



2016-09-01

The Economic Boom, Bust and Transport Inequity in Suburban Dublin, Ireland

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Recommended Citation

Rock, S., Ahern, B., Caulfield, B. (2016) The economic boom, bust and transport inequity in suburban Dublin, Ireland. *Research in Transportation Economics*, Vol. 57, pp 32-43, Sept. 2016.. DOI: 10.1016/j.retrec.2016.09.003

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Title: The economic boom, bust and transport inequity in suburban Dublin, Ireland

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Abstract:

This paper examines the existence and extent of transport inequity and disadvantage in new suburbs in Dublin, built during the Celtic Tiger period and as experienced during the recession. Findings are presented from a household postal survey from three case study areas built between 2001-2008. The case study areas are typical 'middle class' suburbs, and were constructed at a time when Ireland was experiencing unprecedented economic growth. The subsequent recession left many of these areas in significant negative equity, and householders with very limited housing mobility. Results from the survey point to considerable problems that are impacting on population groups typically vulnerable to transport disadvantage, such as low income earners and car-less households. The study also highlights the burdens on middle and high income households, and those who are experiencing 'forced car ownership'. The paper concludes with a commentary on how the findings might be used to inform better transport and planning policy.

Keywords:

Economy and recession

Transport equity

Transport disadvantage

Car related economic stress

Forced car ownership

1. Introduction

The objective of this paper is to examine the existence and extent of transport inequity and disadvantage during the recession in suburbs built between 2001 and 2008, in Dublin. These developments were built during a period of unprecedented prosperity, and were largely car-dependent and lacking in good public transport infrastructure. The subsequent recession has left many of these newer suburbs in negative equity, and the car as the primary or only transport option. It is postulated in this paper that these areas, built as largely middle-class, car-focused suburbs are at risk of transport disadvantage, in part due to the impacts of a significant and deep economic recession. As Ireland now emerges from recession and construction is beginning to grow again, it is important that housing development built in the future does not repeat the mistakes of the past, and that those areas built in the last boom period are retrofitted to minimise transport disadvantage.

Ireland experienced a period of unprecedented prosperity from 1990 to 2008, a period which became associated with the term ‘Celtic Tiger’, first used by British economist Kenneth Gardiner (Kirby, 2010). Accompanying this period of prosperity was a property bubble, with a particularly large number of houses being constructed between 2001 and 2008 (see Figure 1). The economic boom had large impacts on land use and house prices in Dublin, the latter of which increased significantly (Kitchin et al., 2012). Between 2002 and 2007, house prices rose by 65% in Ireland and by 87% in Dublin, where the average price of a new house in 2007 was €485,000, and of a second hand house was €532,900 (Central Statistics Office (CSO), 2008). For many, housing in Dublin was not affordable: in 2006, as Kelly (2009) points out a second-hand house in Dublin cost 17 times what the average person earned. During this time, Dublin became more dispersed with greater suburbanisation and decentralisation of employment (Killen, 2007). This was

associated with increasingly unsustainable travel patterns and poor public transportation provision (Wickham, 2006). This period also saw a significant increase in car ownership with only 227 cars per 1000 population in 1990, rising to 360 cars in 2001 and to 434 per 1,000 population in 2007 (Sustainable Energy Ireland, 2009).

The international financial crisis of 2007/2008 was severely felt in Ireland, with a well-documented collapse of the banking sector and subsequent bail-out by the International Monetary Fund, European Central Bank and European Commission (Honohan, 2009; Kelly, 2009). Much of the blame for this economic collapse in Ireland has been placed on an overheated construction and property sector (Honohan, 2009; Kelly, 2009). During the boom, the economy in Ireland had been overly dependent on construction. Between 2000 and 2007, 27% of the growth in GNP in Ireland was due to construction output (Kelly, 2009). Construction output per capita was higher in Ireland than in any other EU country in 2007: €8557 per capita compared to an EU average of €3000 per capital (CSO, 2008). The residential sector made up 60% of construction output in 2007, and employment in construction rose 40% between 2002 and 2007, accounting for 13% of total employment. By comparison, the construction sector across the EU only accounted for an average of 8% total employment in 2007 (CSO, 2008).

The collapse of the construction sector in 2008, therefore, was very significant for the Irish economy. Construction of new housing stalled and many new housing areas were unfinished and lacking services. In 2011, it was estimated that the Greater Dublin Area had over 90,000 residential units unfinished (Mac Coille and McNamara, 2012). In addition, these new housing areas had been built and the houses sold when house prices were at their highest: the subsequent collapse left many of those in the new suburbs in negative equity and experiencing housing immobility. This was accompanied by rapidly rising unemployment and declining household incomes, particularly for those in the 30-45 age group who had bought in these new suburbs (Duffy, 2010; Kitchin et al., 2010). Unemployment rose from 4.2% in 2005 to a peak of 15.1% during the recession (CSO, 2015). This contributed to an increase in people experiencing relative deprivation. Households in areas that were previously categorised as 'affluent' or 'marginally above average' in the Pobal HP Deprivation Index 2006¹ (Haase and Pratschke, 2012), were brought into relative disadvantage by 2011. These middle and upper-middle class groups have

¹ The Pobal HP Deprivation Index is a method of measuring the relative affluence or disadvantage of a geographical area using data compiled from various censuses. A scoring is given to the area relative to the national average of zero. The index is based on demographic profile, social class composition, and labour market situation (Pobal, 2012). Income is not included in the creation of the index as this information is not available in Ireland.

not previously been identified in the literature as being vulnerable to transport inequity. Thus, this study broadens the population groups traditionally studied in the transport equity research area. It is postulated in this research that people living in areas built during the property boom, including the more affluent groups, are at risk of transport disadvantage. They bought in these areas when property prices were high, but incomes were also high, and so may not have been worried about car dependency. However, they have now been left in suburban areas with negative equity, with lower or no incomes and poor access to alternatives to the car. They also have limited opportunities to move away from these areas.

