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Is Travel Based Residential Self-Selection a Significant Influence in Modal Choice and Household Location Decisions?

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Abstract

Residential Self-Selection is a theory that states that a significant proportion of people base their choice of residential location on the ability of an area to suit their transportation and modal preferences. This paper seeks to examine if residential self-selection can be observed in the population of the Greater Dublin Area and to examine how travel choices and household location decisions interact. The research is based on data collected through the means of a postal survey issued in April 2014.

The research briefly outlines the differences observed in travel behaviour across contrasting land-use areas; with higher use of sustainable modes for residents of denser, mixed-use urban areas with greater public transport options. The link between residency in such areas and particular respondent characteristics is also highlighted with a tendency for residents of these areas to be younger renters, without families, have lower car ownership and shorter occupancies. The paper describes how for a significant proportion of the survey respondents, modal choices were made prior to actual residency. However, the paper also describes that while transport is an important factor in choosing where to live, it is not the primary factor for many residents: whether or not it is the primary factor is dependent on the characteristics of the respondent involved.

The key conclusion is that residential self-selection does not occur to such an extent that it is more important than land-use factors in determining modal-split characteristics. However, it remains a significant contributory factor for certain populations when sustainable modes are considered: younger people, renters, without cars or children. The paper outlines implications for policy, which highlight the importance of taking self-selection tendencies into account when preparing land-use-transport policies to reduce car dependency.

1. Introduction

Residential self-selection (RSS) is a theory that states that people choose where to live based on how they wish to travel and the modes they wish to use. It implies that those who wish, for example, to use public transport, choose to live in areas with characteristics that facilitate the use of this mode. This is contrary to the belief that we can manipulate or change modal choices through land-use and transportation infrastructure policy measures.

The aim of this paper is to examine within a European context the relative impact of residential self-selection on modal choice characteristics of areas when compared to land-use factors. The overall research question deals with the following policy issue:

“Do people choose to live in areas to facilitate their preferred modes or can policy makers influence modal choices by creating particular urban forms?”

The case study is the Greater Dublin Area (GDA), a mono-polycentric city located in the Republic of Ireland. The paper has three objectives:

- (1) To establish if modal choice differs between areas of contrasting urban form.
- (2) To establish if residential self-selection is exhibited in the population of the Greater Dublin Area and to establish the relative impacts of residential self-selection and urban form for the survey population
- (3) If residential self-selection is apparent, to establish which demographic groups are most likely to engage in this behaviour and which groups are least likely to do so

A number of studies have observed a link between denser, mixed-use areas and lower levels of driving while less dense, single-use residential areas produce the opposite effect (Cao et al, 2008; Loo and Chow, 2011; Schwanen and Mokhtarian, 2003; Handy et al, 2005). On this basis, transport planning policy has focused on the creation of new developments, or retrofitting existing areas, to utilise the influence of urban form to promote greater levels of sustainable travel among residents (Bento et al., 2005; Bertaud et al, 2009; Bhat and Guo, 2006). Issues arise when it is considered whether the observed patterns of travel behaviour can be attributed to residential location and the effect of the built-environment or to prior self-selection by residents to live in areas that allowed them to travel in this way (Cao et al, 2008). This concept is known as residential self-selection; people choosing their residential location on the basis of their travel abilities, needs and preferences (Mokhtarian and Cao, 2008). Many travel issues could cause self-selection, such as preferences to have shorter journeys, avoid congestion or locate in safer travel areas but in this study; RSS is restricted to the extent that modal preferences determine household location (Van Wee, 2009; Van Wee et al, 2002). This form of RSS was hypothesised by the authors to be likely to make a significant contribution to modal split characteristics of areas which could be measured accurately using nominal variables for past decisions.

The structure of the paper is as follows:

Section 2 sets out the literature review and the need for further research

Section 3 describes the urban characteristics of the case study area

Section 4 outlines the study methodology, including the; identification of study areas, survey design, sample composition and limitations of the data

Section 5 outlines the analysis of the data

Section 6 outlines implications for research and policy

2. Literature Review and Study Definition

The need for research into residential self-selection is based on the concern that failing to account for modal-preference based RSS, should it exist, will lead to the overestimation of the modal shift capabilities that can be attributed to land-use-transport interventions (Van Wee, 2009; Silva, 2014). Van Wee and Boarnet (2014) state that this suggested overestimation is less of a policy issue for newly developed sustainable neighbourhoods as people with suitable modal preferences and a tendency to self-select would locate there. Problems emerge if the results from such developments are taken as a standard outcome, without accounting for the role RSS, and used to predict the benefits of constructing public transport options in an existing neighbourhood where the population has lower sustainable travel preferences (Van Wee and Boarnet, 2014). In response to this problem, studies have sought to either clarify for the existence of RSS or 'control' for it in order to yield a more accurate estimate of the built environment's effect on travel (Chatman, 2014; Silva, 2014).

Mokhtarian and Cao (2008; Cao et al, 2009) provide a detailed review of the methods and empirical findings of RSS studies, which highlight the often contrary results that emerge in this field. Silva (2014) describes the overall conclusions reached on RSS as 'mixed' with earlier studies tending to conclude that RSS is more important than land-use factors (Kitamura et al. 1997) while more recent studies suggest that the opposite is the case (Bhat and Guo 2007). Based on the extensive Cao (et al, 2009) review of empirical results, it appears that while RSS is found to contribute to the influence of the built environment on travel, much research has found an independent effect of the built environment on travel behaviour beyond self-selection (Cao and Ettema, 2014; Silva, 2014).

When considering this issue, it is important to note that while numerous studies have investigated residential self-selection within the context of land-use and transport, very few have taken place outside North America and the results may not be applicable to other areas (Van Wee and Boarnet, 2014; Wang and Lin, 2014; Cao, 2014). Wang and Lin (2014) outline that this is problematic because travel-related attitudes amongst populations from different countries may vary significantly, depending on differences in socio-economic development, lifestyle factors, social norms and the level of residential choice provided by the housing system. The issue of urban context is also raised by Naess (2014), who views attempts to produce exact predictions of the influence of land-use on transport as impossible due to varying spatial and social situations across urban areas. For this reason, different urban situations may cause self-selection to be irrelevant or take place in a dissimilar form than expected when investigated outside the North American context (Wang and Lin, 2014). Cao (2014) notes five contributions to RSS research from European studies, including;

- Van Acker et al (2011) investigated the role of RSS in Belgian leisure travel and found that the built environment influenced travel independent of self-selection 'subjective' factors but ignoring for self-selection could lead to miss-estimation. Contrary to many American studies (Cao et al, 2009), not accounting for RSS factors could lead to an underestimate of the impact of land-use factors. This result echoed some other studies outlined by the authors (Chatman, 2009; Ewing and Cervero, 2010; Lund et al., 2006).
- Aditjandra et al (2012) concluded that the built environment has an effect on travel behaviour after accounting for self-selection in a British context and concluded that the results would support land-use based responses to reduce car dependency.
- De Vos et al (2012) investigated whether respondents in Belgium lived in areas which suited their travel preferences and found that over half did not currently do so.

