Housing Stress or Transport Stress? Issues in Australian Housing Affordability
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# CONTENTS

About NATSEM ........................................ 1
Author note ........................................... 3
General caveat ........................................ 3
Abstract ............................................... 4

1 Introduction ....................................... 5

2 Variables and data ................................ 6
   2.1 Housing stress ................................ 6
   2.2 Transport costs ................................ 7
   2.3 Spatial Data and Estimation ............... 8

3 Housing Stress .................................... 10
   3.1 The spatial pattern of housing stress ... 10
   3.2 Housing costs, Income and Housing Stress: City vs. Balance of State 13

4 The Inclusion of Transport Costs in Housing Stress ............................................. 14
   4.1 The contribution of transport costs in capital cities ... 15
   4.2 Comparison with balance of state areas .... 17

5 Conclusions ....................................... 20

References .......................................... 21
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These estimates may be different from the actual characteristics of the population because of sampling and nonsampling errors in the microdata and because of the assumptions underlying the modelling techniques.

The microdata do not contain any information that enables identification of the individuals or families to which they refer.

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ABSTRACT

Housing stress is usually measured on the basis of income and direct housing costs such as mortgage repayments and rents. One cost that is not included in calculations of housing stress, but which may be important, is the difference transport costs make. Especially in city areas, paying a premium for a house that is close to work may offset the additional transport costs incurred getting to work. So a measure of housing stress which includes transport costs may give a different picture of housing stress to a measure that ignores transport costs.

In this paper, we argue that transport costs need to be taken into account in measuring housing stress not only in the capital cities but also outside capital cities. We find that in capital cities, bringing transport costs into a housing stress measure increases the number of both purchasers and renters in housing stress by 25 per cent, and it particularly affects households with children. However, we also find that the impact of transport cost is even greater outside capital cities.
1 Introduction

The steady increase in the proportion of people in housing stress in 2007/2008, along with a widening gap between house prices and income became an important policy concern in Australia (Tanton et al., 2008; Beer et al., 2007; Commonwealth of Australia, 2008). With constrained land supply in inner city areas causing a tightening of housing supply and affordability, capital cities in Australia have expanded farther away from the city centres to areas where the cost of purchasing or renting houses tends to be lower than areas around city centres (Beer et al., 2007; Alonso, 1964; Fujita et al., 1999).

The use of cars, including car pooling, may have contributed to the expansion of cities, with new settlements stretching further from the city centres and public transportation networks. Moreover, the car has now become a dominant mode of transport to work (Mees et al., 2008). As a result, it is possible for people to choose the timing of their travel to work, and this gives them more flexibility in choosing the location they would like to reside in, as they do not need to depend on public transport. However, this expansion may also result in an additional travel expense to go from the urban outskirts of the city to inner city areas where most of the work opportunities tend to be concentrated.

Previous studies on housing stress have usually considered direct housing costs such as rent for renters and mortgage repayments, water and general rates for owners with mortgages (e.g., Randolph and Holloway, 2002; Phillips et al., 2006; Yates and Gabriel, 2006; Nepal et al., 2010). Transport costs have seldom been considered in the study of housing affordability in Australia while in a study in the United States, Miller (1982) confirmed that people are willing to pay higher housing costs if they can have shorter transport times or cheaper transport costs.

This paper aims to address this gap by looking at how the inclusion of transport costs changes the rate of housing stress. As the literature has mostly looked at the additional cost of transport in urban city areas, we have also focussed our analysis on capital cities areas, using observations from most of the state capital cities in Australia - Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart. We have excluded Darwin and Canberra because these capital cities were not available separately on the dataset used.

Frost and O’Hanlon (2009) point out that the sustainability of urban development in Australia has been maintained by the development of urban areas outside the established capital cities. Therefore, we have also looked at housing stress and transport costs outside capital cities in Australia. These areas are referred to as Balance of State in the Australian Geographical classification (ABS, 2006).

The research questions that will be addressed in this paper are as follows:

1. How much do transport costs increase the additional costs of living, especially for households in housing stress?

2. How do transport costs change the picture of housing stress?
3. Does the inclusion of transport costs in the calculation of housing stress have a different impact in capital cities compared to outside capital cities?

The definition of housing stress proposed in this paper is based on the 30/40 rule of housing stress, which is that 30 per cent of income is spent on housing and the household is in the bottom two quintiles of income. The advantage of using a 30/40 rule, rather than a 30 only rule, is that households with higher incomes, who may decide to pay more for housing (through either choosing a larger house, a more expensive inner city area, or just by paying more off their loan because they have a higher disposable income), are excluded. In this paper, the definition is changed slightly to include transport costs in housing costs, so 30 per cent of income is spent on housing and transport and the household is in the bottom two quintiles of the income distribution.

This paper is structured as follows. Following the introduction, the second section discusses the variables used in analysing the relationship between housing stress, housing costs and transport costs. The analysis in the third section of this paper starts by examining whether the issue of housing stress is really an issue that is specific to capital cities or whether it affects areas outside capital cities. This is followed by the analyses on the impact of the inclusion of transport costs in housing stress in the fourth section. Finally, we discuss the results and deliver our conclusion in the fifth section.

