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Editors

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Table of Contents

Table of Contents

COGITATIO

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Editorial

The Importance of Transport for Social Inclusion

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Abstract
Links between mobility, social exclusion and well being, and matters related thereto, have been an important focus of research, planning and policy thinking in the land use transport field for about the past two decades, in places such as the UK, Australia, South Africa, North America and parts of South America. This introductory paper to the journal volume on *Regional and Urban Mobility: Contribution to Social Inclusion* summarizes some of the key literature in the field during that period, illustrating how research sometimes takes a place-based approach and at other times focuses on groups of people likely to be at risk of mobility-related social exclusion. The ten articles in this journal volume explore aspects of these relationships, mainly through the lens of at risk groups, across a number of social-spatial settings. Articles draw on case studies from the Philippines, UK/Germany, UK/Colombia, Lisbon, Gilgat-Baltistan, Turkey and Japan, providing a broad set of contexts. The different language and frameworks used by researchers from different professional backgrounds, as illustrated in this volume, highlights some of the barriers that need to be confronted in progressing policy to improve the lot of people experiencing mobility-related social exclusion.

Keywords
cars; mobility; public transport; social inclusion; transport; urban design; walking; youth

Issue
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1. Introduction

The ability to be mobile has always been important to humans, facilitating vital connections with people and places. The culture and functioning of a society or community, shapes, and is shaped by, the need, ability and choices for travel: the distance travelled, the means of travel, who travels and why. In agriculturally-based economies work was located within an acceptable travel time from where the person lived, commonly by walking or perhaps use of an animal for transport, defining the spatial limits to a village's agricultural pursuits. Thus, housing and work environments were closely located, as were common spaces used for the attainment of goods and services and to meet other needs, such as 'religious' practices and social interaction. The way that trip numbers decrease with increasing travel times, and how this might reflect social exclusion, is considered in the article by Cao, Stanley and Stanley (2017) in this journal edition.

The movement from a small agricultural economic base to industrialisation, work specialisation and the movement of people from rural areas to live in urbanised areas, changed travel requirements and increased travel distances but not necessarily travel times, as illustrated by work on travel time budgets (e.g., Marchetti, 1994; Zahavi, 1979). To meet this need, the car has increasingly been the dominant form of transportation in industrialized countries since the 1950s, and in the last few decades there has been rapid growth in car use in industrializing countries. It is estimated that there will be

more than two billion cars globally by 2030, representing a 250% increase in less than 30 years (Sperling & Gordon, 2009). Motorisation is increasing at more than 10% per annum in many cities in industrializing countries (Gakenheimer & Dimitriou, 2011).

2. The One-Sided Transport Option

As car ownership increased for most people, so society became increasingly re-structured to accommodate the private car, roads widened and freeways built, shopping and service centres with parking surrounding them, reflecting a predict-and-provide transport planning mentality. As a result, it has become increasingly harder to travel by other means—walking, cycling or public transport. One of the authors recently foolishly attempted to walk from her hotel accommodation to a meeting in nearby Parliament House in Canberra, Australia's national capital, a feat achieved with considerable detours to cross a freeway and avoid fences and necessitated hiking over large expanses of long wet grass!

Public transport is often in scarce supply outside the central parts of cities. In rural areas and in many cities in industrializing countries walking and cycling have become increasingly difficult and often dangerous and many people rely on informal transport. Movement corridors are made for vehicles. In most urban settings houses are built facing roads instead of bike paths or walkways. Provisions like traffic signals at intersections are timed for the maximum benefit of vehicles, pedestrians sometimes having to wait a long time to cross a road, having to watch out for turning traffic and, unless taken at a running pace, may need two light cycles to cross some roads. Bus stops commonly have no (or minimal) seating and there are few charging stations in urban areas for people on gofers (Stanley, Stanley, & Hansen, 2017).

In industrialized countries, and now in many industrializing countries, the growth in car use is defining urban structure and establishing a trajectory of (path dependent) private vehicle-based solutions. In Melbourne, from 1875–1975, for example, a pattern was established of suburban high-status living and inner-city slums, due firstly to rail transport, then the growth of car ownership, underpinned by the wide spread of employment opportunities. Since that time, structural economic change has led to growth of high productivity/high income knowledge economy jobs in inner areas and loss of manufacturing jobs in middle/outer suburbs. Inner urban land values are soaring in response, densities increasing and lower income households are increasingly 'forced' to the outer fringe or to small apartments in inner areas. The increasingly gentrified inner area receives the benefit of high quality public transport services and outer suburbs are increasingly becoming centres of disadvantage, largely reliant on car travel, with low public transport service levels.

O'Brien, García Vélez and Zaltz Austwick's (2017) article offers insights into a growing area of interest in relation to mobility and social inclusion: the impact of spatial urban design, particularly roads and streets, on community connections, and how the built environment impacts on movement patterns and influences feelings about the spatial areas of their community and sense of place. Interestingly, the authors went straight to seek the views of a group seen by many researchers the group at greatest risk of social exclusion as a result of problems around mobility: children and youth. O'Brien et al. (2017) sought the opinion of youth (11 to 19) in two major cities, Liverpool, UK, and Medellin, Colombia.

The functional importance of transport is mirrored in its significance in household expenditure patterns. In the UK, for example, transport is the largest single household expenditure item, marginally ahead of housing and accounting for 13.7% of average weekly household expenditure (Office of National Statistics, 2017). In the US and Canada, transport is the second largest component of household expenditure, representing 15.8% of consumer expenditure in the US (Bureau of Labor Statistics, 2017) and a high 19.4% in Canada (Statistics Canada, 2017). In both those countries, housing is the only sector with a higher expenditure share. In Australia, transport accounts for 14.5% of household expenditure (Australian Bureau of Statistics, 2017), the third highest expenditure share (behind housing, and food and beverages—we Australians are very hospitable!). In countries that are less car dependent and where public, informal and active travel play greater roles, transport represents a smaller proportion of household spending (e.g., 6.2% in the Philippines and 11.2% in Japan) (Philippine Statistics Authority, 2017; Statistics Japan, 2017).

The high proportions of household spending that goes on transport in countries like Canada, the US, Australia and in rural areas of the UK, particularly where settlement densities are low and car dependence high, has led to the idea of 'forced car ownership' (FCO). In such settings, people generally have little alternative to buying and using a car to be able to participate in the opportunities available in their society, because of a lack of alternative mobility choices (Currie & Senbergs, 2007). With housing usually number one or two for household expenditure share and house prices increasing strongly in many economically successful cities (e.g., Vancouver, Melbourne), the notion of 'forced car ownership' and its associated stresses is highly pertinent for contemporary transport and social inclusion policy.

In this volume, Mattioli (2017) explores FCO in a comparative study of the UK and Germany, extending it to include consideration of potential economic stresses. He finds that people subject to FCO have lower overall levels of social exclusion and material deprivation than households who cannot afford cars but are worse off than 'car deprived' people in a number of domains, including in-work poverty and fuel poverty. Enforced lack of durables is found to be rare among FCO but their levels of economic strain are very close to those of other materially deprived households, despite higher incomes. The authors conclude that more compact settlement patterns

should assist to reduce problems of FCO but these need to be complemented by policy measures in other sectors, such as housing, employment and welfare.