To the author's knowledge, there have been no travel-based RSS studies conducted in Ireland with the closest previous research examining employment sub-centres and choice of mode in the Dublin area (Vega and Reynolds, 2007; 2008). This study makes specific mention of self-selection but concludes that 'further statistical analyses that include... characteristics of alternative modes of transport and the socio-economic attributes of travellers would be needed to give insight into the nature of this relationship in a Dublin context' (Vega and Reynolds, 2007, p.8).

Beyond context-specific issues, Naess (2009, 2014) outlines that self-selection does not raise questions of the impact of the built environment on travel and instead validates the role of land-use factors; as people are aware of the limitations of different urban structures and select those most suitable to them for travel. Under this argument, urban form enables households to self-select and this process can be used to achieve modal shift (Aditjandra et al, 2012). When this is considered, it is important to note that the travel preferences that led to self-selection may themselves be based on experiences of residency in particular land-use areas and so even if it was the case that travel behaviour could be completely attributed to prior self-selection in an area, the contribution of the built environment would still be present in some form (Van Wee, 2009; Van Wee and Boarnet, 2014). Based on these views, combined with the extensive conclusions reached by (Cao et al, 2008), it would appear that entirely discounting the impact of the built environment on travel due to RSS processes is not a justifiable argument and the importance of land-use factors for planning policy is not in doubt (Naess, 2014). Van Wee and Boarnet (2014) summarise this as 'nihilist statements that we know nothing due to residential self-selection are unfounded'. The contrasting views presented in self-selection literature, along with the limited range of geographic locations of the previous studies, suggest that further research is required to achieve greater understanding of RSS but such a study should be framed in a manner which would aid the practicalities of transport policy.

Whether research should continue in the same vein of quantifying RSS influences to 'control' for them in land-use modelling is debatable. Chatman (2014) raises the prospect that this approach may be missing the point and throwing away vital information about residential choices. Chatman (2014) views the understanding of residential decisions as key to providing successful alternative housing as the influx of population attracted by its construction will not be a random group, as proved by the need to control for self-selection, and so understanding the populations which act in this way will be vital to successful outcomes. Essentially, this requires research into the particular populations which will most likely base their residential location decisions on the basis of transport preferences. Consideration of the role of travel preferences in residential choices differs with Naess (2009; 2014; Van Wee and Boarnet, 2014) asserting that travel preferences are not the dominant criteria in household preferences as these are often in conflict with other factors in location decisions. This suggestion is similar to research by Pinjari et al (2007), which found that households and individuals make residential location and modal decisions jointly in a process that involves compromise to achieve a suitable choice for their life stage e.g. locating themselves into areas which suit their socio-demographic background, attitudes and travel preferences.

This presents the argument that at least for certain populations; travel preferences may take a priority in household location but that socio-economic circumstances can constrain both the choice of residence and the mode involved (Cao and Mokhtarian, 2008; Bhat and Guo, 2006; Pinjari et al, 2011; Silva, 2014) while restrictions are also imposed by the limited availability of locations (Naess, 2009). It could be viewed that establishing when such preferences take priority involves further exploration of the time-order of modal decisions in respect to residency between past and current locations. Studies that consider this aspect are rare with many focused on the outcomes of RSS for travel

behaviour rather than the conditions that lead to a tendency to self-select. One exception outlined by Cao et al (2008) is a qualitative study by Hammond (2005) which identified that 18% of respondents selected their commuting mode prior to deciding on a residential location, with 39% making this decision simultaneously. Results such as this suggest that in certain circumstances modal preferences can dictate housing decisions, but it remains unclear which populations can be associated with this activity or the rationale for this behaviour emerging, or indeed, whether it continues throughout life.

This paper is centred on the exploration of the extent that travel preferences, in the form of specific modal preferences, can shape the resulting choice of residential location. It was hypothesised prior to the study that residential self-selection would be observed but only in certain population types. Identifying when this occurs and the specific populations associated with this behaviour will have critical implications for combined housing-transport policy. The suggestion that RSS may vary among different individuals is also put forward by Chatman (2014) with the proposition that the literature has failed to look at both its composition among different populations and the consequences for housing demand. Chatman (2014) succinctly summarises what would be expected to be found amongst a diverse urban population in this regard;

'When moving to a new neighbourhood, some people likely choose where to live in order to be able to travel in a way that they could not in their old neighbourhood. Other people choose particular neighbourhoods so that it is easier to travel the way they are already traveling. And still other people will choose neighbourhoods without focusing very much on how the choice will affect their ease of travel by different modes, since many other important factors play a role in deciding where to live.'

This research attempts to shed further light on the process of self-selection by putting forward the theory that residential decisions are a compromise between modal and locational choices but that in some cases and for some populations the former takes priority. If this is true and those populations can be identified, this can be used to inform the development of housing which encourages sustainable travel. For these reasons, the paper puts greater emphasis on the conditions and process that leads to RSS rather than its resulting effect on travel behaviour.

3. Urban Context: The Greater Dublin Area

The city of Dublin had a typical industrial spatial structure with a strong core served by radial travel patterns until the 1920s when a process of relocation from the centre to the suburbs began and the development footprint expanded significantly (National Transport Authority, 2011). This was aided in particular by the creation of several car orientated 'new towns' in the surrounds of city in 1967 under the Myles Wright Plan (NTA, 2011; Vega and Reynolds-Feighan, 2008). These new towns were deliberately designed to suit car use through low-density housing and formed the basis of expansion in following decades (NTA, 2011). These planning approaches sowed the seeds of future car dependency but Dublin remained a mono-centric city with centralised employment and strong public transport patronage along radial routes until the 1990s (Murphy, 2012). This situation changed significantly with the economic growth of the 1990s and early 2000s which caused decentralisation of jobs and residential expansion further away from the CBD as people sought to buy more affordable residences (Vega and Reynolds-Feighan,

Figure 1. GDA Employment Sub-Centres (Vega and Reynolds-Feighan, 2008)

2008; Murphy, 2012). During this transition, radial travel lessened while inter-suburban, cross-city and reverse commuting became more common as the city became more polycentric in structure and its residents became increasingly reliant on the private car to access employment outside the CBD (*Figure 1*; Browne et al, 2011; Murphy, 2012). As a result, the private car became the primary mode of transport for the majority, something that reflects national trends where the number of registered cars has increased in Ireland by 39% in the past 20 years (Caulfield, 2012).

