

Mapping the 'Mis-location' of Private Rental Tenure in Australian Housing Market: A Case Study of Brisbane, Australia

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Abstract: This paper examines the geographic patterns of 'mis-located' households in terms of a mismatch of income and rental payments in the private market in Australia. Recently, such displacement of lower income households in Australian cities has become a public concern, since higher income households are occupying increasing numbers of low-rent dwellings. However, the extent to which rental tenure is associated with growing socio-spatial polarisation is largely under-studied. Using Brisbane as a case study, we undertake neighbourhood scale mapping and use cross-sectional approaches to address critical gaps in the understanding of spatial rent mismatch in socioeconomically disadvantaged areas. GIS-based analysis not only highlights areas of housing stress and displacement in metropolitan suburbs, but also offers broad implications for policies to address the 'mis-location' of private rental housing in Australian neighbourhoods. The findings will guide housing and urban policy development in a way that anticipates the needs and aspirations of low-income households and first homebuyers and supports efficient fiscal allocation to match rental needs across suburbs.

Introduction

The supply of, and demand for, private rental housing in Australia has been extensively examined (Wulff *et al.* 2011, 2009, 2007; Yates 2007; Yates and Milligan 2007; Yates *et al.* 2004). Previous research shows that the level of access to affordable rental housing for low-income households decreased between 2001 and 2006, while the size of private rental markets increased by 11 per cent (Wulff *et al.* 2011, 2009). Households experiencing housing stress were mostly clustered in socioeconomically disadvantaged areas, with a lack of quality services and limited access to opportunities for social and economic participation (Baum 2008). Housing un-affordability is also linked to frequent moves, shared accommodation with other families, crowding, or even homelessness (Wood *et al.* 2013).

Much of the research into the displacement of affordable housing has been undertaken at a national scale amongst capital cities and large regional centres, with very little analysis at the neighbourhood level (Wulff *et al.* 2011, 2009). There are few studies which investigate whether, or to what extent, local low rental housing stock is being occupied by low-income households. Indeed, in the competitive private rental market, moderate to high income households frequently take up low rent housing, thereby effectively removing, or 'displacing', dwellings from the affordable supply for low income households (Atkinson *et al.* 2011; Wulff *et al.* 2011). This process is called 'displacement' (HUD 2007). Housing stress, on the other hand, is understood when households spend more than 30 per cent of their income on rent (Wulff *et al.* 2009).

Attempts to test the spread of affordable housing development within host areas have to date focused mainly on its impact on property values. The logic is that they operate as a proxy for the bundle of characteristics and features which influence the quality of life and amenity of a neighbourhood (Ki and Jayantha 2010; Galster *et al.* 2003). People are willing to pay a high price for a property in a precinct with low crime rates, ample parking, little traffic and an attractive appearance. Any negative impact on these desirable characteristics, however, whether due to the emergence of affordable housing or anything else, will ultimately see a reduction in property values. American enquiries have found that the impacts of affordable housing development on property values can be positive through to negative, depending in large part on the specific characteristics of the project, its residents and the location (Ellen *et al.* 2007; Galster *et al.* 2003). Based on a review, Nguyen (2005) states that affordable housing development can indeed lower property values. However, she also argues that the likelihood of a negative impact depends much on the project design, management and location: it is most likely to occur where the quality, design

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and management of the development is poor, when it is located in a rundown and disadvantaged area, and where affordable housing residents are clustered.

The present paper addresses the significant issue concerning access to affordable rental housing for low-income households at the neighbourhood scale. It develops a conceptual framework to quantify rental displacement and housing stress, and empirically examines the extent to which Brisbane households were 'mis-located' within the private rental sector from 2006 to 2011. According to Wulff *et al.* (2011), the low rent housing stock in Australia increased from 37 per cent in 2006 to 54.9% in 2011. In Brisbane, 57% of private renters with household incomes in the lowest 40% of the national distribution accessed affordable housing in 2006; this number decreased to 44.5% in 2011 (ABS 2006, 2011).

The aim is accordingly to map the extent of 'mis-location' among private rental households in Brisbane's neighbourhoods, and address the following research questions:

RQ1: What is the extent of private rental housing 'mis-location' in Brisbane and how has it changed from 2006 to 2011?