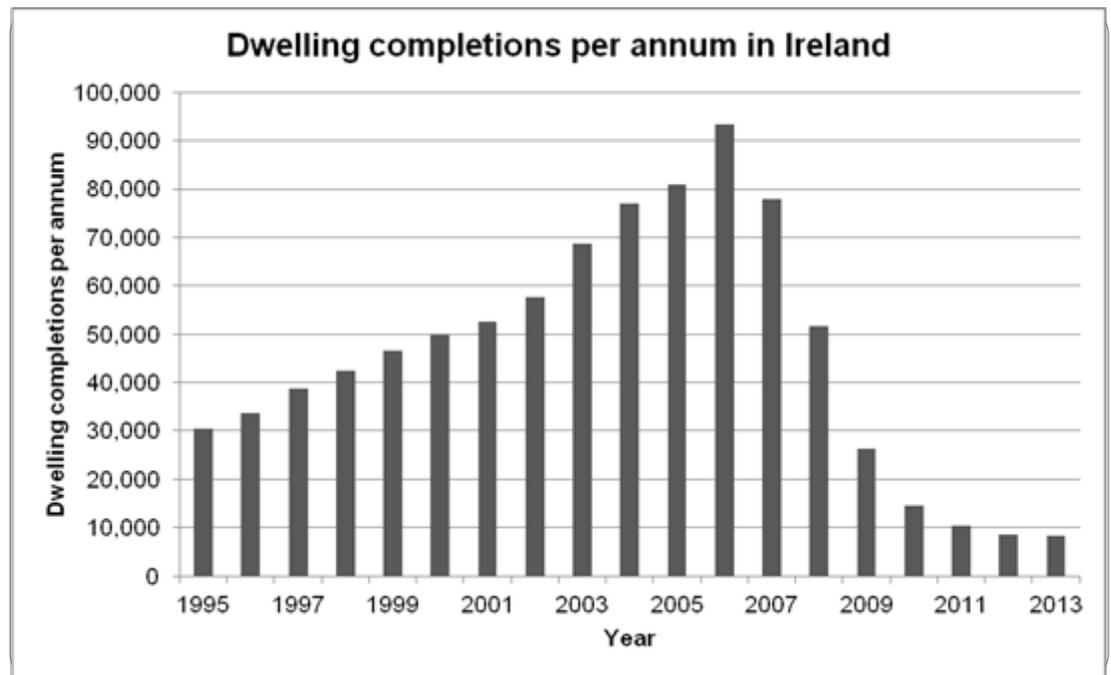
International research into transport equity has largely taken place at times of economic growth, whereas this research has been undertaken at a time of economic recession thereby testing the transport and land-use planning resilience of these housing developments, and furthering the international research through different points in the economic cycle. This study also adds to the emerging body of research in the area of forced car ownership and car related economic stress, and extends its reach into more middle class population groups (where previous research has focussed on low income households), particularly when associated with multi-car ownership.

This paper describes a household survey looking at the experiences of those living in new suburbs in post-boom Dublin, and the impacts that the economic boom and subsequent recession have had on new suburbs and on the levels of transport disadvantage in those suburbs. The findings have important policy repercussions and lessons for other countries experiencing rapid economic development, and for the future planning of new housing areas in Dublin, which is experiencing a significant housing shortage (Daft.ie, 2014).

This study seeks to answer the following research questions:

- Is there a widening of the population groups typically known to be vulnerable to transport inequity and disadvantage evident in post-boom suburban Dublin?
- To what extent is forced car ownership and car related economic stress evident in housing areas constructed between 2001 and 2008 in Dublin?

Section 2 briefly presents the research context and literature review. Section 3 introduces the study and describes the methodology employed. Section 4 provides a summary of the results and findings of the household transport survey. Section 5 concludes and provides insights for policy and practice.



Source: Figure generated using data from the Central Statistics Office (2016)

2. Theoretical and Research Context

The World Bank (1996) argues that, for transport policy to be sustainable and effective, it must support and improve the standard of living (economic and financial sustainability); improve the general quality of life (environmental and ecological sustainability); and its benefits must be shared equitably by all sections of the community (social sustainability). Litman (2012) and Martens (2011) define transport related equity as the fair distribution of transport impacts (benefits and costs) throughout all sectors of society, but with a particular concern for the disadvantaged. Equity, unlike equality, does not require that each person is treated the same, but that they are treated fairly, thus requiring a degree of moral judgement.

A report by the United Kingdom's Sustainable Development Commission (SDC, 2011) presents considerable research evidence that links increasing car dependency in society to increasing levels of inequity. These inequities can then lead to transport disadvantage for certain population groups. Dodson et al (2004) describe transport disadvantage as the condition of disadvantage (whether social, economic, labour market or housing) in which transport plays a key role. Thus, a lack of transport options can restrict fair accessibility to goods, services, employment opportunities etc. This can have an impact on people's equity of opportunity in life, particularly to key life chances such as employment, education and healthcare (Social Exclusion Unit, 2003).

Much of the research in this area is focussed on socially disadvantaged groups (see, for example, Ahern and Hine, 2015; Williams et al, 2014; Crouse et al., 2009; Hine and Mitchell, 2003). These groups include women (including women with young children, lone parents, elderly women and women in public sector housing), the elderly, disabled people, those on low incomes and children (Hine and Mitchell, 2003; Hine 2007; SDC, 2011). More recent research has looked at 'forced' car-ownership and those experiencing car related economic stress (Currie et al., 2009; Currie and Delbosc, 2013; Mattioli, 2014). Assessing the distribution of transport impacts appears to be largely based on the egalitarian principle of 'comparative fairness', which refers to how different population groups fare relative to each other (Temkin, 2009).

Car dependency is subject of many studies relating to social equity and transport. As car ownership and usage has been increasing over the last few decades in developed Western nations, many societies are becoming ever more 'car reliant' and the self-reinforcing nature of car dependency begins to take hold (Newman and Kenworthy, 1999; Lucas and Jones, 2009; Mattioli, 2014). Car reliance sees 'high and increasing levels of car use are observed among the population as a whole and where people without cars are excluded from essential services' (Lucas and Jones, 2009, p.116). The self-reinforcing nature sees the greater use of cars creating the preconditions for further car use, and a gradual reduction in the viability and attractiveness of alternative modes. A lack of car access can then result in transport disadvantage if access to these opportunities and services via alternative modes is not viable (Mattioli, 2014).

In a recent study using the British National Travel Survey, Mattioli (2014) examines the socio-economic composition of car-less households in both rural and urban areas, and argues that this can be used as an indicator of the level of car dependency in a local area. In Australia, recent research has examined another aspect of car dependency: so-called 'transport poverty' or 'forced car ownership' (Currie et al., 2009; Currie and Delbosc, 2013; Currie and Senbergs, 2007). The term 'forced car ownership' concerns the involuntary purchase and maintenance of a car for accessibility purposes due to a lack of other transport options (Banister, 1993; Currie et al., 2009). Existing research is particularly focused on lower income households, and highlights the issues associated with those who cannot afford to own and run a car in societies that are becoming increasingly car reliant. Findings from Currie and Delbosc (2013) show a large increase in forced car ownership in outer Melbourne between 2001 and 2011, mostly in areas with poor access to public transport or walk accessibility alternatives.

Arising out of car reliant societies, the issue of modal inequity has also received some research attention (for example, Delbosc and Currie, 2011 and Wu and Hine, 2003). This is where there is an unfair distribution of access to travel modes, and associated inequity in travel time, particularly by public transport to key

life chance destinations. In North America, this has been termed 'automobile mismatch', where certain population groups (particularly based on race) experience excessive commuting times largely due to their dependence on lower-speed public transportation, as opposed to private vehicles (Taylor and Ong, 1995; Williams et al., 2014).

3. The Study

3.1 The Planning Context

As described earlier, Dublin experienced a considerable building boom during the Celtic Tiger years. This development took place within a planning and policy context that aspired to balanced and sustainable development through national, regional and local policies and plans², although few of these plans emphasised the social equity aspects of sustainable development. Despite these aspirations, local and central government have been heavily criticised for ignoring their own policies, with for example, planning permissions and land zonings being driven by the demands of property developers and speculators (Kitchin et al., 2010). Other scholars point to other issues with the planning system at the time including a lack of integration of transport planning and land-use planning at an institutional level (MacLaran and Williams, 2003), and a lack of effective spatial planning governance at the city-region scale (Williams et al. 2010b; Walsh, 2012).