While urban expansion slowed during the economic crisis of 2008-2015; development before this period reshaped the city into a mono-polycentric urban spatial structure. The GDA retains a relatively strong CBD surrounded by a number of employment sub-centres located between large swathes of single-use, low density suburban housing (*Figure 1*; Vega and Reynolds-Feighan, 2008). Rapid urban expansion has ceased in recent years with the rate of national residential construction growth falling by the following amounts since its peak in 2006; -21% (2007), -44.6% (2008), -58% (2009) and -37.8% (2010). Residential construction has since returned to growth since 2013 but remains significantly lower than the previous decade (Central Statistics Office, 2014).

The public transport network of the GDA is still largely radial in focus with extensive reliance on bus services to provide car alternatives in suburban areas. Heavy rail services are restricted to the coast and westerly lines while light-rail consists of two radial lines and some suburban spurs (*Figure 2*)

In terms of housing composition, the city centre and suburbs show very different types of households: in the centre housing is more likely to be rented, with fewer children, lower car ownership and more apartments than the suburbs (*Figure 3*).

Figure 3: City Centre Detail Urban Context Maps (Mapping: JH, 2015; Data: Census, 2011)

In summary, the GDA represents an example of recent rapid urban growth and decentralisation across a metropolitan area which has a diversity of land-use characteristics leading to contrasting use of sustainable modes or motor vehicles depending on the local area (Caulfield and Ahern, 2014).

4. Methodology

The study is based primarily on the analysis of data collected in a survey distributed to people living in the Greater Dublin Area. The objective of this survey was to collect data on travel preferences, residential location and household preferences. It was felt that this survey was necessary as existing data sources such as the Census (last collected in 2011) do not provide this information. The Census (2011) provides information on car ownership, commuting mode, commuting trip duration and time of trip commencement (Ahern et al, 2013). Further data is provided to Officers of Statistics for origin-destination analysis of work and school trips but this does not broach issues such as transport preferences or the role of travel in housing location. The National Transport Authority conducts a Household Travel Survey (2012) on other trip types, trip frequencies and travel needs but this data is based on a relatively small national sample and unsuitable for detailed study of specific local areas.

The survey conducted was a large scale postal survey which questioned respondents on topics linked to self-selection and incorporated land-use factors through a tailored distribution process. The methodology will provide a brief overview of this process from study area selection, survey design, distribution and the sample composition.

4.1. Study Area Selection Process

To explore the research question, it was important that the survey did not treat the urban area as a homogenous region and instead incorporated differences in land-use composition and travel opportunities so that the effect of the built environment could be considered. It was also deemed important to avoid the use of broad case study approximations due to questionable comparability. A quantitative approach was adopted to identify particular urban development types across the Dublin region for study. This involved GIS analysis of Central Statistics Office (CSO) 'small areas'¹ to

¹ CSO small areas are the most detailed spatial data for census (2011) data; representing between 50-200 households.

categorise the entire Greater Dublin Area² according to the level of local public transport access, jobs/housing balance³ and housing density⁴.

- Public transport access was defined according to frequency and mode through the use of buffers⁵ around stops plotted from GTFS data which included Luas (light-rail), DART (heavy rail rapid transit), Irish Rail (heavy rail commuter services) and Dublin Bus services. National or privately operated coach services were excluded due to lack of quality data.
- Jobs/housing balance was estimated using employment trip destinations from the Place of Work, School or College Census of Anonymised Records (2011).
- Housing density was calculated from Census (2011) data.

Two⁶ types of urban development were categorised to represent areas of urban form where sustainable travel options were a viable option and those where sustainable travel options were available but were typical sprawl areas (*Table 1*).

<i>Table 1: Study Area Urban Form Characteristics</i>				
Study Area	Public Transport Access	Density of Development	Jobs/Housing Balance	References
<i>Sustainable Travel Areas</i>	1-20 minute frequency bus services or 1-30 minute train frequency services within catchment buffer	Over 35 residential units per hectare	Over 1.2 jobs per household	Housing density based on Irish housing policy definitions (Dept. of Environment, 2009) and jobs/housing balance definitions based on Peng (1997)
<i>Unsustainable Travel Areas</i>	20-30 minute frequency bus services or 30-60 minute train frequency services within catchment buffer	Under 30 residential units per hectare	Under 1.2 jobs per household	

The CSO small area identification process resulted in a range of locations for each study area which were related to centrality but not exclusively:

1. Sustainable travel areas of the highest residential and job densities were located in the CBD or in locations near major heavy or light rail stations with the lower end of the scale located in the extremities of the urban core or at suburban rail stations (*Total CSO small areas identified: 47*).
2. Unsustainable travel areas were located outside the city centre and were spread across a wide variety of outer locations from historic Dublin suburbs to 'post-2001' developments and the more rural areas of the GDA (*Total CSO small areas identified: 260*).

The locations of these can be viewed spatially in *Figure 4*.

² Greater Dublin Area (GDA) is the common policy term for the functional urban region. It includes the administrative counties of Dublin City, South Dublin, Fingal and Dun Laoghaire-Rathdown as well as Kildare, Meath and Wicklow.

³ Jobs/housing balance was used as a proxy for defining single use and mixed use areas as land-use data was not available

⁴ Housing density was measured as units per hectare (UPH) for each small area

⁵ Public transport buffers were measured as a 400m radius for bus stops and a 800m radius for rail stops

⁶ Three land-use types were originally used; which separated sustainable travel areas into monocentric (more jobs than housing) and balanced jobs/housing areas. After a smaller than expected response rate, these two study areas were merged. The Peng (1997) definition was used to define the difference between 'balanced' and 'jobs centric' areas.

