

Suburban shocks: Assessing locational vulnerability to rising household fuel and mortgage interest costs

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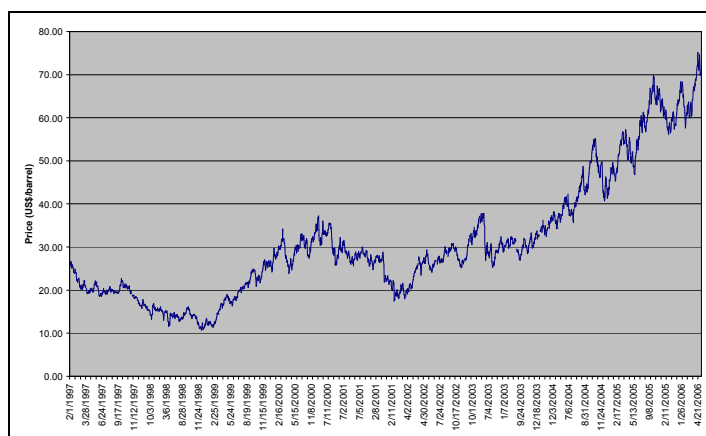
1 Introduction

One of the most discussed economic phenomena since early 2005 has been the marked increase in the global price of oil. The rising global price of oil has been translated into rising domestic fuel costs. Given the heavy dependence of Australian urban transport systems on cheap fuel the rising global oil price raises questions about the impact this phenomenon will have on urban households. The sustained relatively high price of oil has begun to influence other price sectors and the Board of the Reserve Bank of Australia has responded by raising interest rates. There has been little research so far that has reported on how the impacts of rising fuel and mortgage interest costs will be distributed across Australian cities and the implications this may hold for urban and transport policy making

This study undertakes a locational 'vulnerability assessment for mortgage, petrol and inflation risks and expenses' (VAMPIRE) to assess how potential adverse impacts from rising fuel costs would likely be distributed across Australian cities. The study uses ABS Census data to create a vulnerability index that can identify areas of greatest risk, and conversely, those areas where the impacts of rising fuel costs are likely to be less extensive. The study reflects on the capacity of existing urban structures and transport systems to accommodate behavioural responses to rising fuel costs and changing household financial pressures. The conclusions of the research identify a number of potential policy directions to address oil and mortgage vulnerability with an emphasis on equitable spatial provision of public transport services.

2 Oil prices bite

The price of oil has increased markedly in the past year (figure 1). By early May 2006 the price of oil was around US\$70 per barrel, which represents an increase of approximately 40 per cent from the May 2005 price of around US\$50 per barrel. The current high prices appear to be the second 'spike' since mid-2005.



Source: Energy Information Administration (2006, Contract 1).

Figure 1 Price of NYMEX Light Sweet Crude Oil, 1997-2006

The rising global oil price has been translated into similar increases in the cost of petrol in Australian cities. In Sydney during late April the price of unleaded petrol fluctuated between AU\$1.27/L and AU\$1.38/L (Motormouth 2006). These prices equate to an increase in the cost of petrol in Sydney of approximately 40 per cent since the same period in 2005. Similar patterns are found in other cities. Even in Brisbane where petrol purchasers receive a state government subsidy of 8 cents/L, retail petrol prices ranged between AU\$1.19/L and \$1.34/L during late April.

A growing number of media stories have observed rising fuel prices 'biting' motorists (Brown 2006; Gordon and Smith 2006; McMahon 2006) causing a 'pain at the pump' (Fishman 2006; Gittens 2006; Smith 2006) that spreads to household financial circumstances. The theme of struggling families facing a new unpleasant socio-economic reality of rising fuel costs has become a prominent motif in media reports. In Melbourne for example:

Families in the outer suburbs are feeling the pinch as interest-rate rises add to their petrol price woes. Residents in a typical suburban street -- Anna Court, Werribee -- are slashing spending in a bid to make ends meet. Holidays, private health insurance, dining out, entertainment, new household appliances and new clothes are already on the scrap heap. Fedele Franzoni has taken a second job to keep his family budget on track... .."It's just getting so hard. They say we live in the lucky country, but I say that's crap when people have to live like this," Mr Franzoni said... (Walliker, Ife and Cogdon 2006)

For one Sydney reporter the biting appears to be voracious:

Sydneysiders' living standards have fallen over the past year, eaten away by higher petrol prices and falling home affordability. (Burrell 2006)

Rising fuel prices directly are now perceived to be altering household financial and consumption patterns. Less fuel consumption and fewer car trips with reductions in discretionary spending such as 'going out' and entertainment appear to be the main behavioural responses. Public, policy and political concern reflects further anxieties about the implications of indirect inflationary impacts from rising fuel costs on households as increased business production and transport costs are translated into the prices for goods and services.

Headline inflation is currently approximately 3.0 per cent while 'underlying' inflation is approximately 2.5 per cent (RBA 2006). The Reserve Bank of Australia (RBA) reports that over the past year the largest contributors to inflation were fuel, house purchase, and food prices. Of these, petrol prices specifically had 'contributed significantly' to annual inflation growth (RBA 2006, p.3). The RBA appears cautious about the medium term outlook and anticipates that the pattern of fuel price inflation will continue to place pressure on overall prices over the coming few years. The RBA Board considered that the recent inflation rises had 'increased sufficiently' (RBA 2006) to warrant an increase in the official interest rate and responded by raising official interest rates by 0.25 per cent, the first rise for fourteen months.