2 VARIABLES AND DATA

As this study analyses the relationship between housing stress and transport costs, there are several variables that have to be defined. First of all, we need to define housing stress and identify the variables that are used to calculate housing stress. Secondly, we need to define transport costs, and what should be included in these costs.

2.1 HOUSING STRESS

Housing stress refers to the financial burden for a household arising from high housing costs relative to their income. While the housing stress indicator has a number of variants, we used a variant known as the 30/40 rule. This variant of housing stress has been found to be less sensitive across tenure types and choice of income type (Nepal et al., 2010). According to this measure, a household is defined to be in housing stress if it spends more than 30 per cent of its income on housing costs and is also in the bottom 40 per cent of the income distribution.

There are three variables that need to be defined in this definition. The first is the households in the bottom 40% of the income distribution; the second is the income that is used when calculating the 30% of income being spent on housing costs; and the third is the housing costs.
The 40 per cent income cut off means that higher income households who may voluntarily choose to devote a higher fraction of their income for a better dwelling or better location are excluded from being in housing stress. To identify people with household incomes in the bottom 40 per cent of the income distribution, the income distribution should first be equivalised to take into account the number of adults and children in a household. This means that the income for a household with one person is not being compared to the income for a household with five people.

Disposable (or after tax) income was used for income in both the 30% and 40% cut-offs. The reason for this is that disposable income shows what a household has to spend on housing, so taxes are already taken out. Using the 30/40 rule, there is not much difference between using gross or disposable income (Nepal et al., 2010).

The disposable income is then equivalised using the modified-OECD equivalence scale, which assigns a weight of 1 point to the first adult in a household, 0.5 to each of the remaining adults aged 15 years or over, and 0.3 points to each of the dependent children under 15 years (Buhmann et al., 1988). Using this factor, the household income was standardised so that all households had an income expressed relative to that of a single person household. After deriving equivalised disposable household income, all households were ranked by these incomes from the lowest to the highest, and the people in a household were then put into five equal groups (quintiles) Thus each income quintile was a ‘person-weighted’ quintile and we had an equal number of people (not households) in each quintile.

The income used for the 30% rule is not equivalised, as for this variable we wanted the amount the household could spend on housing costs, and this would come from their disposable household income. Not a household income adjusted for household size.

Housing costs are defined as including the regular expenses of a household in providing for their accommodation. For renters, the housing costs refer to rents. For owners with mortgages, it includes general rates, water rates and mortgage repayments for secured or unsecured loans taken primarily for housing purposes including, for example, to build, to alter or add to the current dwelling.

2.2 TRANSPORT COSTS

Transport costs refer to weekly household expenses on transport. On the Household Expenditure Survey, expenditure on transport contained 42 items. We can classify these 42 items into fixed costs of transport and variable costs of transport. Fixed costs comprise expenses that do not vary depending on the travel frequency or distance. Examples of fixed costs are the purchase of a motor vehicle, compulsory registration, compulsory insurance, driver's licence, driving lessons, and subscriptions to motor vehicle organisations. Variable costs include the expenses that vary on the basis of travel frequency and distance. These include fuel, lubricants and additives, parking fees, road tolls, and public transport fares. This paper will specifically look at the impact of variable transport cost on financial stress.
in addition of housing stress. This is because the use of fixed cost such as purchase of motor
vehicle could disguise the true extent of how the need to travel affects one’s financial stress
as people with higher incomes would be more likely to spend money on a high value
vehicle which is not required for everyday trips like going to work shopping.

2.3 Spatial Data and Estimation

Most of the variables used are obtained from the Australian Bureau of Statistics Household
Expenditure Survey (HES) 2003/04. Conducted at the same time as the 2003/04 Survey of
Income and Housing, the Household Expenditure Survey uses a subset of households from
the Survey of Income and Housing, but collects much more information on household
expenditure. The 2003/04 HES contains a sample of 6,957 households, but we only used
6,281 of them as we excluded the Northern Territory and the Australian Capital Territory
from the analysis since the sample for these two territories are combined into one group
(called NT/ACT by the ABS), while their characteristics are very different. From the
sample we used, 4,321 were from capital city areas and represented 4,717,215 households
while 1,960 were from outside capital cities representing 2,801,158 households.

The data from HES 2003/04 are only geographically divided into state and area of state,
which is capital city and balance of state. What we were interested in was the spatial
pattern within these areas, as this work is motivated by the argument that people move
from inner city areas to the outer suburbs of cities to avoid high housing costs.

To derive the spatial distribution of housing costs within city, this study uses a spatial
microsimulation technique (Chin et al., 2005; Chin and Harding, 2006; Tanton et al., 2011).
This method has been widely used in Australia to study housing stress and income poverty
at a small area level (Taylor et al., 2004; Chin et al., 2005; Nepal et al., 2010). The technique
combines census tables and survey micro-data to generate a new set of synthetic micro-
data for small areas for which the survey cannot provide reliable direct estimates. The
synthetic micro-data for small areas created using spatial microsimulation closely reflects
the profile of the population in those areas.

The use of spatial microsimulation modelling was preferred over direct Census data to
obtain housing stress indicators at Statistical Local Area (SLA) level because the Census
data only provided estimates based on gross income while we wanted to base our analysis
on disposable income and the 30/40 rule. Further, while the Census can provide estimates
of average housing costs for small areas, to calculate housing stress, we need estimates of
housing costs for each household in the area.

