

This research note presents an extension of the PhD conducted for the Linkage Grant. The material presented is independent from the Linkage Project and is not endorsed by the NSW Planning and Environment.

Age-cohort and Housing Market demand Area interactions

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4th May 2015**

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The following addresses a request for analysis of the age/cohort flow and the contribution they make to demand in each Housing Market demand Area (HMdA). It is provided in the form of a short note on the use of the age cohort defined mobility data.

Definitions, caveats and possibilities

Before getting on to this, it is important to point out that this data is somewhat limited for the purposes of more nuanced housing market description as nothing is really added concerning the overall profile of the household, or the tenure and cost of the property. This is a limitation with the Table Builder resource as housing and mobility data are maintained in separate databases; the only manner in which a count of persons can be turned into a count of households is through the **Family/Household Reference Person Indicator (RPIP)** methodology (see *Implementing metropolitan planning strategies: taking into account local housing demand: Technical Paper, City Futures, 2013*) with the RPIP variable in **Place of Usual Residence** database.

Thus, only the age of the RPIP is under observation and whilst the RPIP is a sound proxy for a nominal head of household (and can thus be expected to have been active in the decision making processes behind the household's move), reading much more into this status (younger RPIPs as first time purchasers, older RPIPs as downsizers, for example) would be questionable. The same holds in the conflation of RPIP incomes and household incomes. At the best, all the age cohort analysis provides is further indication that housing markets may be segmented by general age groupings at different stages of their housing careers.

The ARC Linkage (LP0990075) and associated PhD that developed the RPIP age cohort method were conducted prior to the release of the 5% Longitudinal Census. This resource has the potential for offering a considerably nuanced piece of analysis on the geographies of different household moves. Working backwards from a profile of recently moved household and linking these to the profile of the households the current household members were in 5 years previously would provide a uniquely rich resource for a manner of research activities directed towards mapping out the current housing market system in Sydney.

Classification of the previous household profiles would enable identification of current first time purchasers (those who moved out of rental or from a family household and are now in owner occupation, for example) or, potentially, downsizers (from an owner occupied property to a smaller owner occupied property, for example). Stated household incomes and associated housing costs (rent or mortgage payments) could be included for economic context. Coupled with this, the 5% Sample file is reported at the SA2 level, providing a relatively fine grained geography for mobility mapping and associated area profiling.

Overview of the data

With these caveats and possibilities set out the following provides a piece of analysis drawn from the data provided in **RPIP Age Flows by HMdA_2011.xlsx**. These 337,128 moves are inclusive of all tenures and household forms, and relate *only* to moves made internally within Sydney. Three points to note on this are firstly that *very* short distance moves (within the same SA2) are not registered. Secondly, multiple moves or moves made during the intercensal period are not captured, so this reported value massively underrepresents the scale of housing market transactions. Thirdly, expressed demand within locations attracting households from *outside* the city is not captured. Therefore, at best the geographical framework generated by the analysis is based on a sample of household interactions and therefore is partial. This said the HMdA framework is generated from observed interactions, so captures important facets of the city's functional housing market structure¹.

Across Sydney, 18 HMdA groupings were identified (again refer to the 2013 technical report on the processes behind this), and the numbering of these reflects the data processing methodology used. For reference, **figure 1** provides an overview of the 18 groupings labelled with the numbering framework used for the analysis in this research note. Broadly:

Area 0: Covers Hunters Hill in the south, through Ermington, Eastwood and Epping and Hornsby, extends to Berowra in the north.

Area 1: Comprises much of inner-south Sydney (Alexandria, Waterloo) and most of the lower Eastern Suburbs of Randwick, Coogee and down to La Perouse.

Area 2: Chester Hill, Bankstown, Punchbowl and Milperra.

Area 3: Baulkham Hills, Castle Hill, Kellyville and out towards Dural.

Area 4: Liverpool, Casula, Green Valley and the fringe locations of Horsley Park and Badgerys Creek

Area 5: Concord, Mortlake and Cabarita in the north through Strathfield and Croydon Park, Canterbury and Ashfield down to Belmore.

Area 6: A broad expanse of the Sydney's peri-rural and rural north, including two nexuses of interaction. The first is centred on Mount Druitt and the second around the Central Coast (see **figure 2**).

Area 7: Running from Manly in the south up to Palm Beach, taking in Terrey Hills and Frenchs Forest.

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Area 8: Ingleburn and Macquarie Fields in the north running through Campbelltown and south to Picton.

Area 9: Covering an area from Arncliffe in the north through to Riverwood, taking in Rockdale, Hurstville and Oatley.

Area 10: Broadly following the Pacific Highway from North Sydney in the south through Chatswood up to Wahroonga.

Area 11: Sutherland Shire.

Area 12: Running from Lidcombe and Olympic Park / Silverwater in the east, through Auburn, Parramatta and out to Seven Hills.

Area 13: Broad expanse containing much of the rural west of Sydney but also Penrith.

Area 14: Central Sydney City and upper Eastern Suburbs, including Bondi.

Area 15: Running from Balmain in the north, through Newtown, Marrickville out to Dulwich Hill and Earlwood in the west.

Area 16: Centred on Fairfield, Cabramatta and Bonnyrigg.

Area 17: Running from Blacktown in the south through to Quakers Hill and Kellyville Ridge in the north.

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Figure 1: Overview of the 18 HMdA groupings