In places such as the UK, Europe, Canada and the US, there is a recent movement against low density development patterns associated with car dominance, with projects such as traffic calming, streets opened to pedestrians, and improving and greening open and public spaces in many cities increasingly common, located within a compact city development framework. Aspects of this trend are also being seen in Australian cities.

3. Social Inclusion Implications of a Lack of Transport

Land use patterns associated with high levels of car dependence have systematically disadvantaged some people, overlooking their travel needs. New urban fringe developments and even a move towards peri-urban settlements offer the most affordable housing for many people in industrializing countries and migrant families, newly established families (first home buyers) and those with a low income, such as sole-parent families, in industrialized countries. Declining investment in transport infrastructure and poor job generation in fringe suburbs that frequently lack transport connections to areas of major employment and other services, is a major problem in terms of entrenching social exclusion (National Institute of Economic and Industry Research, 2010).

Transport in rural areas is far more car dependent and the car plays a vital role in supporting social inclusion in rural and regional areas, particularly in countries like the US, New Zealand and Australia. For example, in Australia, public transport service availability was found to be between five and six times higher in metropolitan Melbourne than in a major Victorian region (Currie & Delbosc, 2011). Some 24% of surveyed regional respondents indicated that there were activities they could not do because of transport problems, compared to 15% in the metropolitan area. Not surprisingly, there was a higher level of risk of social exclusion among regional residents than their metropolitan counterparts. The role of regional public transport in supporting social inclusion is notable (Stanley & Banks, 2012).

Regional and rural people usually find a range of ways to adjust to a lack of local/regional public transport opportunities: buying additional cars (with problems of FCO); walking long distances; undertaking less than optimum negotiations with local options (such as the more expensive local store); establishing support and reciprocity arrangements with others; and modifying or going without some needs. Walking is used for about one-third of all trips in African cities and up to 90% of trips in smaller and poorer cities in Asia (Cervero, 2013a, 2013b). To help fill this travel hole, paratransit or community transport has become established in most industrialized countries. While this meets some needs for some people, it often tends to be exclusionary in itself, removing control of movements away from individual decision-making and being limited in accessibility options. In industrializing countries, informal transport options meet many transport needs for those at risk of social exclusion. This fulfils a need for many, but often at the cost of safety and pollution (Cervero, 2013a).

4. The Interface between Transport, Social Inclusion and Wellbeing

Internationally, over the last decade and a half or so, there has been interest in the unequal distribution of transport mobility benefits between different social groups and/or different areas, particularly as this relates to people without private car access in communities that have become increasingly car-dependent. The Social Exclusion Unit (SEU) popularised this recent awareness of the social value of transport, exploring accessibility barriers that make it difficult or impossible for people to participate fully in society (SEU, 2003). Also, US Federal public transport assistance, through the *Safe, Accountable, Flexible, Efficient Transportation Equity Act*, targeted employment access, elderly individuals and individuals with disabilities (SAFETEA, 2005). Such work builds on earlier interest in access for people with disabilities.

Researchers such as Mollenkopf, Marcellini, Ruoppila, Szeman and Tacken (2005) added a focus on wellbeing impacts of mobility opportunities for older people to the evidence base on transport, inclusion and wellbeing. Australian research then demonstrated how mobility improvements can reduce risks of social exclusion and enhance wellbeing for those at risk of social exclusion and that a high unit value can be imputed to such mobility improvements, this value increasing as household income of the beneficiary reduces (Stanley, Hensher, Stanley, & Vella-Brodrick, 2011).

Despite this broadening approach to social goals of transport, there is still only limited work on social goals in transport and the policy that needs to be put in place to support these. SEU (2003) gave emphasis to the need for accessibility to a number of specific services which they nominated: work, health services, shopping, school and to a lesser extent, leisure activities. In summary, the SEU identified five transport accessibility solutions that are likely to facilitate social inclusion. These are:

1. Increasing the availability of, and reducing the physical barriers to, public transport: this deals with circumstances where public transport is either not on offer or not able to be utilised by a person due to factors such as steps to board a bus or tram;
2. Making transport more affordable: this particularly targets people who are socially excluded for reasons of low income;
3. Reducing the need to travel, by bringing services to people or changing the location of services;
4. Changing the perception that public transport is not safe; and,

5. Widening travel horizons: people on lower incomes, for example, were found to often be less prepared to travel as far to reach work as those on higher incomes.

Australian regional and urban research found that groups of people at risk of social exclusion tend to have relatively lower rates of trip making than others (Stanley et al., 2011). That work proposed recommendations in five main areas, generally in line with the accessibility approach of the SEU:

1. Public transport service enhancements: the study proposed a set of minimum service standards for the route bus system in existing urban areas and in growth suburbs (hourly services on seven days a week, for at least 12 hours a day and longer on some days). It found that this initiative would benefit large numbers in most of the transport disadvantaged groups studied, providing improved travel options for many of their desired activities;
2. Marketing of public transport services: relevant initiatives include awareness programs for seniors, dealing with racism on public transport and extending two-hour tickets to three hours, the latter to allow greater activity linking at reasonable cost;
3. Regulatory reform: greater flexibility in use of the area's school bus system by transport disadvantaged (and other) groups was recommended, to enhance accessibility and improve efficiency of resource use;
4. Transport system planning: restructuring transport planning, to focus on needs identification for improved accessibility rather than on individual transport modes; and,
5. Research: improving understanding of the direct and indirect linkages between transport disadvantage, social exclusion and wellbeing.

Most accessibility planning nominates activities which it is thought people 'should' be accessing, which typically includes employment, education, shopping and such like. Australian findings suggested, however, that transport may have an important role in facilitating the development of social capital and community strengthening, both being a means of facilitating improved personal wellbeing, which is often not recognized by accessibility planning approaches. For example, social capital is created through interpersonal contacts. Implied in this is the need to 'access' people. This can be done through electronic media, but face-to-face contact is still the most common means used for socialising, as evidenced by the plethora of coffee shops, cafes, nightclubs and other less formal social contacts. Face-to-face contacts build trust and deeper relationships. The literature does not consider how this access is best achieved, however face to face contact seems likely to be an important component. Thus, to create the possibility of contributing to various forms of social capital, a person usually needs to be mobile, through car travel, public transport, walking or other means.

Further investigation of the role of mobility in reducing social exclusion looked at the more subtle but important positive outcomes that can arise through the simple ability to be mobile, beyond the meeting of basic needs—education, employment, health and access to supplies. Empirical research showed that mobility enables individuals to accumulate social resources and obtain skills, thus gaining a sense of satisfaction, positive emotions and mental health (Vella-Brodrick & Stanley, 2013). The skills of environmental mastery, positive relationships with others and self-acceptance are all developed (Ryff, 1989). This creates an upward spiral of positive affect that promotes more sustained wellbeing, and mobility is a means of improving mental health. Such mobility is particularly important for youth in isolated regions who lack bridging social capital and risk loss of self-esteem, confidence and risk developing helplessness traits and continuing inter-generational social exclusion (Stanley & Stanley, submitted for publication). Thus, these less direct pathways of the value of mobility to those at risk of social exclusion can offer social and economic benefits, reducing the need for welfare support and health services and give rise to increases in productivity.