RQ2: Is there any spatial clustering of shortage in low cost housing stock for low income households?

RQ3: Is there any spatial clustering in low cost housing stock being occupied by higher income renters?

RQ4: What is the extent that low income households have accessed low cost housing?

There are two phases to the study. First, it provides a comprehensive and up-to-date profile of the geographic patterns of private rental housing displacement in Brisbane. Second, it examines the extent to which housing stress could be attributed to high-income households which occupied low rent housing stock. GIS analysis not only highlights areas of housing stress and displacement across Brisbane neighbourhoods, but also offers broader implications for policies to address the 'mis-location' of private rental housing in Australian neighborhoods.

The next section presents the study area, data and methodology used to quantify and map rental housing 'mis-location' due to either shortage of supply of low cost housing stock for low income households, or low cost housing stock being pre-empted by higher income renters. Results are presented and discussed, with the implications and limitations of the current research identified in the last section.

Study Area and Data

The study area

The study area is defined as the Brisbane Local Government Area (LGA), which has jurisdiction over the inner portion of the Brisbane metropolitan area, the capital of Queensland in Australia. Geographically, it is located in the southeast corner of the State, and has a total area of 972 square kilometres. With a population of 1.04 million or 380,777 households in 2011 (ABS 2011), the city exhibits a low density housing spread on both sides of the Brisbane River, with the CBD sited about 15 km from the river mouth on Moreton Bay. This LGA had 186 gazetted suburbs in 2011, and, overall, a larger population than any other local government area in Australia (Figure 1).



Figure 1 Brisbane Local Government Area

Data source and processing

Data from the 2006 and 2011 censuses released by the Australian Bureau of Statistics (ABS) at the State Suburb (SSC) unit were used in this study. The State Suburb was adopted as the basic geographical unit because it offers the most consistent and appropriate delimitation of neighbourhoods across urban and rural areas in Australia (ABS 2010). Data attributes extracted from the censuses include the number of private renter households categorised by household income and by dwelling rent. Gross unequivalised household income quintiles ranging from very low to very high were defined, based on the national household income distribution of the respective census point in 2006 and 2011. The gross unequivalised income represents the sum of the individual incomes reported by all household members aged 15 years and over, regardless of the size and composition of the household. Subsequently, five weekly rent categories ranging from very low to very high were also defined, with each rent category representing households in the corresponding income category with no more than 30 per cent of income spent on rent (Table 1).

Table 1. Categorisation of gross household income and their corresponding rent categories

Categories of Gross Household Income (GHI)	2006		2011	
	Weekly	Annual	Weekly	Annual
I1 (very low)	\$0-\$499	\$0-\$25,999	\$0-\$599	\$0-\$31,199
I2 (low)	\$500-\$799	\$26,000-\$41,599	\$600-\$999	\$31,200-\$51,999
I3 (medium)	\$800-\$1199	\$41,600-\$72,999	\$1000-\$1499	\$52,000-\$77,999
I4 (high)	\$1200-\$1999	\$73,000-\$103,999	\$1500-\$2499	\$78,000-\$129,999
I5 (very high)	≥\$2000	≥\$104,000	≥\$2500	≥\$130,000
Categories of weekly rent corresponding to appr. 30% of GHI	2006		2011	
R1 (very low)	\$1-\$149		\$1-\$179	
R2 (low)	\$150-\$239		\$180-\$299	
R3 (medium)	\$240-\$359		\$300-\$449	
R4 (high)	\$360-\$599		\$450-\$749	
R5 (very high)	≥\$600		≥\$750	

Note: GHI refers to gross unequivalised income ranges (weekly) that represent the sum of the individual incomes reported by all household members aged 15 years and over. This figure is not equivalised to control for the differing size and composition of the households.

However, some suburbs have only a very small number of rental households in the five income and five rent categories. These small numbers have been randomly adjusted by ABS (2011) to avoid the release of confidential data. Therefore, for this study, we selected suburbs with over 50 rental households for analysis. This step resulted in a total of 156 suburbs in Brisbane. Renter households with income not stated, with negative income or partial income stated were not included. Households which did not state their dwelling rent were also excluded from this study.