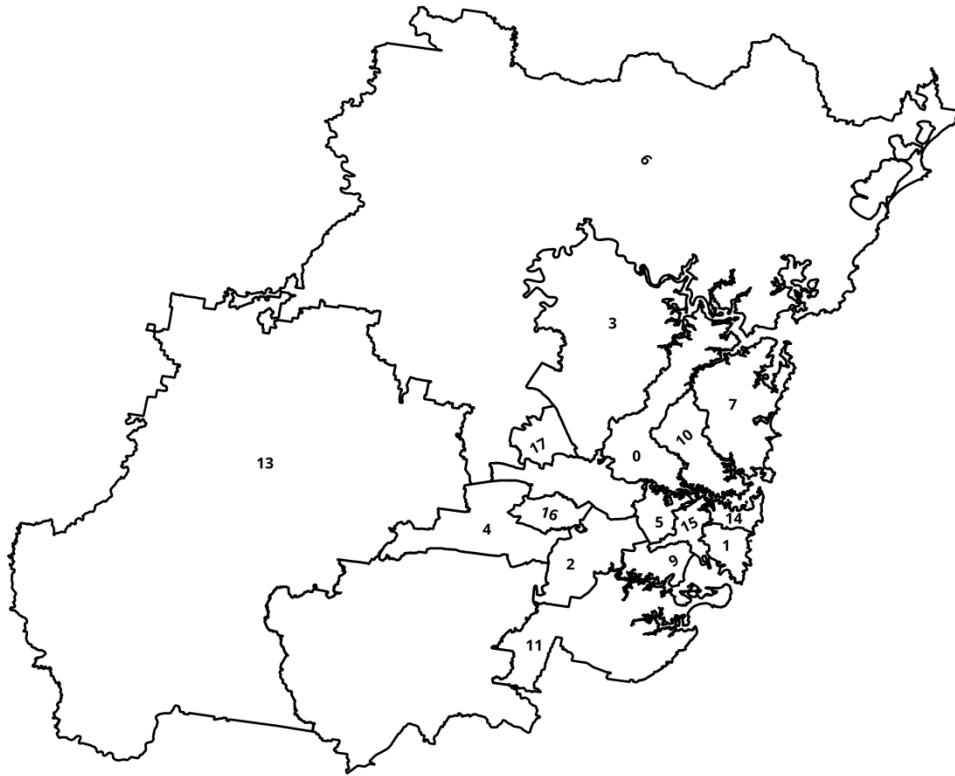


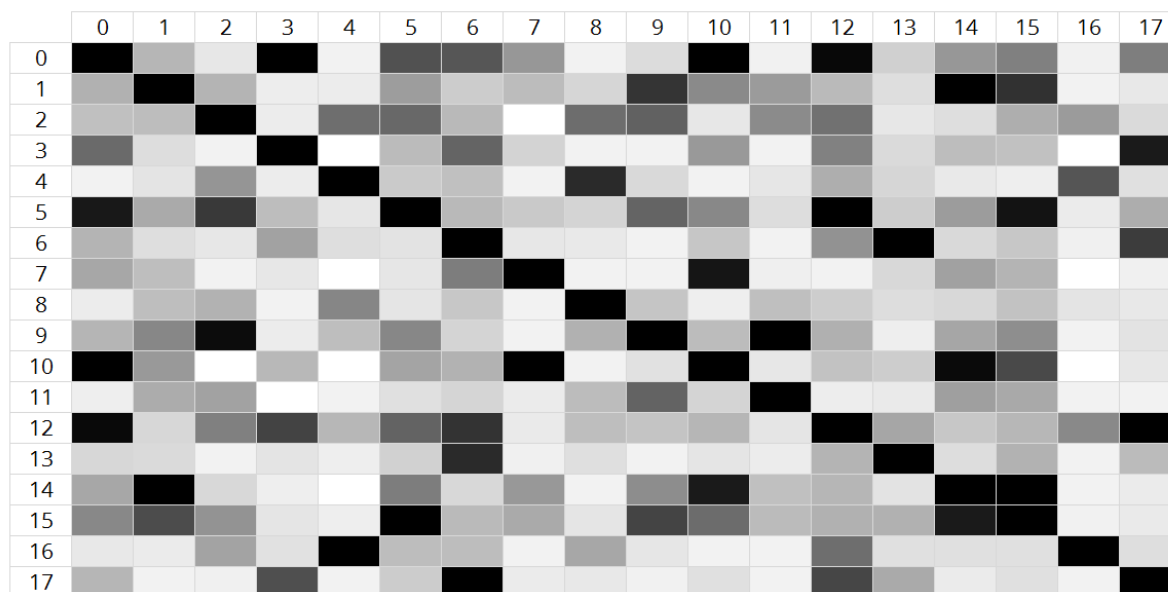
Figure 2: Interactions within HMdA area 6 – note longer distance links between the two nexuses



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Figure 3 presents the interactions within and between the different HMdA groupings, with the column on the left identifying the HMdA of origin and the subsequent columns the HMdA of destination. These values are shaded from white (no, or very small levels of interactions) through to black (high numbers of interactions). From this, it is notable that the *greatest* number of interactions occurs within the same HMdA, shown here as the black boxes running diagonally down from left to right.

Figure 3: Overview of total number of moves made within and between HMdA groupings

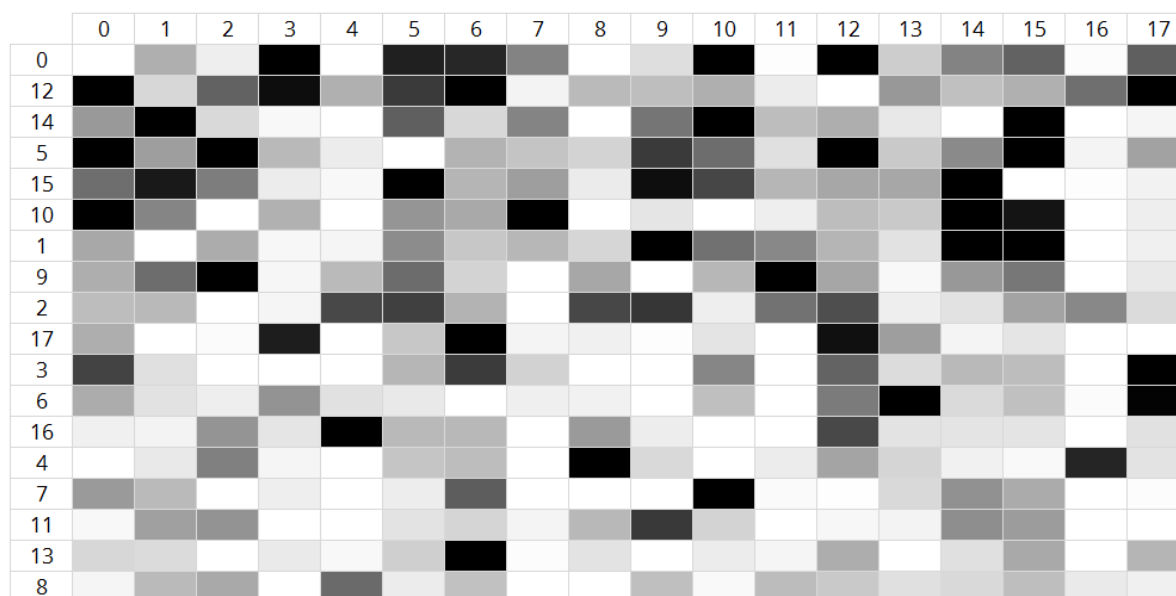


However, there are some inter-HMdA relationships of note. **Area 0** providing households to **Area 3**, **Area 10** and **Area 12**, **Areas 14** and **15** trading households, for example. Indeed, in total 159,342 (47%) households changed HMdA over the period. **Figure 4** presents an overview of these relationships through removal of the intra-HMdA moves. For presentation purposes the ordering of the origin HMdA (columns) is by the number of households moving out from the HMdA. In terms of overall numbers, **Area 0** saw 15,155 households depart it to another HMdA during the period, followed by 14,067 from **Area 12**. In comparison, **Area 13** only lost 3,733 households to inter-HMdA moves during the period and **Area 8**, 2,934. Whilst these inter-HMdA moves do not equate to net-losses in households due to intra-Sydney migration it is worth pointing out that different locations have considerably greater self-containment than others. **Area 13** essentially retained 70%¹ of its households and **Area 8** retained over 80%. In comparison **Area 0** only retained 44% and **Area 15** only 34%.

