What Impact Does Workplace Accessibility Have on Housing Prices? Sydney 2006-2011

Heather MacDonald1, Alan Peters2, Natalya de Pooter3, and Ji Yuan Yu4
1, 3 School of the Built Environment, Faculty of Design and Building, University of Technology Sydney
2, 4 Faculty of Built Environment, University of New South Wales

Abstract: Labour markets evolve continually – changes in the number and types of jobs, the spatial location of firms, and clustering or dispersion, continually restructure the city's economy. The relative accessibility of those labour markets also evolves, reflecting changing travel patterns and preferences, and changing transportation investments. This paper investigates what impact labour market changes between 2006 and 2011 have had on prices of houses and units in different locations. The data is drawn from a custom property sales dataset, Census 2006 and 2011, and other secondary sources. The analysis uses a repeat sales method and controls for other locational attributes that might contribute to explaining price changes. GIS-based analysis incorporates spatial measures and statistics into the analysis. The paper contributes to our understanding of the urban economy by addressing the question "how does employment accessibility affect peoples' housing preferences?"

Introduction

Access to jobs is a key consideration in housing choice, and changes in employment structure, location, and accessibility, drive a substantial share of metropolitan structural change. However, job accessibility interacts with and is overlaid by several other factors. Households with different demographic profiles differ in the value they place on workplace accessibility, and in their travel preferences and constraints (and thus how relative accessibility is defined). The trade-off different households make between employment centre accessibility and other locational factors such as the quality of schools, safety, or urban form preferences, reflects a changing set of social values that are expressed in the relative desirability of different neighbourhoods. Changes in job accessibility also mediate the distribution of social and economic goods: lower income households may become trapped in housing sub-markets with poorer job accessibility, thus reproducing disadvantage, as spatial mismatch theorists argue (Kain 1968; Gobellin, Selon and Zenou 2007). Understanding the association between workplace accessibility and the changing residential preferences of Sydney's population offers insight into an important driver of housing markets, and may inform forecasts of how those changing preferences will contribute to broader metropolitan restructuring.

One lens through which we can understand the changing social value placed on particular combinations of neighbourhood attributes is through an econometric analysis of housing price changes. This paper investigates the effect that changing workplace accessibility had on housing prices throughout the Sydney metropolitan area over the period from 2006 to 2011. We use a repeat sales method to estimate the effect that changing job accessibility had on home prices, controlling for changes in a variety of other locational factors (such as school quality and crime rates), and incorporating estimates of spatial correlations. We discuss the details of the method (and the rationale for the methodological choices) in greater detail below.

The paper begins with a review of some of the key literature on the relationship between residential choice, home prices, and workplace accessibility. Next, we provide a brief overview of employment and housing market trends in the metropolitan area, and explain the methodology we used for this study. We present the results of our analysis, and discuss our findings. We find that increases in employment accessibility were positively and significantly associated with increases in prices for house prices, but were not significantly associated with changes in prices for units. We discuss the implications of these results in the conclusion.

Understanding the relationship between workplace accessibility and housing prices

The basic economic framework used to explain the relationship between accessibility and land costs goes back to Von Thunen's work in the early nineteenth century. The bid-rent function describes how much land is worth as one locates away from a central market. In the classical model of agricultural land, the worth of land (land rent) is given by the total agricultural revenue per hectare minus both the costs of agricultural production on that hectare and the costs of transporting the agricultural output from that hectare to market. Thus the further from the market, the greater the transport costs, the less the worth of land.

This theory was developed, by Alonso (1964), Muth (1969), Mills (1972) and others, to account for the evident separation of different types of land uses and the impact of accessibility on land and housing prices. Insofar as housing costs are concerned, the theory holds that householders will pay for accessibility to work. As with the agricultural land, residential housing costs and the residential land rent will decline as accessibility to the centre decreases.

There have been fairly substantial changes in this understanding since the theory was first formulated. Cities are no longer monocentric, if they ever were. Most large cities have multiple employment concentrations; many, if not the majority of workers in most cities will not work in the "centre" but in suburban employment centres. Most multi-adult households will have more than one employed member, and each individual member may work in a different employment centre. The net result of this is that commuting patterns are much more complex than the theory originally envisaged. Accessibility is no longer merely a measure of the distance to the CBD. Thus, analyses of home prices using distance to the CBD as an indicator of employment accessibility have typically found its impacts to be insignificant (Bender & Hwang, 1985; Heikkila et al., 1989; Kain & Quigley, 1970). Models using multiple centres as a measure of employment have performed better (Bender & Hwang, 1985; Dubin & Sung, 1987; Gordon, Richardson, & Wong, 1986; Griffith, 1981; McDonald & McMillen, 1990).

