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**Unpacking the Demand for Higher Density Housing: An Analysis of Spatially Discontinuous Housing Sub-markets in Sydney and Melbourne**

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# Unpacking the Demand for Higher Density Housing: An Analysis of Spatially Discontinuous Housing Sub-markets in Sydney and Melbourne

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**Abstract**

Australian cities are facing a higher density future. With metropolitan planning strategies in place or under development across much of metropolitan Australia that promote compact city outcomes, the development of higher density housing, particularly in the form of apartments, is becoming a major feature of our housing markets. In Sydney and Melbourne this form of housing has already become a major component in the housing provision.

This paper sets out a novel approach to the delineation of the component groups that underpin the demand profile for private market higher density housing in these two cities. One of the distinctive features of this market is its spatial fragmentation, with pockets of apartments and attached housing highly associated with areas which have been zoned for this kind of dwelling, or where redevelopment of older housing predates the introduction of higher density zoning, as well as the three dimensional nature of the housing. It is therefore difficult to apply traditional two dimensional spatial analysis approaches to delineating the sub-structure of the consumption of higher density housing. Rather than base sub-group definition in terms of the simple geographical delineation of exclusive contiguous sub-areas, this approach uses the concept of spatially discontinuous housing markets to unpack the structure of the current demand for flats and apartments in Sydney and Melbourne.

The analysis is based on special ABS Census 2006 collector district level data for households living in apartment dwellings. A particular innovation is the use of GIS methods to display the spatial interpenetration of a range of different consumption groups within the higher density population, thus avoiding the problem of ecological fallacy common in earlier approaches. The paper therefore offers new insights into the different profiles of demand for higher density housing in Australia's two largest cities at a time when planning policies and markets are delivering greater numbers of this form of housing.

# Unpacking the Demand for Higher Density Housing:  An Analysis of Spatially Discontinuous Housing Sub-markets in Sydney and Melbourne

## Introduction

Australia is a highly urbanized country where, in the past, adequate land encouraged the spread of population in low density suburbs. Recent decades, however, have seen rapid urban growth, especially in the largest two cities of Sydney and Melbourne, and higher density housing (defined here as including attached townhouses, row and terrace housing, low-rise and high-rise flats and apartments) has accounted for the majority of new residential development. Such housing has been promoted as the best way of meeting changing patterns of housing demand with growing numbers of smaller households, of  providing housing in more accessible locations and hence influencing urban travel patterns, of improved environmental outcomes and increased infrastructure efficiency (NSW Dept. of Planning, 2005). At the time of the 2006 Australian Census, 631,000 households were living in higher density housing of all forms in Melbourne and Sydney, up from 546,000 in 2001, and this figure is planned to rise to approximately 1,665,000 households in the next 30 years.  Comparable levels of growth in the higher density market are envisaged for other Australian cities.  Table 1 shows the numbers of flats and apartments (excluding other forms of higher density dwellings noted above) in Sydney and Melbourne in 2001 and 2006.  Sydney's apartment market is significantly larger than Melbourne's, a reflection of greater redevelopment pressure from the historically higher land values in Sydney.

*Table 1:  Occupied apartments, Melbourne and Sydney, 2001 and 2006*

|  | Apartments 2001 | Apartments 2006 | % of private dwellings 2001 | % of private dwellings 2006 |
|---|---|---|---|---|
| Greater Sydney | 343,518 | 390,679 | 23.9% | 25.7% |
| Greater Melbourne | 177,579 | 217,835 | 14.3% | 16.1% |

However, the trend towards higher density redevelopment has been a long one in Australia. In Sydney, while the process of higher density residential renewal has been in progress since at least the 1930s (Spearitt, 2000), recent years have seen substantial increases in the scale and impact of higher density redevelopment (Butler Bowden 2007). Similar initiatives have taken place in Melbourne (Lewis 2000; Costello, 2005; Buxton and Tieman, 2005) and Brisbane (Michell and Wadley, 2004). The development of higher density housing was given a substantial boost in the early 1960s through the passing of strata titling legislation in most States which enabled, for the first time in Australia, the possibility of individual apartments being sold to individual owners (Easthope and Randolph, 2009). This process parallels essential similar developments in other comparable countries (Hamnett and Randolph, 1987; Bailey and Robertson, 1997).

As in other countries, urban consolidation through the development of higher density housing has become the central focus of metropolitan planning policy in Australia (Troy, 1996; Searle, 2004; Birrell *et al,* 2005). Over the last three years, metropolitan strategies developed both for Melbourne (Victoria, Department of Infrastructure 2002) and Sydney (NSW Department of Planning, 2005) concentrate higher density housing around mixed use transport orientated 'activity' centres (Melbourne) or 'strategic' (Sydney) centres and corridors (Holliday, 2000). Initial market-driven imperatives have been increasingly shaped and articulated by metropolitan planning policy to achieve a number of broad objectives.  These strategies are seen to represent a way of restructuring Australian cities so as to be more responsive to

important drivers of change, notably globalisation and the search for sustainability. Put simply, higher density cities have become the new urban planning orthodoxy (Foster, 2006).

However, there is little in these plans to suggest that planners have much idea about the markets they are planning higher density for. A central issue that has emerged since the development of these strategies is the capacity of the higher density market in both cities to deliver the numbers and scale of such development envisaged by the planners. But without an understanding of the market drivers of higher density, the numerical dwelling targets set by planners are little more than abstract wish lists.

The research on which this paper is based is part of a larger project which has sought to establish a better understanding of the drivers of demand in the higher density markets of Australia's two largest cities. It also develops and extends an earlier analysis of the Sydney higher density market which established the segmented nature of this market (Bunker, et al, 2005). This earlier research applied factor analysis to 2001 Census data for collector districts (the smallest Census geographical area comprising an average of around 250 dwellings) identified as having a majority of households living in higher density dwellings. While this focused the analysis only on those CDs with significant proportions of multi-unit homes, by definition it also included data on households in other types of dwelling. The data also included areas of both private and public sector higher density.

The paper sets out an improved and updated approach to the delineation of the component groups that underpin the demand structure for private market higher density housing by using specially prepared 2006 Census data for households living in privately owned higher density dwellings. Therefore, the analysis is focused only on this market, making a much more direct analysis possible. The analysis is also extended to Melbourne, Australia's second largest city, making possible a comparison between the structures of demand for higher density residential housing in these two cities. As the analysis below shows, these are quite distinctive, indicating quite different market contexts for this form of development in the two cities.

One of the distinctive features of this market is its spatial fragmentation, with pockets of apartments highly associated with areas which have been zoned for this kind of dwelling, or where redevelopment of older housing predates the introduction of higher density zoning. It is also a housing market that exists in three dimensions, with often a mix of demand groups within a single building, let alone within a neighbourhood. It is therefore difficult to apply traditional two dimensional spatial analysis approaches to delineating the sub-structure of the consumption of higher density housing. Rather than base sub-group definition in terms of the simple geographical delineation of exclusive contiguous sub-areas, this analysis uses the concept of spatially discontinuous housing markets (Randolph, 1991) to unpack the structure of the current demand for flats and apartments in Sydney and Melbourne.

A further innovation is the use of GIS methods to display the spatial interpenetration of a range of different consumption groups within the higher density population, thus going someway to negate the problem of ecological fallacy common in earlier approaches

The next section discusses the definition of housing sub-markets and introduces the concept of spatial discontinuity as a more appropriate tool in better understanding the nature of the complex and spatially fragmented higher density housing sector. The third section provides an empirical analysis of the sub-markets of the Sydney and Melbourne higher density markets using three dimensional mapping. A final section provides concluding comments.

**The spatial nature of housing markets and the importance of 'the local'**

Housing market analysis offers a way of unpacking the spatial outcomes of the higher density market in order to provide a better understanding of the social impacts urban consolidation policy might deliver on the ground. Recent housing market research has argued that housing sub-markets are formed by structural or spatial factors, or indeed both, and that sub-markets have important *local* dimensions (Maclennan and Tu, 1996; Watkins, 2001). Research of this kind in Scotland argued that the very concept of housing markets relies on a high degree of local spatial self-containment, so that most

households moving house without changing jobs would move within the same area (Jones, Leishman and Watkins, 2001; Jones, 2002). The emphasis in a housing study carried out in Northern Ireland was on the "three interrelated themes of segregation, socio-tenurial polarisation and sub-markets" (Adair *et al.*, 2000, p.1079). The results showed the importance of these themes and the researchers concluded that in order "to sensitise policy to the reality of housing …. it is necessary to unpack local markets with empirical analysis of the key market drivers, including choice patterns." (Adair *et al.*, 2000, p.1091).

There have been a range of more conceptual debates concerning the nature of urban housing market structure and function that have emerged at different times and largely independently within the broad fields of geography, urban economics and applied policy. They all, however, have one underlying theme, namely the importance of understanding *local* sub-structures to housing markets and their interrelationship over space.