3.2 Post 2001 Neighbourhoods

Residential areas constructed from 2001 onwards were typically developed at higher overall densities than pre 2001 areas within County Dublin. The mean population density is approximately 113 people per hectare in predominantly post 2001 neighbourhoods and approximately 71 people per hectare in predominantly pre 2001 areas³. Despite this, there is evidence to show that post 2001 areas are more car dependent than pre 2001 areas (Caulfield and Ahern, 2014). While

² These plans included the National Spatial Strategy 2002-2020 (Department of the Environment, Heritage and Local Government (DoEHLG), 2002); National Development Plan 2000-2006 (Government of Ireland, 2000); Regional Planning Guidelines for the Greater Dublin Area (Dublin Regional Authority and Mid-East Regional Authority, 2004); and A Platform for Change: An integrated transport strategy for the Greater Dublin Area 2000-2016 (DTO, 2001).

³ Using population figures at the small area level from the Census of Population 2011 (CSO, 2012).

population densities are higher, many of these areas are at the periphery of the city and have poor public transport infrastructure.

Post 2001 areas in Dublin have a younger age profile than the population of Co. Dublin as a whole. The former contains a higher percentage of young children (12 years and under), and a higher percentage of people from 20-39 years old. It also contains a much smaller percentage of older people with only 3% of the population aged 60 or over, as compared with 15.3% of the general population (CSO, 2012). The social class of the population is relatively similar with post 2001 areas having a slightly higher representation in the highest two categories: professionals, and managerial and technical workers. The percentage of unemployed people is fairly similar.

These younger, professional groups are not conventionally seen as groups at risk of transport disadvantage. However, this research examines if the recession and associated collapse of the property market in Dublin has heightened the risk of transport disadvantage for these particular groups who are most likely to be in negative equity. Research has shown that younger people have had higher levels of unemployment growth than other age groups during the recession (McGinnity et al, 2014).

3.3 Methodology

The two main data sources used in this research are the national Census of Population 2011 (CSO, 2012), and a study specific primary data-set: the Household Transport Survey (2014). The Census of Population is mainly used to provide and describe the context of the study. Primary data was needed due to the limitations of the Census of Population data to investigate questions of transport inequity, disadvantage, housing immobility, and financial status. For example, household income is not recorded in the Census, and information on trip making is limited to the journey to work and school as discrete journeys, and the mode used. Three neighbourhood level case-study areas are examined to explore the subject area in greater detail, using geographic areas (called 'Small Areas') as defined in by the Central Statistics Office for the Census of Population. The three case study areas are chosen for triangulation purposes to test converging lines of enquiry; and to allow for the drawing of cross-case conclusions as well as cross-case comparisons, where relevant.

The three study areas were chosen based on criteria including:

- 'Small Areas' that have all experienced a reduction in affluence between 2006 and 2011 (due to the economic recession) and represent affluence levels that are most typical of housing built from 2001 onwards (i.e.,

'marginally above average' and 'affluent' as defined by the Pobal HP Deprivation Index). (Haase and Pratschke, 2012)

- Suburban housing areas outside of the M50 motorway that surrounds Dublin, but within the city and suburbs settlement area (as defined by the Irish Central Statistics Office). These areas are where most of the development took place post 2001 (CSO, 2012) and are also at risk of transport disadvantage due to their peripheral location and distance from established service centres.
- Housing areas to a form and density typical of this development period, and to a density encouraged by national planning policy⁴.
- Housing areas that are primarily dependant on buses as their main form of public transport (outside of a 1km walking catchment to train or tram stations). Buses provide the majority of public transport services in Ireland.

A comparative assessment with areas developed pre 2001 was rejected for a number of reasons. Fundamentally, it is not needed to address the research questions, as most of the comparisons are undertaken at the individual or household level within the case study areas, with some inter case study area comparative analysis. It is also worth noting that contiguous comparable areas could not be found with pre 2001 areas as they are generally in smaller pockets of development; are generally not as clearly defined as post 2001 areas; and are influenced by a greater number of external variables than post 2001 areas. The Census of Population 2011 (CSO, 2012) is used to provide a suitable secondary comparative data analysis at the wider county level.

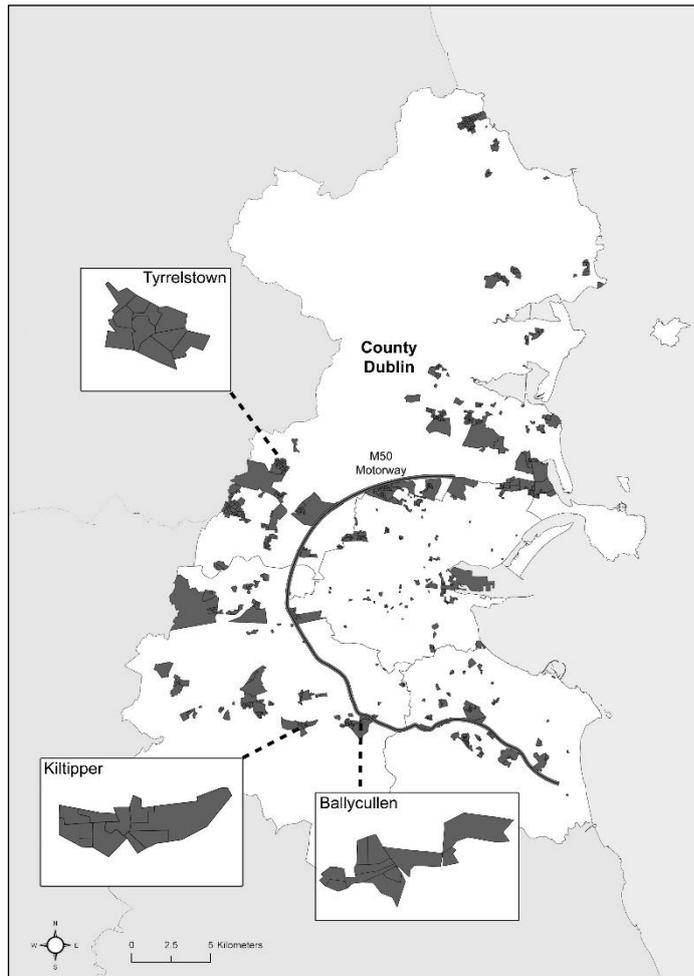
The three case study areas are Ballycullen and Kiltipper within the South Dublin County Council administrative area, and Tyrrelstown within the Fingal County Council administrative area (see Figure 2 below). The survey was distributed to 3,232 households (all households, except those sampled for the survey pilot) within the three case study areas in late February 2014. Householders were also given the option of completing the survey online. After the removal of uncompleted surveys, an overall response rate of 20.5% (representing 650 surveys) was achieved, with 91% of this figure being returned by post and the remaining 9% online.