The 'very low' household income category represents the bottom quintile (20%) of the Australia-wide household income distribution, with an annual income of less than \$31,200 in 2011 or \$26,000 in 2006. Similarly, 'low', 'medium', 'high' and 'very high' household income categories represent approximately the 2nd, 3rd, 4th and 5th quintile of the Australia-wide household income distribution. Each rent category represents households which spent no more than 30 per cent of income on accommodation in the corresponding income category (e.g., the 'very low' rent category represents households which spent no more than 30 per cent of their weekly household income on rent). 'Low', 'medium', 'high' and 'very high' rent categories were defined in a similar way (Wulff *et al.* 2011; Atkinson *et al.* 2011).

Method

Cross-tabulation between income and rent expenditure

We first took a cross-tabulation approach to analyse the relationship between the scaled household income and rent expenditures. Cross-tabulation is commonly used to compare the relationship between two categorical variables and tabulate the results of one variable against the other. By cross-tabulating the income and rent variables using ABS's TableBuilder tool (ABS 2011), a 5x5 matrix was created for each suburb, describing renting households in terms of their gross household income and rent outgoings. A sample 2011 cross-tabulation of the gross income and rent categories in one suburb (New Farm) is shown in Table 2. The figures along the diagonal (cells in green colour) display the number of households which pay rent at the 30 per cent threshold level. They are not experiencing housing displacement or stress. In this example, 902 of 2621 households (34.4%) live in rental housing they can afford.

Table 2: A sample cross-tabulation matrix of income and rent categories in one suburb (New Farm, 2011)

Rent level \ Income level	R ₁ (very low)	R ₂ (low)	R ₃ (medium)	R ₄ (high)	R ₅ (very high)	Sub total
I ₁ (very low)	280	137	60	27	0	504
I ₂ (low)	55	139	128	35	5	362
I ₃ (medium)	15	138	248	53	8	462
I ₄ (high)	3	80	376	121	9	589
I ₅ (very high)	10	29	214	337	114	704
Sub total	363	523	1026	573	136	2621

Source: ABS 2011 Census

On the other hand, data in cells coloured orange (above the diagonal) are the number of households which pay more than 30 per cent of income on rent (462 out of 2621 households, or 17.6%). These households are 'mis-located' and experiencing budget stress (Henman and Jones 2012). Similarly, data in cells coloured red (beneath the diagonal) represent households which pay less than 30 per cent of income on rent (1257 out of 2631 households, or 48.0%). These households are also 'mis-located', because they are occupying housing stock at rents lower than their income could allow, potentially forcing lower income households from the suburb.

The cross-tabulation of data on income and rent was also used to define housing shortage or surplus, or the absolute gap between the number of households in an income category and the number of dwellings available at the 30 per cent affordability benchmark in each suburb. This move is based on two assumptions that in each suburb studied:

- (a) all renter households are accommodated, and
- (b) all private rental housing stocks are occupied.

Using one suburb (New Farm) as an example, Table 3 shows the cross-tabulation result defining housing surplus or shortage in different income and rent categories. In this case, regardless of which household occupied what type of housing stock, there were absolute shortages of 16 and 568 rental houses at ‘very high’ and ‘high’ costs respectively, and a shortage of 141 rental houses at ‘very low’ cost level. On the other hand, there are surpluses of 161 and 564 housing stocks at the ‘low’ and ‘medium’ rent levels respectively (Table 3).

Table 3: A sample cross-tabulation matrix defining rental housing surplus or shortage in one suburb (New Farm, 2011)

Income category	No. of households at each income category	Rent category	No. of households at each rent category	Difference defining surplus (+) or shortage (-) of rental housing at the corresponding income level
I ₁ (very low)	504	R ₁ (very low)	363	-141
I ₂ (low)	362	R ₂ (low)	523	+161
I ₃ (medium)	462	R ₃ (medium)	1026	+564
I ₄ (high)	589	R ₄ (high)	573	-16
I ₅ (very high)	704	R ₅ (very high)	136	-568

Source: ABS 2011 Census

Subsequently, we define two quantifiers to probe the cause of ‘mis-location’ due either to: (a) the absolute shortage of low cost rental housing for low income private rental households (H_{short}), measured by the difference between households in the bottom two quintiles of the Australia-wide household income distribution (i.e., I_1+I_2 in Table 3) and two lowest rent categories (i.e., R_1+R_2) in the total rental housing stock (i.e., sum of all I or sum of all R, which equals to each other); or (b) the low cost rental stock being occupied by higher income renters (H_{displ}), measured by the number of households with income in the top two quintiles of the Australia-wide household income distribution which occupied ‘low’ and ‘very low’ rent housing (i.e., I_4R_1, I_4R_2, I_5R_1 and I_5R_2 in Table 2) in the total rental housing stock.