This inflation sensitivity generated a direct political response via the 2006 Federal Budget which delivered substantial cuts to taxation rates and thresholds that will reduce the household tax burden by thousands of dollars in some cases, particularly for those on very high incomes. Prime Minister John Howard has emphasised repeatedly that rising petrol costs were the overriding political consideration underlying the taxation changes announced in the Budget:

People are paying a lot more for petrol and one of the best ways to help people with the high petrol prices is to put money in their pockets... ..The answer is to put more money into people's pockets because the high price of petrol is having a depressing effect on people's livelihoods, people's incomes. (John Howard, quoted in Tingle 2006)

The Budget tax cuts appear to have temporarily distracted or diverted some of the gathering political consternation and public anxiety associated with Australian households' financial exposure to rising petrol prices. This effect would likely be only temporary if fuel prices were to increase beyond their recent high levels. An understanding of the underlying relationship between housing markets, transport systems and household incomes reveals a continuing risk to households from fuel price inflation.

3 The distribution of car dependence in Australian cities

Australian cities are, by international standards, highly car dependent with the private car being used for most trips (Newman and Kenworthy 1999). Household car use varies markedly however within Australian cities. In general households in the inner areas of Australian cities generally exhibit lower levels of car use than those in outer and fringe suburban areas. Sydney provides an excellent, although not extreme, example of this phenomenon.

Table 1 Selected travel data for Sydney statistical division.

Travel Indicator	Area								Total Syd. SD
	Inner/ East	North East	South East	Inner/ Central West	North West	South West	Outer West	Central Coast	
Average number of trips per person	3.85	4.01	3.81	3.42	3.36	3.31	3.99	4.16	3.74
Private vehicle mode share (all trips) (%)	48.7	67.9	72.3	64.6	80.1	78.7	79.7	77.3	70.0
Private vehicle mode share JTW (%)	49.2	65.2	69.0	64.4	76.8	75.6	77.5	77.3	67.6
Average trip length (km)	5.7	8.2	8.4	8.0	11.8	11.9	13.7	12.8	9.5
Daily VKT per person (km)	10.1	17.9	17.6	14.1	23.2	24.0	33.3	30.1	20.0
Change in VKT per person (%) 1991-2001	-9.9	0.3	9.1	6.0	4.7	23.6	22.8	19.0	11.6

Source: DIPNR (2003, p.2)

The average daily VKT for residents of eastern Sydney was 21.8 km in 2003, compared to 27.4 km for those in middle west areas and 54.6 km for those in the city's outer west. The spatial trends in VKT growth are also uneven. Daily per capita VKT declined almost 10 per cent for residents of inner and eastern Sydney areas during the period 1991-2001 but increased by approximately 23.6 per cent and 22.8 per cent for those in Sydney's south and outer west, respectively (DIPNR 2003, p.2). The spatial divisions in car dependence are widening in Sydney over time and appear to be related to the distance from the CBD. Other Australian cities exhibit similar patterns (e.g. Newman, Kenworthy and Lyons 1985; Morris, Wang and Berry 2002). Car dependence therefore retains its historic importance as a dimension of socio-spatial differentiation in Australian cities (Badcock 1984). These patterns

would suggest that the effects of increasing fuel prices will be unevenly distributed throughout Australian cities and that those in outer and fringe areas are most exposed.

The converse of car dependence is the ability to choose and use other modes of transport for urban travel, especially public transport. The available data suggests that households in inner parts of Australian cities where public transport coverage is dense and frequent tend to use this mode more than those in middle and outer areas. In inner Sydney, for example, motor vehicles are used for only 49.2 per cent of work journeys, while the levels for south and outer west Sydney are 75.6 and 77.5 per cent, respectively (DIPNR 2003). Comparable patterns exist in other Australian cities (Morris *et al.* 2002).

The temporal and spatial availability of alternative methods of travel, particularly public transport, strongly influences transport choices. Public transport provision in Australian cities tends to be of highest quality in terms of spatial and temporal coverage, frequency and connectivity in inner urban locations compared to those on the fringe (Cheal 2003). This spatial difference in the provision of public transport appears to be inversely related to spatial differences in car dependence (Mees 2000). Further, the gentrification of Australian inner cities in recent decades appears to have enabled higher income households to spatially 'capture' public transport services. By comparison those in outer areas of Australian cities are typically excluded from access to high quality public transport services. This differential socio-economic transport geography has substantial implications for households given the recent and potential increases in global oil prices. Those with constrained financial circumstance and high levels of household debt would likely be heavily affected. The distribution of housing debt and income status is also socio-spatially patterned.

4 The distribution of home purchasers in Australian cities

Home purchase location in Australia is closely associated with dwelling availability, household socio-economic status and housing price. New dwellings for sale are typically concentrated in new fringe areas. Also, median house prices for Australian suburbs follow a reasonably consistent spatial 'price decay gradient' whereby house prices decline as distance from the CBD increases (Burnley 1980). There is evidence that these price gradients have become more marked in recent years (Burke and Hayward 2000; Productivity Commission 2004). Price decay gradients in Sydney and Melbourne have steepened as recent house price inflation accelerated to a greater extent in inner city locations compared to those further out (Productivity Commission 2004, p.126, figure 6.2).

Relatively cheaper prices in outer urban and fringe localities have historically made these areas more affordable for many households purchasing housing, particularly those on modest or low incomes who cannot afford housing in the inner and middle areas. The popular perception of outer suburban areas as 'mortgage belts' is, in part, the result of this phenomenon. A large proportion of 'first home owners' purchase their dwellings in outer and fringe areas. For example, 47 per cent of recent first home buyers in Sydney and 49 per cent in Melbourne purchased homes in outer or fringe areas (Productivity Commission 2004, p.255). This pattern is accelerating in some Australian cities. In Melbourne, for example, the proportion of first home owner households locating in outer and fringe areas increased by almost ten per cent between 1991 and 2003 (Productivity Commission 2004, p.244 figure B.6).