Alternative measures of employment access, rather than just distance, have been used to investigate the effects of multiple centres. Noland (1979) used a simple accessibility measure, defined as the total jobs across multiple employment centres weighted by the inverse of distance to each job centre. Others have found that travel time is a superior measure to distance (De Bruyne & Van Hove, 2006; Franklin & Waddell, 2003). Ottensmann, Payton and Man (2008) find that a combination of variables capturing changes in accessibility to employment and overall access to employment perform better in turn than travel time. The analysis of accessibility can be further refined by considering the changing composition of employment by occupation and industry (Shen 1998).

Besides changes to the spatial distribution of jobs across the metropolitan landscape, and the increasing work complexity of family lives, there has also been a realization that households do not merely value accessibility to employment. They also value accessibility to good schools, and to recreation, entertainment and shopping opportunities (Bartholomew & Ewing, 2011; Gibbons & Machin, 2008; Osland & Thorsen, 2005). Thus while accessibility is still a crucial determining factor in land and housing prices (all else being equal, better accessibility means higher prices), our understanding of accessibility has become more complex, and our measurement of accessibility has become more nuanced.

Finally, it is important to point out that accessibility is merely one of the factors determining housing and land prices. Fairly self-obviously, the size, features and evident quality of a particular house or flat will help determine its price. The quality of the local neighbourhood, the amount of local crime, and so on, will have an impact on land prices and thus housing prices (Cheshire & Sheppard, 2004; Lynch & Rasmussen, 2001; Nguyen-Hoang & Yinger, 2011). The hedonic approach to housing prices suggests that when buying a dwelling one is actually buying a bundle of goods: accessibility, size, bedrooms, schools and so on. Some of these are a function of the dwelling unit itself (for instance, the number of bedrooms), but many are a function of the land (for instance, accessibility, neighbourhood quality, schools).

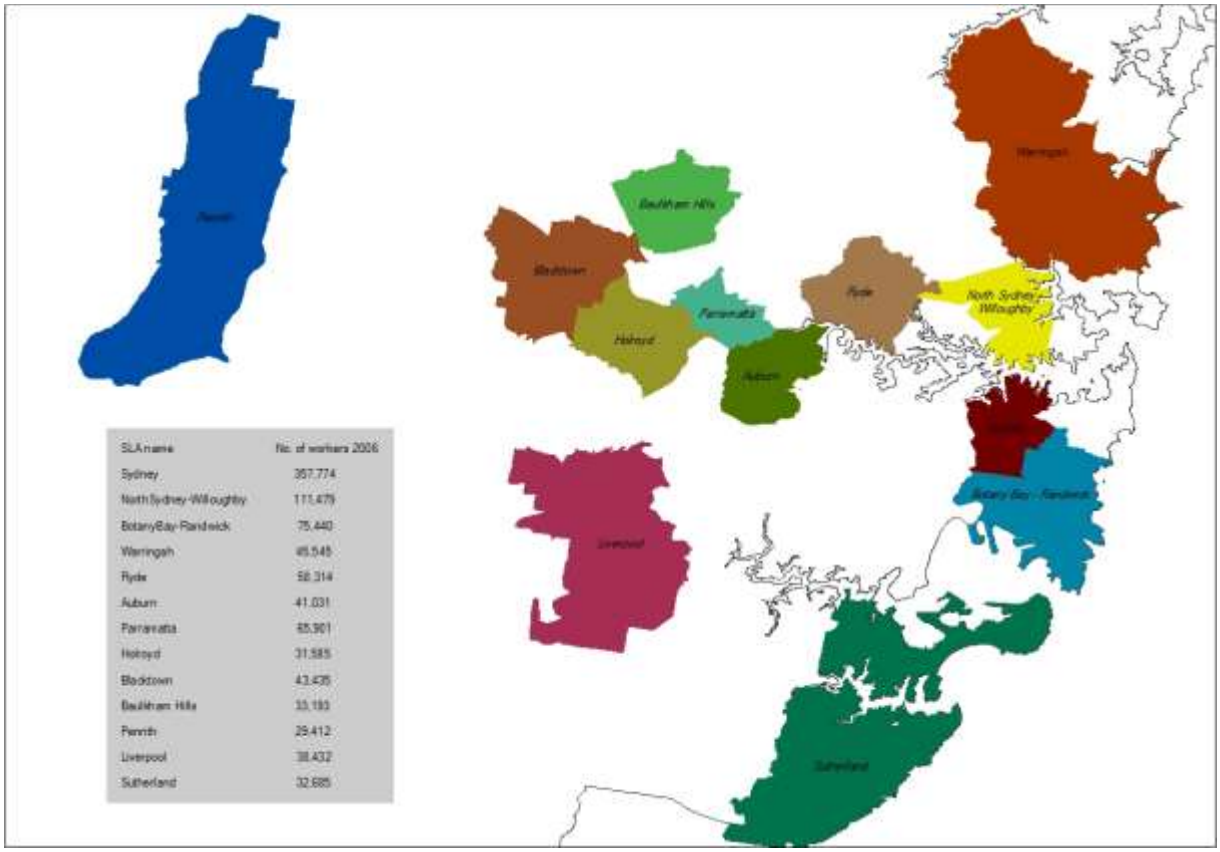
Several studies have developed alternative housing price index models for Australian cities using hedonic, repeat sales or some combination of methods (Costello, 1997; Hansen, 2006; Hill & Melser, 2008; Prasad & Richards, 2006; Rossini, Kooymans, & Kershaw, 1995). Most of that work has focussed on overall housing price movements, and has not examined the impact of specific neighbourhood attributes. This paper contributes to the literature by focussing on the impact that one variable, employment accessibility, has on housing prices.