Mathematically, the two quantifiers of ‘mis-location’ can be written as:

$$H_{short} = \frac{(R_1 + R_2) - (I_1 + I_2)}{\sum_{i=1}^5 I_i} \times 100\% \quad (1)$$

$$H_{displ} = \frac{I_4R_1 + I_4R_2 + I_5R_1 + I_5R_2}{\sum_{k=1}^5 I_k} \times 100\% \quad (2)$$

Hot spot analysis

By mapping the spatial distribution of ‘mis-location’ within the private rental housing market in Brisbane using the H_{short} and H_{displ} quantifiers, hot spot analysis using the Getis-Ord G^* statistic was applied to examine whether there is any systematic and observable local clustering in the rental housing distribution, such as areas with concentrations of high (or low) rental housing shortages or displacement. Specifically, the hot spot analysis was undertaken to assess the geographic distribution of rental housing ‘mis-location’ by either a clustering of suburbs with:

- a) a shortage of low cost rental housing stock for low income rental households (i.e., hot/cold spot of H_{short}), or
- b) low cost private rental housing stock being occupied by high income private renters (i.e. hot/cold spot of H_{displ}).

The Getis-Ord G_i^* statistic is given as:

$$G_i^* = \frac{\sum_{j=1}^n w_{ij}x_j - \bar{X} \sum_{j=1}^n w_{ij}}{S \sqrt{\frac{n \sum_{j=1}^n w_{ij}^2 - (\sum_{j=1}^n w_{ij})^2}{n-1}}} \quad (3)$$

where i and j represent different suburbs in the study area, and n is the total number of suburbs ($n = 156$). x_j is the attribute value (i.e., H_{short} or H_{displ}) for suburb j , while w_{ij} represents the spatial relationship between suburb i and j , measured in GIS using the fixed distance band method. \bar{X} and S are calculated, respectively, as:

$$\bar{X} = \frac{\sum_{j=1}^n x_j}{n} \quad (4)$$

$$S = \sqrt{\frac{\sum_{j=1}^n x_j^2}{n} - (\bar{X})^2} \quad (5)$$

The G_i^* statistic calculated using Formula (3) for H_{short} or H_{displ} results in a z-score and p-value for each suburb, which reveal where the features H_{short} or H_{displ} cluster spatially with either high or low values. A high Z score and a small P value for a feature (H_{short} or H_{displ}) indicate a significant hot spot, and a low negative Z score and small P value indicate a significant cold spot. The higher (or lower) the z score, the more intense the clustering. The occurrence of a z score near zero indicates no spatial clustering.

Furthermore, comparison of the 2006 and 2011 results was conducted through time-series analysis in GIS to identify change in the spatial distribution and patterns of the private rental housing 'mis-location' amongst all suburbs, resulting in a series of maps to illustrate their spatial patterns and changes over time.

Results and Discussion

RQ1: Extent of rental housing 'mis-location' in Brisbane's neighbourhoods from 2006 to 2011

In Brisbane, the number of households which paid more than 30% of income on rent increased from 19.5% in 2006 to 23.7% in 2011, and the number which paid less than 30% of income on rent over the same period decreased from 47.0% to 43%. As such, the households whose rental cost was at the 30% affordable level slightly decreased from 33.5% to 32.3%. Furthermore, amongst the 156 suburbs each with over 50 rental households, 37.8 per cent had an annual household income in the bottom two quintiles of the national income distribution, and only 44.5 per cent accessed affordable housing in 2011 (Table 4).