Figure 4. Location of Study Areas

4.2. Survey Design

The target respondents were individuals aged 18+ living in the addressed household: the respondent was asked to also complete the questions on behalf of other members of the household. The survey collected data on both the current residence and the prior residence of the respondent so that past experiences could be captured. Skip-logic design in both the hardcopy and online versions of the survey ensured that those who had never moved house were excluded from questions about prior residences. The content of the survey was spread cross six sections:

Section A: Travel Behaviour

This section provided modal choice information for commuting, shopping, social and school trips. Further information was provided for trip distance, whether a motor vehicle was required for employment and the destination address for commuting trips. Information was also collected on motor vehicle access and fuel expenditure.

Section B: Residential History and Preferences

Respondents were asked to provide the following information on their prior residence: occupancy type, household composition, duration of residency, local area characteristics, means of travel and parking access. A series of questions (12) were

posed about respondents' current residential preferences. Respondents were asked to rate their agreement with 9 topics measuring the likelihood that certain factors restricted their preferred choice of neighbourhood. An open answer provided space for the respondents to state their reason for moving residence and their length of intended stay at their current residence was also queried.

Section C: Travel Preferences

Respondents were asked to indicate their preferred type of mode for commuting, social and shopping trips if they could use 'any' mode. Respondents were asked 9 questions regarding the important attributes of their chosen mode.

Section D: Housing and Travel Decisions

The objective of this section was to ascertain if respondents had chosen a preferred mode of travel before choosing their home and if so, which mode that was. It also determined whether being able to use this mode was a necessary condition of choosing the residence. The consistency of these decisions over time was also explored as well as variations when renting or owning the property

Section E: Respondent Characteristics

Section F: Household Characteristics

These sections provided important demographic details about the respondent and their household background.

The survey was developed and tested in a pilot study before it was distributed. This pilot survey took the form of a series of semi-structured interviews and written responses from 25 testers over a period of 3 weeks. The key contributions from testers centred on achieving the correct phrasing to question respondents on their 'preferred modes', the creation of a functional layman question to deal with the concept of RSS and the range of topics included in the preference sections on modal choices, household choices and restrictions.

Efforts to create time-series data on past events can lead to possible unreliability due to the inconsistency of respondents recalling past events without being influenced by more recent experiences (Cao et al, 2008). It is acknowledged that the preferred solution to this issue is a longitudinal study which collects data on respondents as they move from one location to another, capturing their varying attitudes, preferences and socio-economic status throughout this period. However, in the timeframe of this project (3 years) this type of longitudinal study was not possible. Where possible, efforts to limit inaccurate recall were made by intentionally not questioning respondents on past variables which would be particularly imprecise (e.g. attitudes to transport several years ago). The survey focused on past events involving straightforward, factual responses such as previous occupancy type or prior choice of mode as survey testers demonstrated no difficulties remembering such information.

4.3. Survey Distribution

In order to identify an appropriate sample size which would be representative of the population, Cochran's (1977) sample size formula was used to calculate the required responses for each area.

$$\frac{(t)^2 * (p)(q)}{(d)^2}$$

Values:

(t): Value for selected alpha level of 0.025 in each tail = 1.96

(p) & (q): Estimate of variance = 0.25

(d): Margin of error accepted by the researcher for the proportion being estimated = 0.05 or 5%

(Bartlett et al, 2001, p. 47)

Using this formula, 384 responses for the larger unsustainable travel areas and 349 responses from sustainable travel areas were required when adjusted for a known population⁷. The survey of Cao et al (2006) achieved a 23% response rate and outlined that postal surveys distributed to the general population can achieve a response rate as low as 10% up to 40%. On this basis, a figure of 20% was taken as the guide for the estimate of how many surveys should be distributed and the Cochran (1977) formula figures were multiplied by five. In total, 4794⁸ surveys were distributed to a random sample of addresses extracted from the national database, Geo-Directory. Surveys distributed to addresses in each study area were kept separate and included identifying codes so that they could be categorised according to study area when returned. Residents had the option to return the survey by freepost or complete it online by following the links or QR codes on the hardcopy version. Surveys were distributed on the 31st of March 2014 and responses received between 2nd April and 28th May 2014.

In total 367 surveys (305 hardcopy; 66 online) were received from the sustainable travel study areas and 470 (442 hardcopy; 28 online) from the unsustainable travel areas; an overall response rate of 16.83%. While within the boundaries of what can be expected in a postal survey distributed to the general population, this figure was slightly lower than expected. This was attributed to the length of the survey, the non-traditional questions involved and the lack of financial incentive for respondents.

4.4. Sample Population

Limitations of the data regarding its context specific nature will be described in line with the results but other issues included; a non-normal distribution which eliminated the use of parametric tests, possible inaccuracies in the recollection of respondents regarding past residences and some bias in the sample when compared⁹ to census data (Table 2):

- Under representation of younger adults and over representation of older groups
- Under representation of lower educational achievement and over representation of 3rd level
- Slight over representation of owned households living in houses in sustainable travel areas
- Slight under representation of rented households in unsustainable travel areas

⁷ Cochran's (1997) correction formula is used when the population is known (Bartlett et al, 2001): $n = \frac{No}{(1 + \frac{No}{Population})}$

⁸ As mentioned previously, three study areas were used at this time and the higher figure reflects this.

⁹ Income data is not collected in the census and cannot be compared.

Table 2: Comparison of Sample Population with Census Results (% of each area)

	Sustainable Travel Area (Survey Result)	Sustainable Travel Area (Total Population)	Unsustainable Travel Area (Survey Result)	Unsustainable Travel Area (Total Population)
Age Bracket				
<18	-	9.1	-	24.1
18-24	5.0	17.9	1.3	9.6
25-34	37.0	40.0	7.9	13.5
35-44	23.7	13.6	17.7	13.8
45-54	12.8	7.6	21.3	13.7
55-64	11.4	5.7	21.5	12.0
65-74	7.5	3.6	19.8	7.8
>75	2.5	2.6	10.4	5.1
Level of Education				
Junior Cert or Less	8.9	15.9	11.3	23.5
Leaving Cert	9.4	11.4	24.3	21.9
Apprenticeship or Certificate	5.8	13.1	12.2	17.5
Bachelor Degree	34.2	27.3	28.8	21.3
Post-Grad Degree	41.7	20.3	23.5	12.3
Not stated	-	11.7	-	3.1
Household Occupancy				
Owned (mortgaged)	15.6	9.9	49	39.9
Owned	19.2	6.1	37.1	37.5
Rented	65.2	80.7	13.9	21.3
Other	-	3.1	-	1.1
Household Unit				
House	24.2	18.5	90.4	88.9
Apartment/Flat	75.8	77.3	9.6	9.9
Other	-	4.3	-	1.2

When considering residents of the study areas through the survey results, some clear trends emerged:

- Sustainable travel areas held a higher proportion of non-Irish residents (Cramer's V; .308, P0.00), respondents without families (Cramers V; .262, P0.00) and adults under the age of 35 (Cramers V; .409, P0.00).
- Apartment residency (76%) was dominant in sustainable travel areas compared to houses (90%) in unsustainable travel areas (Cramers V; .675, P0.00).
- Single occupancy or co-habiting backgrounds were more prominent in sustainable travel areas with a strong trend towards family homes in unsustainable areas (Cramers V; .422, P0.00).