¹ These containment thresholds are lower than reported previously. This is due to the exclusion of moves made entirely within SA2s. The focus of this analysis is on cross boundary mobility.

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Figure 4: Overview of inter-HMda moves



At the fundamental level, these two pieces of overview demonstrate that the HMda groupings highlight a geography that is both fluid and sticky at the same time, depending on the context of location. On the one hand, regions of Sydney appear to be very good at retaining local households and on the other; some locations actively export large numbers of households. One aspect shaping these functions will be the influence of adequate housing options – both in terms of affordability and also in terms of the fit these options have with requirements stemming from the stages of different housing life-cycles people find themselves in.

Age-cohort and housing life-cycle analysis

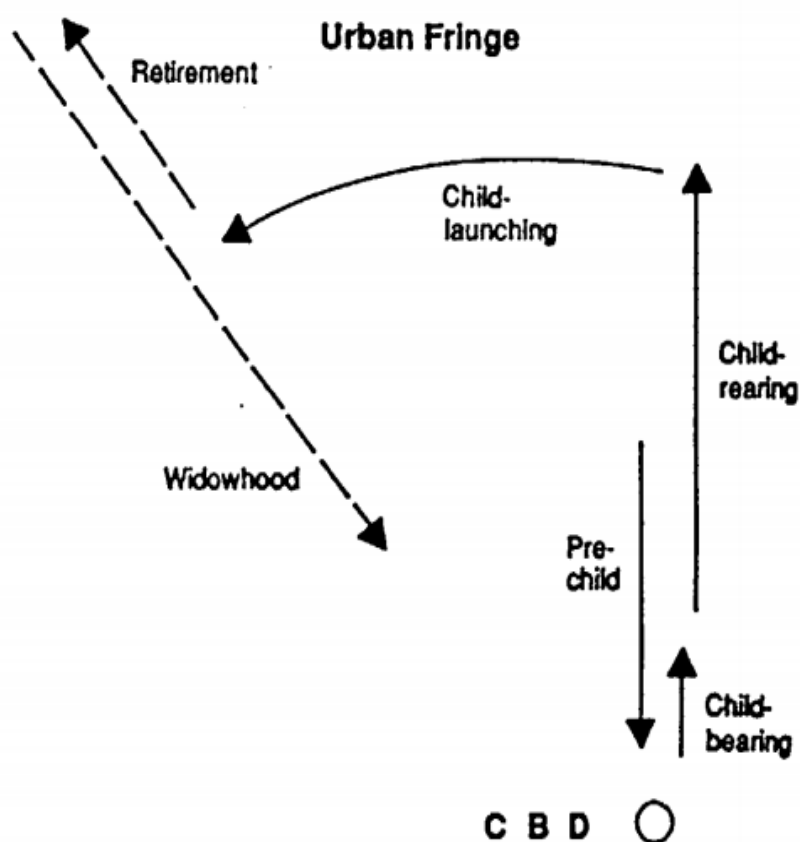
As stated at the outset, whilst the age of a nominal head of household (captured through the RPIP methodology) is not a very robust indicator of relative *form* of demand being expressed (first time purchasers, downsizers) it can be used as a relative proxy for commentary on potential housing life-cycle stages. Nominally, we would expect the youngest RPIPs to be engaged in a stage of their housing life-cycle usually referred to a *pre-child*, those in their mid-20's through to late-30's in a *child-bearing* stage, crossing over with a late-20's to mid-40's *child-rearing* stage. Late-30's through mid-50's captures a period of *child-launching* and post this period *retirement*. Demand for differing housing types expresses itself through the need for space to conduct these stages, with the *child-launching* stage influencing demand through the generation of new *pre-child* demand for properties. However, it should be noted that this life-cycle framework is *very* family centric. It does not take into account

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singles or childless couples (for example), whose presence will have a distinct influence on the following analysis due to the data resource containing *all* household forms.

The *family centric* life-cycle understanding of how demand for housing is expressed across a city is, however, one with considerable legacy and appealing logic supporting it. **Figure 5** presents a schematic overview of how the different stages hypothetically relate to a single urban context. Broadly moves towards the CBD are associated with households in *pre-child* stages and subsequent moves back to suburbia with the later stages (including adjustment moves around suburban locations during the *child-launching* stages).

Figure 5: Schematic of life-cycle relationships to broader urban form (Scargill, 1979)²



This schematic model provides a useful bench mark from which to assess observed age-cohort interactions within Sydney. Of particular relevance here is the held assumption that urban fringe locations can be developed to provide adequate supply for families over time.

To undertake this assessment, it is assumed that despite the potential influence of “non-standard” housing types in the RPIP defined data, there should be a large enough presence of

² Scargill, D.I. (1979) *The Form of Cities*, Bell & Hyman, London

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life-cycle attuned moves. This presence should demonstrate whether the model held in **figure 5** has any relevance to the contemporary specifics of Sydney.

Figures 6 and 7 focus on the RPIP defined cohorts for those aged 20-29 (nominally those engaged in *pre-child* or *child-bearing* forms of demand for housing), 30-39 (those engaged in *child-bearing* through *child-rearing*) and 40-49 (*child-rearing* through early stages of *child-launching*). Combined, these three age cohorts comprise over 75% of the overall activity captured through the RPIP methodology (256,742 unique moves). The 20-29 cohorts comprised 67,795 moves (26% of the total 20-49 cohort), the 30-39 cohort comprised 114,591 (45%) and the 40-49 cohort contributed 74,356 (29%). These groups form the subset for the following analysis.