In addition to household and income questions, the survey asked questions relating to car ownership, car use for a range of trips, and associated levels of

⁴ The mean density for the case study areas is 40.7 dwellings per hectare. The general recommended density for such housing was guided by the Residential Density Guidelines for Planning Authorities (DoEHLG, 1999) which recommended densities in the region of 35-50 dwellings per hectare.

financial burdens. Questions were asked to assess how householders viewed their public transport service, and whether a lack of transport options was perceived to be a barrier to accessing employment opportunities and adult education. Questions were also asked on housing location choice and extent of housing immobility.

Figure 2: Map showing areas where at least 70% of housing was built from 2001 onwards and the location of the three case study areas.



The highest response rate of 28.4% (307) was achieved in the most affluent area (Ballycullen). The response rates for Tyrrelstown and Kiltipper were 17.3% (181 surveys) and 15% (162 surveys) respectively. The response rate is primarily relevant at the household level for which most of the analysis is conducted (i.e., all case study areas combined). The individual case study area response rates are also presented for information purposes, and for comparative analysis where relevant. At the household level the overall response rate is well in excess of the minimum

sample size of 527 that would be required to satisfy a 95% confidence level with a 4% confidence interval. Corrected for finite population, the individual case study areas response rates achieve different sample size margin of errors: Ballycullen (95% confidence level, 4% confidence interval); Tyrrelstown (95% confidence level, 6% confidence interval); Kiltipper (95% confidence level, 6.5% confidence interval). Although the latter two case study areas have confidence levels higher than the more conventional 5% rate, the response rates are considered sufficient, as the analysis is primarily focussed on the household level, and much of the analysis involves considerably more than 650 cases as two adults per household provided individual specific data, where relevant (up to 897 cases depending on the question asked). Two adults, where relevant, were asked to complete specific sections of the survey in order to gain a greater understanding of potential issues at an individual level, rather than just the more conventional 'head of household' level. The latter could result in less information on women, for example.

In terms of representativeness of the population (as compared with the most recent Census of Population), the sample collected is similar in terms of gender. The population split is 53.3% females and 46.7% males, and the collected sample is 56.7% females and 43.3% males. Zero car households were underrepresented in the survey by 6.4%, and multi-car households overrepresented by 8.6%. One-car households, which form the vast majority of post 2001 households types, were well represented. In terms of age groups the sample is underrepresented in the 18-34 years age group, and overrepresented in the 35-44 years age group. As recommended by de Vaus (2002), the sample was weighted for key variables, which in the case of this study is car availability.

A potential criticism of the self-administered postal survey methodology is that it could under-represent disadvantaged groups who may be less likely to respond to such a survey, and in this case are some of the groups that are of interest. However, as this part of the study is spatially focussed on neighbourhoods developed during a particular time period, and seeks to investigate whether a wider range of population groups are exposed to transport disadvantage than previous research has focused on, the only viable way to survey households is to give every household an equal chance to participate; to survey as many households as possible within the budget and time constraints available; and to follow steps as recommended in the literature to maximise survey response.

4. Results and Findings

Analysis is undertaken using descriptive and inferential statistical tests (gamma, Cramer's V and Pearson chi square), and multinomial logit regression, using the statistical software package IBM SPSS (version 20). Relationships are

generally only considered significant at the alpha level of 0.05. The population groups of particular interest in this context and to address the research questions are: low and middle income households; public transport and other active⁵ travel users; non-car and multi-car households. Analysis of the equity of the findings is based on the principle of comparative fairness (how population groups fare relative to each other).

4.1 Population Groups & Transport Inequities

An important part of this study was to examine if there is a widening of the population groups experiencing transport inequities evident in recently developed suburban housing in Dublin. The findings demonstrate that the population groups normally considered to be vulnerable to transport disadvantage (such as low income and car-less households) are experiencing problems in these new suburbs, but that average income/middle income groups and public transport commuters are also experiencing some levels of disadvantage.

4.1.1 Modal and Commuting Inequity

The SEU (2003) discusses the importance of access to employment opportunities for equity of opportunity to key life changes. Part of this study examines the potential inequities associated with accessing employment via different travel modes. Analysis of the study survey finds residents commuting to work by public transport face significant travel-time burdens as compared with residents commuting by private modes, by bicycle or on-foot. The mean door-to-door commuting time for those travelling on foot or by bicycle was 30.5 minutes, and was 29.6 minutes for those commuting by private means (car driver or passenger, van, or motorbike). In contrast, the journey time for those who travel primarily by public transport is over twice as long at 63.4 minutes. This disparity in commuting times illustrates how public transport commuters are at a considerable time disadvantage compared with car-based commuters.

The survey findings show that it is low-middle income households that are disproportionately experiencing burdens associated with commuting times to work. The highest mean commuting times are experienced by the €20,001 – €40,000 income groups⁶ (after-tax) (see Table 1). Another significant finding (see Figure 3)

⁵ On foot, bicycle or by public transport.

⁶ The average wage in Ireland falls within the €20,001–€30,000 income category (after-tax) and the average industrial wage falls within the €30,001–€40,000 income category (CSO, 2014).

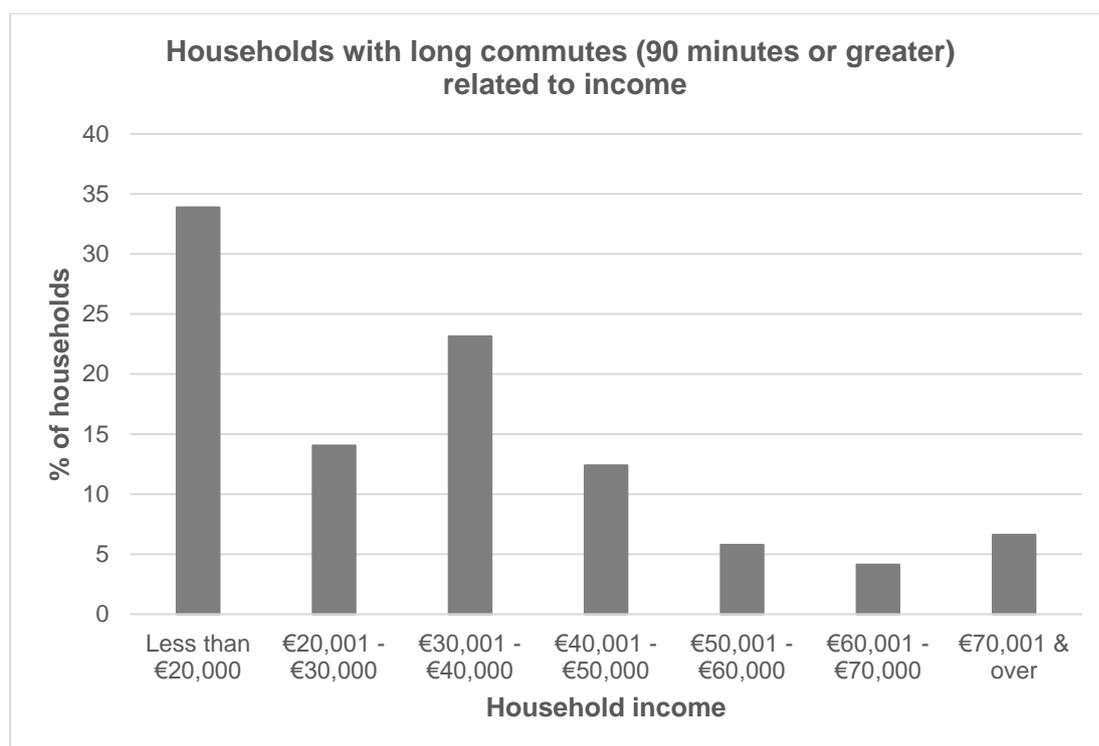
reveals that the lowest income group (less than €20,000) are disproportionately represented in the longest commuting category (90 minutes and over). 34% of households with an income of less than €20,000 have a commute of 90 minutes or greater each way, whereas only 4-6% of households earning €50,001 or over experience a similarly long commute. Middle-income earners/average industrial wage earners are also disproportionately burdened by long commutes to work, with 23% of households within the €30-40,000 income category experiencing commutes over 90 minutes. Low-middle income households are more likely to use buses as their primary commuting mode, which is a significant contributor to the longer commuting times, whereas the higher income households are more likely to use cars. This supports existing international research that demonstrates the positive relationship between income and car ownership (Paulley et al., 2006; Dargay 2001), and longer commuting times for lower income groups (see, for example, Shen 2007), but this research also demonstrates the burdens faced by middle-income households.

