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Examining household relocation pressures from rising transport and housing costs – An Australian case study

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A B S T R A C T

Increasing global energy prices have created serious pressure on transport and energy in Australian cities. The rising cost of transport and energy, combined with the price of housing in metropolitan areas, has placed households under greater economic pressure. This paper investigates how increased household transport costs interact with housing costs in Brisbane, Australia. Drawing on data from journey to work and Australia's Green Vehicle Guide, we estimated household transport costs associated with private vehicle fuel use for work travel. By linking household transport costs with housing costs across urban areas we were able to explore: 1) the spatial relationship between household transport fuel costs and direct spending on housing; and 2) areas of households under the highest pressure from transport costs and housing costs. We then estimated how rising fuel prices in Brisbane were likely to affect household housing location. We consider the trends of transport and housing costs and how they might affect urban spatial structure in the future.

1. Introduction

Energy and transport-related economic stress has become a pressing issue in many cities. These pressures are driven by climate change, uncertainties of oil supply and the associated oil price volatility. Changes in global energy processes have led to changes in cost of transport fuel and have placed pressure on fuel-dependent regions and on lower socio-economic groups. Studies in Europe have revealed that rising energy and housing costs are shrinking household spending capacity and increasing rates of poverty (Mattioli, 2013; Day and Walker, 2013; Lovelace and Philips, 2014). In addition, rising fuel prices and hence transport costs also aggravate the economic burden on households, creating new forms of socio-economic disadvantage in oil-vulnerable areas (Verry and Vanco, 2009; Lucas, 2011). Similar issues with fuel costs and household disadvantage have also been found in more car-dependent countries such as the USA and Canada (Sipe and Dodson, 2013). Increasing attention is being directed to using metropolitan planning policies to ease these urban challenges.

Oil expenditure has become an important concern for motor vehicle users in Australia. Australian cities face increasing challenges with respect to energy security and climate change mitigation because of their high car dependency. The rise in global oil prices has put Australian cities under economic pressure. The 2011 Australian household expenditure survey reported that transport costs make up the third highest category of household expenditure at 16%, after housing at 18% and food at 17% (Australian Bureau of Statistics (ABS) 2011). Fuel consumption is the dominant component of household transport costs. The pressure caused by transport costs varies between cities, urban locations and socioeconomic groups. Earlier studies have investigated which areas of Australian cities would be most affected by rising fuel prices. The results showed that many low-income and car-dependent households would be under considerable economic pressure if fuel prices increased substantially beyond their current levels (Dodson and Sipe, 2008, 2010; Li et al., 2013).

In addition to rising transport costs, Australian households are facing substantial increases in house prices. In 2014, the median house price increased by 18.9% and 7.8% in Sydney and Melbourne, respectively (Domain Group, 2015). In 2011, 35% of Australian urban households owned their dwelling with a mortgage (ABS 2011). Mortgage interest rates in Australia were also affected by fuel prices because of the association between higher fuel prices and inflation. As fuel prices increases they have contributed to general inflation in mortgage rate as well as other costs (Dodson and Sipe, 2008; News, 2016). Residents who are not homeowners are also experiencing increasing rents in Australia's large cities (ABS 2011). The structure of the housing market influences housing affordability as well as household location. In general, dwelling units close to the city centre cost more than units further away, owing to the higher demand for

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central locations with better access to jobs and services and lower transport costs. The increase in housing costs in inner urban areas is also associated with the agglomeration of productive economies and the process of gentrification that has resulted in higher land prices (Burnley et al., 1997; Stimson and Taylor, 1998; Iotti et al., 2015). Low income households unable to afford inner urban housing often find their housing opportunities constrained to outer suburbs where housing prices are lower (Dodson and Sipe, 2008). The distribution of new housing stocks also influences suburban living. Increasingly, outer urban residents are young first home buyers (FHBs) who are often subject to higher mortgage rates (Kupke and Rossini, 2011). Many households moving into outer suburbs were linked to housing upgrade, although some of whom may not have been able to afford new housing (O' Connor and Healy, 2002). Many of these residents experience 'locational disadvantage' in the form of poor access to jobs and public transport. This has resulted in high levels of car dependence in middle and outer suburban areas (Currie and Senbergs, 2007). Such transport disadvantage inevitably imposes higher costs on households because of increased expenditures for fuel.

The effects of high fuel costs combined with the structure of the urban housing market have placed Australian households under economic pressure. The rising cost of transport and housing has attracted attention to questions of affordability and the socio-economic risks generated from each sector (see for example, Carruthers et al., 2005; Beer et al., 2007; Yates, 2008; Walks, 2013; Li et al., 2015b). To date, most scholarly research has focused on the economic stresses associated with either transport or housing, with less attention on the combined impacts. In addition, there has been very little research on the effect of fuel prices on transport costs and household pressures from these changes based on their spending patterns. Fuel costs have important implications for car-dependent countries such as the USA and Australia, where expenditure on fuel for private vehicles is a major component of household expenditure. Changes in fuel prices often lead to changes in household spending in other areas (such as housing), because households often deal with economic stress in one area by reducing spending in another. Research on the network of relationships involving household transport costs, housing pressures, socio-economic status and residence locations has received little research attention.