These (*re*)realisations have been voiced in several ways; *"not only do submarkets matter, but geography matters"* (Bourassa, et al., 2003), from the field of housing economics; the growing need to not just consider the processes of locations but also *"… the diversity of the relations that transect urban areas, and the complexity and unevenness of their inter-relations"* (Healey in DeRoo and Porter 2007 p.30) from planning; the "*broken-up*" solutions identified by Power and Houghton (2007), from applied policy research.

Drawing on these precedents, the remainder of this paper presents an analysis of the character and location of housing sub-markets within Sydney's higher density housing market. Central to this analysis is the view that these sub-markets are formed by *market segmentation* and that each segment can be represented at a *number of locations* that are not necessarily continuous in space (Randolph, 1991; Galster, 1997; Bourassa, *et al.*, 1999). The notion of spatially discontinuous housing sub-markets or segments is a useful way of understanding the fragmented and interpenetrated nature of real housing markets

**Housing sub-markets**

It is widely recognised that housing markets are differentiated socially and spatially. Indeed, much of the last 50 years of urban geographic endeavour has sought to describe and explain this structure. Dating back at least to Grigsby (1963), analyses by urban economists have attempted to define sub-markets in terms of property form (Bajic, 1985; Adair et al., 1996, for example), environmental characteristics (Galster, 1987) and the geographical function of the vendors or those facilitating sales (real estate agents) within the broad market itself (Palm, 1976; Michaels and Smith, 1990). Within the urban sociology tradition, Rex and Moore's (1969) 'housing class' approach can be interpreted in an overtly spatial manner. Social area analyses, especially when linked to new forms of small area census data, also sought to achieve a similar more detailed description of urban residential sub-markets, albeit with no clear articulation of the housing market processes that might be generating such patterns (see Basset and Short, 1979).

Housing sub-markets, conceived of as being relatively homogenous in terms of their demand and supply characteristics, therefore form a basic building block of urban housing market analysis. From an urban economic standpoint, Watkins (2008, p 168) argues that:

> *Sub-markets are deemed to comprise properties (and locations) that are likely to represent relatively close substitutes to consumers searching for dwellings. They have both spatial and structural (dwelling type) dimensions…. In spatial terms, they are likely to comprise several neighbourhoods.*

This formulation, however, does not fully capture the complexity of housing sub-markets in reality. While such a uni-dimension understanding of the spatial outcomes of sub-markets is reasonable in

relatively homogenous green field developments which are largely marketed to a specific demographic ('aspirational' families for example) and where social differentiation through tenure and stock restructuring has not greatly impacted on the composition of the local housing market, it is less appropriate for older suburbs where considerable restructuring of the local housing markets are likely to have taken place over time. Redevelopment of in-fill sites, an influx of rental investment, changing demand segments leading to up- or down-grading, and so on, leads to the emergence of much more complex overlays of sub-markets. In these areas, the delineation of spatially distinct sub-markets is unlikely to fit reality. In any one neighbourhood, there may be a mix of, for example, upwardly mobile younger buyers, and older home owners on low incomes, clusters of gentrifiers and a mobile student and low income renter market. Therefore a more nuanced conceptualisation of how housing sub-markets are located in space is needed.

Randolph (1991), building on labour market segmentation literature (Cooke, 1983) and housing class theory (see Basset and Short, 1979), suggested that the concept of spatial discontinuity offered a much more nuanced way of conceiving of and identifying the geographic expression of housing market structure.

> "*The housing market in any one locality is therefore characterized by a hierarchy of overlapping socially* and *spatially defined segments … Each segment will have its own distinctive economic, social and locational characteristics, defined both in terms of the structure of provision on which it is based and the social characteristics of the population it accommodates*" (Randolph. 1991, p. 34)

The "structure of provision" in this conceptualisation includes both institutional attributes (such as tenure) as well as physical dwelling form.

The concept of spatially discontinuous housing sub-markets therefore explicitly recognizes the interpenetration of different demand sub-markets in space. Traditional methods of analysing the geographical nature of housing markets have relied upon an essential two dimensional representation of spatial outcomes. Mapping techniques, drawing on a lengthy tradition in geographical literature, especially of social area analysis noted above, using standard census mapping techniques essentially result in the delineation of spatially *exclusive* sub-markets. Utilising the concept of spatially discontinuous housing sub-markets allows a much more realistic description of the overlaying nature of housing markets. In this paper, we are able to explore this empirically through the application more sophisticated analysis using factor analysis methods.

**Unpacking higher density housing: a factor analysis of key sub-markets**

We turn now to the empirical focus of the paper: the identification of spatially discontinuous higher density sub-markets in Sydney and Melbourne. The basis of the following analysis is a factor analysis using specially commissioned 2006 Census cross-tabulations obtained from the Australian Bureau of Statistics (ABS). Census Collectors' Districts (CDs) were selected as the spatial basis for this analysis for several reasons. Firstly, the housing stock in any given neighbourhood is diversified (van Kempen and van Wessep, 1998; Kauko *et al.*, 2002). CDs provide the most *localised* area for which dwelling and socio-economic information is collected. Therefore, CD data allow us to more accurately identify these under-researched local market structures (Chow and Coulton, 1998; Maclennan and Tu, 1996). Secondly, CDs are not only mappable, but also allow us to build up a picture of 'functional' housing market areas that are most likely to assist local policy makers (Jones *et al*, 2001). Classification of socio-economic data into meaningful components (factors) in order to describe location based profiles by this method is a necessary methodological step in order to begin to reduce the statistical noise associated with the inter-relation of different sets of variables across space.

This work follows from previous work in the same area (Bunker et al, 2005; also Bourassa *et al*, 2003), with a key difference being the use of specialised figures commissioned from the Australian Bureau of Statistics (ABS) 2006 Census that pertain only to those populations living in some form of flat or apartment at the localised Census Collection District (CD) level (in other words a *defacto* Census of those living in high density developments). This approach serves to negate neighbourhood effects, for example the inclusion extraneous data on those not in high-density forms but within CDs containing apartment developments. It should also be noted at the outset that the extracted data excludes those in all forms of social renting; this decision was made at the outset of the research as one of the primary research questions concerned residents' choice of high-density developments, rather than direct allocation based on need.

Twenty-eight Census derived variables were utilised for the analysis (these are listed in Table 3). There are two important omissions from these socio-economic variables, namely gender and ethnicity. This was a deliberate decision in order to assess variables which *indicatively* could only be assigned to an individual's objective position within socio-economic space. However, given that place of birth is an important consideration affecting apartment living this will be reintroduced after the factor analysis as a refining element. All variables were standardised as Z-scores in order to normalise the fact that several of the variables related to different populations (for example, it could not be expected that everyone included in the analysis would be in the labour force). To sharpen the focus of the analysis, only CDs with a population density per square metre greater than the overall city average for high density residents were selected. This step was applied due to the presence of many CDs with a very low number of high density residents. Such CDs had randomised results in line with the ABS's random error approach to deal with data confidentiality.

The factor analysis generated five factors which explained 83% of the total variance within the high density population (Table 2). This is a very high level of explanation, again illustrating the strength of the utilisation of the specific population of apartment dwellers from the Census. It is evident from Table 2 that Factor 1 is statistically dominant within the high-density population of both cities, accounting for 44% of total variation in the dataset, with Factors 2 and 3 accounting for the majority of the remainder (15% and 10% respectively).

*Table 2: Variance explained by the five factors, Sydney and Melbourne*

| Factor | Eigenvalue | % of Variance | Cumulative % |
|--------|-----------|---------------|--------------|
| 1 | 12.4 | 44 | 44 |
| 2 | 4.2 | 15 | 59 |
| 3 | 2.9 | 10 | 69 |
| 4 | 2.1 | 7 | 77 |
| 5 | 1.4 | 5 | 83 |

### *Description of the Factors*

Table 3 sets out the variables with the highest correlations against each factor; these can be deployed to create profiles of each of the five factors. To add further context to the factors, the overall percentage profiles of the Census data are shown in Table 4 to illustrate the overall characteristics of the populations of each factor grouping.  Similarly, Figure 5 provides data on the proportion of individuals who were Australian born for each factor grouping for Sydney and Melbourne.

*Factor 1: The Economically Engaged ('SINKS and DINKS')*

Dominated by a population comprising young adults through to younger middle aged couples, (with a low presence of under 15 year olds) and lone person households, this group is engaged in middle to higher end occupations and this is reflected in their relatively high household incomes (A$90,000 per year not uncommon). Whilst dominated by renters (63% of all households), this factor also has the greatest proportion of purchasers (25%).  For those renting, the economic position suggests a 'life style' rental market dominated by future home purchasers.