We are confident that the housing costs modelled using the spatial microsimulation model
are reasonable because they have then been validated against small area Census data at the
SLA level. Moreover, these estimates have been used extensively to calculate estimates of
housing stress (Nepal et al 2010, Phillips et al 2005), which have also been validated against
Census data.
The estimates of housing stress at the SLA level in this report are derived from the version of NATSEM’s spatial microsimulation model that uses the 2005/06 and 2007/08 ABS Confidentialised Unit Record Files from the Survey of Income and Housing. The estimation process reweights the household unit record data from the ABS surveys using constraints from Census small area level data. The method used for this is a generalised regression weighting method implemented by the ABS in a SAS macro called GREGWT. This is the same program that the ABS uses to reweight survey households to national totals. For constraints, the model uses 12 benchmark tables from the 2006 Census of population and housing. The benchmarks are shown in Table 1.

<table>
<thead>
<tr>
<th>Number</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age by sex by labour force status</td>
</tr>
<tr>
<td>2</td>
<td>Age by sex by weekly equivalised household income</td>
</tr>
<tr>
<td>3</td>
<td>Total number of households by dwelling type (Occupied private dwelling/Non private dwelling)</td>
</tr>
<tr>
<td>4</td>
<td>Tenure by weekly household rent</td>
</tr>
<tr>
<td>5</td>
<td>Tenure by household type</td>
</tr>
<tr>
<td>6</td>
<td>Dwelling structure by household family composition</td>
</tr>
<tr>
<td>7</td>
<td>Number of adults usually resident in household</td>
</tr>
<tr>
<td>8</td>
<td>Number of children usually resident in household</td>
</tr>
<tr>
<td>9</td>
<td>Monthly household mortgage by weekly household income</td>
</tr>
<tr>
<td>10</td>
<td>Persons in non-private dwelling</td>
</tr>
<tr>
<td>11</td>
<td>Tenure type by weekly household income</td>
</tr>
<tr>
<td>12</td>
<td>Weekly household rent by weekly household income</td>
</tr>
</tbody>
</table>

The reweighting process employed by the spatial microsimulation model usually produces some areas where the GREGWT procedure cannot derive weights, so an estimate for these areas cannot be produced. This is due to the inability of the unit record data to produce a set of weights that would fulfil all the benchmark tables. However, estimates can be derived by reducing the number of benchmarks. The estimation process used for this paper reduces the number of benchmarks for those areas where estimates cannot be achieved using the full set until all areas have an estimate. The trade-off of this is that a smaller number of benchmarks will lead to more inaccurate estimates, so where possible all benchmarks were used; and then the number of benchmarks was reduced one by one and areas were added as they converged. Therefore, we have used the maximum number of benchmarks possible for each SLA to derive a result.

Unfortunately, as fewer benchmarks are used in the estimation process, a consistent bias (an under estimate) is introduced. This bias can be corrected for by inflating the estimates calculated using fewer benchmarks to what they would have been if they had been estimated using the full number of benchmarks. This inflation factor is derived by looking at the regression line through all the areas estimated using fewer benchmarks, and the regression line through all the areas estimated using all benchmarks.
3 Housing Stress

This paper started with a preposition that high housing costs have pushed people to the outskirts of cities to areas with lower housing costs. To investigate this, we will look at the pattern of housing stress within cities. In this paper cities are represented by the capital cities of the six states in Australia - Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart. As stated previously, we have excluded the capital cities of the two territories (Canberra and Darwin) as they are not separately identified on the ABS survey we are using.

However, there are several reasons why housing stress could occur outside a capital city. First, although it can be confirmed that, on average, housing costs are higher in capital cities, it can also be shown that the average income is also higher in capital cities. Therefore, we need to look further at how these two factors could determine the level of housing stress outside capital cities.

The second and probably more important reason is the fact that urban development is not only happening in capital cities. Frost and Hanlon (2009) identify that the history of urban development in Australia has shown that the growth of cities in Australia has been sustained by the development of new small cities within capital cities, especially in Adelaide and Canberra, and cities outside the capital city, especially in the south east of Queensland (for example, the Gold Coast and Sunshine Coast). Therefore, an urban issue such as housing stress can also occur outside capital cities. This has been confirmed by Phillips et al (2006) and Yates and Gabriel (2006) by estimating the level of housing stress for small areas and showing that housing stress does occur outside capital cities, especially in Queensland where there are a higher proportion of households in housing stress outside Brisbane than within Brisbane.

3.1 The Spatial Pattern of Housing Stress

The previous discussion suggests that housing stress is an important issue both within capital cities as well as outside them. In this section, we will use the results from our spatial microsimulation model to gain a clearer picture about this issue.

Figure 1 shows the spatial distribution of housing stress around Australia. The housing stress rate in this figure is classified based on a population weighted quintile, with the darker colours showing higher rates of housing stress. It can be seen that, in general, housing stress tends to be higher in capital cities and lower in remote and regional areas. As discussed, this may reflect the high housing costs in cities and lower housing costs in remote areas. Yates et al (2006) shows that most households in housing stress are in the Sydney metropolitan area, followed by some areas around Brisbane and inner Melbourne, and this housing stress is highly correlated with the higher cost of housing.