In view of the rising energy costs, this paper seeks to explore the spatial relationship between household transport fuel costs (mainly due to the commute to work) and direct household spending on housing, and the how these expenditures would be affected by insecure fuel energy prices in Brisbane, Australia. We then evaluate the economic pressures faced by households and how rising fuel costs are likely to affect residence location and the implications for planning policies. An important element of this study was the development of a method for assessing household expenditure on transport and housing and the resulting socioeconomic pressure. Previous studies have measured household transport in relation to distance or travel time or the efficiency of using certain transport modes in certain areas (Wu and Hine, 2003; Yigitcanlar et al., 2009; Currie, 2010; Kaplan et al., 2014). There is a dearth of research on the real cost of regular travel activities to households. This paper draws together currently available transport datasets to provide deeper insight into household transport fuel costs. A key feature of the analysis is that it combines motor vehicle registration data with standard fuel efficiency data and household travel information to measure the fuel use of vehicles in Brisbane. This analysis provides a much improved evidence base for evaluating patterns of household expenditure on vehicle fuel. Another novel aspect of the research is that we have linked household expenditure on fuel for transport with spending on housing to investigate the network of relationships involving these variables in an urban area.

The paper is organised into seven sections. The next section describes the study area. Section 3 describes the data and Section 4 explains the methods and techniques used for the analysis. Section 5 presents the results with their policy implications discussed in Section 6. The final section provides the conclusions and limitations and outlines areas for future research.

2. Study area

Brisbane, the third largest city in Australia, is located in the south-eastern corner of Queensland. Since the 1960s Brisbane has been a low density metropolis. During this period the city has experienced rapid urban expansion, accelerated by the improved transportation infrastructure, construction of major highways and growth in use of private motor vehicles. Although employment activities have been concentrated in the central business area (CBD) and its immediate frame, new residents have tended to settle in suburban areas. This pattern of growth has created an imbalance in access to jobs and activities which is exacerbated by the spatial housing market of Brisbane where housing prices decline with distance from the CBD. Outer urban areas have been traditionally affordable for households. However, with the rapid suburban expansion, many outer suburbs have experienced significant population increases and growth in housing market. Many home buyers in these areas are young FHBs who have high mortgage burdens (Kupke and Rossini, 2011).

Because of its dispersed urban structure and past failures to expand public transport to its large, dispersed suburban areas, Brisbane has become a car-dependent city. Today approximately 80% of daily trips are made by motor vehicle. Fig. 1 shows the proportion of car usage for commuting in Brisbane. In general, the middle and outer suburbs of Brisbane show a high level of car dependency whereas inner suburbs are characterised by modest rates of car use and high use of public transport, walking and cycling.

Brisbane has also experienced fuel price growth in the last two decades. Fig. 2 displays Brisbane's petrol prices between 1994 and 2015 (Queensland Government, 2015; Royal Automobile Club of Queensland, 2015). There were two price spikes over the past decade in 2003–2008 and 2009–2014, with increases 56% and 36%, respectively. Although fuel prices dropped in 2009 and 2015 due to the global financial crisis and the price war in global oil market, the overall price growth has been significant. The fuel price increase is expected to continue over the long term due to the growing oil demand in Australia and supply uncertainty in global oil markets. In addition, the federal government budget is dependent on fuel excise income, which means that fuel prices will not be declining in the foreseeable future. Therefore, growing transport fuel costs combined with housing costs have placed car dependent households under high economic pressure.

3. Data

Four main datasets were used to assess household transport fuel costs and housing costs: *Journey to work (JTW)* data, *household income* and *household mortgage and rent repayment* data were obtained from 2011 Australian census. *Brisbane motor vehicle registration* data was obtained from the motor vehicle registration department in the Queensland Government.

3.1. Journey to work data

Household transport cost was calculated for vehicle fuel cost associated with household commuting travel only. This is because JTW is a daily activity for most of the population and accounts for the majority of household transport costs (Horner, 2004). We did not include other types of household travel (e.g. shopping), because we assume most households are able to adjust their non-work travel costs (e.g. by changing travel destination or times of travel) when fuel prices rise. The JTW dataset collected from the 2011 ABS Census provides detailed spatial information on trip origins and destinations, as well as trip mode. It comprises all private vehicle trips between origin and destination zones for Brisbane metropolitan areas. The spatial unit