Table 4: 'Mis-location' of private rental housing in Brisbane from 2006 to 2011

	2006		2011	
	Number of households	%	Number of households	%
Households paying more than 30 per cent of income on rent	22,518	19.5	28,257	23.7
Households paying 30 per cent of income on rent	38,556	33.5	38,534	32.3
Households paying less than 30 per cent of income on rent	54,138	47.0	52,515	44.0
Low income private renters ^{1*}	44,593	41.2	44,953	37.8
Low income private renters which accessed affordable houses ^{2*}	27,090	57.0	19,994	44.5
Low cost private rental houses occupied by high income private renters ^{3*}	11,235	19.4	5,494	14.9
Total	115,212	100	119,306	100

Note:

¹ These are households renting privately with household income in the bottom two quintiles of the Australia-wide household income distribution.

² These are the low income private renters who pay 30 per cent or less of their household income on rent.

³ These are private rental houses with low and very low rent (that is, less than \$239 per week in 2006 or \$299 per week in 2011) which were occupied by renters with household income in the top 40 per cent of the Australia-wide household income distribution.

*Excluding households in suburbs with fewer than 50 renter households (24 suburbs in the 2011 census were excluded).

Overall, there was a 4.2 percentage points increase in number of households which were under housing stress from 2006 to 2011, as well as a slight decrease by 1.2 percentage points in the proportion of household which were not under housing stress and also not occupying rental housing below their income level (see Table 4 rows 1 and 2). Accordingly, there was a three percentage point decrease in the number of households which paid less than 30% of their income on rent (as before, row 3). On the other hand, 14.9% of low and very low rent houses were occupied by households with high or very high incomes (i.e., household income in the highest 40% of the national income distribution) in 2011 (Table 4, last row). When compared with the 19.4% level in 2006, this statistic indicates that, from 2006 to 2011, there had been a 12.5 percentage point decrease in the proportion of low income households accessing affordable housing, even though there had been a 4.5 percentage points decrease in the proportion of high income households occupying low cost rental housing. This finding indicates that there is a share shortage of low cost rental housing in the private rental market.

Figure 2 illustrates the proportions of rental households paying more than 30% of their income on rent in 2006 and 2011. While suburbs in greenish colour show a lower proportion below 20% which decreased from 2006 to 2011, suburbs showing in yellow and orange colours display a higher proportion, between 20 to 30%, which has increased to incorporate most suburbs in 2011 (see Figure 2b). Two suburbs had over 40% of rental household paying more than 30% of income on rent (i.e., St Lucia and Robertson); this situation remain unchanged from 2006 to 2011. St Lucia hosts The University of Queensland with a high demand for student accommodation, while Robertson is a prestigious suburb in the south of Brisbane with large houses and high rent. Figure 3 shows the proportion of low cost private rental houses occupied by high income private renters in 2006 and 2011, and the predominate greenish colour in most suburbs in 2011 indicates that rental housing 'mis-location' due to housing displacement decreased across most suburbs in Brisbane during the period (Figure 3).

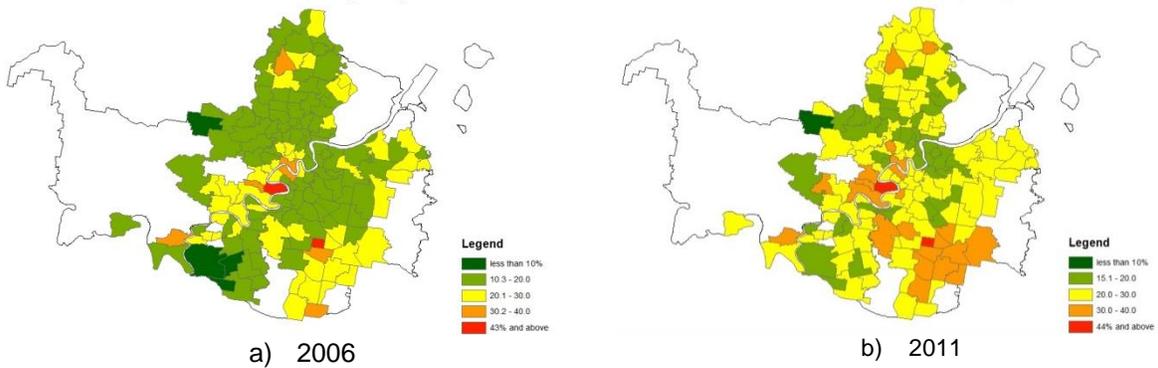


Figure 2. Proportion of households paying over 30% of income on rent by suburbs in 2006 and 2011 (extent of housing stress)