Employment and housing trends in Sydney

The metropolitan area has maintained a steady annual population growth rate of about 1% over the past two decades, a period of continued economic expansion, despite the GFC in the late 2000s. Sydney has relatively centralised employment, with 20% of metropolitan jobs located in the City of Sydney (the Local Government Authority). However, metropolitan strategic planning has supported the decentralisation of jobs (and residents) over several decades, and these goals have been supported by relocating state government jobs to designated growth centres. Figure 1 shows the employment centres we use in this analysis. Centres were chosen based on a minimum employment

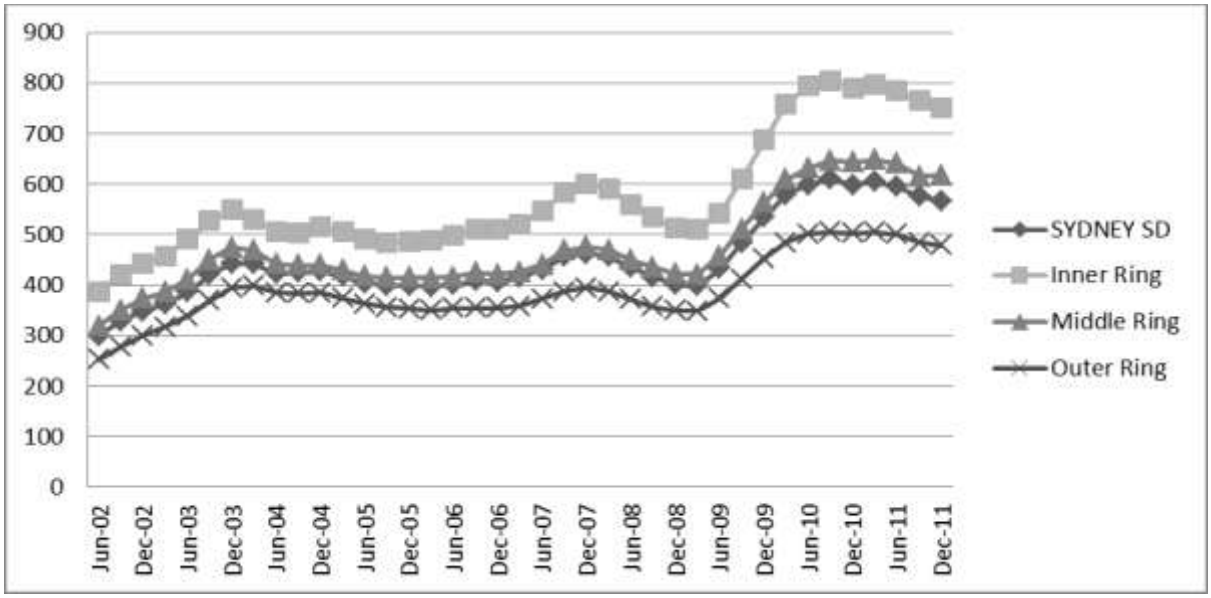
of 30,000 at the Statistical Local Area (SLA) level (based on the "place of work" enumeration of the ABS 2011 Census of Population and Housing database).