The availability of residential land in fringe areas has historically not been consistently matched by the extensive or comprehensive provision of employment and public services. The result can be 'locational disadvantage' whereby modest income households seeking home ownership experience a lower quality of access to employment and services, due to their financial constraints and locational opportunities, than the metropolitan residents

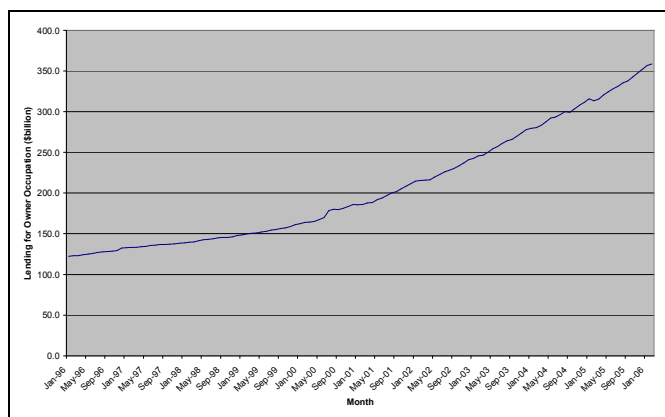
generally. Inadequate public transport services have been identified as key element in locational disadvantage (Maher, Whitelaw, McAllister, Francis, Palmer, Chee and Taylor 1992; National Housing Strategy 1992). Burnley *et al* (1997, p.1125) argued that the uneven spatial provision of services and the differentiation of housing markets produced unfair outcomes for modest income groups:

To the extent that people move to outer suburbia to obtain affordable housing, such pricing trends may be socially inequitable unless strong policies to relocate employment and to develop public transport are pursued in tandem.

The relevant question for urban transport scholars in this context is whether these potentially inequitable outcomes may be exacerbated by rising fuel costs, mortgage interest rates and general price inflation.

5 The distribution of housing debt

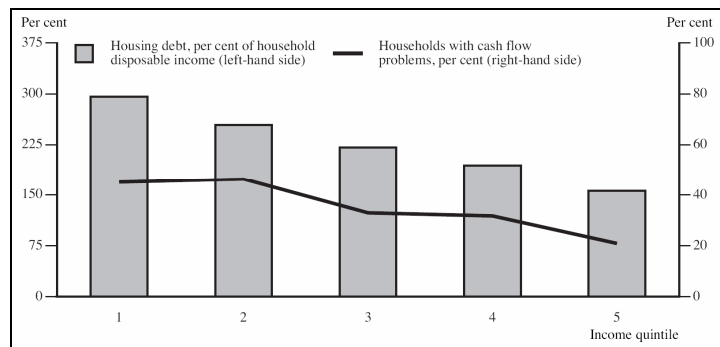
The final dimension of Australian urban structure that must be understood when considering the issue of oil vulnerability is the level of household mortgage debt by location and level of car dependence. Interest rates have remained historically low for the past decade. This period has subsequently seen a sustained expansion in the levels of owner-occupied household loans (Figure 2) and a sustained rise in median house prices.



Source: RBA (2006, table D05)

Figure 2 Lending for owner occupied house purchase in Australia, 1996-2006.

A relative minority of Australian households are undertaking home purchase. In Australia in 2001 only 27.8 per cent of households were purchasing their dwelling while 41.7 per cent owned their home outright and 27.6 per cent were renting (Kennedy and Robertson 2003). These aggregate proportions mask some important dimensions. The spatial distribution of household mortgage debt burdens relative to household income levels is not well documented – a curious scholarly and policy oversight in a society that celebrates mortgage funded home ownership. There is a strong probability that while home purchasers constitute a minor proportion of households overall they may nonetheless comprise a higher proportion of households in certain urban sub-regions. This in turn implies that the socio-economic effects of rising fuel costs on home purchasers will also be unevenly distributed across Australian suburbs. Income differences also play a role in this spatially uneven distribution.



Source: La Cava and Simon (2005, p.45).

Figure 3 Housing debt as a proportion of household income for debtor households, 2001.

The distributional impact of mortgage pressures varies across Australian households. Lower income households who are purchasing owner occupied housing tend to have higher levels of debt as a proportion of their income than higher income households (Figure 3). Of households with housing debt, those on lower incomes were also more likely to have financial difficulties than those on higher incomes (Figure 3). There is currently only limited data available about household mortgage debt levels relative to income and, given marked subsequent house price inflation since the La Cava and Simon (2003) study, the trend is probably towards greater levels of household debt (Figure 2) and thus greater levels of exposure to mortgage and oil risks.

The new policy relationship that is being drawn between rising fuel prices, interest rates and mortgage costs (RBA 2006) has significant implications for the socio-economic and financial circumstances of households within Australian cities. Despite the discussion provided above there is little scholarly or policy knowledge about the combination of car dependence, mortgage debt and the socio-economic profile of households at the local scale. The specific distribution of oil and mortgage interest rise impacts is currently poorly understood beyond the broad spatially aggregated contours. If policy makers are to respond to address this exposure there is need for detailed empirical data that can illuminate the extent of this vulnerability. Given that the problems are inevitably also spatially expressed, it is essential that spatial analysis be undertaken to assess the distribution of such risks.

In a previous study (Dodson and Sipe 2005), a version of which is forthcoming in an international journal, we sought to identify the areas of Australian cities which would be socio-economically most affected by rising fuel prices and general price inflation through the use of an oil vulnerability index based on Census data. This paper undertakes a similar analytical index, focusing on housing debt, which we refer to as the 'vulnerability assessment for mortgage, petrol and inflation risks and expenditure' (VAMPIRE).

6 The vulnerability assessment for mortgage, petrol and inflation risks and expenditure

The VAMPIRE index is constructed from four indicator variables obtained from the 2001 ABS Census that are combined to provide a composite mortgage vulnerability index that can be mapped at the geographic level of the Collection District (CD). The VAMPIRE therefore assesses the average vulnerability of households within the CD rather than indicating the specific vulnerability of particular households. The variables used are:

Car dependence:

- Proportion of those working who undertook a journey to work (JTW) by car (either as a driver or passenger)
- Proportion of households with 2 or more cars

Income level:

- Median weekly household income

Mortgages:

- Proportion of dwelling units that are being purchased (either through a mortgage or a rent/buy scheme)

The use of these variables merits some explanation. The first two variables indicate the extent of car dependence for urban travel as used in our earlier study (Dodson and Sipe 2005). The JTW figure provides a basic indicator of demand for automobile travel while the number of motor vehicles per household indicates the extent of household investment, and thus dependence, on motor vehicle travel. Together these variables provide an indicator of the extent to which households are exposed to rising costs of urban travel. The mortgage variable represents the prevalence of mortgage tenure and accordingly household exposure to interest rate rises within a locality. The income variable is used to measure the financial capacity of the locality to absorb fuel and general price increases. Together these four variables provide a basic but comprehensive spatial representation of household mortgage and oil vulnerability.