5. Capabilities and Primary Goods

The literature on social inclusion often includes discussion from major philosophers such as Rawls (1971), Sen (1993), and Nussbaum (1999), discussing social justice and the requirement for all people to be able to meet their needs in order to achieve wellbeing. Needs range from physiological requirements, safety, relationships, to self-esteem and self-actualisation. Mobility plays a vital role in enabling people to meet these objectives and be included in a well functioning society.

In the current volume, Hickman, Cao, Mella Lira, Fillone and Bienvenido Biona (2017) apply a capabilities framework to help understand travel as between high and low-income neighbourhoods in Manila. This is useful because there have been few such attempts to operationalize the capabilities approach in a transport/travel setting. The article distinguishes between what people might be able to access (capabilities) and their actual travel, which the authors term 'functionings'. Hickman et al. (2017) find significant differences by gender, age, income and neighbourhood, with social equity implications. The authors note that a capabilities approach is empirically difficult but offers opportunities to better incorporate social considerations alongside economic and environmental factors in a travel setting.

6. Who Is at Most Risk?

Discussion of the population groups most likely to be at risk of social exclusion due to relatively poor mobility op-

portunities typically highlights older people, youth (especially young people living in rural settings), people with a disability, people with language difficulties (e.g., recent arrivals), those on low incomes, and those with little or no car access, with women and single parents also sometimes included (Currie & Delbosc, 2011). People exhibiting multiples of these characteristics seem likely to be at relatively higher risk. The authors' current research also suggests that pre-school children should be added to this list, particularly in regional Australia, because of the demonstrated high lifetime costs that are potentially associated with being unable to attend pre-school. More generally, this volume includes a large number of presentations that focus on particular types of people who are more likely to face risks of social exclusion due to their mobility circumstances.

Akyelken (2017) explores how gender affects mobility-related economic exclusion in industrial zones in Turkey. The author uses a mixed methods approach to explore how men and women from different social backgrounds access industrial zones, to identify specific constraints that women face in accessing economic opportunities. Women's socioeconomic and educational backgrounds emerge as important predictors of commuting patterns and access to the industrial zones. The study confirms that gendered daily travel patterns are a useful unit of analysis for investigating unequal access to economic opportunities. Employer perceptions of women's work spaces and time use also emerge as important considerations.

Cao et al. (2017) seek to identify areas of relative transport disadvantage within an archipelagic region of the Philippines. The authors assess constraints that limit travel between cities and townships by undertaking a small travel behavior survey and developing a trip generation/distribution model, applied across four population centres, to observe how physical isolation from larger centres of social confluence can be reflected by lower trip volumes and associated increases in risks of social exclusion. The article estimates how faster inter-island travel times will impact on inter-island travel opportunities for people living in areas of relatively greater transport, social and economic disadvantage, with the expectation of associated reduction of exclusion risks and improved economic opportunities.

Yamamoto and Zhang (2017) examine mobility challenges facing elderly people in rural Japan, where declining population numbers, a shortage of public transport services and reducing opportunities for being driven by elderly male family members or friends are combining to increase exclusion risks. The article illustrates how cultural attitudes and social norms affect the ways in which older people manage their mobilities. An interesting question is whether the tendency of the older people who were surveyed to 'accept', somewhat resignedly, their circumstance of likely reduced mobility should determine policy responses, or whether policy makers should actively seek to promote adequate mobility opportunities for all, to ensure inclusion. Our view is firmly in the latter camp.

Hussain, Fisher and Espiner (2017) use a qualitative approach to identify a range of impacts associated with development of Karakoram Highway in the remote Gilgit-Baltistan region, which is administered by Pakistan. Development of the road has underpinned accelerated growth in population and tourism in particular, in this mountainous region. Consultations suggest that this has reduced the region's isolation, broadened employment and income generating opportunities and improved access to education, healthcare and goods and services. People's knowledge of surrounding areas and of other cultures has increased, associated with increased travel opportunities and the influx of tourists. The authors argue that these impacts are indicative of greater social inclusion. Conversely, some respondents to the study's surveys suggested that the road had altered the peace in the area (which was previously a single ethnic group with local governance) and others thought that there 'has been a decrease in love, respect, and relationship' and a reduction in the old sense of community. The authors recognize this as a simultaneous reduction in inclusion, at one scale, alongside an increase at another.

Migration is the focus of two papers in the volume. Viry, Ganjour, Gauthier, Ravalet and Widmer (2017) assess associations between social visits and migrants' social capital, from a Swiss data set, with migrants defined by distance between birthplace and place of residence (i.e., not necessarily inter-country migration). Implicit in the analysis is that a higher level of social capital will mean a higher chance of social inclusion. As expected, they show that migrants have more spatially dispersed networks. These are associated with higher numbers of emotional support ties, compared to those with spatially close networks, and higher bridging social capital. Trust, however, declines as network spatial dispersion increases, perhaps partly reflecting the relatively greater influence of bridging social capital, compared to bonding capital, within the survey respondents' social capital stock, as network spatial dispersion increases. Bonding social capital tends to be associated with closer networks. Contrary to their expectations, the authors conclude that distant social visits have relatively little impact on social capital, across a range of social capital indicators. They suggest this result may be due to social visits being an insufficient indicator of the factors that contribute to the process through which family and friendship networks build norms of solidarity and reciprocity and a strong sense of togetherness at a broader spatial scale.

Buhr and McGarrigle (2017) discuss migrant mobilities and use of space in Lisbon, from two perspectives. They first look at migrants' urban knowledge and skills and how they employ them to use Lisbon's resources and then consider some of the ways place-specific urban resources of a religious nature sustain, and are sustained by, various mobility practices. Structural constraints are revealed by these examinations. People attending a Sikh

Gurdwara and suburban mosque provide case study material. Outer urban migrants faced a poor range of work opportunities when their primary employment (in construction) finished, their migrant status compounding the narrow employment choices found in the outer urban parts of the city (similar to challenges faced by people in outer low density cities in Australia and North America). The local religious network of the mosque provided supporting bonding social capital (although the authors do not use this terminology). In contrast, bridging social capital from the Sikh community provided expanded migrant employment choices, partly reflecting its more accessible location within Lisbon. Networks were essentially local with the suburban fringe religious community but wider for the more accessible Sikh community. Locational and religious influences are jointly working on migrant mobilities, experiences of the city and associated opportunities for inclusion.