Figure 1: Employment Centres (SLA-level) in Sydney



Sydney's real housing prices have increased through most of the study period. Although prices declined slightly during the first few quarters of the GFC, a combination of counter-cyclical stimulus measures (such as enhanced home buyer subsidies and interest rate reductions), and reduced housing production, likely resulted in increased real prices. But housing markets have not increased uniformly across the metropolitan region. Figure 2 shows trends in real home prices since 2001; over the past five years, the gap between prices in the inner ring of the metropolitan area and the middle and outer rings has widened substantially. Real housing prices were calculated using the ABS Existing Housing Index to remove the effects of inflation.

Figure 2: Real Median Home Prices by Metropolitan Location, 2002-2011 ($2002)



Source: Calculated by the authors from Land and Property Management Median sales prices: historical trends, and ABS Existing Housing Index. Inner, Middle, and Outer Ring designations are based on the definitions used in the Greater Metropolitan Sales reports obtained from Land and Property Management (http://www.housing.nsw.gov.au/About+Us/Reports+Plans+and+Papers/Rent+and+Sales+Reports/Latest+Issue/)

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Do these trends in real prices reflect changes in the metropolitan area's labour markets? The following section of this paper explores this question through a detailed analysis of the factors underlying home price changes.

Methodology and data

Our methodological choices have been driven to some extent by the limitations of available housing price data. Because land rather than improvements are taxed in NSW, there is little consistent information about the characteristics of dwellings, so a conventional hedonic analysis is difficult, in the absence of detailed data gathered for the purpose (Hansen, 2006). Repeat sales analysis may offer an acceptable alternative, demonstrating relatively small differences in performance from hedonic models (Case & Szymanoski, 1995; Case & Shiller, 1987; Crone & Voith, 1992; Goetzmann, 1992). Because repeat sales approaches estimate changes based on pairs of sales for the identical unit, they do not rely on detailed information about home characteristics (such as age, condition, size and other features) because these are assumed to remain constant. Thus, they may be more appropriate to use in places where detailed unit level analyses are infeasible (Hansen 2006). Data on all home sales are derived from property transfers recorded by Lands and Property Management; prices are verified by transfer documents. Thus, in contrast to real estate agent reports, the data is better quality.

Data for a sample of 13,198 properties that sold at least twice between 2006 and 2011 (inclusive) were purchased from a proprietary data service that provides a further level of error identification on sales data reported by Lands and Property Management. The characteristics of the cases are summarised in Table 1. These are the independent variables included in the models below. Property characteristics were obtained from the purchased dataset, as reported by real estate agents. Neighbourhood and resident characteristics were obtained from the 2011 ABS Census of Population and Housing, and from the ABS Construction Statistics series. Data on crime rates was obtained from the NSW Bureau of Crime Statistics and Reporting (BOSCAR) database for 2006 and 2011. Data on education test scores (NAPLAN) for 2009 was obtained from the Australian Curriculum Assessment and Reporting Authority (ASCARA). We chose the 2006 to 2011 period because it coincided with bi-annual census counts, but also because it covered the years before the GFC began (2006-07), the years when the crisis was at its peak (2008-09), and the beginning of the post-GFC era (2010-11).

Table 1: Sample Characteristics (attached)

The repeat sales analysis method is based on the assumption that the best predictor of a home's sale price at time 2 is its sales price at time 1. Pairs of sales are used to estimate the increase in a home's

value, controlling for the length of time between sales, and the timing of sales. Controls (t1, t2…) are included in the model to reflect the quarter in which each sale occurred, to capture the effects of interest rates, consumer confidence, and other unmeasured factors. The form of the Weighted Repeat Sales (WRS) model (after Case and Shiller 1987) is as follows:

$$P_j = P_i(1 + r_1)D_1\ (1 + r_2)D_2(1 + r_3)D_3\ \ldots(1 + r_N)D_N$$

Where P_i = the initial sales price
P_j = the second sales price
r_t = rate of appreciation in period i
D_t =dummy variable equal to -1 for the first sale and +1 for the second sale in each pair.

The method assumes that the other characteristics of the home (size, location, attributes, and condition) will not have changed, and thus that the second sale price reflects the changing value of a constant set of characteristics.

Clearly, this is a simplifying assumption. Homes may be better or worse maintained; home improvements and extensions may alter the home's attributes; and, the perceived amenity of the home's location may be affected by many factors (both positive and negative) (Goetzmann & Spiegel, 1995). Another consideration is that the sample of homes used to estimate values may be biased towards homes that sell frequently – which tend to be lower priced or less desirable homes (Clapham, Englund, Quigley, & Redfearn, 2006).