*Factor 2: Low-income Families ('Battlers')*

Strongly categorised by families (65% of the population) with children (21% under 15 years old) this group is engaged in lower occupational employment (39% in lower skilled occupations) which is reflected in low household incomes (almost half with an income below A$800 per week compared to a national median of A$1,027). Incidences of unemployment were also greatest amongst this group (12% of the labour force compared to 5.2% nationally). This said, well over a third of this group either owned their apartment outright or were in the process of purchasing, indicating a low end home ownership sector.  Importantly, almost two thirds of this group is overseas born, indicating a major role for this segment of the apartment market for immigrant communities.

*Factor 3: Achieving Education (Students)*

Comprising high levels of non family households (Lone Person or Group) and the greatest proportion of 15-24 year olds (almost 40%) this group is extensively engaged in private renting (78%). They also have the lowest household income profile, with over a third outside the labour force. Whilst data on educational activity was not included in the analysis; the CDs with this factor's highest score were predominantly located around sites of tertiary education, leading to the conclusion that this factor predominantly represents a student submarket. From Table 5 it is evident that this factor also had the lowest level of Australian born population (30% in Sydney and 38% in Melbourne).  Among those born overseas, Chinese (20%), Indonesian (16%) and Indian (12%) nationals predominate. In the Australian context, many Australian-born students study at tertiary establishments in their own home towns or cities and most continue to reside in their family home. It is the foreign student body which engages much more in private renting.

*Table 3: Correlations of socio-economic variables with Factors, Sydney and Melbourne (high positive values only)*

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| Population under 15 | - | 0.91 | - | - | - |
| Population 15-24 | - | 0.31 | 0.88 | - | - |
| Population 25-34 | 0.75 | - | 0.45 | - | - |
| Population 35-54 | 0.61 | 0.62 | - | - | 0.31 |
| Population 55-64 | 0.32 | 0.35 | - | 0.41 | 0.57 |
| Population over 65 | - | - | - | 0.90 | - |
| Family Households | 0.61 | 0.66 | - | - | - |
| Multiple Family Households | - | 0.70 | - | - | - |
| Lone Person Households | 0.59 | - | - | 0.64 | - |
| Group Households | 0.46 | - | 0.76 | - | - |
| Nil weekly Income (A$) | - | - | 0.88 | - | - |
| Under A$350 weekly income | - | - | - | 0.73 | - |
| A$350-799 weekly income | 0.30 | 0.61 | - | 0.47 | - |
| A$800-1399 weekly income | 0.76 | 0.42 | - | - | - |
| A$1400-2499 weekly income | 0.88 | - | - | - | - |
| A$2500-3999 weekly income | 0.50 | - | - | - | 0.78 |
| Over A$4000 weekly income | - | - | - | - | 0.84 |
| Owns Outright | - | - | | 0.84 | 0.35 |
| Purchasing | 0.74 | 0.41 | - | - | - |
| Privately Renting | 0.71 | - | 0.56 | - | - |
| Managers, Professionals and Technician Occupations | 0.77 | - | - | - | 0.55 |
| Service, Administrative and Sales Occupations | 0.85 | 0.36 | - | - | - |
| Machine operators and Labourer Occupations | 0.39 | 0.79 | - | - | - |
| Full Time Employment | 0.90 | - | - | - | 0.32 |
| Part Time Employment | 0.59 | 0.44 | 0.45 | - | - |
| Unemployed (in Labour Force) | - | 0.67 | 0.52 | - | - |
| Not in Labour Force | - | 0.59 | 0.50 | 0.55 | - |
| Labour Force Not Stated | - | - | 0.46 | - | 0.45 |

*Table 4: Census derived percentage profiles of total apartment dwelling population by dominant Factor scores, Sydney and Melbourne*

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| Under 15's | 8% | 21% | 5% | 8% | 7% |
| 15 to 24 | 14% | 15% | 39% | 10% | 10% |
| 25 to 34 | 38% | 24% | 32% | 20% | 32% |
| 35 to 54 | 28% | 28% | 16% | 21% | 30% |
| 55 to 64 | 6% | 6% | 4% | 10% | 11% |
| Over 65 | 6% | 6% | 4% | 32% | 10% |
| Single Families | 44% | 65% | 39% | 38% | 50% |
| Multiple Families | 0% | 2% | 0% | 0% | 0% |
| Lone Persons | 44% | 27% | 38% | 57% | 39% |
| Group Households | 11% | 6% | 23% | 5% | 11% |
| No or Nil Income | 2% | 3% | 15% | 2% | 2% |
| Under A$350 | 9% | 16% | 15% | 27% | 7% |
| A$350 to A$799 | 17% | 33% | 19% | 28% | 11% |
| A$800 to A$1399 | 29% | 30% | 24% | 22% | 18% |
| A$1400 to A$2499 | 29% | 15% | 18% | 14% | 25% |
| A$2500 to A$3999 | 14% | 3% | 8% | 6% | 30% |
| Over A$4000 | 1% | 0% | 1% | 1% | 7% |
| Owned Outright | 12% | 14% | 10% | 37% | 23% |
| Purchasing | 25% | 24% | 12% | 16% | 21% |
| Private Renting | 63% | 62% | 78% | 47% | 56% |
| Managers, Professionals and Technician Occupations | 54% | 29% | 52% | 46% | 70% |
| Service, Administrative and Sales Occupations | 31% | 32% | 27% | 32% | 22% |
| Machine operators and Labourer Occupations | 15% | 39% | 21% | 21% | 8% |
| Full Time | 78% | 65% | 61% | 71% | 78% |
| Part Time | 18% | 23% | 28% | 22% | 18% |
| Unemployed | 4% | 12% | 11% | 6% | 3% |
| Not in Labour Force | 14% | 32% | 30% | 41% | 16% |
| Labour force position not stated | 11% | 12% | 16% | 10% | 21% |

*Table 5: Australian born as a percentage of total apartment population by dominant factor scores, Melbourne and Sydney*

|  | Sydney | Melbourne |
|---|---|---|
| Factor 1 | 54% | 58% |
| Factor 2 | 37% | 38% |
| Factor 3 | 30% | 36% |
| Factor 4 | 53% | 59% |
| Factor 5 | 54% | 56% |

*Factor 4: Residentially Retired ('Empty Nesters')*

Over a third of this factor are aged over 65 an over a half are lone person households. Although heavily correlated with low incomes and with over 40% not in the labour force, almost two in five own their apartment outright. This group also had the highest incidence of Australian born, suggesting that this population is predominantly white retirees.

*Factor 5: The Apartment Elite*

To a large extent this final factor can be seen as a mid-life point between Factors 1 and 4. They are middle aged and are engaged in higher end occupations, with over a third drawing annual household income in excess of A$130,000. Whilst over half are renting (possibly through company lettings), almost a quarter own their property outright.

**Analysis of Factors by City**

It should be noted, however, that the factor analysis process identifies overall statistical pervasiveness *within* CDs. Simply put, the process gives emphasis to populations that are most spatially concentrated. In the methodology outlined above the most statistically pervasive factor was the Economically Engaged, and this is a facet of the high-density form to which they are more aligned – large developments, that sometimes comprise entire CDs. However, this built form mode isn't the most common mode in Australian urban areas, the most common being smaller blocks (typically comprising between 6 to 12 units) that tend to be intermixed in locations with lower density housing. This infill style of development, whilst numerically greater is more spatially diverse and exists across many older suburbs. So, in other words, there is the potential that other factors, whilst not as spatially concentrated as the Economically Engaged, may in fact have a sum total population size *greater* then this group

In order to explore this potential each CD was attributed with its primary factor classification and the sum total each CD's higher-density population was assigned to this factor. Whilst this approach can be criticised as falling into the Ecological Fallacy trap (as discussed earlier) it does serve to underline an important point, namely the level of potential classification overlap.

As Table 6 shows, the predominant market share in terms of overall population size, in Sydney was the Battler group – low income family renters, often immigrants, and very much at the bottom end of the Sydney apartment market. In contrast, this group accounted for only 10% of the apartment market in Melbourne.

*Table 6: Percentage of high density population in Factor groups by total of CDs classified by primary factor*

|  | Sydney | Melbourne |
|---|---|---|
| Battlers | 38% | 10% |
| Economically engaged | 24% | 22% |
| Apartment Elite | 23% | 13% |
| Residentially Retired | 10% | 25% |
| Achieving Education | 6% | 30% |

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In practice, the smaller scale and more recent construction of the Melbourne market has meant there are fewer apartments in lower value locations and therefore it accounts for a much lower proportion of the low income market here. In Sydney, relatively higher property prices across the city and the relative absence of public housing (which only accounts for 5% of the Sydney housing stock) and the greater prevalence of older (1960 and 1970s) low amenity blocks provides a ready market for investors seeking returns from lower income households who can't afford to buy.