Table 1: Mean commuting times* to work per household income band (survey data)

Household income	Mean	N	Std. Dev.
Less than €20,000	33.19	67	22.75
€20,001 - €30,000	36.32	120	23.21
€30,001 - €40,000	38.19	170	24.84
€40,001 - €50,000	34.83	105	25.13
€50,001 - €60,000	32.37	164	17.83
€60,001 - €70,000	31.26	125	17.85
€70,001 & over	34.47	123	19.09
<i>Total</i>	<i>34.54</i>	<i>874</i>	<i>21.64</i>

* Average door-to-door commute each way in minutes

Figure 3: Percentage of households in case study areas with long commutes to work related to household income (after-tax) (survey data).



4.1.2 Access to Opportunities & Disadvantage

The study survey reveals that car ownership levels have a moderate to strong negative association with householders reporting transport related access related barriers to employment and further education: as car ownership increases, access related barriers to suitable employment and adult education decreases. The SEU (2003) notes the importance of access to employment and education to further one's life chances. Figure 4 illustrates that 45.2% of zero car households said they found transport to be a significant barrier to finding a suitable job, or changing jobs; compared with 21.9% of one car households and only 18.3% of multi-car households ($p > .000$; gamma value 0.33). With regards to access related barriers to adult education, a gamma value of .288 indicates a moderate association ($p > .000$) (see Table 2).

Similar to other studies (such as Paulley et al., 2006), this study shows that car ownership is positively correlated with income. Thus, as might be expected, similar findings are also evident with income and access related barriers to employment ($p > .000$; gamma value 0.34), and adult education ($p > .000$; gamma value .236). Whilst low income households (less than €20,000) are the group experiencing the greatest barriers to adult education, it is the average income households (€20-€30,000) that are feeling the greatest barriers to employment opportunities.

Figure 4: Extent of self-report access related barriers to employment related to car availability.

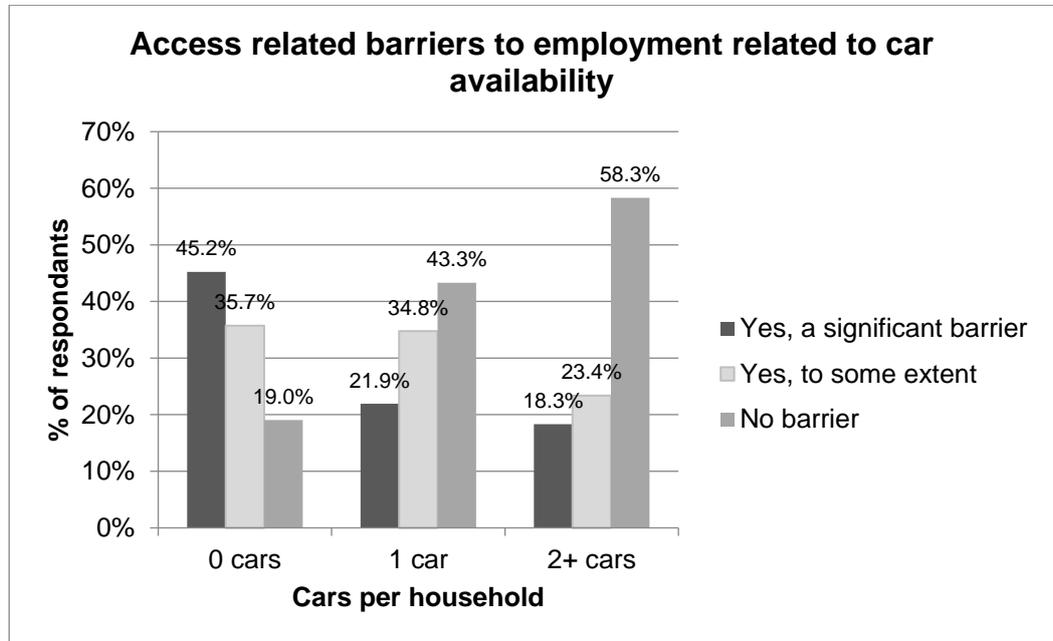


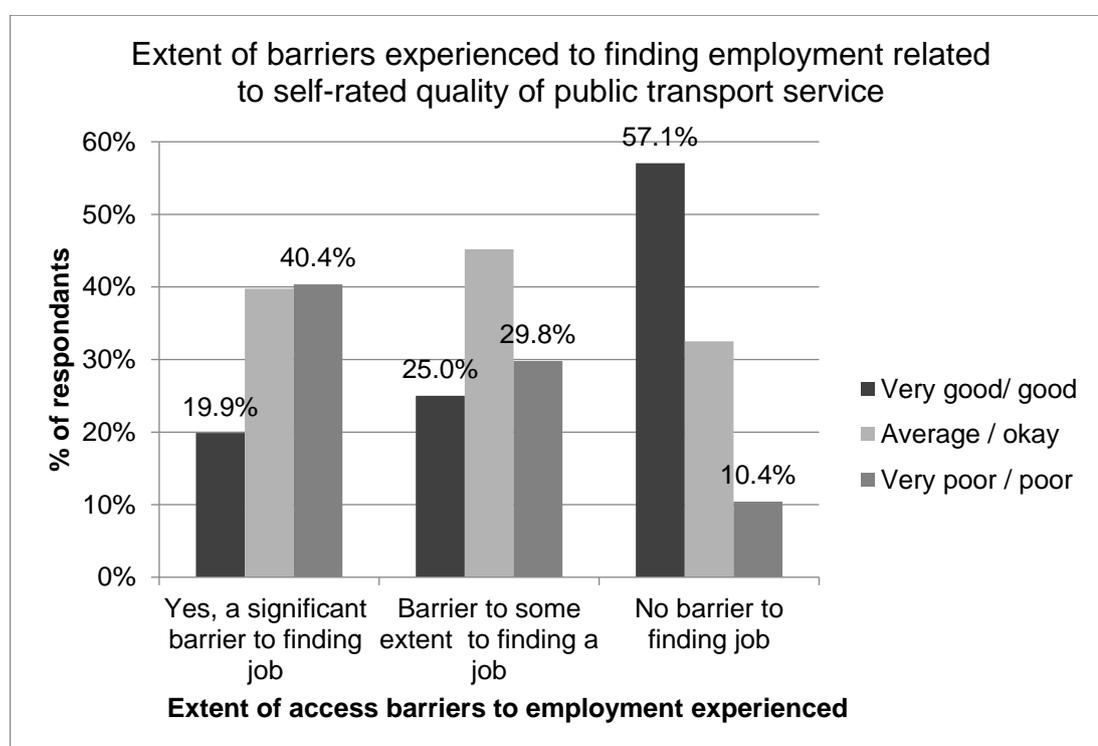
Table 2: Extent of self-reported access barriers to adult education related to car availability.