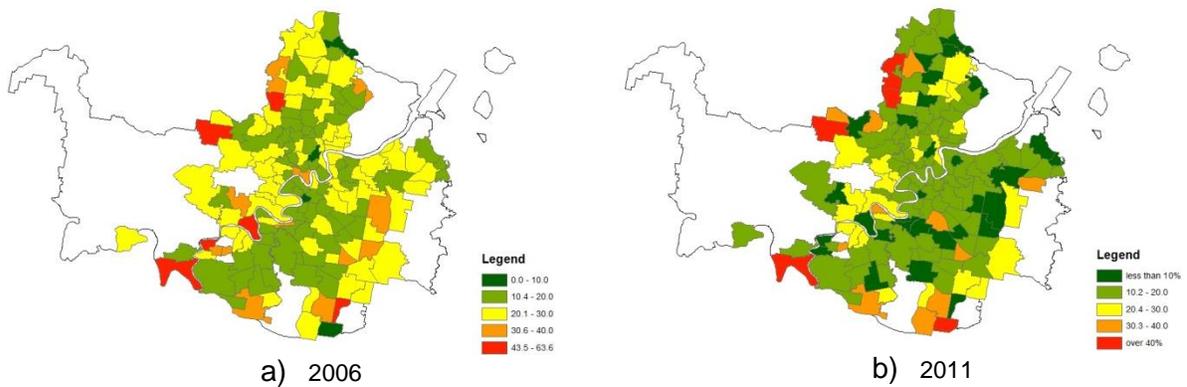


Figure 3. Proportion of low cost private rental houses being occupied by high-income households in 2006 and 2011 (displacement)

RQ2: Clustering of suburbs with low cost rental housing shortage for low income households (H_{short})

Hot spot analysis of the H_{short} quantifier reveals spatial clustering of suburbs with an absolute shortage of low cost rental housing stock for low income rental households (Figure 4).

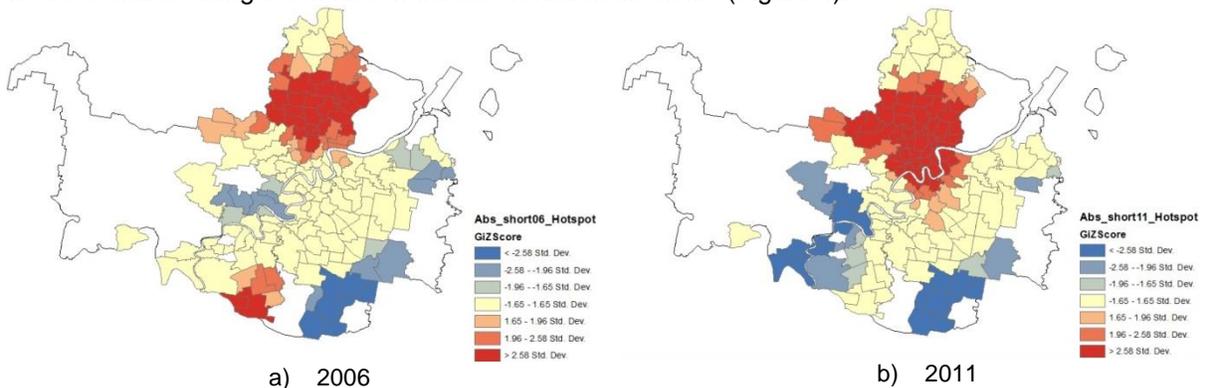


Figure 4. Spatial clustering of absolute shortage of low cost rental housing stock (2006-2011)

Figure 4 shows two hot spots of spatial clustering of high H_{short} values in 2006 but only one in 2011. There was a large area of spatial clustering of high H_{short} values in northern Brisbane in 2006, which had expanded in size towards the CBD and south Brisbane suburbs in 2011. This growth indicates a significant shortage of low cost rental housing stock in an axis covering Brisbane's northern to south suburbs. The spatial clustering of low-cost housing shortages in the southwest suburbs became insignificant from 2006 to 2011, indicating more or less a balance between supply of, and demand for, low-cost rental housing. Alternatively, areas in a bluish colour indicate statistically significant cold spots, or

areas clustered with low H_{short} values, indicating that these suburbs are not experiencing low cost housing shortage issues. These cold spots appeared in the southeast, and part of the west and east of Brisbane suburbs in 2006, and expanded in western Brisbane suburbs, while those in the east and southeast reduced their extent to 2011 (Figure 4).