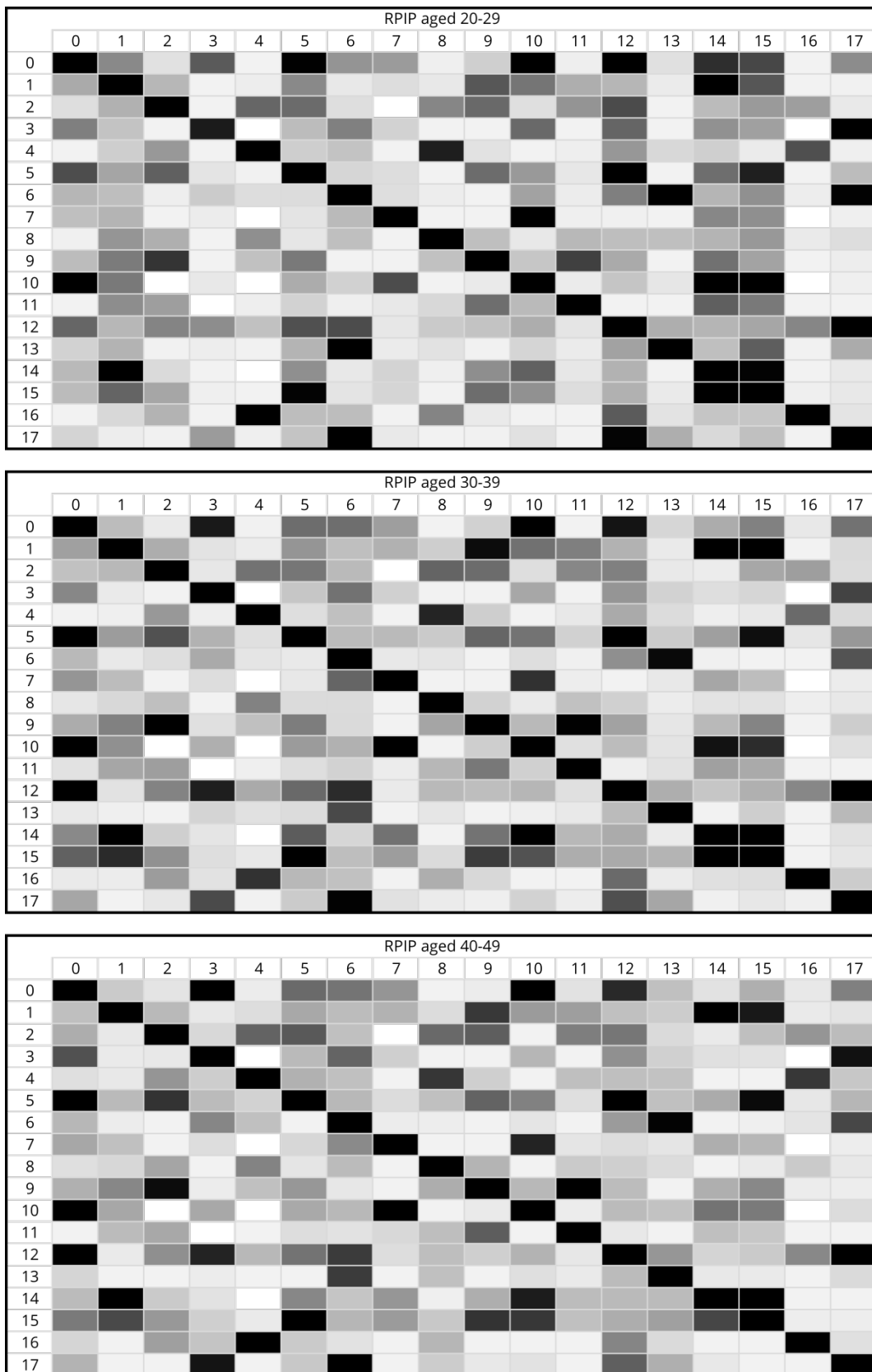
Figure 6 presents all interactions between and within HMdA groupings. From this, it is apparent that the containment of moves within HMdA (origin and destination the same) is a recurring feature across all age cohorts. Outside of this reassertion of the local nature of many household moves, the other distinct point is the relative attraction of **Areas 1, 12, 14 and 15** for the 20-29 cohorts. Placed in context, this observation is not that surprising as all four areas comprise the densely populated (and higher density developing) centres of inner-Sydney (**Areas 1, 14 and 15**) and Olympic Park through to Parramatta (**Area 12**). Whilst the relative pull of these areas is evident in the older cohorts (particularly **Area 12** for the 30-39 cohort), it is also notable that the majority of other relationships are repeated irrespective of the age cohort presented.

Figure 7 recasts the previous analysis removing the intra-HMdA relationships. Aside from slight differences in overall numerical composition (lighter greys replacing darker greys; for example), one of the most striking findings is that the expression of demand is largely comparable across the cohorts; the patterning remains the same.

To this point, the analysis presented demonstrates that, at least for the younger cohorts, the life-cycle model exhibits some relevance. Central locations (including the city's second CBD of Parramatta) do attract cohorts that are nominally within the *pre-child* stages of life-cycle. However this is tempered by strong local connections demonstrated by the repeated reoccurrence of black boxes along the diagonal axis. Further, after the influence of local moves has been controlled for (the difference between **figures 6 and 7**) there are strong similarities between the HMdA relationships expressed by the three main age-cohorts. This finding suggests that, on the whole, a life-cycle understanding of housing market operation may not be completely relevant for understanding the dynamics of the Sydney context.