	<i>Yes, a significant barrier</i>	<i>Yes, to some extent</i>	<i>No barrier</i>
0 Cars	32.2%	35.6%	32.2%
1 Car	12.4%	27.9%	59.7%
2+ Cars	10.9%	24.1%	64.9%

The study also reveals the perceived importance of good quality public transport to those experiencing significant self-reported access related barriers to employment and further education. There is a strong statistically significant negative relationship ($p > .000$) revealed between the extent of access barriers experienced and how the residents rate their public transport service. For example, over 40% of respondents who experience significant access barriers to employment rate their public transport as either 'poor' or 'very poor', whereas only 10% of those who do not experience access barriers give their public transport service a similar poor

rating (see Figure 5). This relationship is supported by a strong gamma value of -.504. These findings are consistent across the three case study areas, with the strongest level of dissatisfaction with the public transport service expressed in Tyrellstown, which also has the lowest numbers of daily bus departures. These findings lend further support to international research that shows the significant role public transport provision can have in the extent of social exclusion and transport disadvantage experienced (Hine and Mitchell, 2003; SEU, 2003).

Figure 5: Extent of barriers experienced by residents to finding employment related to self-rated quality of local public transport service.

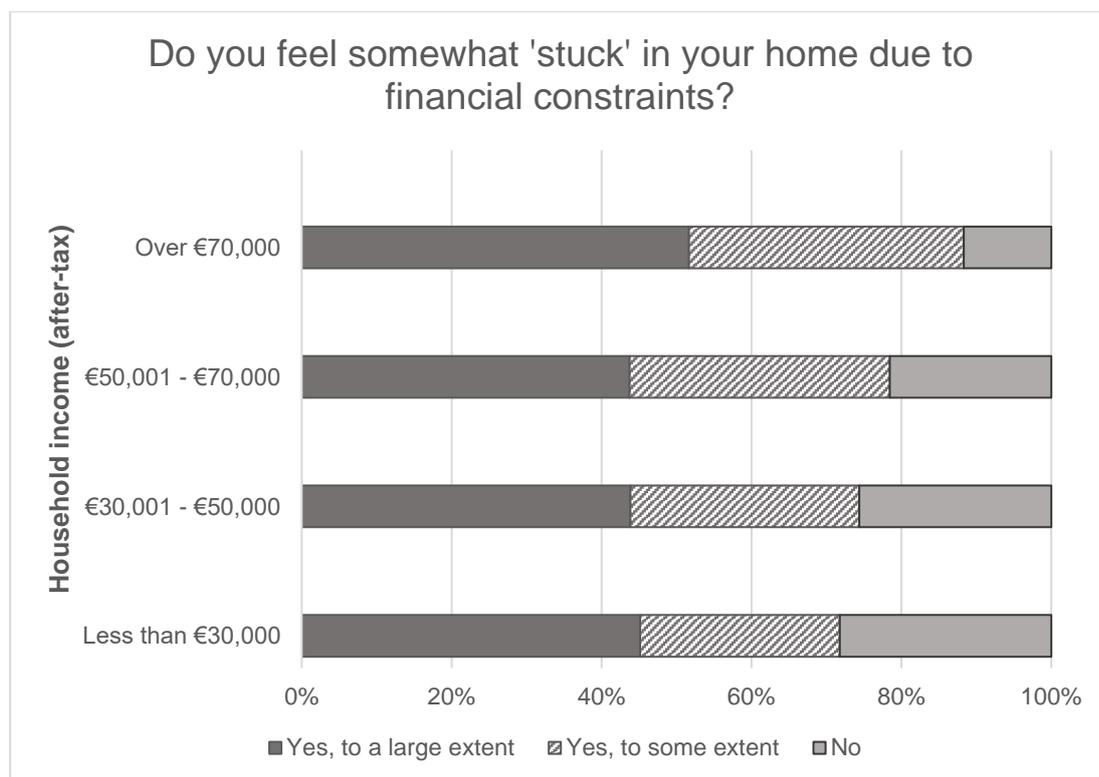


Transport related adult education barriers and employment opportunity barriers appear to be affecting all age groups, with 18-29 years experiencing disproportionate burdens. Disaggregating the access to employment opportunities further reveals that women are experiencing disproportionate burdens across 4 out of the 6 age groups, with the greatest burdens falling on 18-29 year old women, followed by 35-39 year old women. Women, in general, are a vulnerable group to transport disadvantage (Hine and Mitchell, 2003; Hine 2007), although the findings in this survey are not clearly supportive of this overall conclusion and depend on the case study area, with statistically significant barriers to employment only being

experienced by the women in Tyrrelstown (chi square 5.419; df 2; $p=0.067$). Women report more barriers than men in Ballycullen, but less in Kiltipper.

The results illustrate that many of the population groups commonly identified as vulnerable to transport disadvantage internationally are also represented in this Irish study, such as low income earners and households without cars. An interesting additional finding is the widening of groups experiencing such issues, with a sizeable portion of average and middle income households falling into this category. This could be associated with wider economic recession in Ireland, as a large portion of all income categories (between 46% and 54%) stated that they feel considerably stuck in their homes due to financial constraints ($p=0.051$) (see Figure 6). It is actually the highest income group that feels the most stuck. 80.1% of those who feel stuck expressed a desire to move home to a different area if they could ($p>.000$; Cramer's $V=.351$). The age groups that feel the most stuck in the home due to financial constraints are the 35-39 year olds, followed by the 40-49 year olds ($p=.001$). These are also the age groups who most desire to move home to a different area ($p>.000$). Research in Ireland has shown that these are also the age groups that are most likely to be experiencing negative equity on their homes (Duffy and O'Hanlon, 2013). This raises potential concerns about the long term sustainability of these communities if large cohorts move out of the area as soon as their financial circumstances improve. Those with the greatest desire to move are in the wealthiest income groups, thus potentially leaving low-income families overrepresented in the community in the future. In addition, the least educated respondents also expressed the least desire to move area, although these figures were not statistically significant. Taken together, this could contribute to further transport disadvantage and social exclusion issues to take hold in these neighbourhoods in the future.

Figure 6 Households suffering financial constraints.