**Analysis of Factors by Location**

Turning now to the central issue of the spatial location of these groups; Tables 7 and 8 set out their broad location in terms of three simple geographic zones, Inner, Middle and Outer suburbs, for each city (defined in Figures 1 and 2).

Once again, there are clear differences between the cities, although the overall social gradient from inner to outer is evidence for both. Firstly, the Battler group is predominately a middle suburban market in Sydney, but an outer suburban market in Melbourne. This confirms earlier analyses (Randolph and Holloway, 2005) which established a close association between this lower income group and the band of suburbs built mainly between 1930 and 1960 and where higher density renewal around town centres and train lines took place from the 1960s following local rezoning and the growth of the strata market. These are amongst the most disadvantaged communities in Sydney and, to a lesser extent, in Melbourne.

In contrast, the economically engaged are predominantly either an inner city *or* an outer city grouping. Of all the groups, the retired show a more even distribution, with middle and outer areas predominating, a reflection of the more limited purchasing capacity of this group. The remaining two groups, the apartment elite and those in education, have an inner city orientation. The former, in particular, is highly concentrated in the inner city areas where recent apartment building has been orientated to a higher end market, for example Melbourne's Docklands redevelopment and Sydney's Pyrmont, both old maritime and industrial areas. Students also are closely associated with inner city locations, a reflection on the large university sector in these two cites, with substantial number of overseas students.

*Table 7: Distribution of groups in Sydney by broad location (Column %)*

| *Sydney* | Inner | Middle | Outer |
|---|---|---|---|
| Battlers | 9% | 59% | 39% |
| Economically engaged | 25% | 10% | 34% |
| Apartment Elite | 52% | 13% | 3% |
| Residentially Retired | 6% | 13% | 25% |
| Achieving Education | 8% | 5% | 0% |

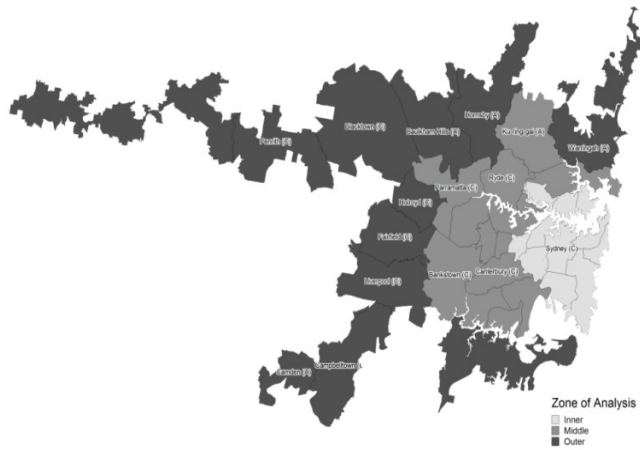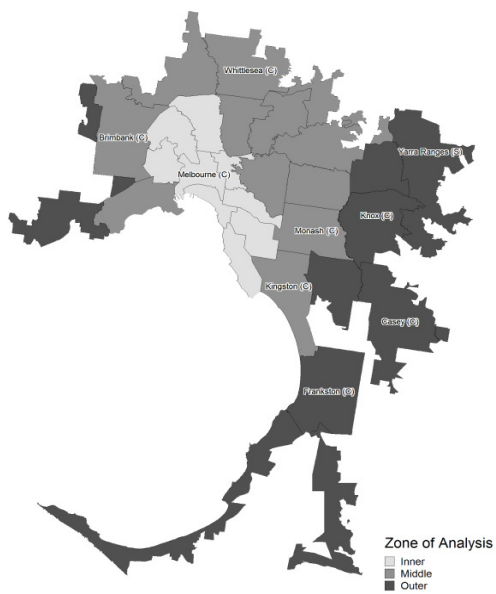*Figure 1: Inner, Middle and Outer Suburb definition, Sydney*

*Table 8: Distribution of groups in Melbourne by broad location (Column %)*

| Melbourne | Inner | Middle | Outer |
|---|---|---|---|
| Battlers | 1% | 15% | 36% |
| Economically engaged | 29% | 10% | 0% |
| Apartment Elite | 22% | 3% | 0% |
| Residentially Retired | 16% | 36% | 64% |
| Achieving Education | 33% | 36% | 0% |

*Figure 2:  Inner, Middle and Outer Suburb definition, Melbourne*

**Spatially discontinuous higher density sub-markets in Sydney and Melbourne**

But how do these sub-markets play out in space at the local level? Figures 3 to 6 maps the two primary factor groupings based on the loadings of each CD against the factors for Sydney and Melbourne. The distinctive locational attributes of each of the five markets in each city are clear. However, a key point to note here is that although they are located in distinctive spatial sub-markets, the interpenetration of the five sub-markets is also evident. No one sub-market occupies an exclusive distribution across the city, despite having distinctive geographical characteristics. In part, some of the crossover reflects variations within the price profiles of each sub-market. We specifically excluded measures of dwelling price (rent or property valuation data) in this analysis specifically to focus on social profile characteristics. Adding a price profile into the analysis would essentially compound the income potential capacities inherently expressed in the outturn factors from the household income data.

Moreover, the spatially discontinuous nature of the sub-markets is clearly evidenced in these maps. This illustrates why the fragmented spatial distribution of the apartment market in both cities makes a traditional approach to the spatial analysis of housing market structure so difficult. This both reflects the spatial planning context, with higher density limited to areas where the local planning zoning allows such development, as well as the literally, three dimensional nature of higher density housing markets. Both these features make more conventional conceptions of spatial housing markets of limited use.

Figure 7 has been provided as a means to visually conceptualise the interplay between the 5 factor groupings in a particular high density market in central Sydney (Pyrmont), an area subjected to a major urban renewal process over the last two decades with higher density apartment replacing redundant port facilities in the central area of Sydney. This suburb is relatively unique as all 5 factors co-exist (to varying degrees) across the neighbourhood.
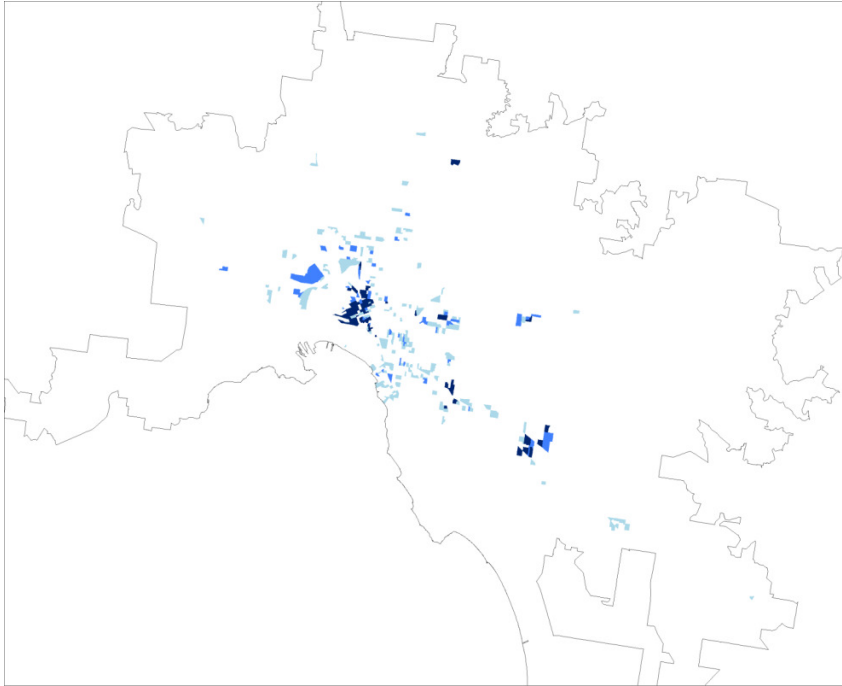
*Figure 3:  Factor 1 – Economically Engaged: Sydney*
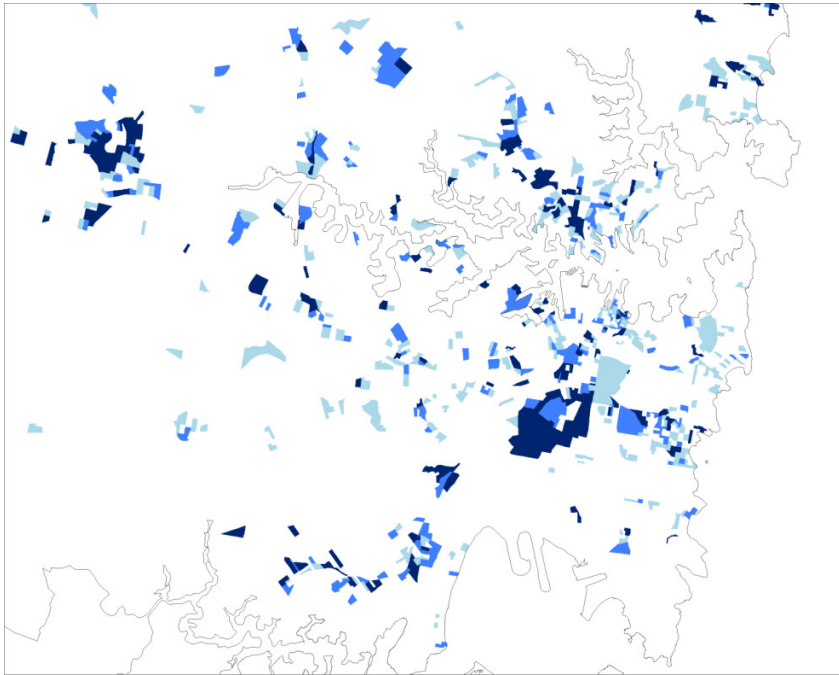