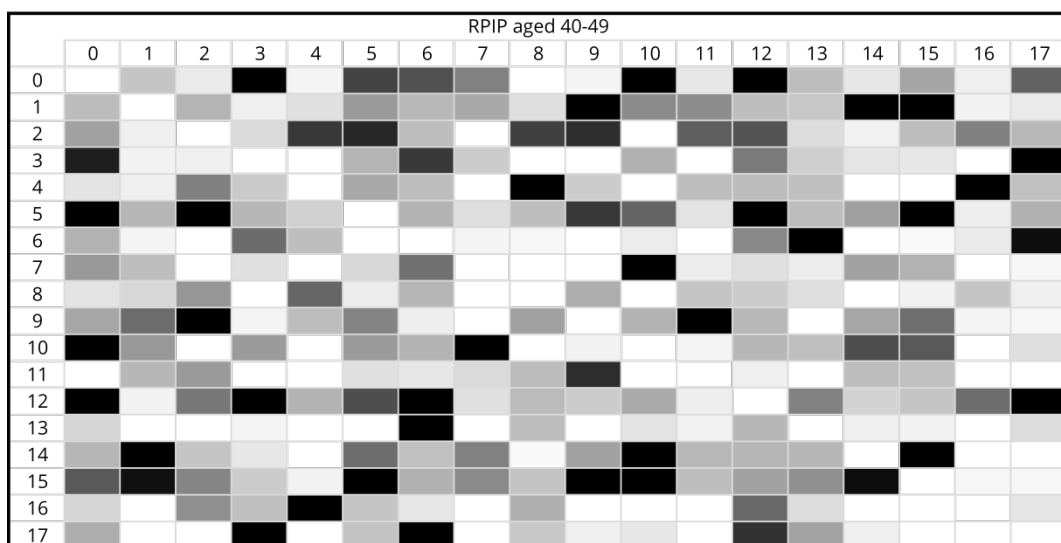
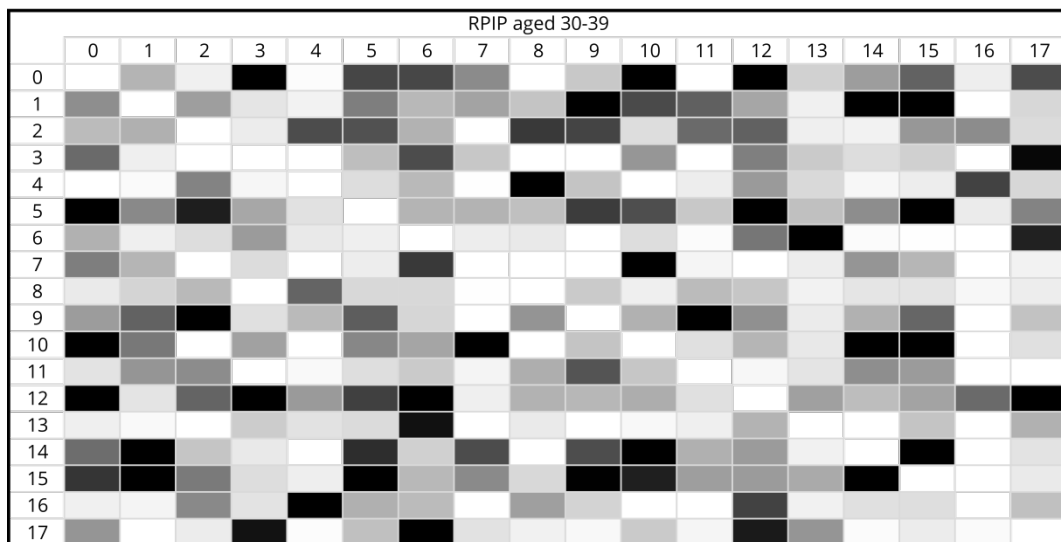
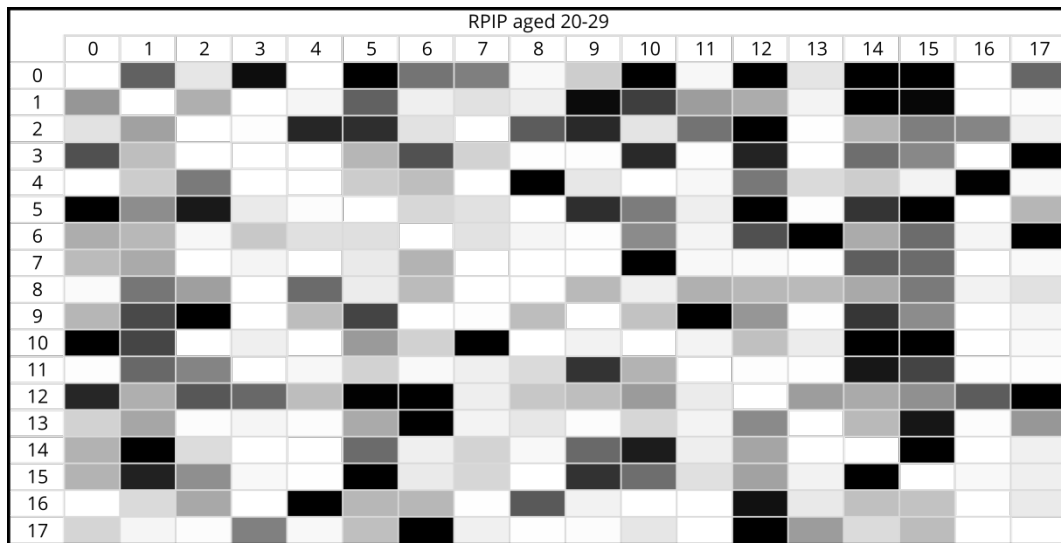
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Figure 6: Overview HMdA interactions by different RPIP age groups



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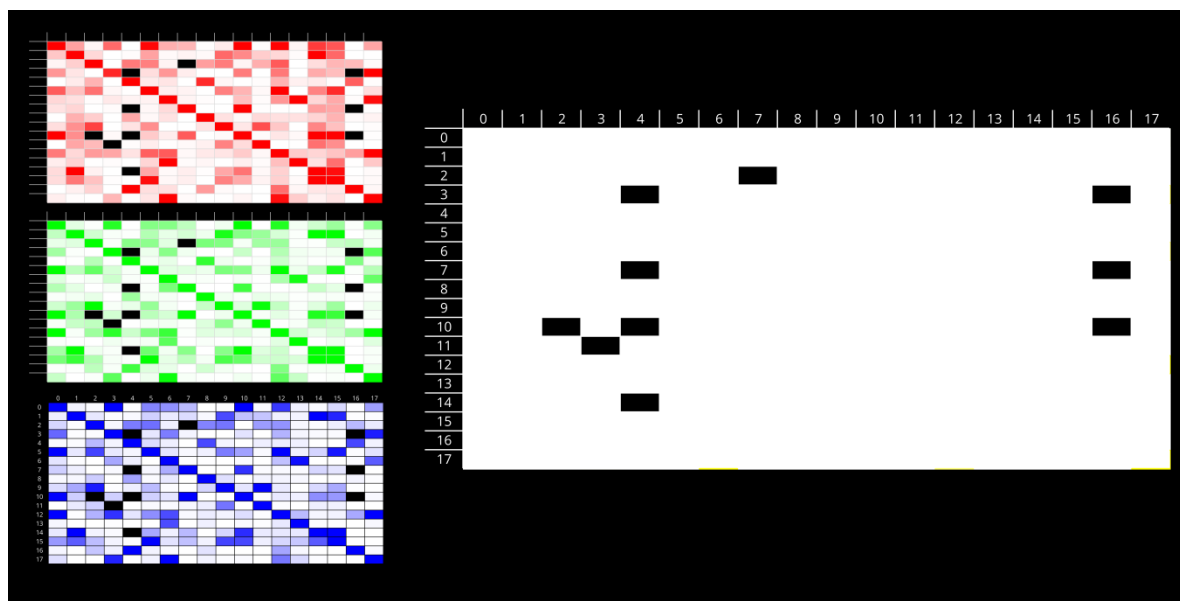
Figure 7: Overview HMdA interactions by different RPIP age groups (intra-HMdA removed)



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In order to further underscore this observation that there appears to not be much in the way of overall differences between how the different age-cohorts distribute across the HMdA geography **figure 8** presents as synthesis of all HMdA interactions. Here the 20-29 age cohorts has been shaded white through to Red, the 30-39 cohort white through to Green and the 40-49 white through to Blue (the three matrices on the left of the figure). Where no interactions occur the cells have been left blank, in **figure 8** these are black.