In this analysis, we attempt to address the limitations of the traditional repeat sales model in several ways. We identify outliers and flag properties that "flipped" (were re-sold within six months) to control for homes that have undergone substantial renovation or expansion, using the method suggested by Teranet-National Bank of Canada (n.d.). Low priced homes are flagged to control for the arithmetic effect of higher percentage increases on smaller base values. We also incorporate several measures of changes in locational attributes over the time period studied. We would expect that significant changes to the locational attributes that guide home purchases might make their effects felt over relatively short periods. For instance, the release of educational score data for schools in 2009 may have substantially altered the desirability of homes in some neighbourhoods. Sharp increases or decreases in visible crimes (in particular property crime and vandalism) might do the same.

The focus of this analysis is on changes in employment access. The change in job accessibility variable was constructed by calculating the change in the number of jobs between 2006 and 2011 for each major employment centre in the metropolitan area and dividing this by the squared distance from the property to the central point of the employment area (a modified gravity model). Employment centres are shown in Figure 1 above; they were chosen based on a minimum of 30,000 jobs. Number of jobs was obtained from the ABS Census of Population and Housing "place of work" count of people employed in each of the chosen employment centres. Unfortunately we are not able to include time-based measures of trip length to job centres; instead, distances (as the crow flies) were calculated using ARCGIS. The modified gravity model is a widely used measure of job accessibility, based on the assumption that as the distance to a job centre increases, the number of jobs any individual is likely to find attractive enough at that location, diminishes (Noland, 1979; Ottensmann et al., 2008). Thus, for each property in our database, we have an estimate of the total jobs accessible in 2006 and 2011, and the change in jobs accessible over that period. We control for population change in each model in order to reflect the effect of increased competition for jobs.

The dependent variable (home price increases) is standardized using the ABS Housing Index for Sydney for the appropriate quarter (to eliminate the effects of inflation). We use the log of this number to ensure the variable approximated a normal curve. All variables were tested in order to evaluate three major issues. First, we had to determine where to apply weights to correct for heteroskedasticity. We did this using Koenker's test, and found that houses but not units in NSW needed to be weighted. Next, we tested out a variety of methods to identify outliers, finally using a spatially based calculation which compared price increases to those of neighbouring properties (buffers were applied based on densities). Tests for multicollinearity (using the VIF, or variance inflation factor) and auto-correlation (Durbin-Watson) identified no problems in the models that excluded region, with the VIF scores below 5, and Durbin-Watson test statistics between 1.796 and 2.015. The models that included dummy variables for region (using Inner Sydney as the reference case) did have some VIF scores above 5 for some regions; this level of multicollinearity might be expected when including flags for nine out of ten regions. This did not appear to produce unstable

results, as multiple iterations of slightly different versions of the models produced essentially similar results. We do not place strong emphasis on differences amongst regions in this analysis.

We tested for the existence of spatial auto-correlation in the data (the likelihood that price changes in one case would be correlated with price changes in neighbouring cases). We used Moran's I to test for this, and the test returned a result of 0.139354 (the equivalent of a 1% likelihood that the spatial distribution of cases was random). In order to correct for this spatial auto-correlation, we calculated a spatial lag for each case. We used a distance-based weights matrix for this calculation, using varying distance bands based on the residential density of the location. We ran the standard checks on the residuals to see whether they were spatially correlated. Our initial checks for residual spatial clustering suggest they are not.

Findings

The analysis began with a base model (in Table 2), including all cases in our sample. The signs of the coefficients are what we might expect – homes with more bedrooms and bathrooms increased more substantially in price, as did those in places where more new dwellings had been added. Dwellings in places where property crime rates had increased or with schools scoring in the bottom decile of the state on educational outcome measures, saw less rapid price increases. Measures of changes in commuting mode saw positive effects associated with places where transit use and walking and biking had increased. The coefficient for changes in job accessibility was positive and significant.

Table 2: Model 1 and Model 2 (attached)

We anticipate that in addition to the spatial effects from neighbouring properties, the location of a home would reflect changes due to the fortunes of the particular region within which it was located. Model 2 included dummy variables for each region of the metropolitan area (the reference group was Inner Sydney). The signs of the coefficients remained the same in this model, but some became less or insignificant (the proportion of new dwellings added, the presence of a primary school in the bottom decile, and the change in commuting by transit), as we might expect once region is controlled for. Others became significant – the change in the burglary rate (with a positive association in contrast to property crime), and the change in median household income. Most importantly for our purposes, the coefficient for changes in job access also became insignificant, once we controlled for the region in which a home was located. Are job access effects subsumed in location within the metropolitan area, once we control for these other measures of neighbourhood change?