Household income, personal income and gender differences between respondents from each study area were not statistically significant.

5. Relationship between Urban form and Modal Choice

5.1. Travel in Areas of Contrasting Urban Form

The first research objective seeks to identify whether contrasting urban form characteristics are associated with significant differences in the modal choices of residents. The literature would suggest that land-use measures to create denser areas, with more local jobs and greater public transport accessibility can be associated with lower levels of private vehicle use. The comparison of household access to motor vehicles between residents of the two study areas gives an indication that this is very

much the case (Figure 5). In these results (Cramers V; .554, P.00); we can observe that half of respondents from sustainable travel areas do not have access to a motor vehicle. In unsustainable travel areas non-vehicle access does not appear to be a viable option. Trends of single vehicle ownership are near equal in both study areas, but access to two or more vehicles is much more prominent in unsustainable travel areas.

In considering the modal split for different trip types¹⁰ in sustainable travel areas, statistically significant results emerged¹¹ (Figure 6). A majority of respondents use walking as their primary mode for all trip types with this particularly so for shopping trips. Motor vehicle use ranged between 17.7% (commuting) and 22.9% (shopping) for all trip types with public transport usage at a similar level. While the motor vehicle is used by some respondents for trips, these results would not suggest significant car dependency in this study area. The large proportion of active modes would suggest short trip distances are involved, an aspect related to the mixed-use nature of these areas.

Figure 7 outlines the modal split characteristics of respondents from unsustainable travel areas. The motor vehicle acts as the primary mode for residents of these areas for all trip types. Public transport

¹⁰ Commuting mode in both areas excludes a small percentage of respondents who worked or studied from home (<5%)

¹¹ Statistically significant associations were observed between study areas and commuting mode (Cramers V; .597, P0.00), mode for shopping trips (Cramers V; .607, P0.00) and the mode for social trips (Cramers V; .616, P0.00)

is the second mode (14%) for commuting and social trips while walking plays this role for shopping trips (12.6%). Considering these areas have a reasonable level of public transport options, the low results for this mode are notable and suggest that longer trip distances and lower densities have created an urban form unsuited to alternative modes of travel.

Overall, these results demonstrate that different types of urban form are associated with significant differences in modal split characteristics in the population who have responded to this survey. Private motor vehicle use and car dependency is generally very high across the GDA (Caulfield, 2012) and so the results for sustainable travel study areas represent an important variation from normal trends. This would confirm the links observed in the literature that denser, mixed use areas with greater transport options are associated with lower levels of car dependency (Cao et al, 2008; Loo and Chow, 2011; Schwanen and Mokhtarian, 2003; Handy et al, 2005). The Irish policy guidelines (2009) which recommend a minimum of 35 units to 50+ units in public transport corridors would also be supported by these results. However, a note of caution must be mentioned when the responses in relation to household mobility are considered as: respondents in sustainable areas indicated that they were unlikely to remain living in their current homes, while those in unsustainable areas indicated a likelihood to remain in their current homes (*Table 3*; Cramers' V; .518, P0.00). It would be important to establish how many of those living in sustainable areas intend to stay in sustainable areas or if there is a movement to unsustainable areas as people become older and if that leads to a change in mode.

Table 3: *How much longer would you expect to be living at your current address?*

	< 1 year	1-5 years	6-10 years	10+ years	No intention to move again	
Sustainable Travel Areas	74 20.8%	173 48.7%	26 7.3%	18 5.1%	64 18.0%	355 100.0%
Unsustainable Travel Areas	16 3.4%	75 16.2%	42 9.1%	67 14.4%	264 56.9%	464 100.0%

5.2. Past Experiences and Modal Intentions in Household Location Decisions

When the travel characteristics of contrasting urban areas are considered as a simple cause-and-effect relationship, it would appear that residency in a particular area plays a role in determining the choice of mode. However, these descriptive results do not incorporate the possible role of travel-based residential self-selection which some researchers postulate could have a greater influential role than land-use (Kitamura et al, 1997) or at least act as an important contributory factor to the observed figures (Cao et al, 2008). Exploration of the time-order of decision-making in respect to household location and modes is required to clarify this issue.

The study sought to ascertain whether respondents who had moved at least once in their lifetime (N: 749) had 'intended to use a particular mode of transport' for the majority of their trips prior to moving into their current residence. 68-70% of respondents had prior modal intentions and no statistically significant associations were identified between this result and the type of study area or respondent characteristics. This would suggest that modal choices are at least part of household location decisions regardless of the circumstances of the individual involved. Whether this result simply represents prudent assessment of transport options by respondents prior to moving or travel-based self-selection requires further analysis. The suggestion that the latter may have taken place is strengthened by considering the specific modal intentions involved. In this regard, strong associations emerge (Cramers V; .617, P0.00) between those who intended to use active modes or public transport prior to locating in sustainable travel areas (83% of intentions) and those who moved into unsustainable travel areas intending to use motor vehicles (73%).

It was demonstrated that the stated modal intention prior to moving was a continuation of the modes used previously at the respondents' last residence in many cases ¹² (Cramers V; .556, P0.00). Further statistically significant associations were observed between this prior choice of mode and the respondent's circumstances at their last address regarding housing type, occupancy type, vehicle ownership, parking access, parking price and duration of occupancy. Those less inclined to choose a motor vehicle prior to moving tended to come from past residences associated with rented apartments, shorter occupancy, zero car ownership and more restricted parking access. This was also observed regarding the land-use characteristics of previous neighbourhoods where there was a suggestion that those who had previously lived in areas of urban form more suitable to car-use, intended to use a motor vehicle at their next address.