Figure 8: Composite colour matrix of HMdA interactions by age-cohorts



Bringing together these colours generates a composite colour; red and green combined (for example) produce yellow, green and blue produce magenta. A single colour or composite colour would indicate that a specific cohort or grouping of two cohorts characterises a move between or within a specific HMdA. However, as presented in the composite matrix (right of **figure 8**) almost all rows and columns are white. This composite colour is a product of relatively equal amounts of red, green and blue and indicates that age-cohort profiles (controlled for differences in overall numbers) utilise Sydney on a relatively equal basis.

Table 1 details the black cells, or null HMdA relationships; locations between which none of the households moved. The majority of these null relationships may be structural, with evidence of limited connections between the North Shore and the South West of Sydney. Null relationships between areas which are a long distance from each other (such as Sutherland Shire and Baulkham Hills) are explicable as well.

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Table 1: Null HMdA relationships

| Households from these locations.... | Did not move to |
|--|--|
| Area 2: Chester Hill, Bankstown, Punchbowl and Milperra | Area 7: Running from Manly in the south up to Palm Beach, taking in Terrey Hills and Frenchs Forest |
| Area 3: Baulkham Hills, Castle Hill, Kellyville and out towards Dural | Area 4: Liverpool, Casula, Green Valley and the fringe locations of Horsley Park and Badgerys Creek AND Area 16: Centred on Fairfield, Cabramatta and Bonnyrigg |
| Area 7: Running from Manly in the south up to Palm Beach, taking in Terrey Hills and Frenchs Forest | Area 4: Liverpool, Casula, Green Valley and the fringe locations of Horsley Park and Badgerys Creek AND Area 16: Centred on Fairfield, Cabramatta and Bonnyrigg |
| Area 10: Broadly following the Pacific Highway from North Sydney in the south through Chatswood up to Wahroonga | Area 2: Chester Hill, Bankstown, Punchbowl and Milperra AND Area 4: Liverpool, Casula, Green Valley and the fringe locations of Horsley Park and Badgerys Creek AND Area 16: Centred on Fairfield, Cabramatta and Bonnyrigg |
| Area 11: Sutherland Shire | Area 3: Baulkham Hills, Castle Hill, Kellyville and out towards Dural |
| Area 14: Central Sydney City and upper Eastern Suburbs, including Bondi | Area 4: Liverpool, Casula, Green Valley and the fringe locations of Horsley Park and Badgerys Creek |

Indeed, the limited amount of null interactions serves to further underscore the observation that, even defined through broad age groupings, the *majority* of household moves manifest remarkably equally across the city. Again, these findings indicate that attempting to understand the dynamics of Sydney's housing market in terms of a life-cycle paradigm may be difficult; *everywhere is connected to everywhere else, but local relationships are stronger.*

Age-cohort profiling of HMdA

Up to this point the research has essentially identified and restated the observation that the HMdA structures captured through mobility analysis serve to question assumptions about housing market function in Sydney. Whilst aspects of an, understandably held, assumption of how central areas attract and then repel households engaged in a *life-cycle* understanding of housing demand is partially presented, the underlying story is one of reasserting locality underscoring the majority of mobility based activity.

Attempting to balance out these two contradictory situations is difficult as the analysis presented so far suggests that both have merit for understanding housing market

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performance structured through age-cohort analysis. In all reality, both capture mechanisms at work that are not mutually exclusive; *some may, some may not but it's a lot more complex than that.*

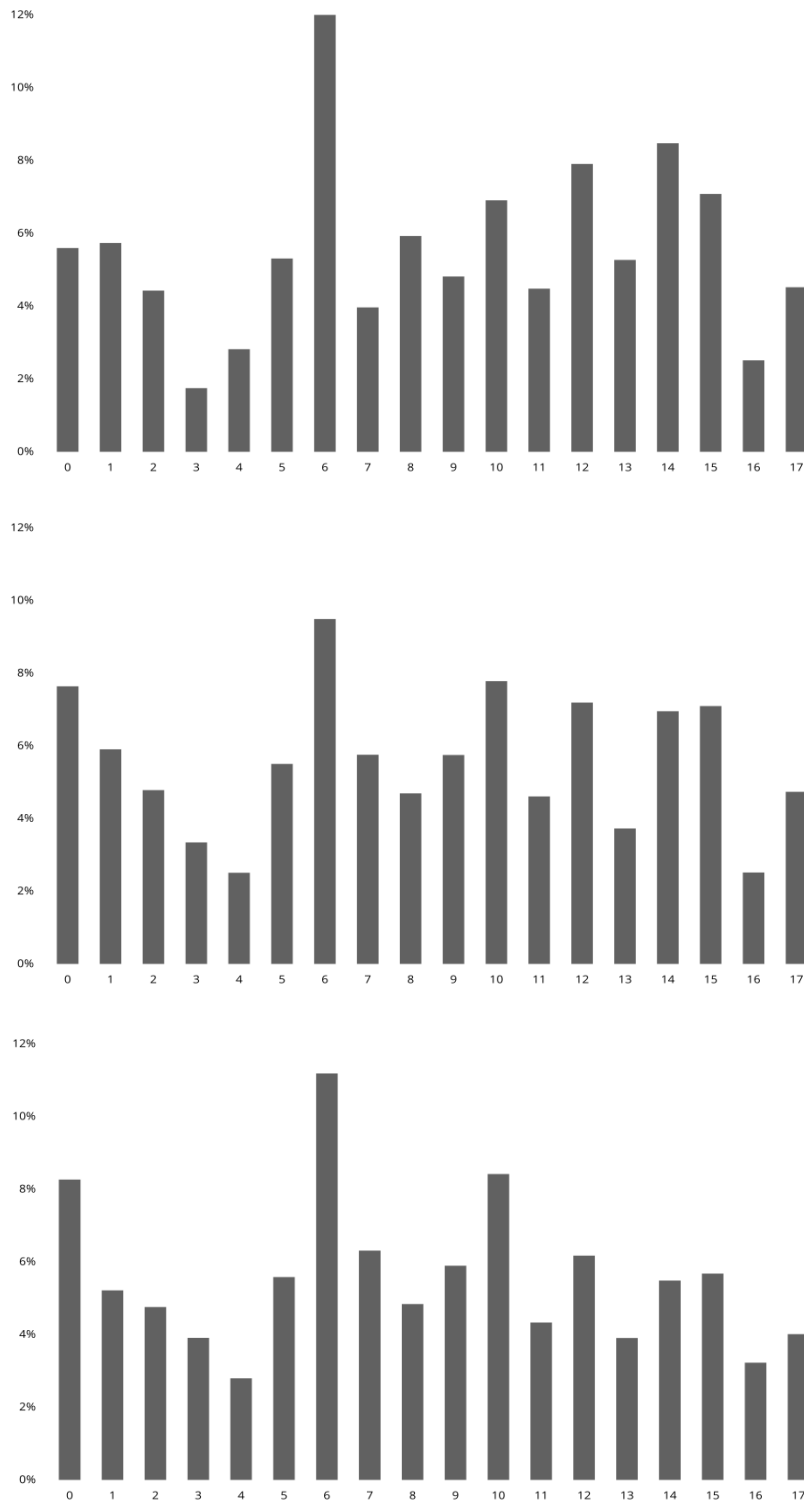
This final section focuses on the differences in age-cohort structures between Housing Market demand Areas. The intention here is to assess whether there are *any* unique drivers of housing demand present on age-cohort definable grounds, or whether each HMdA essentially contains similar profiles.