Transport disadvantage and wellbeing (defined as including measures of social exclusion) of rural high school students in Japan is discussed by Perez-Barbosa and Zhang (2017), with a particular focus on teasing out challenges facing students living in de-populating areas. High school students in three areas of declining population and one of growing population in Hiroshima Prefecture provide the study sample base. The authors find that students living in a depopulating area generally experience longer school trips and rely more on public transport, conditions they define as indicators of transport disadvantage, associated with lower levels of self-reported wellbeing. Lifestyle habits were found to be healthier in the non-depopulating sample, who also performed better on a range of measures the authors use to suggest social inclusion (health condition, participation, accessibility, social support). Conversely, students attending high schools in rural de-populating areas rated more highly, in inclusion terms, on volunteering and enjoyment of a natural lifestyle, matters that are commonly associated with residential choices associated with a rural lifestyle. Disentangling residential location choices and associated available modal options means household decision hierarchies are important in understanding key associations with wellbeing and social inclusion/exclusion.

7. The Value of this Edition

This edition of *Social Inclusion* offers important insights into the association between social inclusion and the ability to be mobile. It offers perspectives on a wide range of disadvantages that have been created by mobility problems, the value of mobility to individuals, communities and society more generally, and possible mobility solutions to facilitate inclusion. It reveals some of the complexities of the subject that now attracts a range of disciplines. This edition has the value of showing the breadth and importance of the topic, but also shows that there is a long way to go to get common language and understandings about the concepts and build a coherent theoretical base. Yet without this development clarity, policy development will not be clear or persuasive.

While this edition offers insights into social exclusion in industrialized countries, particularly those in rural locations and migrants, importantly, it opens up new areas. The Sustainable Development Goals and the New Urban Agenda promoted by the United Nations, and widely being adopted, bravely talk about the need for social inclusion (United Nations, 2015). However, there is little knowledge on this problem in general in industrializing countries and almost no work on the important associations between social inclusion and transport. The two articles based in the Philippines and the Gilgit-Baltistan article in this edition, for example, are welcome contributions at the very beginning stages of this journey.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Indicators of Socio-Spatial Transport Disadvantage for Inter-Island Transport Planning in Rural Philippine Communities

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Abstract
This article seeks to identify areas of relative transport disadvantage within an archipelagic region of the Philippines, so its people can be privileged through the provision of faster inter-island journeys to support social inclusion. It assesses the constraints that limit travel between cities and townships by undertaking a small travel behavior survey and trip generation/distribution model across four population centres, to observe how physical isolation from larger centres of social confluence can be reflected by lower trip volumes and associated increases in risks of social exclusion. The article's methodology makes use of limited information to identify where reductions in inter-island travel time can be proposed for people living in areas of greater relative transport, social and economic disadvantage, so that individual economic and personal travel opportunities can be made more accessible, reducing exclusion risks and promoting well-being.

Keywords
intermodal transport; island; mobility; Philippines; regional development; social exclusion; transport disadvantage

Issue
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1. Introduction

Mobility is often difficult in rural areas and archipelagic settings, where geographical isolation from major population centres is linked to poor accessibility and lost opportunities for inclusion and human development. Understanding transport systems across all modes, and associated constraints, precedes an appropriate institutional response in such places.

The Philippines is a South East Asian nation comprising 7,641 islands that support a population of over 100 million people. This creates mobility and access issues for a country challenged by its archipelagic dispersion of islands, expanding population and rapid urbanization. This article focuses on one of the seventeen administrative regions of the Philippines, MIMAROPA (see Figure 1), which comprises 1,978 islands, 29,621 km2 of land, and is home to approximately three million people (Philippine Statistics Authority, 2017).

The article seeks to understand the problem of social exclusion associated with limited inter-island transport connections in MIMAROPA and to identify some opportunities to reduce exclusion risks and promote greater social equality. It assesses constraints that limit travel between islands, by undertaking a small travel behavior survey and trip generation/distribution model across four of the region's population centres. The observations illustrate how physical isolation from larger centres of so-

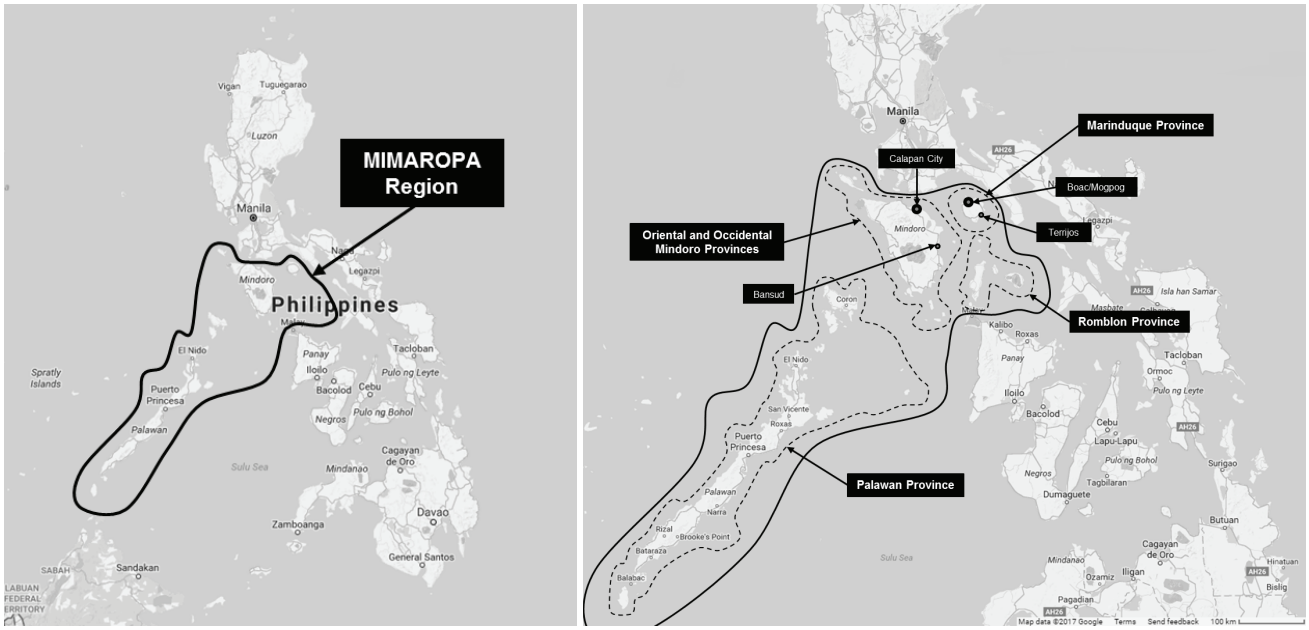

Figure 1. Map of the Philippines, MIMAROPA and its provinces within the Philippine Islands.

cial confluence can be reflected by lower trip volumes, which has implications for individual economic opportunity and social inclusion. Inter-modal network and infrastructure changes are proposed for MIMOROPA, with a view to improving mobility opportunities for people from areas of greater relative transport, social and economic disadvantage.

The article is organized as follows: Section 2 summarizes key literature relevant to the subject matter, focusing particularly on transport/mobility and social inclusion in a rural/regional setting; Section 3 provides background information on the study area; Section 4 sets out the findings from a survey undertaken for the study, to shed light on whether rural/regional people are likely to be at risk of social exclusion for reasons of lack of transport opportunities; Section 5 presents the results; and Section 6 includes some discussion and sets out the article's conclusions.