4.2 Forced Car Ownership and Car Related Economic Stress

Trends in Ireland indicate that as car ownership levels increase, the car is being used more and is associated with greater levels of trip making (National Transport Authority, 2013). The study findings support these trends, and provide an indication of the potential for social inequities to exist as car dependency increases. Analysis of the survey data reveals higher car ownership than the average across Dublin, in addition to a statistically significant ($p > .000$) chi square positive correlation between increasing car ownership and increasing car use for journeys to work, school, the local store, visiting friends and family, and to the bank or post office. These trips account for the majority of trips undertaken in Ireland (CSO, 2011).

Findings from the study survey provide evidence to support the argument that there is a degree of 'forced car ownership' (FCO) and associated car related economic stress in the case study areas. The vast majority of car-owning respondents said that they felt that a car was a necessity to get about (see Table 3). Out of the zero-car households, only 30% reported that they did not need a car as they can get around satisfactorily without one. This is a particularly concerning statistic considering that all case study areas are located within approximately 10-12 km (i.e. not large distances for a capital city) of the city centre and all are within the city and suburbs settlement area, albeit at the edge of this area. In addition, all are

within 4km of a designated major or county town centre within their respective local authority areas.

42% of all multi-car households would consider reducing to one car if local transport and services were better. This figure increases to 75% for the lowest income households (under €20,000 per annum after tax) and 50% for average income households (€20,001– €30,000 per annum after tax). This lends further support to the argument that there is a degree ‘forced car ownership’ in these areas, particularly for the lowest income grouping, which would have the least means to own and run a car. These findings also have interesting transport policy implications as they give an indication of the number of car trips that could be reduced each year if services were improved in post 2001 areas.

Table 3 Car-owning householders response to question asking if they viewed a car as a necessity to get about where they live

Answer	% of households
Yes, definitely	79.5%
Yes, to some extent	18.5%
No	2%

Whilst the study survey finds that car ownership increases with income ($p > .000$, gamma 0.676), there are still high levels of car ownership for the lower income categories, which is placing a financial strain on residents’ household budgets. Car dependency appears to be placing a disproportionate financial burden on low-middle income households. Using multivariate cross-tabulated analysis, a strong statistical association is revealed between the number of cars per household, income levels and self-reported financial burdens associated with car ownership ($p > .000$; Gamma. 301) (see Figures 7 and 8). Low income multi-car households (<€30,000) report twice as much significant financial stress as low income single car households. Middle income households (€30,000-50,000) and the highest income households (>€70,000) are also experiencing greater financial burdens associated with multi-car ownership than single car households. For example, 18.4% of single car households compared with 25% of multi-car households within the €30,000-€50,000 income categories report significant burdens; and no high income single car households report financial burdens, whereas 11.5% of multi-car high income households report significant financial burdens. These findings suggest that there is a degree of forced car ownership across all income groups, particularly for multi-car households.

Multinomial regression analysis (see Table 3) also reveals that those who are experiencing the highest levels of financial burdens associated with car ownership are also likely to be experiencing significant barriers to accessing job opportunities, as well as feeling stuck in their homes due to financial constraints. The potential 'forced' nature of their car ownership is also evident by how they perceive the quality of their public transport service in terms of serving their regular needs. Those with the largest financial burdens associated with car ownership rate their public transport the poorest, thus they are likely to feel that having a car is a necessity regardless of the financial burdens it imposes on their household budgets.

Out of the four income groupings, those on the lowest incomes are experiencing the greatest financial burdens associated with car ownership, but the analysis also reveals that the two middle income groupings are also experiencing burdens. The lowest income grouping are almost 50 times more likely than the highest income grouping to be experiencing burdens, as compared with almost 12 times for the second lowest or average income grouping, and 8.5 times for the second highest income grouping. The overall model has a 'final model' statistical significance of $p > .000$ and a Pseudo R-square (Nagelkerke) of .25 illustrating a moderate association.

Figure 7: Single car households, income and self-reported financial burdens associated with car ownership.

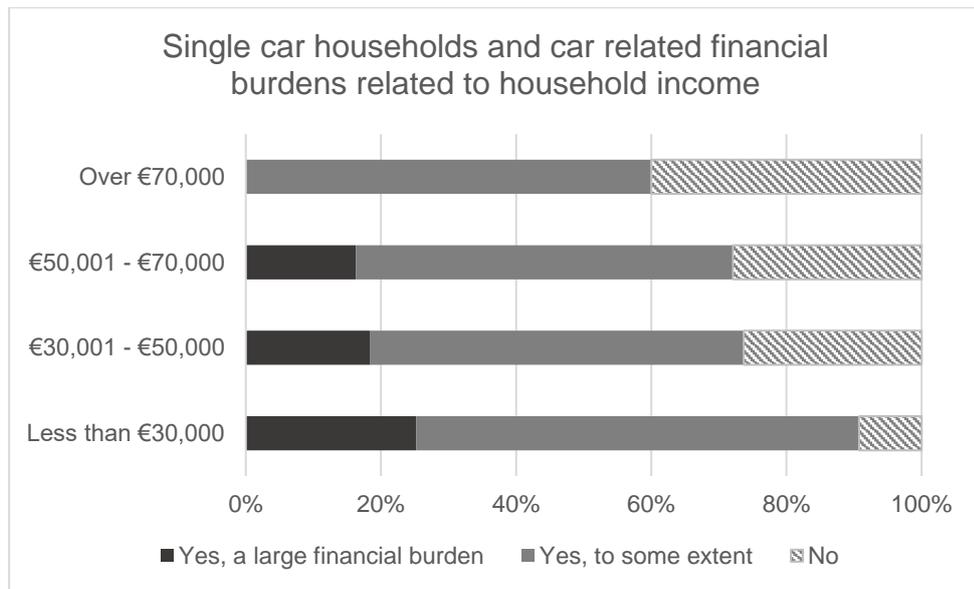


Figure 8: Multi-car households, income and self-reported financial burdens associated with car ownership.

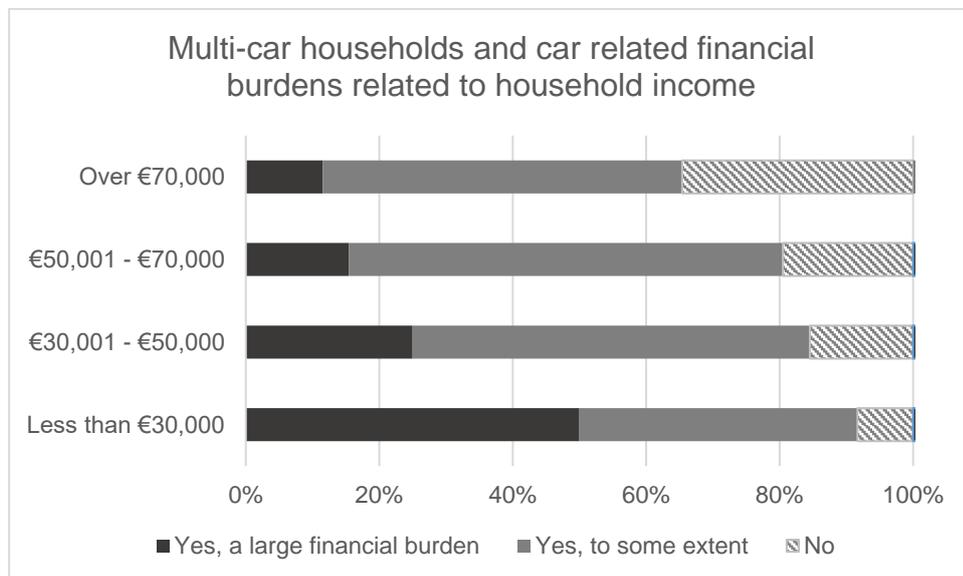


Table 4 Regression model illustrating characteristics of those experiencing financial burdens associated with car ownership