Yates et al (2006) shows the importance of analysing the level of housing stress within capital cities. Figure 1 shows that apart from Sydney, there is a similar story in other capital
cities. It shows that besides having an inner city area with high housing stress, Brisbane, Melbourne, Adelaide and Perth have high housing stress areas on the outskirts of the capital cities. In Brisbane, besides the inner city areas such as St Lucia, Dutton Park, South Brisbane and “City Remainder” having high levels of housing stress, there area also high levels of housing stress in the outer south of the capital city such as in Woodridge, Marsden, Inala, Willawong, Waterford West and Kingston as well as in the outer north of the city such as in Caboolture – Central, Morayfield, Redcliffe-Scarborough and Deception Bay.

Melbourne shows a similar pattern, with Melbourne Inner as the area with the highest rate of housing stress but also Hume in the North part of Melbourne, Dandenong and Casey in the South East of Melbourne, Melton in the West and Yarra Ranges in the East all having relatively high rates housing stress. The pattern can also be observed in Adelaide and Perth.

Sydney shows a slightly different picture with households in high housing stress concentrated in the west of Sydney inner city including Auburn, Canterbury, Parramatta, Bankstown and Fairfield. Housing cost appears to play a lesser role in determining housing stress in Sydney. The north of Sydney inner city has much lower housing stress despite facing the highest housing costs in Sydney. The concentration of housing stress in western Sydney is likely to be due to the concentration of disadvantaged areas in Sydney as shown by Vidyattama et al. (2008), and Mitchell and Bill (2004). The other area in Sydney that has high levels of housing stress is around Gosford and Wyong in the outer North of Sydney.

The main message from this analysis is that although the inner city areas do have high level of housing stress, the problem also stretches to the outskirts of the capital cities. This means that households in these areas will suffer housing stress and high transport costs – or, in other words, living in these areas will not get you out of housing stress, and may give you higher transport costs. This supports the finding of Dodson et al (2006) that shows transport disadvantage is highly correlated with other types of disadvantage.

The pattern may be different if we separate housing stress for renters and home purchasers. Randolph and Holloway (2002) indicate that renters in housing stress are likely to be located in high density areas while purchasers are more likely to be located in low density areas. This means that housing stress in the inner city area is more likely to consist of renters while housing stress in the outer parts of the capital cities is more likely to consist of home purchasers.
From looking within capital cities, we now look at the pattern outside the capital cities. The immediate picture from Figure 1 is that the areas with housing stress outside capital cities are dominated by areas on the eastern coast of Australia, mainly the NSW North Coast up to Queensland. The picture in Queensland mainly confirms the picture of housing stress outside Brisbane described by Phillips et al (2006) and Yates et al (2006), showing high levels of housing stress in the areas outside Brisbane, especially in the coastal area north of Brisbane such as Maroochy, Tiaro, Noosa and Hervey Bay. Areas in the south of Brisbane such as Surfers Paradise, Southport and Pimpama-Coomera also suffer high levels of housing stress. We also find that housing stress continues down the northern coast of NSW in areas such as Tweed Heads and Lismore, and continues down the coastal areas to south through Richmond Valley, Clarence Valley, and Coffs Harbour to Newcastle.

The issue of housing stress outside capital cities appears to be in a small area along the coast of NSW and Queensland, but due to the pattern of settlement in Australia, the proportion of households living in this area is relatively large. Approximately 46.7 per cent of the population outside capital cities is estimated to live in areas where the level of housing stress falls in the first and second highest quintile of housing stress, with 21.7 per cent in the highest quintile and 25 per cent in the second highest quintile. The proportion is
even bigger if we only consider NSW and Queensland, with 28.1 per cent and 33.8 per cent of the population outside of the capital city living in areas that fall into the highest quintile of housing stress.

This means that the impact of transport costs on housing stress could be higher outside capital cities due to the road infrastructure and availability of public transport being lower outside capital cities, as well as the longer distance that may need to be travelled to get to certain services. Offsetting this would be less traffic congestion getting to work.

### 3.2 Housing Costs, Income and Housing Stress: City vs. Balance of State

In this sub section, we further investigate housing stress in capital cities and the balance of State areas. In the discussion of the last sub section, we argue that the main reason why capital cities could be more vulnerable to housing stress is because of higher housing costs. Nevertheless, with higher incomes in capital cities (as shown in Table 2), the rate of housing stress in capital cities may still be lower than outside capital cities. We use data from the 2003/04 Household Expenditure Survey (HES) and the 2007/08 Survey of Income and Housing (SIH) from the ABS to see whether capital cities have higher incomes and housing costs, and how these affect the rates of housing stress.

The 2003/04 Household Expenditure Survey data were used because in the next section, we will be looking at transport costs, and these were only available on the 2003/04 HES. However, we also used the 2007/08 survey, which is the latest data from the ABS, to show that the results are consistent for the latest data in Australia.

Table 2 shows the average housing costs, average disposable income, the proportion of housing costs to income and the housing stress rate for 2003/04 and 2007/08 in Capital Cities and Balance of State. Note that the figures from 2003-04 are not directly comparable to the figures from 2007/08 as the 2003/04 figures have not been inflated to 2007/08 prices. The proportion of housing costs to Income and the housing stress rate are comparable over the two years. Also note that we have used average income to compare to average housing costs. Because of the skewed income distribution, for most analysis we would use median income. However to ensure housing costs, income and transport costs are comparable, we have used average income for this paper.