The VAMPIRE index was constructed by combining the variable combinations according to car dependence, income and mortgage by assigning an index score and weighting according to the percentiles shown in Table 3. High levels of car ownership, JTW by car and mortgage tenure received high index values while low levels of household incomes received lower scores. Thus a CD with high levels of car ownership, JTW by car, income and mortgages would receive a score of 15 (5+5+0+5), as shown in Table 2.

The four variables we have selected are not equal in their contribution to VAMPIRE. The variables have been weighted according to their proportional contribution to the overall VAMPIRE score (Table 3). Thus of a total possible VAMPIRE score of 30, five points are provided by each of the car ownership and JTW variables while ten points each are provided by the income and mortgage scores. We are not aware of any research that could inform a different balance in the assignment of VAMPIRE weights. This could however be explored in future research. We consider these weights to be reasonable in the context of the present study.

Table 2: Value assignment relative to Census District percentile for VAMPIRE.

Percentile	Value Assigned			
	<i>Car own ≥ 2</i>	<i>JTW by car</i>	<i>Income</i>	<i>Mortgage</i>
100	5	5	0	5
90	4	4	1	4
75	3	3	2	3
50	2	2	3	2
25	1	1	4	1
10	0	0	5	0

Table 3: Variable weighting for VAMPIRE

Indicator	Proportion of households with \geq two cars	Proportion of work trips by car	Income level	Proportion of households with a mortgage
Potential points:	5	5	10	10
Weighting:	33.3%		33.3%	33.3%

Thematic maps were then created for five major Australian cities (Brisbane, Gold Coast, Sydney, Melbourne and Perth) based on the ABS definition of the urban area and shaded for consistency in terms of VAMPIRE categories (Table 4). The results of the mapping are presented in Figures 4 to 8 below.

Table 4: Assignment of VAMPIRE ratings to map shadings.

VAMPIRE value:	1 to <10	10 to <15	15 to <17	17 to <19	19 to \leq 22
Shading:					

7 Results of the VAMPIRE

7.1 Brisbane

The geography of the greater Brisbane urban area is comprised of a large core area from which four broad growth corridors extend north, west, south and east. The VAMPIRE results for Brisbane (Figure 4) demonstrate a wide variation in mortgage oil vulnerability levels between CDs within the metropolitan region. The central area of Brisbane immediately surrounding the CBD exhibits the highest concentration of low vulnerability localities within the metropolitan area. Other areas with low or moderate VAMPIRE scores were dispersed throughout the middle suburbs mostly within 15 km of the CBD. The middle suburbs of Brisbane also display some variation in vulnerability with a mix of moderate scores.

High mortgage and oil vulnerability scores were found in many middle, outer and fringe suburban localities. The highest VAMPIRE levels were found predominantly in the outer growth corridors to the north, west and east. Each of these corridors contains many CDs with VAMPIRE scores above 17, indicating high levels of mortgage and oil vulnerability. The overall picture is of broad tracts of outer suburban locations exhibiting high levels of mortgage and oil vulnerability. There are some very small pockets of moderate mortgage and oil vulnerability in outer areas at Redcliffe in the north east, at Cleveland in the south and near central Ipswich. These however are rare relative to the broad tracts of highly vulnerable densely mortgaged residential areas within the growth corridors.

It appears that the availability of public transport is a moderate guarantor of lower mortgage oil vulnerability. Middle-suburban localities within 15 km of the CBD demonstrate lower mortgage and oil vulnerability than those further out. These areas of the Brisbane metropolitan area exhibit the best public transport services, in particular the bus services operated by Brisbane City Council. Some specific outer suburban moderate vulnerability areas are also located close to good public transport, such as parts of the western, eastern and southern corridors. The overall picture provided by Brisbane is of a graduated spatial divide between the inner and middle areas with higher quality public transport exhibiting

lower mortgage and oil vulnerability than those in the more dispersed and poorly served outer suburban locations. Outer suburban and fringe areas where public transport is poor are clearly most vulnerable to the impacts of rising fuel and mortgage costs.

7.2 Gold Coast

The urban geography of the Gold Coast is broadly linear, with a relatively dense strip of activities stretching north-south along the coastline. The Gold Coast is highly dispersed and does not contain a well-defined CBD. The densest concentration of employment is at Surfers Paradise situated at the mid northeast of the coastal strip. While there are some further, although weaker, concentrations of activity at Southport, Burleigh, Nerang and Robina, much of the Gold Coast displays a dispersed urban form and activity structure.

Mortgage and oil vulnerability is clearly spatially patterned within the Gold Coast (Figure 5). The clearest pattern is for lower vulnerability to be distributed along the eastern coastal strip with some concentrations. Highest vulnerability is predominantly distributed to the west of the Pacific Highway, particularly in the northwest, west and south. Some pockets of low vulnerability are apparent in the middle suburban strip of the Gold Coast, although these areas also exhibit concentrations of high mortgage oil vulnerability, such as at Varsity Lakes and Mermaid Waters.