We hypothesised that job access might have different impacts on the market for units compared to that for single detached houses, given that the occupants of single detached homes are likely to differ (on variables such as age, household structure, and income) from occupants of units. Table 3 presents two separate models for units and separate houses. Interestingly, the school quality indicators are not significant in the unit model, but increases in commuting by biking and walking is. This may reflect demographic differences between households living in units versus houses (fewer families, more singles and empty nesters). Most interestingly for our purposes, the effects of changes in job accessibility have a negative (but only marginally significant) effect on changes in unit prices.

Model 4 performs the same analysis for single detached houses. The property specific variables perform as expected. Crime rates have significant effects, but the signs are inconsistent – negative for property crimes and positive for burglaries. Poor school quality has significant effects for secondary but not primary schools. However, the variable for changes in job accessibility is positive and significant. This result is the opposite of what one might expect – job access appears more rather than less important for buyers of detached houses compared to buyers of units.

Table 3: Model 3 and Model 4 (attached)

We investigated the job accessibility variable further. A cross tabulation of job accessibility by highest third and lowest third price categories for units and houses suggested an explanation for this counter intuitive finding (Table 4). On average, units had far better job accessibility than houses, and this was the case for both highest and lowest sub-groups. That accessibility has also improved more sharply for units than for houses between 2006 and 2011. One explanation for our findings may be that job accessibility is much more sharply differentiated for houses, and thus buyers place more of a premium on homes closer to better labour markets. It is less sharply differentiated for units, so buyers of units may be discriminate less based on relative job accessibility.

Table 4: Accessible Jobs for Highest and Lowest Price Quartiles

	Accessible jobs 2006	Accessible jobs 2011	Mean % change in job accessibility
Units	276540.23	294881.99	18.34
high priced units	300059.70	320981.78	20.92
low priced units	254678.18	270770.62	16.09
Houses	222927.34	236923.36	14.00
high priced houses	269561.84	287795.01	18.23
low priced houses	178240.88	188469.62	10.23

Note: All differences significant at $p < .000$

Discussion

Overall, we find that changes in employment access have stronger effects on single detached home prices compared to units, once we control for the region of the metropolitan area. There are several potential explanations for this.

One explanation is that the demographic profile of unit dwellers differs from those of house dwellers. Households living in units are more likely to be smaller, and more likely to be at either end of the age spectrum (younger or older). They may be more mobile as a result, and able to choose homes based on access to a specific job rather than a wide range of potential jobs. Fewer unit dwellers may value access to a wide range of jobs compared to families in the child rearing years, where the job accessibility of two wage earners must be balanced against other locational preferences. Changing family structure (and changing economic imperatives) may be reflected in these results. While this explanation may be persuasive, it relies on a sharp divide between the residents of units compared to single detached homes, which is not necessarily borne out by the evidence. An increasing number of families choose to live in units (especially when we consider how broad the definition is – "units" include apartments as well as town houses and terraces).

A second explanation (explored above) is that units already have access to a wider range of jobs than single homes, even after controlling for region. The benefits of greater density and more mixed land uses may be less widely distributed for single homes. Those single homes that do benefit from mixed use, job-rich areas may command a premium, and the value differential may have widened over the past half decade, as concern about economic security and job stability has sharpened.

These findings raise further questions. In this analysis, we do not investigate the composition of job growth, or the nature of labour market change. Some employment sectors have grown more rapidly than others over the study period, and some have better prospects for future growth. How do these differences in job quality, stability, and rewards, differ among the major employment centres in the metropolitan area? Are these differences reflected in housing market outcomes? Do the somewhat unexpected findings that house prices are more likely than unit prices to reflect improved job access mask a much more complex set of judgements about the nature of jobs to which one has access?

Table 1: Sample Characteristics

	Houses	Units	Total
Property characteristics			
Beds	3.4255	2.1145	2.8151
Baths	1.7547	1.3976	1.5885
Land area	675.1692		675.1692
Floor area	173.9812	116.3114	122.7931
Neighbourhood characteristics 2011			
% single houses locally	.6732	.4312	.5558
% semi / row/ terrace houses locally	.1288	.1290	.1289
% apartments locally	.1923	.4343	.3097
% worktrips by transit	.1828	.2528	.2168
% worktrips by car	.6434	.5382	.5924
% worktrips by bike/walk	.0380	.0832	.0599
Ratio of new dwellings to 2006 dwellings	.0566	.0571	.0568
Resident characteristics 2011			
% renters	.2873	.3854	.3349
% homeowners	.6949	.5953	.6466
Median age household head	36.4555	35.5252	36.0043
Median mortgage repayments	2285.9706	2367.5933	2325.5574
Median weekly rent	368.2010	401.2857	384.2470
Persons per bedroom	1.1460	1.1995	1.1720
Median household weekly income	1551.7087	1561.8842	1556.6438
Crime and Education			