*Figure 4:  Factor 2 – 'Battlers': Sydney*
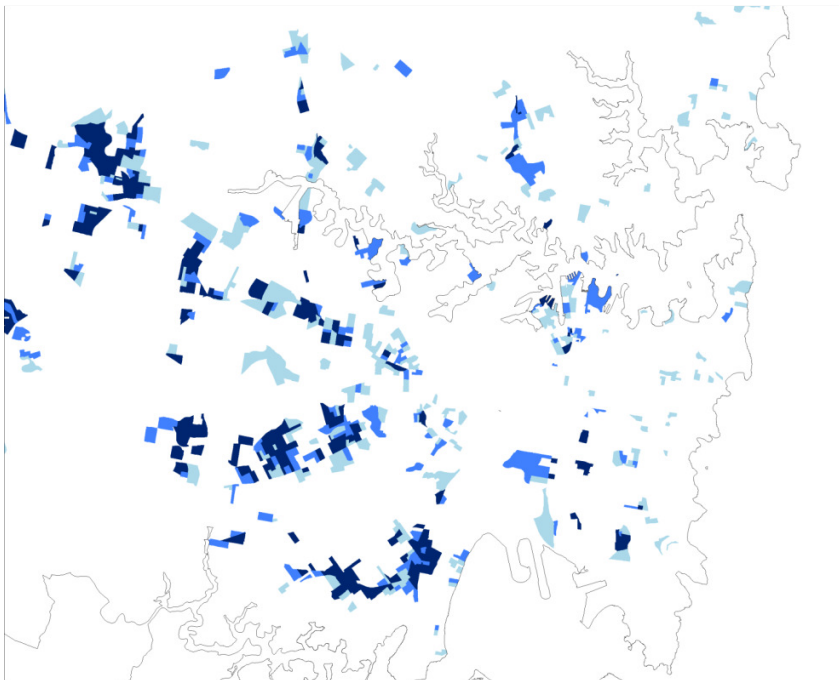
*Figure 5: Factor 3 - Achieving Education: Melbourne*



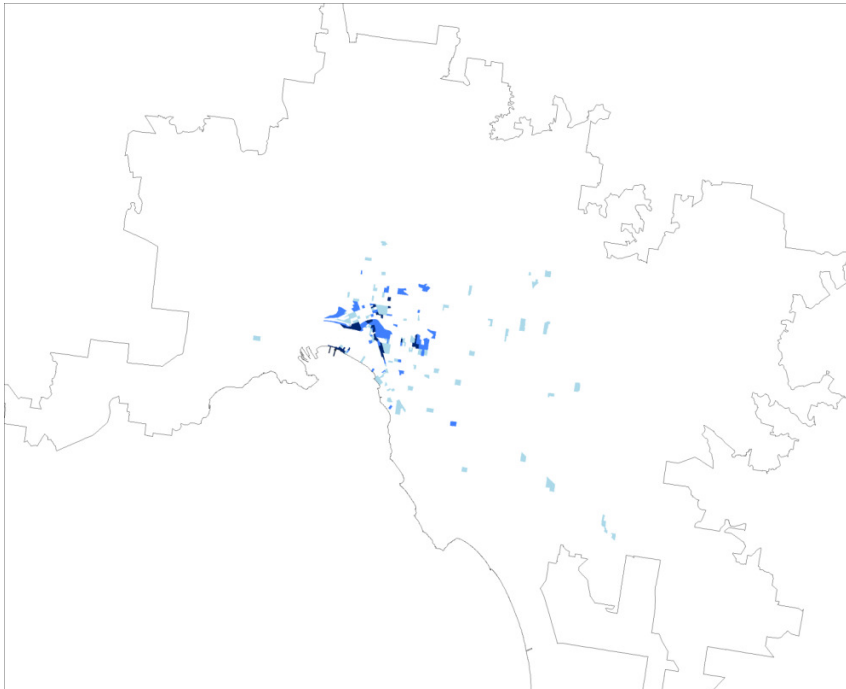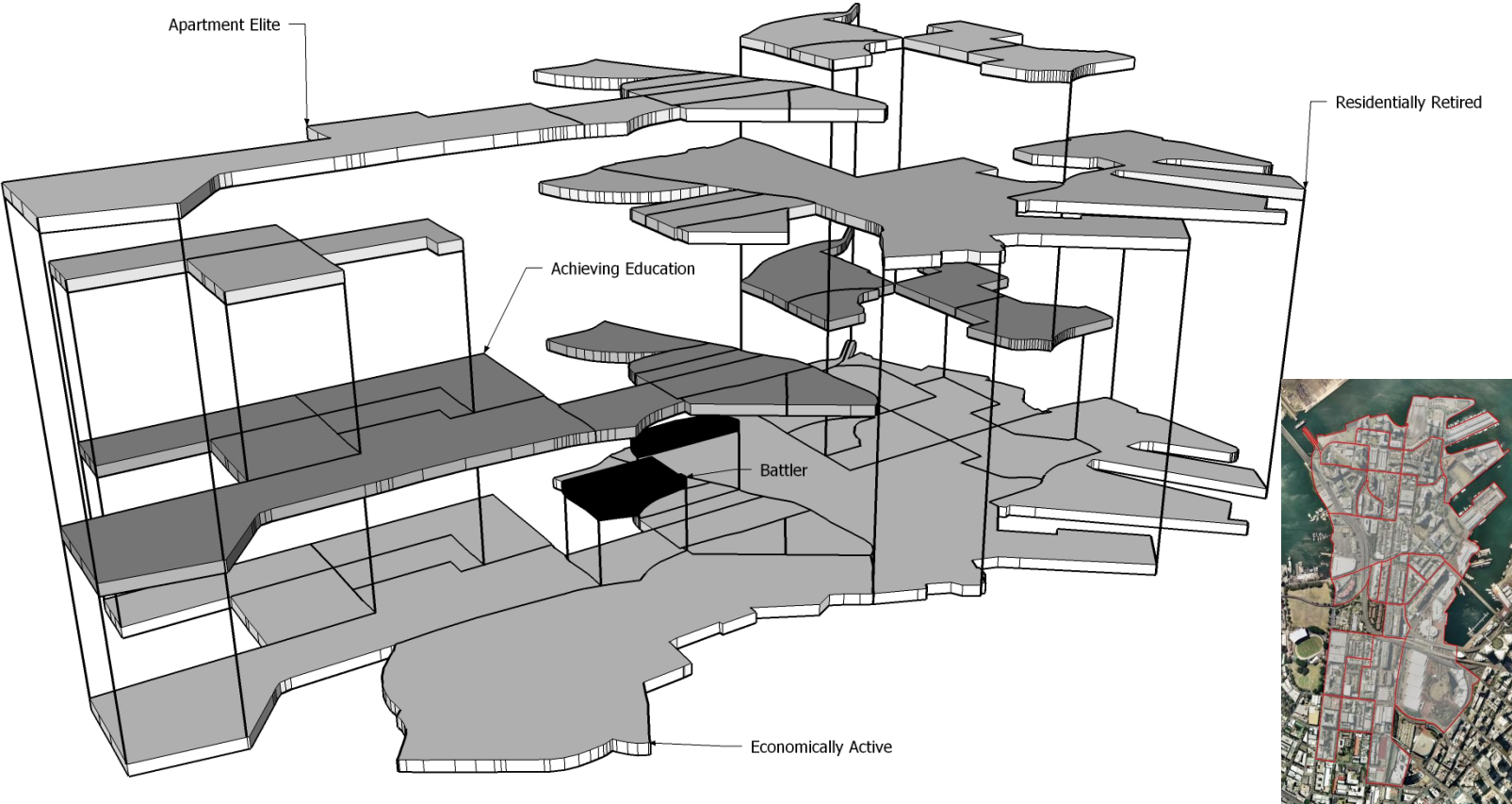*Figure 6: Factor 5 - Apartment Elite: Melbourne*

*Figure 7: Exploded CD level diagram of overlap of High Density markets in Pyrmont (Inner Sydney)*

Valuable as these visualisations are in illustrating the discontinuous and fragmented nature of the higher density market, they do not provide a precise analysis of the degree to which sub-markets are interpenetrate in space. Table 8 illustrates the degree of interpenetration of the five factors produced in the analysis through the assessment of the total population size within locations where the different factors return a statistically robust score, but less than the primary factor used in the classification.