2. Literature Review

The contemporary literature on social exclusion has a strong focus on developed economies, such as the European Union and Australia, where large-scale social environments have been built around the assumption of high mobility. Levitas et al. (2007, p. 9) define social exclusion as:

> The lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities available to the majority of people in a society, whether in economic, social, cultural or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole.

Social exclusion thus implies that an individual is not able to participate in the mainstream society in which he or she lives (Piachaudt, LeGrand, & Piachaud, 2002), and some groups are particularly subject to social exclusion risks, such as children and youth, elderly people, those with a disability, those on low incomes, and those who live in rural or isolated areas (Stanley, Hensher, Stanley, & Vella-Brodrick, 2011).

Social exclusion is often linked to the role of transport in providing individuals with access to increased opportunities for social interaction (Stanley, Stanley, & Davis, 2014). The link between social exclusion and transport is mediated through development of a form of social capital known as bridging social capital (Vella-Brodrick & Stanley, 2013). Different networks of connected people create different types of social capital (Stone, Gray, & Hughes, 2003). *Bonding social capital* assists the process of 'getting by' on a daily basis. The networks are close and dense and foster trust and reciprocity. *Bridging social capital* allows people to 'get ahead' by accessing multiple networks and therefore resources and opportunities, thus increasing social inclusion. For remote island communities dependent on inter-island transport, access to a broader range of social and economic opportunities is likely to be impeded by expensive, infrequent and unreliable transport.

The concept of social exclusion has not been adopted in developing countries until comparatively recently. The World Bank published what would appear to be its first report on social inclusion in developing countries in 2013, but it does not refer to the association between transport and social inclusion. Social exclusion is mentioned in five of the United Nations' 17 Sustainable Development Goals (United Nations, 2017). Sustainable Development Goal 11, urban sustainable development, includes an important sub-section on transport and refers to vulnerability:

> 11.2—By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all people and goods, improving road safety and expanding public and non-motorized transport, with attention to the needs of those in vulnerable situations. (Simon & Arfvidsson, 2015, p. 6)

The Sustainable Development Goals are becoming increasingly important in defining global policy and priorities, becoming the main criteria in 2015 for setting geographical priorities in decentralized development cooperation, that is, cooperation between international cities and regions (Marta & Akhmouch, 2017). Thus, understanding the role of transport and its impact on social inclusion is of considerable importance to the Philippines, given the disparities in social equity between its cities and regions (see Section 3 below). Understanding disaggregated sub-national metrics that reveal regional disparities is said to be important in understanding a country's achievement of goals, despite possible challenges in gathering this data in developing countries.

Social exclusion is commonly concentrated in fringe and peri-urban areas in both developed and developing cities (UN-Habitat, 2013). Similarly, rural and regional areas commonly have higher levels of social exclusion and accessibility barriers, where people have difficulty reaching services to meet their essential needs due to poorly developed public transport systems.

Social exclusion needs to be understood within a cultural, political and spatial context. In a developed country, social exclusion is understood as an inability to have the opportunities to take part in the dominant societal structures/economic paradigm, in terms of employment, service availability and participation. This paradigm is commonly being replicated in developing countries where a form of market-based capitalized economy is seen as the solution to removing poverty. However, inclusion and well-being could also be viewed in the context of a more traditional economy, based on a village setting.

The work of Sen in the late 1990s holds particular relevance for Philippine rural development. Sen (1999) proposed that development should be evaluated in terms of 'the expansion of capabilities,' so that people can lead the kind of lives they value and have reason to value. Moreover, he indicates that social exclusion is a complex matter and encompasses a range of dimensions that go beyond poverty. For example, the full promotion of human rights and political liberty is central to the contemporary political rhetoric, and the notion of 'development as freedom' characterizes much of the prevailing democratic aspiration.

Transport services are essential in helping people reach destinations they deem important and the transport system is, at its core, invested in enabling individual capacity (Cass, Shove, & Urry, 2005). Mobility is both a direct driver of social inclusion, in that it enables a person to access services and work, as well as being a facilitator of other drivers, enabling people to build social capital and connection to community (Stanley, Stanley, & Hensher, 2012). However, in a developing world, the cultural context for inclusion may well be localized, with paid employment not needed for inclusion, but rather accessibility to health (including quality food and water), and education as the major needed services. Connection to the community and social capital may be able to be achieved through informal and active transport (walking) in a rural village context. The adoption of informal and intermediate means of transport in areas devoid of formal transport supply may be important forms of meeting longer distance mobility needs to support inclusion (Cervero & Golub, 2007). The provision of mobility may also rapidly change with the advance of new technologies, such as low-cost air carriers and faster ferries (Cass et al., 2005; Church, Frost, & Sullivan, 2000).

Connections to bridging social capital and wider social opportunities may be spatially constrained. In an archipelagic setting like the Philippines, where inter-island ferries and connecting transport are important for remote social inclusion and economic participation, it is critical that such transport is made safe, accessible and time efficient, in order to provide basic services, such as health and education, to rural and remote communities. It is the linking of smaller communities to larger regional cities that is particularly addressed in this article.

In terms of literature related to inter-island connectivity in the Philippine archipelago, development constraints imposed by the infrastructure base have been recognized by authors such as the Asian Development Bank (2010), Llanto (2016) and Francisco (2017). Llanto (2016), for example, explains how inter-island connectivity depends on a network of small municipal ports, old domestic ships and the roll-on/roll-off (RoRo) ferry system, with shipping accounting for over 80% of passenger and freight movements in this market segment. Llanto (2016, p. 243) argues that 'stronger external and inter-island connectivity will enable it [the Philippines] to take advantage of trade, investment, and growth opportunities in this dynamic region, thereby fostering inclusive growth', but points out that improvement in these areas faces funding challenges.

Francisco (2017) analyses the effectiveness of the RoRo system, pointing to increases in both agricultural and non-agricultural incomes of households near RoRo ports and in agricultural incomes on nearby islands. Improved school attendance was also identified, household gains from the RoRo system being transferred to their offspring in a process that increases human capital levels. The analysis underlines the importance of the inter-island transport system and, by implication, the potential opportunity for increased social inclusion associated therewith, through improved educational participation and increased household incomes, in both agricultural and other pursuits.

More broadly, however, Roxas and Fillone (2016) note the lack of transportation studies for secondary

cities and peripheral regions in the Philippines. Their research focuses on travel time valuation for inter-island passenger transport in the Western Visayas region, where they find that lower income persons have lower travel time values than those with higher incomes. As expected, therefore, lower income people are more likely to use cheaper, but relatively slower, inter-island transport modes, suggesting RoRo rather than fast ferries, or airplanes where all three are available. This is relevant for the sampling process used in this study.

3. The Philippines and MIMAROPA Region Study Area

Across the Philippines, expensive, infrequent and unreliable transport in remote and rural areas is shown to reduce a person's capacity to access essential healthcare, education and employment opportunities, thereby limiting full development of their human potential (National Economic and Development Authority [NEDA], 2016). In 2016, the Philippine Institute for Development Studies (2016) found that poor and low income families are highly concentrated in rural areas, with the majority of wealthy families living in urbanized areas. Additionally, the United Nations Development Programme (2013) found that development between urbanized and rural areas in the Philippines remained uneven, calling for the Philippine government to do more on inequality reduction efforts in distant and marginalized areas. Reductions to social inequality remain an important development objective of the Philippine government, as reflected in its 2017–2022 Philippine Development Plan (NEDA, 2016).