As in the other Australian cities we have examined, the distribution of mortgage and oil vulnerability on the Gold Coast appears to be closely linked to the land market and to the quality of the public transport system. The lowest vulnerability areas are concentrated around the highest quality public transport services on the Gold Coast which ply the Gold Coast Highway adjacent to the eastern seaboard. The quality of these services appears to be reducing oil vulnerability along the length of that strip. Tenure effects may also be influencing oil and mortgage vulnerability in these areas. Conversely, those areas with poor public transport and relatively higher concentrations of mortgagee households are predominantly located in new growth areas west of the Pacific Highway. These areas display high levels of mortgage and oil vulnerability. Mortgage and oil vulnerability is clearly spatially differentiated on the Gold Coast with 'outer' western areas most at risk from the combined impact of rising fuel and mortgage costs. Activity dispersion may also be influencing oil and mortgage vulnerability in these localities.

7.3 Sydney

Sydney is structured around a central business district that is situated to the mid-south of the Sydney harbour. The urban area surrounding the CBD is extensive, and extends far to the north, west and south. Two urban corridors extend northwest and southwest. Like Brisbane, Sydney's urban geography is strongly patterned in terms of mortgage and oil vulnerability, as revealed by our analysis (Figure 6). Two broad areas display low or moderate levels of vulnerability. These include an area broadly described as inner northern Sydney that extends from the harbour mouth in the inner northeast to a broad area from north of the CBD to Hornsby in the north. A further area of low vulnerability is apparent around and to the east of the Sydney CBD and this area also extends through the suburbs approximately 15 km south and west of the CBD. The highest concentration of low vulnerability is immediately around the Sydney CBD and North Sydney.

Higher levels of mortgage and oil vulnerability are found in areas beyond 20 km from the Sydney CBD to the north, south and in particular to the west. This effect is particularly pronounced in the greater western Sydney region, from Baulkham Hills in the north of this

region to south of the urban area, and in the south west and north west corridors. Sydney's most concentrated areas of mortgage and oil vulnerability are located in the outer north and south of the western region. A higher proportion of households in these locations are likely to be at high social and financial risk from fuel and mortgage and price increases than elsewhere in the Sydney region.

Some particular patterns of mortgage and oil vulnerability in Sydney deserve mention in relation to the public transport network. The heavy rail system appears to confer some