*Table 8: Apartment dwelling population concentration by intersection of factors (scoring above .3 loadings on Varimax Rotation)*

| Intersection of Factors | % of total population |
|---|---|
| One Factor only | 61% |
| Two Factors intersecting | 22% |
| Three Factors intersecting | 7% |
| Four Factors intersecting | 10% |

This highlights another issue concerning the spatial discontinuity of interrelated housing sub-markets and the potential for a multiplicity of demand utilisation (from different population groups) concentrating on single high density developments. The implications of this, together with more detailed examination of the segmentation of housing markets and differences between the two cities in this regard, are the subject of forthcoming papers from this research.

**Sub-market spatial interpenetration**

While Table 5 indicates the degree of spatial interpenetration between the factors, it does not establish the extent of spatial interrelationship. The following analysis takes the top two factors in each city (in terms of overall gross population size) and considers their spatial relationship in graphical form. This analysis is provided in order to demonstrate the complexity of the interrelations when only considering the spatial distribution of two factor groups only; as has been demonstrated previously up to four groups intersect across 10% of the total population.

For the purposes of clarity the ABS's Suburb geography has been utilized, rather than the previous analysis which used the much smaller Collector District level. To this end interrelationships of the factor groupings at the micro-level will be suppressed; nevertheless, the following does emphasise the sheer complexity and level of spatial discontinuity that housing markets can contain.

For Sydney the two most dominant factor groups were the Battler and Economically Engaged groups. The two key differences, shown in Table 4 above, between these groups were the employment status of the adult populations and the much greater presence of children in the Battler group.

Figure 8 is divided into four quadrants by lines intersecting the 0.0 origin for each group. The actual location of the 0.0 line is in itself a useful indication of the spatial nature of both the groups.

*Figure 8: Groupings of Suburbs by presence / absence of Factor Groups 1 and 2 - Sydney*
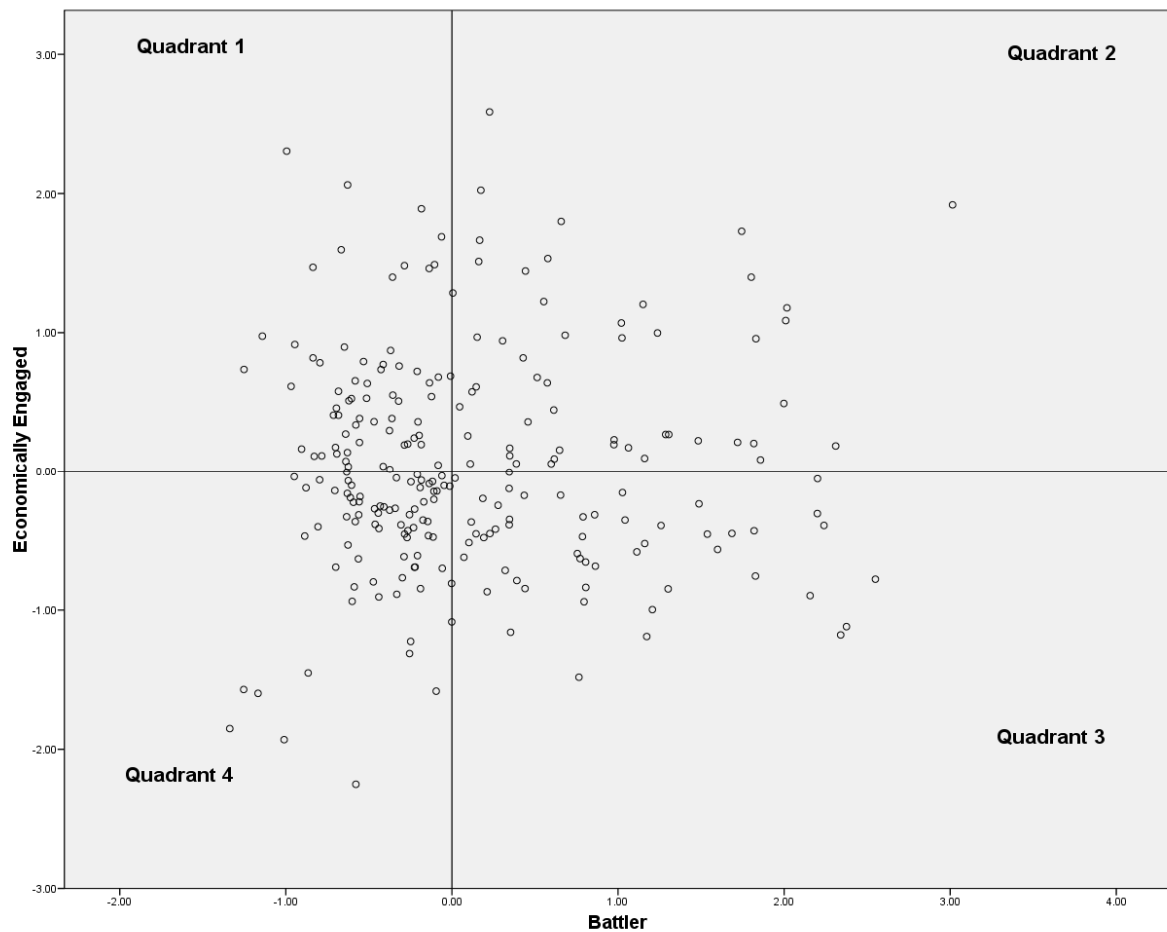


From this analysis we can see that the Battler group is more widely spread, spatially, while the Economically Engaged appears to have more of a tendency to concentrate. In part, this is a facet of the differential physical form of apartment development in Sydney; the Battler group being more aligned with older developments of 2- and 3-storey blocks of 4 – 10 apartments spread across a wider geography than the newer larger developments (typically schemes of more than 50 apartments) which are more associated with the Economically Engaged.

The four quadrants are:

> *Quadrant 1* – locations dominated by Economically Engaged populations
> *Quadrant 2* – locations comprising an increasing mix of Economically Engaged and Battler populations
> *Quadrant 3* – locations dominated by Battler populations
> *Quadrant 4* – This lower left hand quadrant reflects locations where both the Economically Engaged and Battler populations are not represented at any meaningful statistical level.

Figure 9 maps out the distribution of the three groups identified in Figure 8 for Sydney suburbs. The actual geography generated by this conforms, broadly, to the social geography of Sydney with lower income Battler households (Quadrant 3) clustering in middle ring suburbs and more affluent Economically Engaged (Quadrant 1) in inner city suburbs to the north and south of the CBD area.

Quadrant 2, the more mixed suburbs, are clustered in two main areas – around Botany Bay to the south and around the central west major centre of Parramatta.

*Figure 9: Spatial distribution of Factor Groups 1 and 2, Sydney*
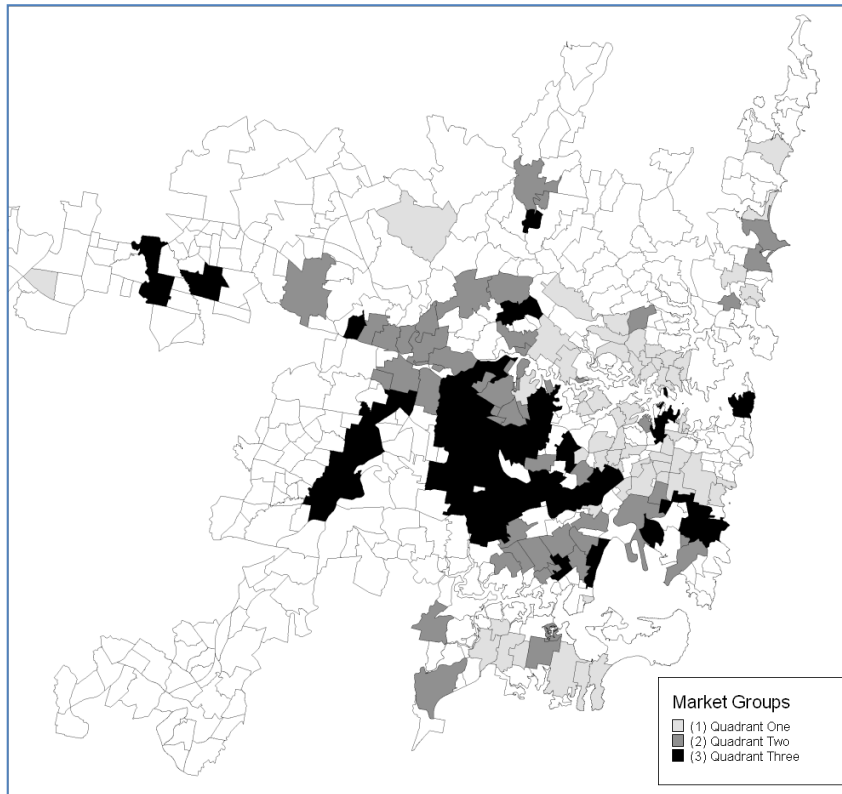


Melbourne's profile is dominated by the Achieving Education and Residentially Retired Factor groups. Figure 10 demonstrates that, on the whole, these two groups occupy spatially distinctive spaces in Melbourne. Indeed, when the same group classification process used in the Sydney case is applied, only 12 suburbs (out of a total of 133 suburbs containing apartments) can be classified as Quadrant 2, containing some element of mixing of these two populations.