MIMAROPA's poverty incidence among families, described as the proportion of Filipino people that live below the poverty line, was estimated at 17.4% in 2015, slightly above the national average estimate of 16.5% (PSA, 2017). By contrast, the National Capital Region, which contains the Metro Manila megacity, was estimated at only 2.7% and the adjoining, highly-urbanized CALABARZON Region at 6.7%. The above average poverty incidence in MIMAROPA suggests that social exclusion is likely to be a concern and that bridging social capital should be a particularly important objective, making it a suitable study area.

In 2013, the MIMAROPA branch of the NEDA developed the MIMAROPA Intermodal Transport Plan (MITP). It informed MIMAROPA's Regional Development Plan (RDP) of 2011–2016, which identified the acceleration of socially inclusive transport infrastructure as part of its agenda (NEDA, 2014). More specifically, it sought to integrate MIMAROPA's agriculture and tourism sectors with the wider Philippine economy, expand the transport network to increase the inter-connectedness between MIMAROPA's five island provinces, position MIMAROPA's administrative centre, Calapan City, as the central node for the region's transport network and, last, to improve social equity through the prioritization of infrastructure in areas of comparatively poor access to jobs, services and people. This last objective is the primary focus of this article, particularly in terms of promoting social inclusion and improving the well-being of remote communities.

The small study is limited to passenger-based transport with a trip distance range of 0 to 300 kilometres and a focus on intermodal transport (RoRo and buses/vans). Previous work on disadvantage and transport in the MIMAROPA Region was produced by NEDA between 2011 and 2014, as part of an evidence-building exercise to inform MIMAROPA's MITP and RDP (NEDA, 2014). It acknowledged at the time that MIMAROPA's transport network lacked a fully organized system that linked its island provinces directly to one another:

> Traditionally, the region has relied on private sector efforts to operate transport services. However, transport service providers thrive in the high-risk environment through the trial-and-error of routes, some with non-regular schedules, or 'special trips.' Moreover, it operates within poorly developed infrastructure assets that are poorly constructed, situated, and designed. (NEDA, 2014, p. 81)

That work developed 28 indicators of transport disadvantage in MIMAROPA, measuring traditional indicators such as travel time and journey reliability, through a survey distributed to 220 respondents across the region's five provinces. This produced a baseline understanding of MIMAROPA's transport system from the perspective of key stakeholders, which included land-transport operators, traffic managers, urban planners, academics, consultants, infrastructure advisors, private-sector investors, airport managers, tourism officers, maritime shipping operators and members of the Philippine coast guard.

The development of a polycentric transport network is central to this study's methodology of generating data (see Figures 2 and 3). A polycentric network refers to a network of communities, municipalities, regions or nations that join together for a shared or common goal. The networks can be driven by social, political, or industrial needs at local to global scales (Kramar & Kadi, 2013). The established movement corridors serving MIMAROPA's five island provinces operate as part of a broader hub-and-spoke network, where services centralize and gravitate towards the National Capital Region, containing Metro Manila. In Figure 2, the National Capital Region can be denoted as 'S' and MIMAROPA's five provinces as 'A' through to 'E'. 'F' through to 'H' can be referred to as other regions. The RDP recognizes that this network type lacks direct services between neighbouring provinces, forcing intermodal transfers between indirect nodes where people do not necessarily need to be. Thus, the RDP's response is to develop a polycentric transport network where direct 'port-to-port' services between provinces are prioritized, to lower inter-island travel times. The RDP's preferred network type is conceptualized in Figure 3. It promotes a regional polycentric hub-and-spoke system, where rural cities have increasing degrees of interconnection within their own region.

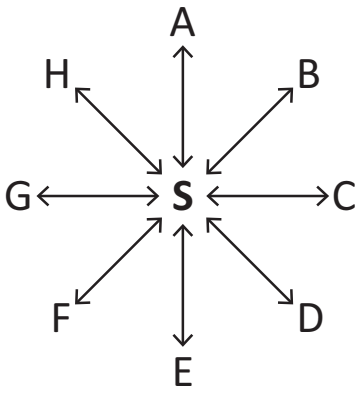

Figure 2. Hub-and-spoke network development (Starkey, 2006).

In Figure 3, larger cities in MIMAROPA—such as Calapan City or Puerto Princesa City—can be denoted as 'B', or 'D', with smaller towns, such as Bansud and Terrijos, referred to as 'o', 'z', 'y', and so forth.

The methodology developed for the current study intends to contribute to the knowledge base that tests the idea of polycentric inter-island transport networks in rural archipelagic settings. As noted, MIMAROPA's RDP seeks to improve social inclusiveness by investing in comparatively remote areas that lack good inter-island transport. It identified six seaport locations as having potential to facilitate more inter-island connections: Cawit (Marinduque), Pola (Oriental Mindoro), Taytay (Palawan), Cuyo (Palawan), San Jose (Occidental Mindoro) and Looc (Romblon). The current study will help shed light on the prospective effectiveness of such an approach in terms of the impact such investments might have on regional/rural cities and small towns that risk being left behind socioeconomically.

4. Study on Regional Transport-Related Social Exclusion

4.1. Approach

This article reports on a small study to test the idea that rural communities are at greater risk of social exclusion, relative to larger city counterparts, due to greater difficulties in accessing transport services, and that substantial improvements in inter-island transport opportunities can support increased inclusion opportunities. The study is regionally based, informed by work on mobility and social exclusion by Stanley et al. (2011), Lucas (2011) and Starkey (2006). It is aimed at identifying areas of greater isolation within MIMAROPA and the findings may help support the MITP in mitigating transport-related exclusion and increasing opportunities for social participation.

The methodology developed for this study was a two-stage process: first using a survey to collect data that is then used to help inform a gravity model of travel patterns. Both stages are intended to shed light on problems related to remoteness and transport disadvantage. Given that it is only a small study, it provides an indication of the issues and characteristics that are typical of the survey area, which would ideally then be refined by a more comprehensive appraisal.