The study sought to ascertain the role of these related past variables¹³ at the time when the modal decision prior to residency was made. A binominal logistic regression test was performed (*Table 4*) to explore what the likelihood was that a sustainable or unsustainable mode would have been chosen by the respondent. The independent variables were characteristics of previous travel and household characteristics shown to have an autonomous and statistically significant effect on the dependent variable. The logistic regression model was statistically significant (N; 495, $\chi^2(12) = 232.312$, $P < .000$) and explained 49.9% (Nagelkerke R^2) of the variance. Two independent variables emerged as significant at the 95% level and these were the mode used at the previous residence and the duration of occupancy at the last address. The results showed that past car users were 15.1 times more likely to intend to use a motor vehicle at their next residence than those who had used an active mode previously. Public transport did not emerge as a statistically significant influence. Duration of residency at the last address was shown to be influential with those who had lived longer at their last

¹² A continuation of past modes for 80% of car users, but less so for walkers (67%) and public transport users (60%)

¹³ Socio-economic and demographic information was excluded as only present-day data was available for comparison which would not necessarily reflect the individual or household at the time of moving.

address being 1.9 times (3-5 years), 2.7 times (6-10 years) or 2.2 times (10+ years) more likely to intend to use a motor vehicle than those who lived at their last address for less than 2 years.

Table 4: Logistic Regression Model; Prior Modal Intentions on the Basis of Past Variables

Dependent Variable Encoding					
Intended Sustainable Mode = 0					
Intended Unsustainable Mode = 1					
<i>Variable</i>	B	S.E.	Wald	Sig.	Exp(B)
Constant	-2.436	.580	17.629	.000	.088
Previous Housing Type (Base = House)					
Apartment	-.449	.289	2.415	.120	.638
Duration of Stay at Previous Residence (Base = Less than 2 years)			9.660	.022	
3-5 years	.670	.334	4.024	.045	1.955
6-10 years	.986	.338	8.525	.004	2.680
11+ years	.811	.351	5.330	.021	2.251
Main Mode Used at Previous Residence (Base = Active Modes)			110.01	.000	
Public Transport	.203	.363	.312	.576	1.225
Motor Vehicle	2.717	.305	79.397	.000	15.142
Public Transport at Previous Residence (Base = No Public Transport Access)			3.097	.377	
Poor public transport services	.776	.526	2.176	.140	2.173
Good public transport services	.420	.520	.652	.419	1.521
Excellent public transport services	.310	.580	.286	.593	1.363
Previous Local Area: Single Use or Mixed Use (Base = Mainly Houses, Few Local Businesses)			1.042	.791	
Mixture of housing and local businesses	.008	.290	.001	.978	1.008
Businesses or shops with some housing	-.624	.858	.529	.467	.536
No businesses or shops locally	.308	.462	.443	.506	1.360
Number of Cases	495				
Nagelkerke R^2	49.9%				
Hosmer & Lemeshow test	P = .705				
Classification accuracy	81.4%				

The results presented in this section suggest that when modal choices are made prior to residency, these transport intentions are significantly influenced by the modes being used at the time when the decision is made, except in the case of public transport. The role of past occupancy duration is also highlighted as a lesser, but still influential, factor. In respect to the influence of prior intentions on the travel characteristics of areas; it was found that the intended mode continued to be used at the time of survey for 80-90% of cases for active mode or motor vehicle intentions. The qualitative study of Hammond (2005) found that 57% of people chose modes prior to residency, this figure is lower but

still similar to the 68-70% found in this quantitative study. Specific detail on the time-order of decisions from other studies is not available for further comparison but it does raise the suggestion that modal choice is not necessarily caused by the conditions present in the current area of residence. The determination of whether prior modal intentions take priority in the choice of residence is explored in *Section 5.3* along with the resulting influence on modal split characteristics.

5.3. Travel-Based Residential Self-Selection Attitudes in the Sample Population

The second objective of the study is to establish if residents of different urban forms chose to live there to facilitate particular modal preferences. From the results presented thus far, transport factors are a consideration in household location decisions with the choice of mode often taking place prior to residency. This observation combined with the evidence of a strong link between current and past travel behaviour gives the impression that travel-based RSS may have been exhibited in the sample population. Determining if this was the case requires assessment of whether modal choices took priority in the housing location decision process. A question in the survey broached this issue directly with specific mention of the time-order of decisions.

Respondents stated their agreement to the following statement¹⁴ on a five-point scale;

'When deciding to move to a new location, I would consider areas that would suit my preferred mode of transportation for the majority of my trips before considering the types of neighbourhood available'

A slight majority (51%) of respondents agreed with prioritising preferred modes over neighbourhood characteristics but nearly half were either opposed or neutral to the idea (*Figure 8*):

The relationship between these responses and the level of importance respondents attached to other issues in household location added context to these results. Statistically significant relationships outlined that those who responded favourably to this statement also put greater importance on access to quality public transport locally and shorter commutes when choosing a home. Those who disagreed were more likely to put greater emphasis on living in a particular housing type, having sufficient parking space, living in attractive neighbourhoods and having good car access. This outlined that

¹⁴ It could be queried whether this statement captures all of the facets involved in RSS as it excludes other aspects of household location choices. This statement was the result of extensive discussion with testers and its deficiencies reflect the challenge of creating layman terminology for what is essentially an academic concept. Attempts to use a 'modal preferences over all other aspects' or other similar statements provoked an unnecessary level of misunderstanding and feedback suggested the choice was between transport and what the testers considered to be 'neighbourhood types' e.g. housing estates or denser areas, attractiveness of the local area, crime rates, etc. This 'residential self-selection statement' should be viewed as a functional compromise which captures whether residents prioritised modal preferences in household location decisions.

modal preference prioritisation was just one aspect in a set of transport focused household preferences. Those who disagreed with the concept were more likely to favour housing preferences removed from transportation issues or those focused on motor-vehicle use. This highlighted a possible mode-specific divide in the responses and further statistical tests outlined that:

- Agreement reduced as car ownership increased (Gamma; -.295, P0.00)
- Agreement was greater from those who had 'intended' to use a sustainable mode (*Figure 9*)
- Disagreement was greater from those who had 'intended' to use a motor vehicle (*Figure 9*)

Few clear divides emerged according to the background of the respondent with no statistically significant links between these responses and gender, educational level or the type of occupants. Slight (.1-.2) associations were observed between a higher level of agreement and those who were non-Irish, renting apartments, single, younger or intended to move again in the short term. These demographic groups reflected the respondent characteristics found in sustainable travel study areas as outlined in *Section 4.4*. Residency in sustainable study areas was shown to be statistically linked with higher levels of agreement (62% vs 42%) and lower levels of disagreement (21% vs 33%) when compared with residents of unsustainable areas (Cramers V; .204, P0.00).