The analysis confirms that, on average, housing costs in capital cities are higher than housing costs in the Balance of State areas. However, incomes are also higher in capital cities than they are in the balance of state area. In 2003/2004, the average housing costs in a capital city was 45.5 per cent higher than it was in the balance of the state, while the income gap was only around 17.5 per cent. Therefore, the proportion of income being used for housing costs, on average, is lower in the balance of state areas compared to the capital city. Taking all this into account, as well as the variation of both income and housing costs in the
capital city and the balance of state, we estimate that the level of housing stress in capital cities is only slightly higher than the level in the balance of state.

Table 2 Housing cost, disposable income and housing stress in capital city and balance of state, 2003/2004 and 2007/2008

<table>
<thead>
<tr>
<th>Area</th>
<th>Average Housing Cost per Household</th>
<th>Average Disposable Income per Household</th>
<th>Proportion of Housing cost to Income</th>
<th>Housing Stress rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>HES 03/04</td>
<td>Capital city</td>
<td>$174.95</td>
<td>$967.80</td>
<td>18.08</td>
</tr>
<tr>
<td></td>
<td>Balance of state</td>
<td>$120.23</td>
<td>$823.57</td>
<td>14.60</td>
</tr>
<tr>
<td>SIH 07/08</td>
<td>Capital city</td>
<td>$241.08</td>
<td>$1,396.52</td>
<td>17.26</td>
</tr>
<tr>
<td></td>
<td>Balance of state</td>
<td>$172.41</td>
<td>$1,124.94</td>
<td>15.33</td>
</tr>
</tbody>
</table>

Source: HES 2003/2004 and SIH 2007/2008 excluding household with zero or negative disposable income

To see whether the pattern has changed over time, we compare this result with an estimate from the 2007/2008 SIH. From 2003-04 to 2007-08, the housing costs in capital cities increased by 37.8 per cent while the average income increased by 44.3 per cent. This meant that the average proportion of income being spent on housing costs in capital cities fell from 18.1 per cent to 17.3 per cent. However, the proportion of households in housing stress increased from 10.5 per cent to 11.1 per cent indicating increasing inequality in the process.

Housing costs in the balance of state areas were growing faster than incomes in this four year period. Therefore, it is reasonable to expect that the rate of housing stress increased over this period. Despite this, housing costs in capital cities are still higher than in the balance of state, although the gap is narrowing. It is for these reasons that we looked at housing stress for capital cities and the balance of the State, as housing stress is obviously no longer just a capital city issue.

4  THE INCLUSION OF TRANSPORT COSTS IN HOUSING STRESS

This study started with the theory that poor and medium income households that were forced to the outskirts of cities to avoid housing stress in inner city areas are then burdened with high transport costs, and will therefore still experience financial stress once these transport costs are taken into account. From the previous discussion, we could expect that there are many households that are already experiencing housing stress that would be stretched even more when transport costs are added to housing costs as some areas with high levels of housing stress are located in the outer part of the capital cities. This may also be the case for the balance of state area as the transport costs could be higher in these areas due to lower levels of road infrastructure and public transport. Therefore, we have looked at the impact of adding transport costs to housing costs in the capital city and balance of state areas.
4.1 The Contribution of Transport Costs in Capital Cities

In this section, we compare estimates of housing stress with and without incorporating transport costs into housing costs. The estimates of transport costs are derived directly from the ABS Household Expenditure Survey 2003-04. We first examine how much an average householder in housing stress is paying in transport costs, and then how many more households would experience housing stress if transport costs were included in housing costs.

It can be seen from Table 3 that the average weekly transport costs for purchasers in housing stress was $63.76, or around nine per cent less than the $70.15 paid by purchasers not in housing stress. For private renters, the average transport cost of those in housing stress was $37.40 per week, which is almost 37 per cent less than the $58.96 paid per week by those not in housing stress.

Another way of looking at this is to look at what proportion of income is being spent on transport costs. On average, home purchasers who are already in housing stress are paying 10.7 per cent of their disposable income on weekly transport costs, double the proportion spent by those not in housing stress (5.2 per cent – see Table 3). For private renters, transport costs still absorb a greater proportion of the income of those in housing stress (8.4 per cent) compared to 5.5 per cent of disposable income for those not in housing stress but the proportion of the additional cost is not as much as purchasers.

This shows that purchasers who are in housing stress are not avoiding the pressure of transport costs. Instead, transport costs could really add to their financial stress. Renters in housing stress are also paying a high proportion of their income on transport costs, but not as high as purchasers in housing stress. This indicates that purchasers in housing stress are contribute more of their income to housing costs, suggesting that they are located in the outer areas of capital cities as shown in Figure 1.