First, the study collected a small amount of new data to test the expected connection between physical isolation and transport disadvantage. It does this by conducting a customized travel behavior survey in four locations across MIMAROPA: (i) Calapan City, (ii) the Mogpog-Boac conurbation, (iii) Bansud, and (iv) Torrijos (see Figure 1). It also constructs a simplified trip generation/distribution model, using limited passenger data to interpret and manipulate inter-island 'origin-destination' movements for the predominant modes of inter-island

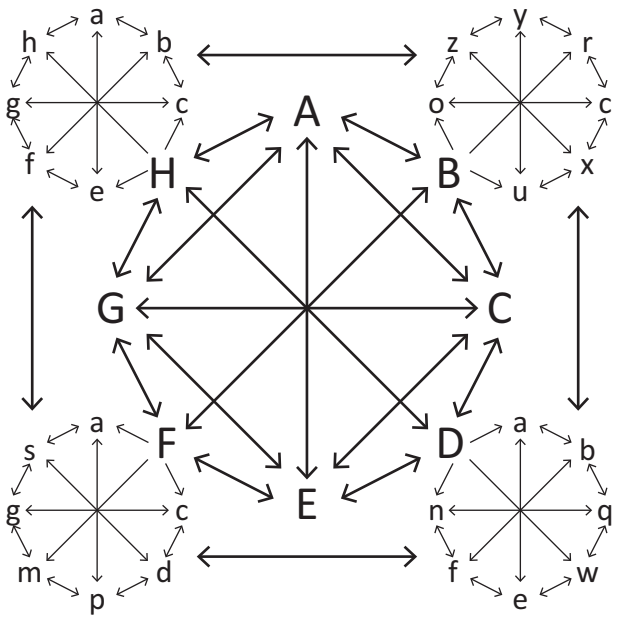

Figure 3. Polycentric network development (Starkey, 2006).

travel: land transport (by bus/van), or marine transport (by RoRo ferry). The second component draws upon survey and gravity model findings to understand where effective linkages can be provided in MIMAROPA to offer remote communities access to greater opportunities. Although the surveys capture some information on local travel within the four locations sampled, the findings focus on intra-regional travel, as a means to bridge social connections between communities within archipelagic settings.

4.2. Travel Survey Instrument

The first stage involved developing a survey instrument to shed light on current travel patterns and perceived problems associated therewith. The survey instrument was adapted from an existing questionnaire that had been developed by two of the current authors and colleagues for an Australian analysis of links between transport disadvantage, social exclusion and well-being (Currie et al., 2009; Stanley et al., 2012). The survey adopts one of five dimensions of social exclusion risk developed by Stanley et al. (2011), this dimension being employment status, partly to ensure surveying was undertaken in safe environments for the interviewers and partly to increase the response rate. Twenty-two questions were selected, modifying the original Australian survey to reflect the different transport modes and different categories of travel behavior within the study areas.

The survey questions were framed around five topics that cover broad aspects of individual travel behavior. To encourage a good response rate, it was intended that participants could respond to the various questions within five minutes. The survey questions covered the following:

(i) last inter-island trip taken (time and day of week they travelled), including details of their origin and destination;
(ii) trips undertaken the day prior to being surveyed, including:

    a. the number of trips taken (to aggregate how often people travel within their own environment);
    b. the purpose of their trips (to identify the primary reasons for travelling, such as work, education, shopping, recreation, personal business, caring for others and visiting friends and relatives);
    c. the modes of transport used (such as ferries, buses, vans and jeepneys, to reveal what modes people depend on and how many modes they use on a given day);
    d. the estimated distances travelled (to gain insight into the distances travelled to reach their activities);

(iii) perceived importance of transport access (for instance, how much they consider affordability, reliability, independence and options for inter-island travel to be of value to them);
(iv) perceived difficulty in travelling (e.g., whether they feel they can meet transport costs and have options they need for inter-island travel); and,
(v) travel behavior to specific destinations, such as the National Capital Region (Metro Manila), or intra-regional destinations within MIMAROPA (e.g., Oriental Mindoro, Occidental Mindoro, Marinduque, Romblon and Palawan).

One factor surrounding the communication of the survey was language: around 50% of the Philippine population speak English as a second language, with the mother tongues, in most instances Tagalog, coming from a pool of 11 languages and 175 dialects. Within MIMAROPA, fourteen languages are spoken, twelve of which are unique to the region. This prompted the use of multilingual counterparts who could explain the survey to others in both Tagalog and English, both official languages of the Philippines.

An important issue on survey implementation was choice of survey areas within MIMAROPA. These needed to be sufficient to provide a good sense of travel patterns and problems, within the constraints of a small study. The decisions behind site selection were based on the hierarchy of human settlements and the increasing degree of 'remoteness' that is being observed between regional cities and small towns of differing scale across the region. Differences in travel input costs, such as time and money (e.g., related to distance), means that there is a significant variation of trips expected in a comparative assessment between regional cities and small towns. Simply put, greater difficulties in affording and accessing transport is expected to result in fewer intra-regional trips undertaken within a sample from a small town. Conversely, more trips are expected between larger regional cities, where there are likely to be more transport services and intermodal facilities.

As indicated in Figures 4 and 5, two regional cities and two small towns in the Oriental Mindoro and Marinduque provinces were selected for the survey distribution. The National Capital Region is marked to denote its place in the existing hub-and-spoke system as a major interchange point between sampled nodes.

Respondents were targeted inside public administration buildings on weekdays between the hours of 9am and 5pm, as a baseline for the study's sample size. This sampling method captures a specific segment of local populations, where respondents are more likely to be employed and travel as a function of their employment. They are also more likely to be cognizant of their own transport challenges and thus realize and appreciate the importance of travel. Hence, it is likely that individuals who are at the greatest risk of being socially excluded will be unrepresented or under-represented in

Figure 4. Survey area selection schema based on a hierarchy of cities and towns.

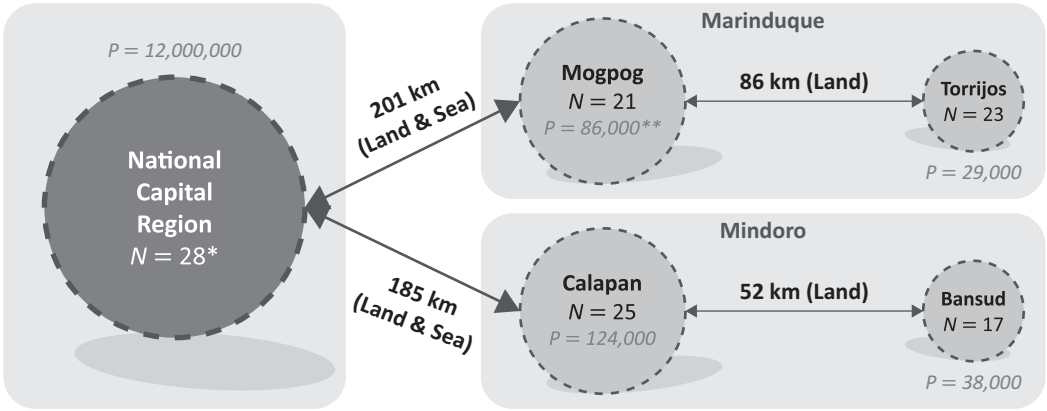

Figure 5. Survey area selection schema based on the study's conceptual framework.

this small sample (due to safety reasons in distributing the survey).

Figure 5 details the number of individual responses that were collected in each survey area: Calapan City (N = 25), Mogpog/Boac (N = 21), Torrijos (N = 23), Bansud (N = 17) and the National Capital Region as a reference (N = 28), collected over a two week period (N = 114).

4.3. A Gravity Model to Estimate Inter-Island Trip Making

The second stage involved developing a simplified gravity model to replicate MIMAROPA's pattern of inter-island trip making. Gravity models have long been used in international trade-flow analysis (e.g., Tinbergen, 1962), based on Newton's universal law of gravity. They also

have a long history in four step urban travel demand modelling, where trip distribution models have commonly been of this type, essentially aiming to replicate urban trip length distribution patterns (see, for e.g., Brady & Betz, 1971; Jones, 1970).