% Change in property crime rate, 2006-2011	-.2366	-.2660	-.2509
% Change in burglary rate, 2006-2011	-.2135	-.2597	-.2359
% with Public Primary school in lowest decile	.1804	.1150	.1487
% with Public Primary school in highest decile	.2148	.1984	.2068
% with Public Secondary school in lowest decile	.1960	.1558	.1765
% with Public Secondary school in highest decile	.1206	.1840	.1514
percent tertiary students	.0510	.0650	.0578
Employment patterns			
% employed	.9420	.9419	.9420
% residents working in CBD	.1629	.2602	.2101
% residents working in LGA of residence	.3034	.3052	.3043
Change in jobs accessible, 2006-2011	13.9960	18.3418	16.1032

Table 2: Models 1 and 2

	Model 1			Model 2		
	Standardized Coefficients			Standardized Coefficients		
	Beta	t	Sig.	Beta	t	Sig.
t2	-.031	-2.691	.007	-.029	-2.519	.012
t3	-.040	-3.547	.000	-.034	-3.047	.002
t4	-.045	-3.939	.000	-.035	-3.163	.002
t5	-.033	-3.064	.002	-.022	-2.071	.038
t6	-.091	-7.907	.000	-.074	-6.542	.000
t7	-.107	-9.452	.000	-.093	-8.371	.000
t8	-.128	-11.344	.000	-.109	-9.798	.000
t9	-.134	-12.432	.000	-.112	-10.532	.000
t10	-.139	-12.424	.000	-.114	-10.432	.000
t11	-.109	-9.170	.000	-.082	-7.007	.000
t12	-.120	-9.807	.000	-.089	-7.350	.000
t13	-.089	-7.151	.000	-.053	-4.284	.000
t14	-.123	-8.910	.000	-.079	-5.742	.000
t15	-.163	-11.673	.000	-.112	-8.023	.000
t16	-.205	-14.844	.000	-.152	-11.055	.000
t17	-.222	-15.880	.000	-.163	-11.711	.000
t18	-.238	-15.719	.000	-.178	-11.804	.000
t19	-.277	-18.217	.000	-.201	-13.180	.000
t20	-.249	-15.956	.000	-.175	-11.128	.000

	.319	27.084	.000	.451	35.357	.000
First sale price is in the bottom third	-.178	-13.847	.000	-.255	-19.308	.000
First sale price is in the top third	.220	24.481	.000	.187	20.704	.000
Spatial lag	.092	6.171	.000	.217	13.921	.000
Three or more bedrooms	.010	1.212	.226	.000	.037	.970
Floor area is greater than average	.010	1.114	.265	.038	4.041	.000
Land area is greater than average	.126	9.366	.000	.170	12.832	.000
Two or more bathrooms	.015	1.406	.160	.020	1.951	.051
Two car spaces	.071	3.847	.000	.043	2.298	.022
Change in population	-.098	-5.646	.000	.054	2.419	.016
Ratio of number of new dwellings 2006-2011 to total dwellings 2006	.070	2.212	.027	.194	5.741	.000
Change in median weekly household income (in 1000's)	-.018	-1.527	.127	-.006	-.512	.609
Percentage change in the number of First Home Owners Grants from the financial year of first sale to the financial year of the second sale	-.193	-4.924	.000	-.247	-4.798	.000
Percent change in property crime rate	.023	.931	.352	.139	4.557	.000
Percent change in burglary rate	-.066	-6.147	.000	-.028	-2.323	.020
Govt primary school in bottom decile of State	-.055	-4.863	.000	-.046	-3.971	.000
Govt secondary school in bottom decile of State	-.117	-5.687	.000	-.037	-1.601	.109
Change in number of post-secondary students	.156	5.480	.000	-.025	-.756	.450
Change in job accessibility (in 100's)						