RQ3: Clustering of suburbs with low cost rental housing being occupied by high income private renters (H_{displ})

We also analysed the hot and cold spots of H_{displ} , or the geographic patterns of ‘mis-location’ due to low cost rental houses being occupied by higher income households in 2006-2011. Figure 5 shows that, from 2006 to 2011, there was a distinct change in the hot spot patterns of low cost rental properties which were occupied by high-income households. In 2006, there was one large hot spot in the west, but in 2011 there were two distinct ones, the first in the northwest and second in the south. When comparing Figure 4b with Figure 5b, it can be seen that the northwest hot spot of H_{displ} overlaps with the hot spot of H_{short} , indicating both displacement and absolute shortage of low cost rental stock. Conversely, the southern hot spot overlaps an area where there is an excess of low cost rental stock. Therefore displacement of lower income households does not necessarily occur in all areas where high-income households occupy low cost rental properties.

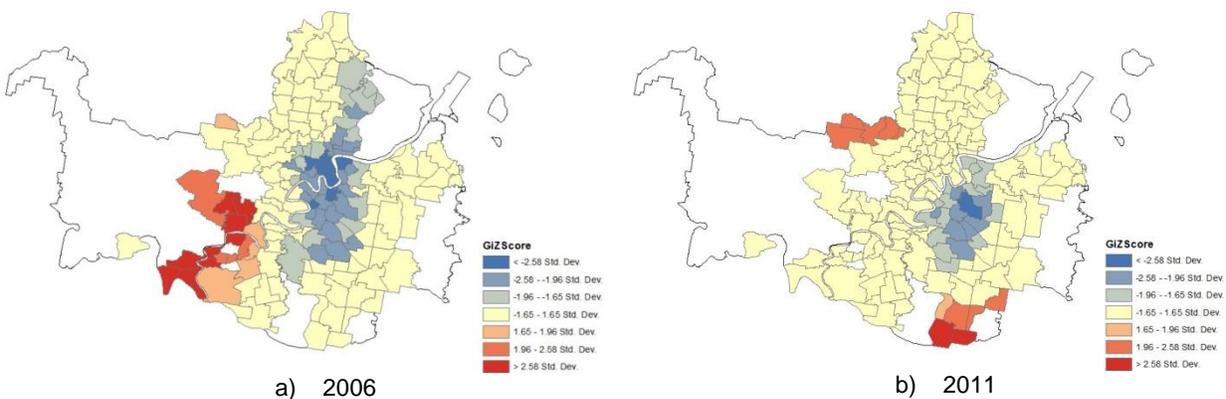
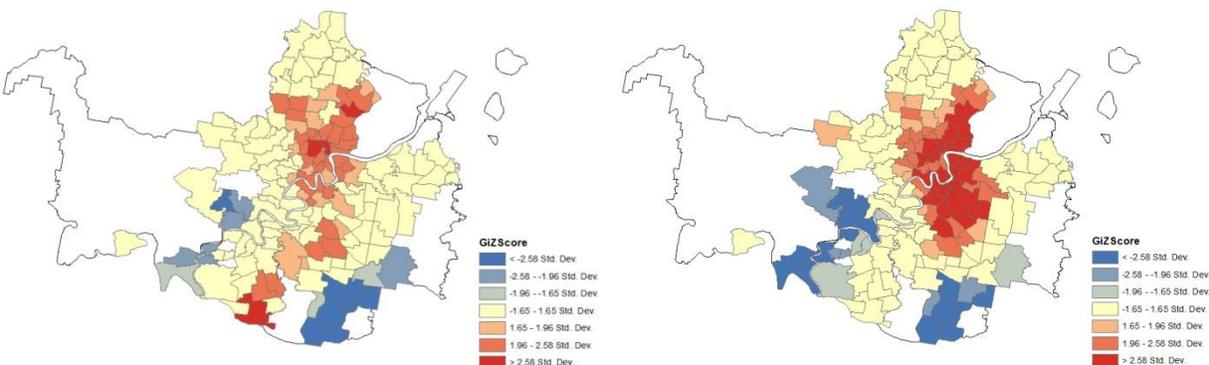