This pattern may be different in Sydney for two reasons. First, Figure 1 indicates that housing stress in Sydney is more concentrated in the disadvantaged areas that are just to the west of the inner city area. Second, the housing costs in disadvantaged areas in Sydney are relatively low, although they are also not too far from the inner city area as a result of the polarisation of housing costs between disadvantaged areas and not disadvantaged areas (Yates and Wood, 2005).
Table 3 Housing cost and transport cost as proportions of disposable income, Capital City of States 2003/2004

<table>
<thead>
<tr>
<th></th>
<th>Weekly disposable income</th>
<th>Weekly housing cost ($)</th>
<th>Housing cost as per cent of income</th>
<th>Weekly variable transport cost ($)</th>
<th>Variable transport cost as per cent of income</th>
<th>Housing plus transport cost ($)</th>
<th>Housing and transport cost as per cent of income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchaser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Not In Housing Stress</td>
<td>$1,231.81</td>
<td>$307.45</td>
<td>24.96</td>
<td>$69.26</td>
<td>5.62</td>
<td>$376.71</td>
<td>30.58</td>
</tr>
<tr>
<td>- In Housing Stress</td>
<td>$1,335.08</td>
<td>$311.80</td>
<td>23.35</td>
<td>$70.15</td>
<td>5.25</td>
<td>$381.95</td>
<td>28.61</td>
</tr>
<tr>
<td>Private Renter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Not In Housing Stress</td>
<td>$896.81</td>
<td>$214.69</td>
<td>23.94</td>
<td>$52.72</td>
<td>5.88</td>
<td>$267.41</td>
<td>29.82</td>
</tr>
<tr>
<td>- In Housing Stress</td>
<td>$1,079.65</td>
<td>$223.43</td>
<td>43.12</td>
<td>$37.40</td>
<td>8.35</td>
<td>$230.62</td>
<td>51.46</td>
</tr>
</tbody>
</table>

Source: Calculated from Capital City of States sample of HES 2003/2004 excluding household with zero or negative disposable income

Table 4 shows that changes in housing stress after including transport costs into housing costs are different for purchasers and renters. When transport costs are added to housing costs, housing stress for private renters increases by 5.7 percentage points from 23.2 to 29.0 per cent while the level of housing stress for purchaser increases 2.9 percentage points from 11.0 to 13.9 per cent. In terms of the number of households, both the number of purchaser and renters who are in housing stress increase by around 25 per cent if the transport costs are included.

To see further how transport costs affect households, we look at the impact on several types of households where the number of observations from the survey is adequate. Table 4 shows that the inclusion of transport costs into housing costs in capital cities will affect families with children, especially sole parents, more than couples without dependent children and lone person households. With transport costs which consist of on average 7 per cent of the sole parent disposable income, the level of housing stress for sole parents who are home purchasers increases from 20.2 to 26.4 per cent. This means an increase of around 30 per cent in the number of sole parent households in housing stress as a result of including transport costs. Although on average the proportion of income used for transport by lone person households is slightly higher than in couple households with children, the inclusion of transport costs pushes more couples with children into housing stress.

The picture is worse for private renters. The inclusion of transport costs increases the level of housing stress in households with children more than couple without children and lone person households. The inclusion of transport costs increases the rate of housing stress of sole parent renters from 37.9 to 50.2 per cent and couple with children renters from 20.6 to 29.7 per cent.
## Table 4 Percentage of households in housing stress with and without Transport Costs, Capital Cities, 2003/2004

<table>
<thead>
<tr>
<th>Purchasers</th>
<th>No. of Purchaser HH</th>
<th>Transport cost (per cent of income)</th>
<th>Housing stress without transport cost</th>
<th>Housing stress with transport cost</th>
<th>percentage point difference</th>
<th>Percentage increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple only</td>
<td>386,120</td>
<td>5.16</td>
<td>5.5</td>
<td>6.5</td>
<td>1.0</td>
<td>18.6</td>
</tr>
<tr>
<td>Couple with Children</td>
<td>776,118</td>
<td>5.78</td>
<td>14.9</td>
<td>19.2</td>
<td>4.3</td>
<td>29.0</td>
</tr>
<tr>
<td>Sole Parent Lone Household</td>
<td>83,956</td>
<td>7.09</td>
<td>20.2</td>
<td>26.4</td>
<td>6.1</td>
<td>30.3</td>
</tr>
<tr>
<td>All</td>
<td>1,719,728</td>
<td>5.62</td>
<td>11.0</td>
<td>13.9</td>
<td>2.9</td>
<td>26.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Private renters</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple only</td>
<td>195,439</td>
<td>5.71</td>
<td>17.5</td>
<td>20.5</td>
<td>3.0</td>
<td>17.1</td>
</tr>
<tr>
<td>Couple with Children</td>
<td>232,082</td>
<td>5.67</td>
<td>20.6</td>
<td>29.7</td>
<td>9.1</td>
<td>43.9</td>
</tr>
<tr>
<td>Sole Parent Lone Household</td>
<td>112,248</td>
<td>5.83</td>
<td>37.9</td>
<td>50.2</td>
<td>12.4</td>
<td>32.7</td>
</tr>
<tr>
<td>All</td>
<td>1,101,103</td>
<td>5.88</td>
<td>23.2</td>
<td>29.0</td>
<td>5.7</td>
<td>24.7</td>
</tr>
</tbody>
</table>

Source: Calculated from the capital city sample of HES 2003/2004 excluding households with zero or negative disposable income