One way to do this is to consider the percentage distribution of each age cohort across the HMdA geography. Presenting the data in this manner will demonstrate whether there are *specific* HMdA locations that attract (or retain) an age-cohort disproportionately. **Figure 9** presents these distributions, and from this it is apparent that **Area 6** attracts or retains a notably higher proportion of the 20-29 and 40-49 cohorts. Indeed, almost 13% of the moves made by the 20-29 cohorts were either within **Area 6** or ended in **Area 6**, for the 40-49 cohort this value was almost 12%. As observed earlier (**figure 2**), **Area 6** has a unique structure comprised of two nexuses of interaction around the Mount Druitt area and on the Central Coast; these two nexuses are linked together by evidence of longer distance moves.

Given the relative uniqueness of this area's interactions the following excludes it from the analysis. However, in doing so it is important to stress that this removes 27,667 interactions from the age-cohort analysis (11% of 256,742 unique moves). Whilst it may be expedient to remove the influence of **Area 6** for the purposes of analysis, the dynamics it contains are just as much the product of how Sydney's housing market functions as any other. An understanding that 11% of *all* moves conducted in Sydney are the product of this peri-urban conveyor effect should not be lost.

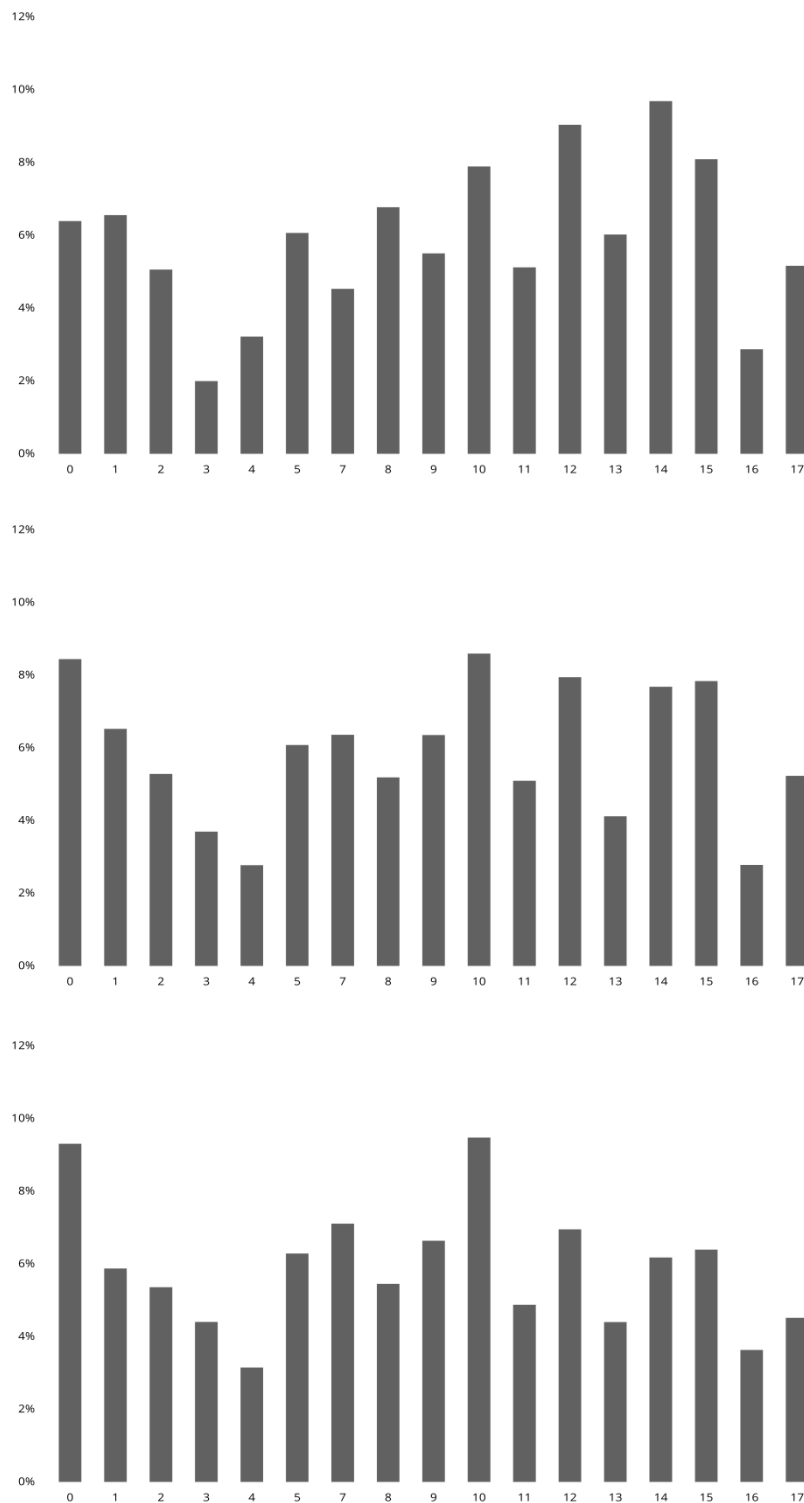
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Figure 9: Percentage of each cohort moving by HMdA (top 20-29, middle 30-39, bottom 40-49)



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Figure 10: Percentage of each cohort moving by HMdA (top 20-29, middle 30-39, bottom 40-49) – Area 6 removed



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Figure 10 presents the percentage contribution of moves made by each of the three age cohorts within the HMdA groupings after the influence of **Area 6** has been removed. Whilst there are obvious peaks and troughs it should be pointed out that the relative differences between these are marginal.