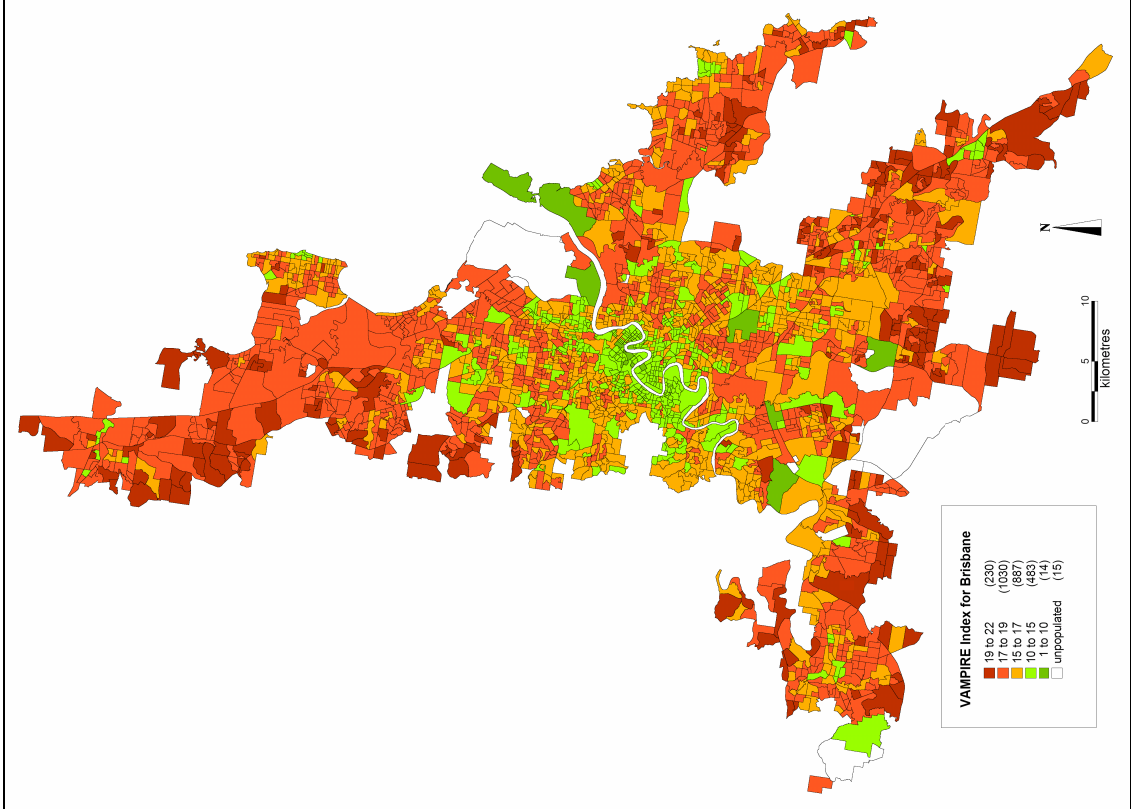


Figure 4: Mortgage and oil vulnerability in Brisbane

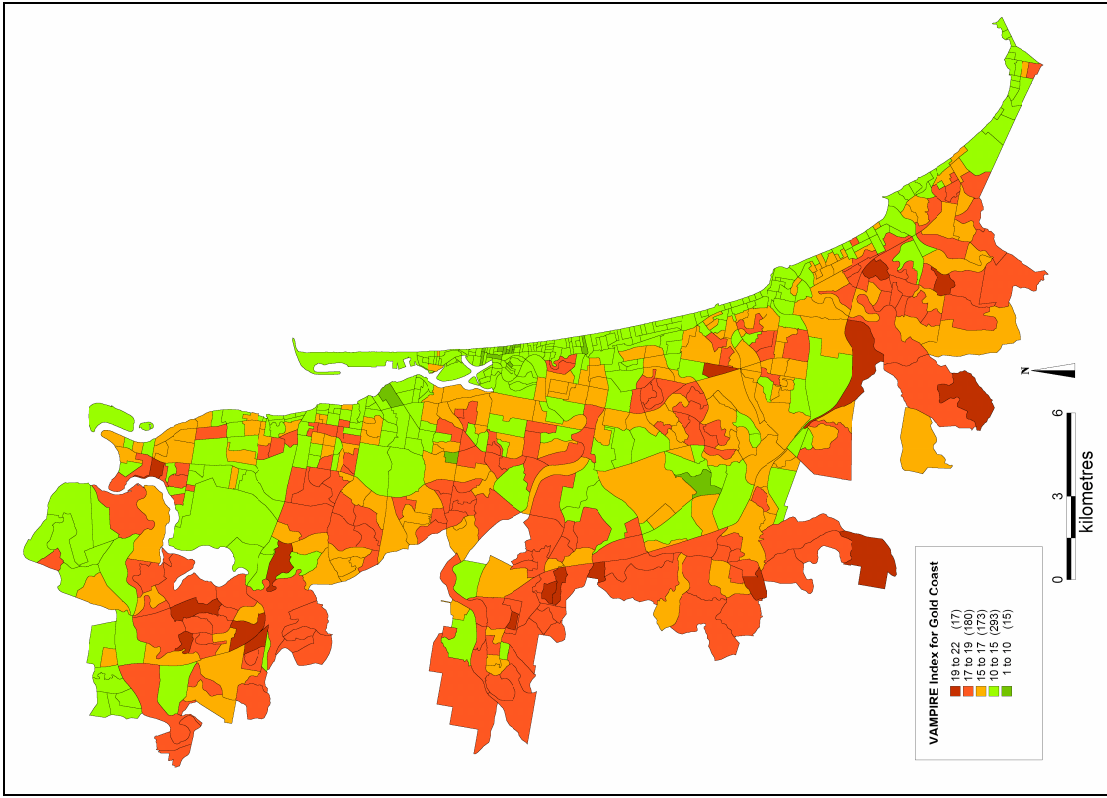


Figure 5: Mortgage and oil vulnerability in the Gold Coast

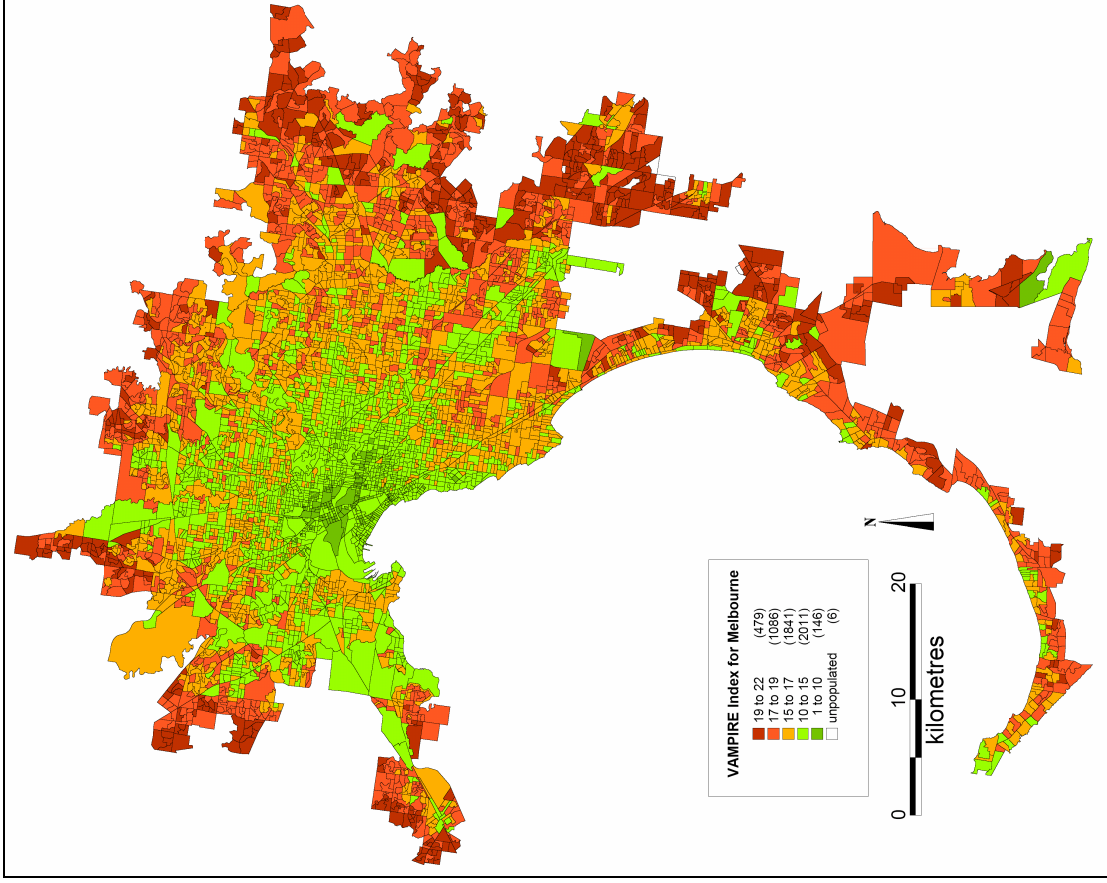


Figure 7: Mortgage and oil vulnerability in Melbourne

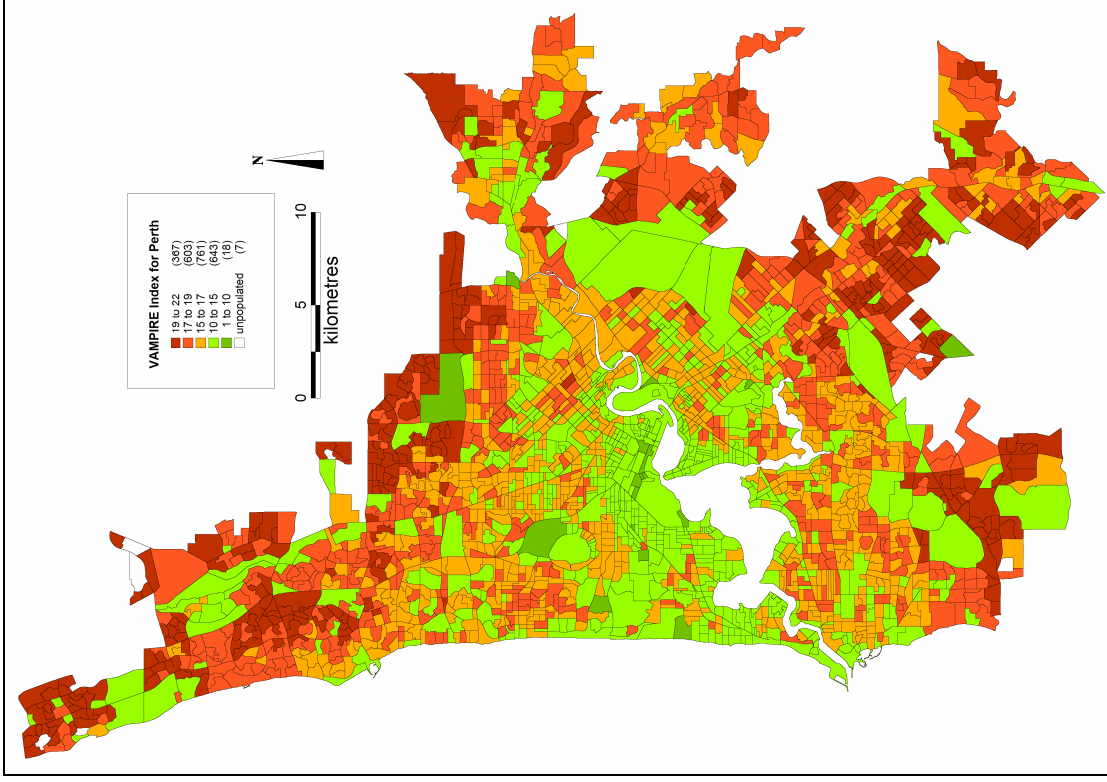