### 4.2 Comparison with balance of state areas

As discussed in section 3, it is important to compare the results that we find in capital city to those in balance of state areas for two reasons. First, there has been considerable development of urban areas outside the capital city boundaries that may make housing stress greater in the balance of state areas. Second, the impact of transport costs would possibly be higher outside capital cities due to the lack of road infrastructure and public transport.
### Table 5 Housing costs and transport costs as proportions of disposable income, Balance of State, 2003/2004

<table>
<thead>
<tr>
<th></th>
<th>Weekly disposable income</th>
<th>Weekly housing cost ($)</th>
<th>Housing cost as per cent of income</th>
<th>Weekly variable transport cost ($)</th>
<th>Variable transport as per cent of income</th>
<th>Housing plus transport cost ($)</th>
<th>Housing and transport cost as per cent of income</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purchaser</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Not In Housing Stress</td>
<td>$1,055.61</td>
<td>$232.65</td>
<td>22.04</td>
<td>$59.63</td>
<td>5.65</td>
<td>$292.28</td>
<td>27.69</td>
</tr>
<tr>
<td>- In Housing Stress</td>
<td>$1,146.00</td>
<td>$233.99</td>
<td>20.42</td>
<td>$60.86</td>
<td>5.31</td>
<td>$294.86</td>
<td>25.73</td>
</tr>
<tr>
<td><strong>Private Renter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Not In Housing Stress</td>
<td>$785.66</td>
<td>$146.97</td>
<td>19.47</td>
<td>$46.67</td>
<td>6.18</td>
<td>$193.65</td>
<td>25.66</td>
</tr>
<tr>
<td>- In Housing Stress</td>
<td>$960.74</td>
<td>$147.13</td>
<td>15.31</td>
<td>$51.05</td>
<td>5.31</td>
<td>$198.18</td>
<td>20.63</td>
</tr>
</tbody>
</table>

Source: Calculated from Balance of State sample of HES 2003/2004 excluding household with zero or negative disposable income

Table 5 shows that the issue of housing stress outside capital cities is caused by incomes rather than housing costs as the weekly housing costs for those in housing stress is similar to those who are not in housing stress. On average, the weekly transport costs in balance of state areas is lower than the transport costs spent by households in capital cities. This is more likely to be the result of lower use of public transport by households in the balance of state areas than the lower cost of transport in these areas.

This can be confirmed by looking at Table 6, which shows the proportion of households who have used public transport for capital city and Balance of State areas. It can be seen that the proportion of who have used public transport in Balance of State areas is much lower than the proportion in capital cities, with less than a third of the proportion of households in the Balance of State using public transport compared to those in capital cities. The lowest access was among purchasers in the Balance of State area, with less than 10 per cent of the households expenditure allocated for public transport. This would most likely be due to accessibility of public transport in these areas, and the need for purchasers who are paying off a loan to travel to work.
Table 6 The use and cost of public transport and car fuel, Capital City and Balance of State, 2003/2004

<table>
<thead>
<tr>
<th></th>
<th>Proportion of Households with Public Transport Expenditure (%)</th>
<th>Weekly Public Transport cost of those who use it ($)</th>
<th>Proportion of Households with Car Fuel Expenditure (%)</th>
<th>Weekly Car Fuel cost of those who use it ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital City</td>
<td>32.42</td>
<td>$13.84</td>
<td>77.70</td>
<td>$39.18</td>
</tr>
<tr>
<td>- Purchaser</td>
<td>31.34</td>
<td>$14.74</td>
<td>87.28</td>
<td>$44.89</td>
</tr>
<tr>
<td>- Private Renter</td>
<td>42.05</td>
<td>$14.17</td>
<td>71.12</td>
<td>$35.72</td>
</tr>
<tr>
<td>Balance of State</td>
<td>10.19</td>
<td>$11.63</td>
<td>77.97</td>
<td>$38.84</td>
</tr>
<tr>
<td>- Purchaser</td>
<td>8.81</td>
<td>$12.27</td>
<td>84.46</td>
<td>$44.89</td>
</tr>
<tr>
<td>- Private Renter</td>
<td>12.00</td>
<td>$13.28</td>
<td>76.83</td>
<td>$36.09</td>
</tr>
</tbody>
</table>

Source: Calculated from Balance of State sample of HES 2003/2004 excluding household with zero or negative disposable income

Table 7 shows that the impact of including transport costs on the level of housing stress for different types of households. It shows that the level housing stress for home purchasers, who had the lowest proportion of households with public transport expenditure in Table 6, increases from 10.2 per cent to 15.7 per cent as a result of including transport costs, a 54.3 per cent increase. The biggest impact appears to be on sole parent home purchasers where the number in housing stress almost tripled when transport costs were included. The increase in the level of housing stress for renters is also high, but the rate of increase is not as high as it was for purchasers. This may be due to the fact that the level of housing stress for renters in the balance of the State is high even before including transport costs. This all confirms that housing stress is not only suffered by households outside capital cities but that they are also more vulnerable to transport stress as well, although the issue is not about traffic congestion outside the capital cities.
Table 7 Percentage of households in housing stress with and without Transport Costs, Balance of State, 2003/2004