Figure 5. Spatial clustering of low cost rental houses occupied by high income households, 2006-2011

RQ4: Clustering of low income household who accessed affordable rental housing

Subsequently, Figure 6 shows the spatial clustering of rental households which accessed affordable housing in 2006-2011. The figure highlights that, in 2011, although there was a hot spot of shortage of affordable rental houses in the north (as shown in Figure 4b), this is also the area with high cluster of low-income households which were able to access affordable rental houses. This coincidence can be attributed to the low clustering of H_{displ} , or fewer high income households occupying low cost rental housing in these suburbs. On the other hand, although there was a cold spot of low cost rental housing shortage in the southeast Brisbane suburbs, there was still a significant clustering of suburbs in that sector with low access to affordable housing by low income households. This situation can also be attributed to the clustering of high income households occupying low cost rental houses in these suburbs (as shown in Figure 5b).



a) 2006

b) 2011

Figure 6. Spatial clustering of low income households who accessed affordable rental housing, 2006-2011

Conclusion

This paper develops a method to examine the extent and spatial distributions of housing 'mis-location' as well as changes over time using cross-tabulation and hot spot analysis of income and rental expenditure data at local scale. Overall, the proportion of households experiencing housing stress increased and became more spread out across suburbs in Brisbane from 2006 to 2011. Our analysis also shows certain spatial patterns of rental housing 'mis-location', due to either the absolute shortage of low cost housing for low income households, or low cost housing being occupied by higher income households, or the combined effect of both moves. While significant shortages of low cost rental supply exist in the northern suburbs extending towards the CBD and south Brisbane, northern to eastern Brisbane suburbs remain as areas with strong clustering of low income households able to access low-cost rental housing. This fortunate situation occurs due to a low incidence of high income households occupying low-cost housing stocks. On the other hand, low income households living in the west and southeast corner of Brisbane suburbs were more challenged in accessing affordable housing, due to higher income households competing for low cost houses. Temporally, while the spatial patterns of affordable housing changed from 2006 to 2011, the extent of low income households experiencing housing stress grew, especially in Brisbane's western suburbs.

A lack of understanding relating to the mobility and location choices of low income households can have significant policy ramifications. In particular, a spatial mismatch in the demand for, and supply of, affordable rental housing will arise if planning for resource allocations across locations continues to be based on the location choices of existing higher income households (i.e. baby boomers) despite divergent preferences from younger and less affordable generations (i.e. child-bearing households). For instance, affordable housing displacement leading to stress is closely related to rental mis-location for younger and low-income households who need greater accessibility to their workplaces in order to save commuting costs. Urban renewal projects in Brisbane should also consider the density of low and middle income households while planning for any affordable housing provision (Davison *et al.* 2012). Affordable housing provision across neighbourhoods not only improves the mismatch between the quantity of rental stocks and housing stress, but it can also reduce the extent of 'mis-location' of the rental needs of prospective residents and relieve housing stress for lower income households which cannot access affordable housing. The investigation has thus improved understanding of the geographic patterns of rental displacement at a neighbourhood level and the extent to which housing stress can be attributed to high income households which occupied low rent stock in Brisbane neighbourhoods between 2006 and 2011. The geographic patterns of housing stress and rental displacement across suburbs were not uniform and many areas showed little or no match between rent stocks and housing stress.

The current study is limited in a number of aspects. First, even though we excluded suburbs with small numbers of rental households, the allocation into 25 categories still resulted in some suburbs with a small number of households in one or more categories; these small numbers could potentially be randomised by the ABS due to its confidentiality policy. Second, our analysis of housing shortage and surplus is based on the assumptions that all that (a) all renter households are occupied and (b) all private rental housing stock is occupied by private renter households in each suburb. Therefore, we did not take into consideration either homelessness or issues with rental housing vacancy. They remain to be addressed in future research.

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