The results provided an opportunity to investigate whether contrasting modal split characteristics could be attributed to self-selection tendencies in the sample population. New variables were created which combined prior modal intentions with attitudes towards prioritising particular modes in household location decisions. This excluded respondents who had never moved house in their lifetime but included those who had never 'intended to use a particular mode' as a control group for comparison. Four attitudinal group variables were created to capture varying RSS tendencies, divided by the mode specific nature of their preferences when self-selection appeared likely (*Table 5*).

Table 5: RSS Tendencies by Attitudinal Group

Attitudinal Group	Modal Choices Made Prior to Residency?	Opinion towards prioritisation of modal preferences over neighbourhood factors statement
Group A	✓	Expressed <i>disagreement</i> with the statement
Group B	✓	Expressed <i>a neutral opinion</i> towards the statement
Group C	✓	Expressed <i>agreement</i> with the statement and intended to use a sustainable mode
Group D	✓	Expressed <i>agreement</i> with the statement and intended to use an unsustainable mode

Table 6 demonstrates what proportions of the population sat within each grouping.

Table 6: Proportional Presence of RSS Attitude Groups in the Sample Population

	% of Sample Population	N
No Prior Modal Intentions	27.49	229
Group C - Sustainable RSS	20.41	170
Group A	15.73	131
Group D - Unsustainable RSS	12.85	107
Group B	12.24	102
Never Moved Residence	11.28	94

The important conclusions to be reached from Table 6 are threefold. Firstly, the largest segment of the sample (38.77%) is not involved in self-selection according to modal preferences. Secondly, the presence of RSS tendencies in the sample population constitutes just over a third of the total population (33.26%; Groups C-D). Lastly, just under a third of the sample did not prioritise modal factors when choosing a home but did choose their mode prior to residency (27.97%; Groups A-B).

The third objective of the study sought to identify the demographic characteristics associated with RSS behaviour. A series of statistical tests allowed for comment on the population characteristics of those with RSS tendencies¹⁵. Moderate or strong associations suggested the following profiles:

Sustainable RSS Tendencies (Group C): Generally living in rented apartments in sustainable travel areas with access to slightly restricted parking. They are more likely to have no access to a motor vehicle and their intention to use a sustainable mode is a continuation of past modal experiences. Predominantly less than 45 years of age with a higher possibility of being an immigrant, most will move again within 5 years' time.

¹⁵ The respondent characteristics associated with unsustainable RSS tendencies were almost identical in composition to Group A-B respondents. Those uninvolved in self-selection had a much more balanced distribution across all occupancy types, housing types, ages, residency areas and car ownership level variables.

Unsustainable RSS Tendencies (Group D): Generally living in owned houses in unsustainable travel areas with no restrictions to parking access. They are more likely to have access to 1-2 motor vehicles and their intention to use an unsustainable mode is a continuation of past modal experiences. Mainly older than their 'sustainable RSS' counterparts and unlikely to be a migrant, most will live in their current residences for at least another 6-10 years or more.

RSS would appear to be a contributory factor, but not the sole explanatory factor, for the modal split characteristics observed in areas of contrasting urban form. For this to be the case, RSS tendencies would have had to have been acted upon in practice and resulted in residency in an area which would facilitate a particular mode. A simple frequency comparison of the current areas of residence for each RSS tendency from *Table 6* is shown in *Table 7*. This observation shows that Group C respondents did locate in areas suitable for sustainable modes in most cases. In sustainable travel areas, RSS tendencies accounted for 40% of residents with a lower 22% proportion for unsustainable travel areas. Those who do not prioritise a particular mode tended towards unsustainable travel areas by default while those uninvolved in self-selection are nearly equally split between study areas. This latter group represents the control variable and this would confirm that the presence of RSS transport attitudes causes significant variation from the norm in residential location choices.

Table 7: Study Area of Residence for Each RSS Attitude Group (Cramers V; .417, P0.00)

	Sustainable Travel Area	Unsustainable Travel Area	
No Prior Modal Intentions	108	121	229
Group C - <i>Sustainable RSS</i>	134	36	170
Group A	42	89	131
Group D - <i>Unsustainable RSS</i>	18	89	107
Group B	33	69	102
Proportion of Residency Based on Mode-Specific RSS Tendencies	40%	22%	

A binominal logistic regression test was performed to confirm these results and ascertain the degree of likelihood that current areas of residence could be predicted from RSS tendencies when such preferences were present¹⁶. The logistic regression model (*Table 8*) was statistically significant (N; 510, $\chi^2(3)=135.579$, P0.00) and the model explained 31% of the variance (Nagelkerke R^2). No statistically significant differences were observed between Group A and Group B respondents. Respondents with an unsustainable RSS tendency were 2.33 times more likely to live in unsustainable transport areas than Group A respondents. Sustainable RSS tendency respondents were 87% less likely to live in unsustainable travel areas than Group A respondents. The model would confirm that RSS tendencies appear to have a strong influence on the residential location chosen by the respondent. Yet such attitudes are not the only explanatory factor in residential choices and a majority of the population do not agree that they would act in this manner.

¹⁶ Those who 'had never intended to use a particular mode' were excluded from this test as their almost random residential distribution would reduce the effectiveness of the model and they had shown no traits of being involved in self-selection.

Table 8: Logistic Regression Model Results; Current Residency Prediction by RSS Tendencies

Dependent Variable Encoding					
Residency in Sustainable Travel Area = 0					
Residency in Unsustainable Travel Area = 1					
<i>Variable</i>	B	S.E.	Wald	Sig.	Exp(B)
Constant	.751	.187	16.092	.000	2.119
RSS Tendency Type					
(Base = Group A)			109.115	.000	
Group B	-.013	.283	.002	.962	.987
Group C - <i>Sustainable RSS</i>	-2.065	.265	60.687	.000	.127
Group D - <i>Unsustainable RSS</i>	.847	.319	7.050	.008	2.333
Number of Cases	510				
Nagelkerke R^2	31.3%				
Hosmer & Lemeshow test	P = 1				
Classification accuracy	74.4%				

6. Discussion and Implications for Research and Policy

There are a number of limitations to the study described in this paper. Respondents were asked to express agreement or disagreement with a statement about prioritisation of transport factors when choosing where to live. The same respondents were asked to explain whether or not they chose a particular mode before moving to their current residence. This introduces the possibility that attitudes have changed over time due to residency in particular areas (Van Wee, 2009) e.g. a respondent made a prior choice of mode due to practical requirements but after travelling in this way, now decides they would pursue future residential locations to facilitate this mode. The issue of bias in the sample (Section 4.4) also means there is an underrepresentation of younger respondents, who were shown to be more likely to fall into Group C. If this group had been more accurately represented, it is possible that the tendency to self-select for sustainable modes would have been more prominent.