<table>
<thead>
<tr>
<th>Family Type</th>
<th>No. of Purchaser HH</th>
<th>Transport cost (per cent of income)</th>
<th>Housing stress without transport cost</th>
<th>Housing stress with transport cost</th>
<th>percent age point difference</th>
<th>Percentage increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple only</td>
<td>210,395</td>
<td>5.79</td>
<td>6.2</td>
<td>9.2</td>
<td>3.0</td>
<td>49.2</td>
</tr>
<tr>
<td>Couple with Children</td>
<td>436,560</td>
<td>5.39</td>
<td>10.3</td>
<td>16.3</td>
<td>6.0</td>
<td>58.6</td>
</tr>
<tr>
<td>Sole Parent</td>
<td>49,194</td>
<td>6.18</td>
<td>11.3</td>
<td>31.0</td>
<td>19.7</td>
<td>174.1</td>
</tr>
<tr>
<td>Lone Household</td>
<td>132,274</td>
<td>6.52</td>
<td>15.3</td>
<td>17.6</td>
<td>2.3</td>
<td>14.9</td>
</tr>
<tr>
<td>All</td>
<td>915,582</td>
<td>5.65</td>
<td>10.2</td>
<td>15.7</td>
<td>5.5</td>
<td>54.3</td>
</tr>
</tbody>
</table>

Private renters

<table>
<thead>
<tr>
<th>Family Type</th>
<th>No. of Purchaser HH</th>
<th>Transport cost (per cent of income)</th>
<th>Housing stress without transport cost</th>
<th>Housing stress with transport cost</th>
<th>percent age point difference</th>
<th>Percentage increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple only</td>
<td>113,447</td>
<td>6.06</td>
<td>11.1</td>
<td>20.1</td>
<td>9.0</td>
<td>80.8</td>
</tr>
<tr>
<td>Couple with Children</td>
<td>133,754</td>
<td>5.39</td>
<td>19.1</td>
<td>32.7</td>
<td>13.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Sole Parent</td>
<td>95,893</td>
<td>6.18</td>
<td>39.8</td>
<td>51.3</td>
<td>11.6</td>
<td>29.1</td>
</tr>
<tr>
<td>Lone Household</td>
<td>191,233</td>
<td>6.26</td>
<td>45.7</td>
<td>48.0</td>
<td>2.3</td>
<td>5.1</td>
</tr>
<tr>
<td>All</td>
<td>597,315</td>
<td>6.18</td>
<td>28.2</td>
<td>36.2</td>
<td>8.0</td>
<td>28.5</td>
</tr>
</tbody>
</table>

Source: Calculated from HES 2003/2004 Balance of State sample excluding household with zero or negative disposable income

5 CONCLUSIONS

This study was motivated by an increasing concern about housing affordability in Australia (Beer et al., 2007; Tanton et al., 2008). This concern has grown rapidly in the past decade after Australia experienced decades of low housing costs due to abundant land for urban development (Stretton, 1989). However, more recently, the increasing cost of purchasing a house has forced many younger families into rental properties (Wulff and Maher, 1998) and the rapid increase in housing prices has also pushed rents up. As a result, the push to find cheaper housing in the outskirts of capital cities has been strong for both home purchasers and private renters.

This study begins with the assumption that the high cost of housing in inner city areas may mean that households on low to moderate incomes move to the city outskirts to avoid housing stress. However, this may be a false economy, as the transport costs for these households will be higher. The results of this study show that moving to the outskirt of the city does not automatically mean the household will escape housing stress. This is
especially true for home purchasers who are likely to be willing to go to the outskirt of the city and still face housing stress in order to have their own home.

This is shown in the proportion of home purchasers in housing stress facing a higher proportion of their income being spent on transport costs compared to those not in housing stress. This may be because their transport costs are only slightly below those of a household that is not in housing stress and as a result, the proportion of income that they have to use to pay for their transport costs is relatively high given their relatively low income. On the other hand, although the transport costs faced by renters in housing stress are considerably lower than those who are not in housing stress, the proportion of income being spent on transport costs is still higher than those who are not in housing stress. This may be because their transport spending is restricted by their low level of income. This confirms the observation by Dodson et al. (2006) that socially disadvantaged people may also experience transport disadvantage.

The inclusion of transport costs into housing costs increases the proportion of households that experience housing and transport stress in capital cities. It is estimated that around 25 per cent more households will be considered in housing stress if the transport costs are included in the calculation of housing stress. Most of this comes from households with children, and especially sole parents. Around half of sole parents in private rental housing are estimated to be in housing stress when their transport cost are included, while 30 per cent of couples with children in rental housing are suffering housing stress when the transport costs are added.

As urban areas outside capital cities grow, housing stress has also become an issue in these areas. This is especially true for the Eastern coast of Australia, especially to the North and South of Brisbane and through Tweed, Lismore to Newcastle. Although the areas with high housing stress are relatively small, the population living in these areas consists of almost one third of NSW and Queensland Balance of state populations.

While the survey used hardly covers remote areas, we found that the level of housing stress in the Balance of State areas (so outside the capital cities) is only slightly lower than those in capital city areas. The transport costs in these areas are not much different than those in capital cities despite a lower level of road infrastructure and public transport. This could indicate a lower use of public transport in these areas due to limited availability. The impact of transport costs on housing stress for this group is relatively large. The inclusion of transport costs could increase the housing stress for purchasers by up to 50 per cent, and this particularly affects sole parents. Therefore, the issue of housing stress with transport costs is an important one for areas outside capital cities.

**REFERENCES**