Figure 11 shows the spatial distribution of the three groups and highlights a very high degree of spatial separation. The Achieving Education cohort (Quadrant 1) is broadly tied to newer developments within the CBD and associated transport nodes. This geography is also broadly associated to the distribution of two of Melbourne's three universities and the major transport links that access them. The Residentially Retired (Quadrant 3) are more concentrated in older (smaller) developments in the city's middle and outer suburbs, a reflection of lower costs of this sector and the low income potentials of this group. Interestingly, the relatively few locations where the two groups coexist include *both* new development locations and also further out in the city's south west. Of these two, the later is easier to explain as it coincides with the location of Melbourne's third university (Monash University) which is based in a mature suburb containing older apartments. The mix in the central locations is more likely to be an instance of a market similar to the central Sydney one with older retirees purchasing into new developments (downsizing) which are also populated with younger renters, including large numbers of students.

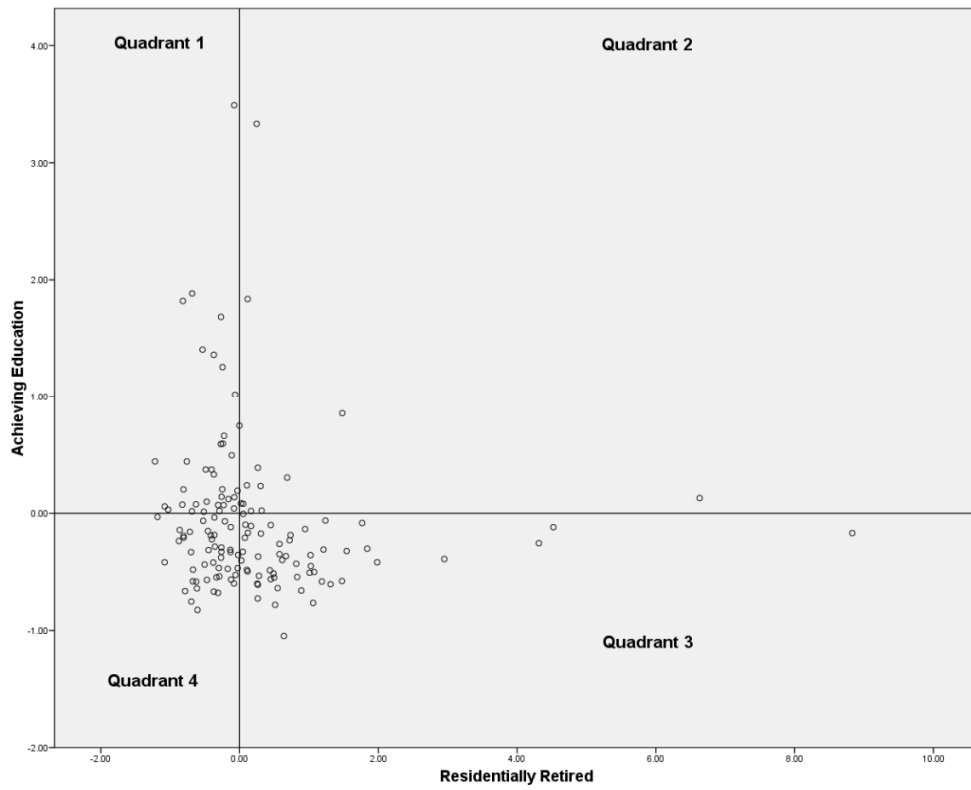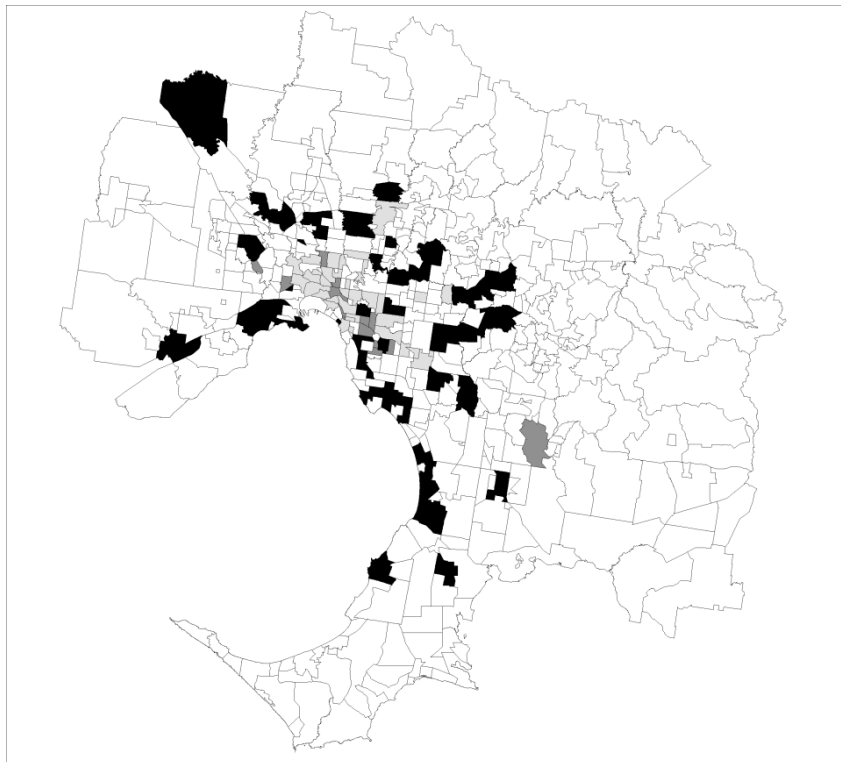*Figure 10: Groupings of Suburbs by presence / absence of Factor Groups 3 and 4 – Melbourne*



*Figure 17: Spatial distribution of the Groups 3 to 4 – Melbourne*

## Conclusion

This paper had two main objectives. The first was to develop a more nuanced understanding of the demand utilisation profile of the apartment markets in Sydney and Melbourne, the two largest apartment markets in Australia. To do this, a statistical analysis of 2006 Census data was undertaken to unpack the key groups that underpin demand for this form of housing. As we have seen, the analysis illustrated five distinctive sub-market segments that characterize the apartment market in the two cities. These are substantially different to the profile of the mainstream house market, which has much greater proportions of family households, home owners and those on moderate to higher incomes.

But while these sub-markets are of interest in themselves, the analysis also exposed the very different profiles of apartment dwellers in the Melbourne and Sydney. The former is dominated by students (the Achieving Education) and younger economically active populations (the Economically Engaged): the 'SINKS' and 'DINKS' of marketing jargon, essentially younger, moderate incomes, predominately childless people in the earlier years of the housing careers. In Sydney, the apartment market was dominated by the 'Battlers', essentially one of the most disadvantaged groups in the housing market, and, again, the Economically Engaged. This in itself is instructive.

Given the almost identical strategic planning polices in both cities, both promoting high density urban renewal in and around activity centres and transport nodes, the finding that these two markets are driven by significantly different utilisation profiles suggests that planning policies in these two cities may need much finer tuning to the realities of the individual markets than they may currently be. The domination of these markets by rental sector, regardless of the sub-market position, is a major reason why planners hoping to promote higher density urban renewal rather than low density fringe Greenfield development will need to better understand the distinctiveness of the investor market which responds to a very different set of market influences to that of the home ownership market (Selig, et al, 2009).