Figure 8: Mortgage and oil vulnerability in Perth

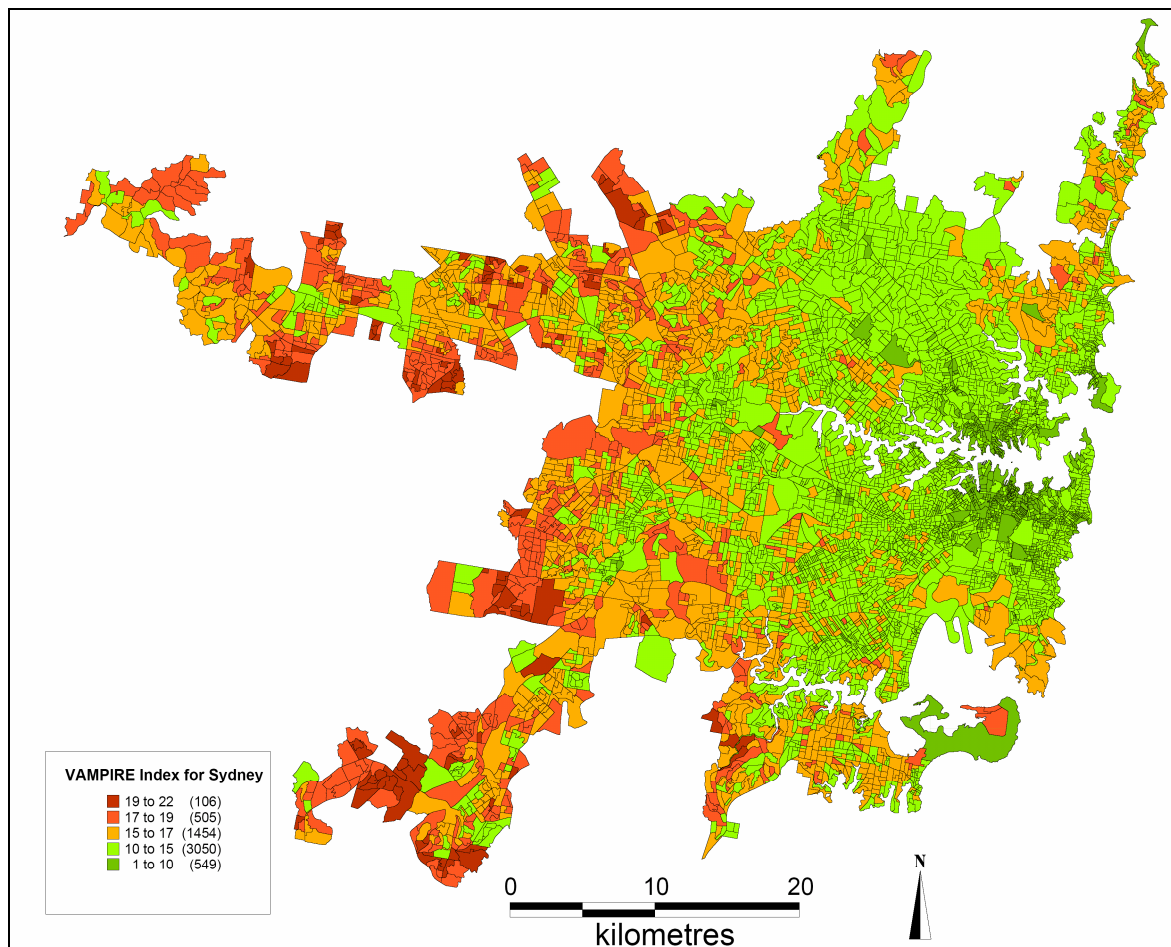


Figure 6: Mortgage and oil vulnerability in Sydney

advantage to a number of areas within Sydney. This includes a broad swathe of suburbs along the northern Sydney rail line from north Sydney to Hornsby.