	.071	6.766	.000	.039	3.355	.001
Percent change in bike or walk commuting	.040	2.977	.003	-.014	-.934	.350
Percent change in transit commuting				-.091	-8.714	.000
CanterburyBankstown				-.229	-18.472	.000
CentralCoast				-.076	-5.837	.000
CentralNorthern				-.155	-10.529	.000
CentralWestern				.034	2.998	.003
EasternSuburbs				-.174	-12.517	.000
FairfieldLiverpool				-.022	-2.006	.045
InnerWestern				.012	.939	.348
LowerNorthern				-.271	-16.952	.000
NorthWestern				-.020	-1.574	.116
NorthernBeaches				-.187	-13.934	.000
OuterSouthWestern				-.044	-3.315	.001
St.GeorgeSutherland						

Table 3: Models 3 and 4

	Model 3	Units only		Model 4	Houses only	
	Standardized Coefficients			Standardized Coefficients		
	Beta	t	Sig.	Beta	t	Sig.
t2	-.034	-2.052	.040	-.030	-2.004	.045
t3	-.051	-3.178	.001	-.031	-2.090	.037
t4	-.026	-1.617	.106	-.041	-2.785	.005
t5	-.038	-2.415	.016	-.022	-1.601	.109
t6	-.087	-5.261	.000	-.067	-4.478	.000
t7	-.132	-7.933	.000	-.069	-4.726	.000
t8	-.142	-8.752	.000	-.091	-6.147	.000
t9	-.136	-8.723	.000	-.096	-6.814	.000
t10	-.114	-7.034	.000	-.115	-7.925	.000
t11	-.082	-4.819	.000	-.084	-5.369	.000
t12	-.063	-3.487	.000	-.099	-6.210	.000
t13	-.013	-.711	.477	-.067	-4.153	.000
t14	-.052	-2.574	.010	-.086	-4.718	.000
t15	-.096	-4.565	.000	-.107	-5.880	.000
t16	-.156	-7.829	.000	-.144	-7.755	.000
t17	-.158	-7.533	.000	-.152	-8.286	.000
t18	-.177	-7.940	.000	-.167	-8.321	.000
t19	-.203	-8.786	.000	-.184	-9.221	.000
t20	-.175	-7.397	.000	-.158	-7.694	.000

First sale price is in the bottom third	.434	23.471	.000	.513	28.515	.000
First sale price is in the top third	-.263	-14.420	.000	-.279	-13.986	.000
Spatial lag	.123	9.243	.000	.156	12.087	.000
Three or more bedrooms	.107	6.729	.000	.094	2.678	.007
Floor area is greater than average	.044	3.275	.001	.021	1.969	.049
				.029	2.072	.038
Land area is greater than average						
Two or more bathrooms	.018	.959	.337	.290	15.268	.000
Two car spaces	.011	.796	.426	.024	1.677	.094
Change in population	-.024	-.893	.372	.044	1.576	.115
Ratio of number of new dwellings 2006-2011 to total dwellings 2006	.062	1.769	.077	.047	1.573	.116
Change in median weekly household income (in 1000's)	.136	2.623	.009	.150	3.363	.001
Percentage change in the number of First Home Owners Grants from the financial year of first sale to the financial year of the second sale	-.048	-2.568	.010	.018	1.161	.246
Percent change in property crime rate	-.305	-3.562	.000	-.181	-2.837	.005
Percent change in burglary rate	.094	1.886	.059	.182	4.721	.000
Govt primary school in bottom decile of State	-.026	-1.504	.133	-.015	-.880	.379
Govt secondary school in bottom decile of State	-.026	-1.582	.114	-.062	-3.821	.000
Change in number of post-secondary students	-.016	-.531	.596	-.046	-1.244	.214
Change in job accessibility (in 100's)	-.086	-1.751	.080	.232	4.645	.000

Percent change in bike or walk commuting	.061	3.586	.000	.011	.691	.490
Percent change in transit commuting	.015	.672	.502	.003	.167	.867
CanterburyBankstown	-.069	-4.540	.000	-.104	-6.782	.000
CentralCoast	-.168	-10.866	.000	-.278	-14.366	.000
CentralNorthern	-.038	-2.261	.024	-.082	-3.986	.000
CentralWestern	-.156	-6.518	.000	-.134	-7.022	.000
EasternSuburbs	.070	3.869	.000	.011	.746	.456
FairfieldLiverpool	-.091	-4.967	.000	-.232	-10.705	.000
InnerWestern	-.017	-.961	.337	.003	.254	.799
LowerNorthern	.010	.472	.637	.021	1.333	.183
NorthWestern	-.211	-11.307	.000	-.331	-12.632	.000
NorthernBeaches	.007	.331	.741	-.009	-.536	.592
OuterSouthWestern	-.100	-7.188	.000	-.248	-11.256	.000
St.GeorgeSutherland	-.035	-1.739	.082	-.020	-1.104	.270

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