Model Results		B	Std. Error	Wald	df	Sig.	Exp(B)
Yes, a large financial burden associated with car ownership	<i>Intercept</i>	-2.777	.786	12.481	1	.000	
	Significant barrier to employment opportunities	1.326	.454	8.530	1	.003	3.765
	Barrier to some extent to employment opportunities	.679	.374	3.287	1	.070	1.971
	No barrier to employment opportunities	0 ^p			0		
	Feel stuck in home to a large extent due to financial constraints	1.892	.391	23.468	1	.000	6.636
	Feel stuck in home to some extent due to financial constraints	.233	.417	.313	1	.576	1.263
	Do not feel stuck in home due to financial constraints	0 ^p			0		
	Low income (<€30,000)	3.892	.738	27.834	1	.000	48.988
	Middle income (€30,000-€50,000)	2.474	.666	13.808	1	.000	11.869
	Upper middle income (€50,000-€70,000)	2.140	.663	10.406	1	.001	8.501
	High income (>€70,000)	0 ^p			0		
	Very good or good public transport service	-1.421	.429	10.982	1	.001	.241
	Okay/average public transport service	-.901	.416	4.695	1	.030	.406
	Very bad or bad public transport service	0 ^p			0		
	Yes, to some extent	<i>Intercept</i>	-.093	.474	.039	1	.844
Significant barrier to employment opportunities		.657	.398	2.721	1	.099	1.929
Barrier to some extent to employment opportunities		.531	.295	3.235	1	.072	1.701
No barrier to employment opportunities		0 ^p			0		
Feel stuck in home to a large extent due to financial constraints		1.151	.303	14.399	1	.000	3.161
Feel stuck in home to some extent due to financial constraints		.128	.287	.200	1	.655	1.137
Do not feel stuck in home due to financial constraints		0 ^p			0		
Low income (<€30,000)		2.070	.460	20.273	1	.000	7.927
Middle income (€30,000-€50,000)		.918	.335	7.488	1	.006	2.503
Upper middle income (€50,000-€70,000)		.774	.321	5.812	1	.016	2.169
High income (>€70,000)		0 ^p			0		
Very good or good public transport service		-.512	.361	2.008	1	.156	.599

Okay/average public transport service	-.304	.366	.689	1	.406	.738
Very bad or bad public transport service	0 ^b			0		

a. The reference category is: No.

b. This parameter is set to zero because it is redundant.

5. Conclusion & Policy Insights

This paper presents the findings from a self-administered postal survey which forms part of a larger research study into transport related social equity issues in housing areas in Dublin constructed between 2001-2008; a period which formed a considerable part of the last building boom in Ireland. The research looks at 3 typically middle-class suburban areas. The subsequent recession has seen affluence and house prices drop significantly in these neighbourhoods. The paper has sought to examine if these areas have suffered from transport inequities during the recessionary period.

Results from the study survey point to considerable problems in these areas that are disproportionately, and therefore one can reasonably argue, unfairly impacting on particular population groups, including population groups that are not traditionally seen as disadvantaged. Using the principle of comparative fairness, there is clear evidence that different population groups are faring inconsistently relative to each other, particularly when it comes to equity of opportunity to key life chance destinations such as employment and education. There is also evidence of high levels of car dependency, including a degree of forced car ownership and car related economic stress, particularly for low and middle income multi-car households. In addition, the desire of a large proportion of the population to move away from their neighbourhood poses issues for the long term sustainability of the community.

The self-reinforcing nature of car dependency and its integral relationship to the development of social inequities and unsustainable development will require a strong and effective policy response. International research has shown that the encouragement of active travel has the maximum chance of success if the private car is made slower, less attractive and more expensive than active modes (Kenworthy and Laube, 1999; Buehler, 2011). The principles of fairness should see accessibility to destinations that have the most impact on life-chances, such as work, education and healthcare being prioritised (SEU, 2003). Thus, these areas should be clearly mapped at the city scale, and an access strategy created centring on being able to access these areas in a time-competitive, safe and comfortable manner by active modes. It should be reasonable to be part of a non-car household in a city, and to not be disadvantaged in terms of access to key life-chances

because of that. It is acknowledged that not all destinations in a city could be reasonably expected to be accessible without a car, but key destinations should be. In terms of employment destinations, for example, prioritisation may need to be provided to some suburban and lower skilled job hubs, which are largely inaccessible by good quality public transport, and may be a factor contributing to a degree of 'forced car ownership' and associated car related economic stress in lower-income households.

Section 4.2 above noted that 79.5% of car-owning households viewed owning a car as a necessity to get about where they lived. Although there is a high percentage of people with these views, there are still 42% of multi-car households that stated they would be willing to consider reducing to one car if local services and public transport were improved. Two-car households represent 40.9% of the case-study area households or 31.3% of all post 2001 households (CSO, 2012), this highlights a considerable opportunity to shift a large percentage of the population's mobility patterns towards more sustainable transport. Section 4.2 illustrates the link between increasing levels of car usage for certain trips with increasing levels of car ownership, thus a policy to encourage multi-car households to reduce to one car should be considered as part of a wider car dependency reduction strategy, with an associated active travel promotion strategy.

Good local walking and cycling environments, that also link to good local and city-wide public transportation, have significant potential to improve the transport equity of an area, and to minimise transport disadvantage. In the case study areas (particularly in Ballycullen and Kiltipper), there is evidence of local accessibility issues by active modes. This is demonstrated, for example, by the extent of car-use for local trips, such as the local shop and primary school. Further research into this area of local accessibility (including the potential role of car-focussed infrastructure) in residential neighbourhoods constructed during the Celtic Tiger period in Ireland would shed more light on the potential issues and solutions, as well as the processes that enabled this approach to urban and transport planning.

These development outcomes took place at a time of high demand for housing and within a local and national policy framework that envisioned sustainable development, showing that policy solutions alone may not solve the issues; and that social and political change may also be needed. Social equity, as a pillar of sustainable development, must be given due consideration, in addition to economic development and environmental protection. This is particularly pertinent as following several years of economic recession and very little new housing being constructed in Dublin, there is now a significant demand again for new housing (Daft.ie, 2014; Housing Agency, 2014) and care will be needed to ensure the mistakes of the past are not repeated again.

Acknowledgements

This research was funded by University College Dublin (UCD) through an Innovation Bursary. The author would like to thank the Central Statistics Office of Ireland, and Haase and Pratschke (regarding the Pobal HP Deprivation Index) for providing the data used in this study.

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