Birrell et al., 2005). These flows mainly occur by car and cause environmental problems. Public transportation is effective in serving centripetal flows but not cross flows, as this pattern of cross flows generates multiple destinations. Even if the multi-centre structure consisted of compact cities, it is not easy to generate an independent realm around each centre.

Moreover, various destinations are important in order that each husband and wife in a family has an opportunity to select his/her job as it occurs in the American automobile-dominated suburb. This is a very critical and difficult issue regarding the relation between suburbanization trends and new urban visions such as compact cities, as mentioned in Healy and O’Connor (2001). In metropolitan areas in the 21st Century, it is an issue of consequence as to how we control cross flows as well as the locations of centres.
Comparatively independent suburbs, which show inter-relationships with each other and do not involve contact with the CBD due to international relationships in the globalizing economy, are increasing in number. They communicate directly to regions abroad. The headquarters of international companies, such as UPS or Home Depot for example, can be found in the northern suburbs of Atlanta. Many Japanese companies are located in the south-eastern suburbs of Melbourne.

Current metropolitan areas are composed of diverse and patched places: CBD, inner city and various suburbs. They have no definite boundaries. They are continually reproduced by global interrelationships interacting together with local relationships (Massey, 1994; Amin and Thrift, 2002).

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