Even within the generally vulnerable western Sydney region some relatively low vulnerability localities can be discerned. These appear to be clustered around major rail nodes, including Parramatta, Fairfield, Cabramatta and Liverpool, but also to some extent Blacktown, Penrith and Campbelltown (Figure 6). Similar effects are apparent in the middle-western localities of Bankstown, Regents Park and Auburn. While we have not directly calculated the role of public transport in this study, and tenure effects may be implicated in this pattern, a preliminary assessment suggests that proximity to a major rail node seems to offer western and outer Sydney suburbs some protection from the social and financial risk associated with rising fuel and mortgage costs.

7.4 Melbourne

Melbourne's urban geography is generally structured as an extensive urban area from which a number of weakly defined urban corridors extend outwards. The VAMPIRE for Melbourne demonstrates the metropolitan area is spatially variegated in terms of mortgage and oil vulnerability (Figure 7). Localities that score the lowest on the VAMPIRE are concentrated in close proximity to the Melbourne CBD and extend to the east and north of this area. Areas of highest mortgage and oil vulnerability in Melbourne are concentrated in outer and fringe

suburban areas and are distributed around almost the entire perimeter of the metropolitan area. A number of highly vulnerable areas appear to be associated with Melbourne's outer urban growth corridors. These include the southwest, northwest and north. Comparable areas are apparent in the north east and south east. Some areas scored particularly highly on VAMPIRE. These include many new housing estates, such as Caroline Springs and Hillside in the Melton East growth corridor and areas such as Narre Warren and Berwick in the Casey growth corridor.

The middle areas between the Melbourne's inner city and the outer suburbs demonstrate considerable VAMPIRE variation although some patterns can be discerned within these areas. The influence of the major rail lines is apparent in Melbourne's middle-outer east, with lower vulnerability localities strung along the Lilydale, Glen Waverly, Dandenong and Frankston rail lines. Similar patterns are present along the Sydenham, Broadmeadows and Upfield rail lines in the outer west. The clearest examples of this pattern are observed at Dandenong, Springvale and Clayton which exhibit large clusters of low mortgage and oil vulnerability localities. Income and tenure effects are no doubt playing a role here, but it is notable that the public transport system appears to be contributing to higher mortgage and oil resilience in those immediate areas where it is of higher quality.

7.5 Perth

Perth's urban geography is structured around a CBD surrounded by an extensive urban area from which a number of growth corridors extend to the north, east and south. As with other Australian cities, mortgage and oil vulnerability as measured by the VAMPIRE is unevenly distributed throughout the Perth metropolitan area. Areas of lowest vulnerability are concentrated immediately adjacent to the Perth CBD and this concentration extends eastwards. The broad arc of Perth's middle-ring suburbs displays a mix of mortgage and oil vulnerability levels. Within this area a number of localities received moderately low VAMPIRE scores, but a comparable and marginally greater number received moderately high scores. The areas of Perth that demonstrated the highest concentration of high VAMPIRE scores were found in a broad arc of outer and fringe areas including most of the growth corridors.

While the influence of public transport on the levels of mortgage and oil vulnerability in Perth are difficult to discern, there does appear to be some effect arising from the availability of public transport services. The best example of this phenomenon is the corridor between the CBD and Janebrooke-Greenmount where a number of low mortgage and oil vulnerability localities are observed. Such an effect is also apparent, although less marked in the Armadale and Joondalup corridors. The greater availability of public transport in the middle suburban areas is also likely contributing to relatively lower, albeit uneven, levels of mortgage and oil vulnerability in these localities. This may be due to the greater capacity for circumferential work journeys provided by public transport services in these areas.

8 Conclusions and policy directions

Our analysis has demonstrated that household financial and socio-economic vulnerability to rising fuel prices and mortgage interest rates is likely to be widespread across the outer suburbs of Australian cities. Households are most exposed to these price pressures because of their combined mortgage exposure, modest incomes and high car dependence. Should fuel prices increase substantially beyond their current high levels many households in the outer and fringe suburban areas of Australian cities may experience high levels of

financial stress. Urban planning and transport policy makers need to begin contemplating how spatially sensitive urban policies can play a role in ameliorating these impacts.

Australian urban policies have since the late-1990s included a number of provisions to address car dependence through promotion of higher density development within Australian cities and such schemes as Travel Smart™. Yet the deployment of such policies offers only limited potential to address mortgage and oil vulnerability. Achieving higher urban densities is complicated by housing market dynamics that are unevenly and irregularly expressed and which may not be directly related to transport costs. Consolidation policies also typically focus new development around public transport nodes, but it is the locations that lack existing public transport that will be the most affected. Further marked rises in fuel prices would likely have far greater effect than social marketing schemes such as TravelSmart™ yet use of alternatives to private motor vehicles remains feasible only for those who have access to such services at a reasonably high quality.

The main urban policy that could significantly reduce the uneven distribution of household exposure to rising fuel and mortgage costs would be a program to improve outer suburban public transport services to a level of service quality comparable to that provided to inner city locations. This however would be expensive and would require a significant shift in government spending priorities. Fortunately however funds are currently available for major transport projects. In Brisbane for example major road, tunnel, bridge and busway projects have been proposed with a total cost of multiple billions, yet most of these will be built in locations where car use and mortgage and oil vulnerability is relatively low. Across Australian cities the funds from major road projects could be relatively easily redistributed to suburban public transport improvements in which local service frequency and connectivity on existing road space would be the overriding policy objective.

There is a further need for urban scholars to give greater attention to household financial behaviour and conditions within Australian cities. It seems curious to us that there is no publicly available data set that can shed insight into the combination of household location, mortgage debt, travel costs and income. Rising fuel costs and the dependence of Australian households on private motor vehicles for the majority of trips indicates a major imperative to redress this scholarly and policy failure.

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