Areas 3, 4 and 16 are relatively underrepresented in the 20-29 cohorts (top), with **Areas 12, 14 and 15** demonstrating relatively stronger influence. Largely, this captures the relative attraction of the *inner cities* of Sydney and Parramatta at the expense of the established suburban locations such as Baulkham Hills. These relationships decline a little in the 30-39 cohort (middle), with more suburban locations (**Areas 0 and 10**, for example) becoming more prominent, although the presence of the *inner cities* areas remains. This trend continues into the 40-49 cohorts (bottom). Whilst subtle differences can be observed between the HMdA utilisation of the cohorts, it is worth reiterating that none of these are immensely significant.

Table 2 presents a synthesis of the interactions by HMdA. The cohort columns represent the percentage contribution each series of moves (including intra-HMdA) has made. In these the relative differences between the peaks and troughs identified in **figure 10** are more clearly set out. For the 20-29 cohort, the *combined* presence in **Areas 12, 14 and 15**, accounts for a little over quarter (26.8%) of the overall distribution. **Areas 0 and 10** combined account for 17% of the distribution for the 30 to 39 cohorts and 18.8% for the 40 to 49

Also included in **table 2** are the changes in percent between the three cohorts. Essentially this captures the relative increases and decreases in HMdA relationships by age cohort. Again, however, it should be stressed that *overall* there are not *extremely* strong or specific relationships between age cohort and HMdA locations, since the overall percentage distributions on which they are based are small. A gradual shift back to suburban locations can be seen in the 32% change between the presence of the 20-29 cohorts and 30-39 cohorts in **Area 0**. A considerably greater shift (although based on very small values) can be seen in **Area 3**. Smaller increases in **Areas 7, 9 and 10** are also present. Conterminously, percentage decreases in the presence of the 30-39 cohorts can be seen for **Areas 12 and 14**. Largely, the decreases in percentage profile are replicated by the 40-49 cohorts; although of note is their increasing presence in **Areas 13 and (particularly) 16**. However, whilst these differences look quite marked when represented as changes in percent, it should be stressed that they are the product of very small differences between the three age cohorts in terms of overall distribution.

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Table 2: Percentage distribution of each age-cohort by HMdA and change in percent
(note: Area 6 excluded)

| | 20-29 Cohort | 30-39 Cohort | 40-49 Cohort | Change in percent between 20-29 and 30-39 | Change in percent between 30-39 and 40-49 |
|---------------|-----------------|-----------------|-----------------|---|---|
| 0 | 6.4% | 8.4% | 9.3% | 32.0% | 10.2% |
| 1 | 6.6% | 6.5% | 5.9% | -0.4% | -10.0% |
| 2 | 5.1% | 5.3% | 5.4% | 4.4% | 1.4% |
| 3 | 2.0% | 3.7% | 4.4% | 85.0% | 19.1% |
| 4 | 3.2% | 2.8% | 3.1% | -13.9% | 13.6% |
| 5 | 6.1% | 6.1% | 6.3% | 0.2% | 3.4% |
| 7 | 4.5% | 6.4% | 7.1% | 40.3% | 11.7% |
| 8 | 6.8% | 5.2% | 5.5% | -23.4% | 5.1% |
| 9 | 5.5% | 6.4% | 6.6% | 15.4% | 4.5% |
| 10 | 7.9% | 8.6% | 9.5% | 8.9% | 10.2% |
| 11 | 5.1% | 5.1% | 4.9% | -0.5% | -4.3% |
| 12 | 9.0% | 7.9% | 7.0% | -12.1% | -12.5% |
| 13 | 6.0% | 4.1% | 4.4% | -31.6% | 6.8% |
| 14 | 9.7% | 7.7% | 6.2% | -20.7% | -19.6% |
| 15 | 8.1% | 7.8% | 6.4% | -3.1% | -18.4% |
| 16 | 2.9% | 2.8% | 3.6% | -3.2% | 30.7% |
| 17 | 5.2% | 5.2% | 4.5% | 1.3% | -13.7% |
| Totals | 59,325 | 103,713 | 66,037 | | |

Conclusions

One of the underlying features identified by the research presented is the *relative* comparability of HMdA profiles when assessed through the contribution mobility defined age-cohorts make to their overall demographic profile. However, underpinning these findings is the possibility that such a broad representation of age-cohort interactions essentially suppresses more nuanced relationships. As, stated at the outset and reiterated throughout, the data captures all household interactions not just *family centric* ones. This is an unavoidable problem stemming from the availability of resources to provide such nuance. The relative lack of any discernible suburban to urban to suburban flows repeatedly encountered may well be a part product of the *holistic* nature of the underlying RPIP derived resource. Conversely, given that children still grow up, leave the family home and engage in family formation of their own over time – and that these processes form the life blood of housing market performance – is the constant reiteration of local based interactions a *truer* representation of how the Sydney housing market works?

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A point that cannot be overlooked is that most moves *are* local. The weighted average distance moved by all households (controlling for longer distance moves made by few households) is a little over 6 kilometres. This simple statistic underlines the conclusions drawn from the research presented. The housing markets in which households operate are local and centred, contributing to a *city of centres* based on local interactions.

ⁱ For context here, Fair Trading NSW register an average of 90,000 new rental bonds a year for NSW as a whole (data based on newly lodged bonds for the 2009 calendar year). The Australian Property Monitor data available through the AURIN Portal (<https://portal.aurin.org.au/>) reports 154,774 sales (of Houses and Units) for the same period. These two values are not mutually exclusive; properties may be sold and let as rental in the same year (and vice versa), essentially providing a double count. Further, properties may be sold and left unoccupied.

However, combined these two values provide an indicative headline number of transactions that may be the result (or result in) a household moving.

This headline figure is 244,744 residential transactions per year.

Since this value is for NSW as a whole, and the context of the mobility analysis is the Sydney Greater Capital City Statistical Area a crude percentage proportion can be applied based on the number of occupied residential properties reported in the 2011 Census:

$$1,521,398/2,471,299 = 61\%$$

This provides a crude approximation of a little under 150,000 ($244,744 \times 0.61 = 149,293$) transactions a year that may be the product of residential mobility. Multiplying this value by 5 for comparison of the 2006-2011 time frame the research note covers produces 746,469 potential residential transactions (excluding social housing and informal transactions).

This value will capture *all* private sector facilitated moves made into and around Sydney (including moves made from inter-State and overseas), including moves made during the intercensal period (and thus completely excluded from the Census collection process). However, retaining this value is useful as it suggests that the RPIP method captures the geography of around 45% of all residential interactions conducted. Netting off moves made to the city from outside of the Sydney Greater Capital City Statistical Area would increase this value considerably. It is, therefore, worth noting that the sample frame on which the analysis is based captures a *considerable* volume of the number of moves made during the period 2006-2011.