The main conclusion regarding the research objectives is that modal characteristics of areas of contrasting urban form do not appear to be the sole result of prior self-selection. The original research question in this paper was:

“Do people choose to live in areas to facilitate their preferred modes or can policy makers influence modal choices by creating particular urban forms?”

The findings of this research project would appear to support the approach of building denser, mixed-use developments with alternative transport options to promote sustainable travel behaviour. This would support the assertions of Naess (2014) and Van Wee and Boarnet (2014) that the presence of RSS does not invalidate the importance of land-use measures in transport planning policy. Furthermore, modal use was often shown to be a continuation of previous travel experiences so the creation of areas not reliant on the private car would encourage this behaviour in future moves.

However, travel-based RSS does appear to be a contributing factor to the transport characteristics of contrasting urban form areas with this occurring to a greater extent (40%) in sustainable travel areas. Due to the weak performance of public transport preferences, when self-selection occurs in the Greater Dublin Area it is for active modes or car preferences with the latter accounting for 22% of residents in sprawl areas. While a tendency to agree with prioritisation of modal preferences over neighbourhood factors is exhibited in a minority of respondents (33.3%), another 27.9% of respondents do not prioritise modal preferences but have chosen their mode prior to living in a location. Therefore, it could be stated that modal preferences are important when choosing where to live for 61.2% of respondents, with 33.3% prioritising them over neighbourhood factors. This finding does not invalidate the role of urban form as residents will be aware of the travel limitations of particular urban areas and choose modes accordingly (Naess, 2009; 2014). But contrary to the views of Naess (2014), it does appear that in particular instances for the population under study; household location choices have been made on the condition of facilitating particular travel preferences. Similar to the research of Pinjari et al (2007), it would seem that self-selection does not occur for all respondents because residential location is an acceptable compromise between the needs and limitations of the residents involved, with transport preferences not acting as a priority for all.

The comparison of sustainable or unsustainable travel areas outlined that residents of the former are transient while residents of more car-dependent areas are less residentially mobile. For land-use policy to affect permanent modal shift, this situation may need to be reversed. The respondent characteristics associated with those in Group C show that they are more likely to be younger, renters, without families or access to a car. Those in Groups A-B-D are generally older owner-occupiers with families and access to motor vehicles. This suggests that at a particular life stage other factors take priority over travel preferences and residents have to 'graduate' to car and household ownership in sprawl areas. The study area selection process highlighted that sustainable travel areas are limited across the GDA and rarely provide for people who want to own their properties or live in houses, aspects which would increase the occupancy length (*Figure 3*). This presents the following issues:

- The small number of sustainable travel areas located in the GDA means a certain amount of self-selection to pursue a preference, or requirement, to use active modes is inevitable in order to avoid the majority of areas where such means of travel could not be realised.
- The lack of supply of family-sized houses for sale, in sustainable travel areas immediately eliminates this type of residency for many population groups even if price is not considered e.g. the low proportion of families in central areas (*Figure 3*)

These issues support the argument made by Chatman (2014) that research which controls for residential choice fails to consider issues regarding varying market segments for housing and regional supply to facilitate different housing demand. Levine's (1998) research found that affordable denser housing with shorter commutes was a key attractor in housing demand for a particular population subset: lower-moderate income groups and single worker households. The short supply of this type of housing in favour of "low-density, large-lot, automobile-dependent development styles" meant that those who would have, or might have, chosen to live in localities where sustainable alternative housing was available could not do so (Levine, 1998). This 'undersupply of alternative housing' was questioned by Cao (2008) in his study from Northern California but it would seem in the GDA that areas where sustainable travel can be realised are very limited with the housing unit and occupancy types available within them unsuited to long term residency.

On this basis, it would appear that the urban context and housing supply characteristics of the GDA have contributed to the presence of self-selection in the sample population and also threatened the permanency of the modal shift achieved by land-use measures.

7. Conclusions

This research set out to answer the question: *"Do people choose to live in areas to facilitate their preferred modes or can policy makers influence modal choices by creating particular urban forms?"*

The paper sought to contribute to the debate regarding the relative influence of urban form and residential self-selection on modal choice. It would appear that while some members of the population do exhibit elements of residential selection and choose to live in locations that suit their travel preferences, for others their modal choice can be influenced by urban form. The paper has identified in the survey population, the characteristics of people who fall into each of these groupings. The travel characteristics of more densely populated areas with more local jobs and public transport options are in significant variation to the motor vehicle dependency observed in areas with low housing density and limited local employment.

Travel-based residential self-selection is a contributory factor to the modal split characteristics of areas but not to an extent that would invalidate the positive role of land-use measures in promoting sustainable travel. In respect to the presence of RSS tendencies in the population, the discussion has highlighted the context specific nature of land-use transport studies and the problematic issues that could arise in taking results from one urban region and applying those assumptions to another. This paper suggests that some segments of the population do self-select areas according to modes but this takes place in a city with restricted travel options and a polarised housing market. These conditions put greater emphasis on the need for non-car modal preferences to be achieved by residents who, out of necessity or inclination, do not wish to live in the majority of areas more suited to vehicle use. If the urban area provided equally distributed and diversified land-use characteristics with a variety of housing and transport options across all areas, would self-selection still be present? Answering this question requires further studies from European contexts as the current scope for cross-comparison is limited. It cannot be confirmed whether these results reflect a GDA specific bias, a mono-polycentric city bias or even indeed a cultural impetus in the population to live and travel in a certain way at different life stages. Improving our knowledge of RSS is important for the creation of effective policies that co-locate transport and housing but greater focus is needed on the decision process involved in the consideration of transport preferences in housing choice. Further understanding of when sustainable transport preferences cease to take priority in housing location may allow for greater insight into how tailored housing policies could encourage those with sustainable RSS tendencies to live and travel in this way for the long term rather than for just a short period of their lives.

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