The second objective was to test the concept of spatially discontinuous housing sub-markets in the context of the apartment market in these two cities. The analysis has shown that in the case of the Sydney and Melbourne apartment markets, the five main demand groupings did indeed exhibit fragmented and interpenetrating spatial characteristics. As we noted above, this fragmented structure is in large part a reflection of the outcome of spatially segregated zoning regulations which has led to apartments being developed in largely distinctive locations (typically town centres and along transport routes), although the prevalence of many older pre-1960s blocks of apartments in Sydney (typically no more than ten dwellings) in mature suburbs also has an impact here. The basic outcome of this conceptualisation is that within a given sub-market, households may have the opportunity of substituting dwellings across a number of different and spatially disconnected locations.

However, the main value of this conceptualisation is to develop a more realistic understanding of how housing markets are structured in space. The concept of spatially discontinuous housing markets offers a more nuanced way to describe the spatial aspects of different sub-markets and how they interact in space. In high density markets, which are becoming a major component Australian cities, and indeed already dominate many cities in Asia and elsewhere, a conceptualization of the spatial structure of the housing market that can be articulated, in effect, in three dimensions is likely to prove much more valuable than the traditional two dimensional approach derived from mainstream social area analysis and economic housing market studies.

This analysis also serves to illustrate how spatially complex housing markets are in practice. Characterising localities with certain fixable profiles and assuming the influence of this characteristics on the role, function and trajectory of locations, is clearly inadequate, as the critics who raised the ecological fallacy 50 years ago argued. The approach presented here offers a way out of this difficulty that, while still using Census derived and spatially aggregated small area statistics to undertake the analysis, provides a much more potent tool for unpacking sub-markets and, in doing so, understanding the drivers behind the demand for particular forms of housing in specific locations.

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**Appendix 1:** Apartments by local government area, 2001 and 2006, Sydney (top 5 highlighted by column)

| LGA | 2001 | 2006 | % All Dwellings 2006 | 2001-2006 | % Change |
|---|---|---|---|---|---|
| Ashfield | 7804 | 8063 | 47.2 | 259 | 3.3 |
| Auburn | 5400 | 7915 | 35.4 | 2515 | 46.6 |
| Bankstown | 6978 | 8320 | 13.7 | 1342 | 19.2 |
| Baulkham Hills | 1309 | 2650 | 4.9 | 1341 | 102.4 |
| Blacktown | 3559 | 4598 | 4.9 | 1039 | 29.2 |
| Blue Mountains | 1192 | 962 | 2.9 | -230 | -19.3 |
| Botany Bay | 5588 | 6413 | 43.6 | 825 | 14.8 |
| Burwood | 4054 | 4114 | 35.4 | 60 | 1.5 |
| Camden | 211 | 301 | 1.8 | 90 | 42.7 |
| Campbelltown | 1302 | 1525 | 3.0 | 223 | 17.1 |
| Canada Bay | 8220 | 10939 | 38.7 | 2719 | 33.1 |
| Canterbury | 18363 | 18560 | 37.0 | 197 | 1.1 |
| Fairfield | 6982 | 7554 | 12.9 | 572 | 8.2 |
| Gosford | 5530 | 6655 | 9.3 | 1125 | 20.3 |
| Hawkesbury | 897 | 976 | 4.3 | 79 | 8.8 |
| Holroyd | 7801 | 8566 | 25.0 | 765 | 9.8 |
| Hornsby | 7517 | 9645 | 17.3 | 2128 | 28.3 |
| Hunter's Hill | 1106 | 1248 | 25.1 | 142 | 12.8 |
| Hurstville | 7272 | 7591 | 26.4 | 319 | 4.4 |
| Kogarah | 5763 | 7233 | 34.9 | 1470 | 25.5 |
| Ku-ring-gai | 3929 | 4544 | 12.6 | 615 | 15.7 |
| Lane Cove | 5674 | 5819 | 44.5 | 145 | 2.6 |
| Leichhardt | 6284 | 6674 | 27.7 | 390 | 6.2 |
| Liverpool | 6827 | 7142 | 13.0 | 315 | 4.6 |
| Manly | 8741 | 8785 | 50.4 | 44 | 0.5 |
| Marrickville | 11670 | 12356 | 37.4 | 686 | 5.9 |
| Mosman | 6348 | 6399 | 50.7 | 51 | 0.8 |

| | | | | | |
|---|---|---|---|---|---|
| North Sydney | 23029 | 23970 | 70.8 | 941 | 4.1 |
| Parramatta | 14923 | 18433 | 31.5 | 3510 | 23.5 |
| Penrith | 4048 | 4195 | 6.7 | 147 | 3.6 |
| Pittwater | 3041 | 2971 | 13.1 | -70 | -2.3 |
| Randwick | 26938 | 28091 | 53.0 | 1153 | 4.3 |
| Rockdale | 12158 | 14325 | 37.7 | 2167 | 17.8 |
| Ryde | 11627 | 12101 | 30.3 | 474 | 4.1 |
| Strathfield | 3096 | 5169 | 43.2 | 2073 | 67 |
| Sutherland Shire | 16469 | 18300 | 22.6 | 1831 | 11.1 |
| Sydney | 48959 | 63617 | 73.9 | 14658 | 29.9 |
| Warringah | 15752 | 18463 | 33.9 | 2711 | 17.2 |
| Waverley | 18315 | 18818 | 62.1 | 503 | 2.7 |
| Willoughby | 8747 | 11306 | 41.6 | 2559 | 29.3 |
| Wollondilly | 213 | 167 | 1.2 | -46 | -21.6 |
| Woollahra | 13832 | 14132 | 55.1 | 300 | 2.2 |
| Wyong | 3247 | 4471 | 7.2 | 1224 | 37.7 |
| **Total** | **382716** | **436082** | **26.5** | **53366** | **13.9** |

**Appendix 2**:  Apartments by local government area, 2001 and 2006, Melbourne (top 5 highlighted by column)

| | 2001 | 2006 | % total Dwellings 2006 | 2001-2006 | % change |
|---|---|---|---|---|---|
| Banyule | 2,803 | 3,533 | 8.4 | 730 | 26.0 |
| Bayside | 3,553 | 4,512 | 14.0 | 959 | 27.0 |
| Boroondara | 10,390 | 11,759 | 21.1 | 1,369 | 13.2 |
| Brimbank | 3,078 | 3,672 | 6.8 | 594 | 19.3 |
| Cardinia | 501 | 762 | 4.0 | 261 | 52.1 |
| Casey | 2,359 | 2,867 | 4.2 | 508 | 21.5 |
| Darebin | 9,175 | 9,459 | 19.5 | 284 | 3.1 |
| Frankston | 2,957 | 3,519 | 8.1 | 562 | 19.0 |
| Glen Eira | 10,919 | 12,568 | 26.4 | 1,649 | 15.1 |
| Greater Dandenong | 6,281 | 8,502 | 19.9 | 2,221 | 35.4 |
| Hobsons Bay | 3,075 | 3,046 | 10.1 | -29 | -0.9 |
| Hume | 1,609 | 1,881 | 4.1 | 272 | 16.9 |
| Kingston | 6,362 | 7,670 | 15.1 | 1,308 | 20.6 |
| Knox | 2,032 | 2,353 | 4.7 | 321 | 15.8 |
| Manningham | 1,275 | 1,973 | 5.3 | 698 | 54.7 |
| Maribyrnong | 4,216 | 4,723 | 19.5 | 507 | 12.0 |
| Maroondah | 2,133 | 2,970 | 8.2 | 837 | 39.2 |
| Melbourne | 13,505 | 22,751 | 76.9 | 9,246 | 68.5 |
| Melton | 472 | 741 | 2.9 | 269 | 57.0 |
| Monash | 4,252 | 5,665 | 10.0 | 1,413 | 33.2 |
| Moonee Valley | 7,353 | 7,844 | 19.4 | 491 | 6.7 |
| Moreland | 8,216 | 9,181 | 17.6 | 965 | 11.7 |
| Mornington Peninsula | 2,224 | 2,130 | 4.3 | -94 | -4.2 |
| Nillumbik | 842 | 376 | 2.0 | -466 | -55.3 |
| Port Phillip | 20,475 | 22,927 | 60.6 | 2,452 | 12.0 |
| Stonnington | 15,083 | 16,065 | 43.4 | 982 | 6.5 |
| Whitehorse | 3,414 | 5,164 | 9.6 | 1,750 | 51.3 |
| Whittlesea | 1,116 | 1,781 | 4.5 | 665 | 59.6 |
| Wyndham | 1,334 | 1,758 | 4.8 | 424 | 31.8 |
| Yarra | 9,135 | 10,227 | 35.8 | 1,092 | 12.0 |
| Yarra Ranges | 1,179 | 1,207 | 2.5 | 28 | 2.4 |
| **Total** | **163319** | **195592** | **15.2** | **32,273** | **19.8** |

Figure A1: Higher Density Submarkets around a transport node: Epping, North Sydney



Figure A2: Higher Density Submarkets for the apartment elite and retired: Rushcutters Bay, Eastern Sydney