Tinbergen's work on trade flows estimated exports between pairs of countries as a function of their respective levels of Gross National Product (GNP) and the distance between them, with the respective co-efficient values on GNP and distance all around unity (negative in the distance case). Other studies of the use of the simple gravity model in trade flow analysis have confirmed this broad order of co-efficient values on GNP (such as Head & Mayer, 2014), with their example for Japan but using GDP rather than GNP. Similarly, values of around −1 for the distance decay parameter have been found in other trade flow analyses, with a reported range between −0.8 and −1.4 (Fernandez, 2014).

Gravity modelling in urban transport demand work has tended to use travel time or even generalized travel cost as the deterrent function, rather than distance, better reflecting the disutility experienced in taking a trip. In longer distance travel modelling, however, distance is often used. Liu et al. (2014), for example, finds a distance decay parameter of −0.8 for inter-urban trips between 370 cities in China and estimates an even higher distance decay parameter of −2 for airline passenger movements. Based on his analyses, Fernandez (2014) argues that there is little to choose between distance and time as the basis for the decay parameter for longer distance passenger travel in Mexico but that travel time (plus cost, if available) is preferred for shorter trips, which accords with practice in many urban gravity modelling applications.

Following Tinbergen's (1962) general approach, the current model assumes that the number of passenger trips between two regions is a function of their scale, reflected by population size (a pull factor), with travel time acting as a deterrent or barrier to trip-making. The model is expressed as:

$$F = G\left(\frac{m_1 m_2}{r}\right)$$

where:

- F is the interaction between m_1 and m_2 (inbound and outbound trips in this case);
- G is a constant, to be estimated;
- m_1 and m_2 are the populations of the origin and destination;
- r is the distance or travel time between the origin and destination (kilometres or minutes).

Following Tinbergen (1962), the present model assumes co-efficient values of unity on population and average travel time. It is important that travel time is modelled instead of distance, as it considers in-vehicle travel time of different modes, as well as wait/transfer times between different modes used throughout a journey. Distance does not reflect the disutility associated with wait/transfer times. The model used available inter-island port-to-port trip data obtained from the Philippine Ports Authority, which records passenger and freight movements annually. This data allows the study to impute water-based travel movements into a trip generation/distribution matrix that can model inter-island interactions between MIMAROPA's five island provinces. This could then be used to estimate prospective demand if new/improved inter-island linkages were to be developed that affect variables in the model (such as in-vehicle travel and wait times between origins and destinations), through iterative calibration techniques. Given the simplicity of the model, there is scope for a more refined approach to take this study further at a later date.

5. Analysis and Findings

5.1. Survey Results

The survey results reveal some basic information on variables such as travel distance, travel time, travel frequency and trips made the day prior to being surveyed.

The average *distance travelled* in a respondent's last inter-island journey ranged from a minimum of 66 kilometres to a maximum of 1,291 kilometres, with a mean distance of 284 kilometres.

Average *inter-island travel times* ranged from a minimum of 2 hours to a maximum of 16 hours. The average omits two outlying responses where respondents had identified international destinations by plane in their response, which skewed the analysis. Interestingly, the mean inter-island travel time calculated for a respondent is 7.92 hours, with a standard deviation of 3.6 hours. Thus, for a mean distance travelled of 284 kilometres, the implicit typical speed of inter-island trips is around 35 kilometres per hour. This illustrates the slow nature of travel throughout the region, due to factors such as a need for long intermodal transfers at interchange nodes (for example from bus, van or jeepney to ferry) and slow-moving transport, such as RoRo ferries.

In terms of *inter-island trip frequency*, the last time a respondent had left their island ranged from a minimum of 1 day ago to a maximum of 1,370 days ago, with the mean value being 95 days. This suggests that respondents, on average, travel to a destination outside their island around once every three months. The positively skewed distribution of trip frequency data suggests that some respondents have not left their island for a long time (i.e. years).

Information on *trips made the day prior to being surveyed* was collected, to inform the nature of local trip making. The mean number of return trips made the day before was 2.6. This is in line with expectations, giving some comfort to the validity of survey responses. As expected, the main trip purpose was work-related, with 55 respondents out of the total sample of 87 (63%), listing work as one of their reasons for travel. It is noted that a

number of respondents did not leave their homes in the Mogpog sample (denoted as '0' trips undertaken 'yesterday'), where the previous day fell on a national public holiday (Eid-al-Fitr Day).

By consolidating the data of four samples into two sets, one representing regional cities (Calapan City and Mogpog/Boac) and the other representing smaller townships (Bansud and Torrijos), the study is able to enhance the statistical strength of its samples for comparative analysis (see Table 1).

The comparison of statistical mean values between cities and townships in Table 1 also meets a test of sensibility: it shows that residents of smaller towns, relative to their larger city counterparts, need to travel greater distances, take more time to travel, make fewer inter-island trips and take more transport modes, due to additional intermodal transfers required.

Despite limitations in being able to obtain a larger sample size across a wider area, the survey data collected allowed for significant associations to be found through bivariate correlation analysis. Table 2 shows eight significant relationships with confidence intervals greater than 95% (two-tailed test), and the corresponding inferences that are linked with socio-spatial transport disadvantage.

The findings in Table 2 relate strongly to this study's focus on the risks of social exclusion through transport disadvantage. This includes the importance of independent travel and the sense of personal mastery or control it affords to individuals. The analysis strongly suggests that when a respondent finds it more difficult to access transport, both inter-island and local, they take fewer trips. Similarly, if travel costs increase and it becomes more difficult for a respondent to find appropriate transport services, this makes it harder for them to undertake desired trips. Subsequently, the reliance on others for travel also increases, which negatively influences the total number of trips a respondent seeks to make to another island destination. These findings suggest that people from small rural communities are at greater risk of social exclusion, relative to their larger city counterparts, due to greater difficulties in accessing non-local transport.

Another key finding relates to the concept of independent travel. The survey findings reveal that if a respondent's dependency on others is increased, say, through the need for a driver in a remote area to take them places, then that respondent is less likely to travel. The feeling of empowerment a respondent has in being able to undertake inter-island travel, to get to places quickly, to have transport options and to be able to travel when they want to cannot be ignored in the context of this study, as individual well-being has been shown to be linked to an individual's sense of personal mastery, which is supported by the capacity for independent travel (Stanley et al., 2011).

5.2. Gravity Model Configuration and Observations

The gravity model is separate to the survey work and allows origin-destination trips to be estimated across the region. Its input and output variables are set out in Table 3 for key intra-regional pairs, using limited secondary origin–destination (O–D) port data obtained from seaport administrations in 2014. The model is used to estimate the remaining O–D pairs. It is important to note that the model features a manual 'proportional fitting' technique, which requires a constant value to be defined within its formula. To this end, the study has assigned the constant value of 'G' in Formula (1) to be 0.0165, which appears to best fit with obtained passenger statistics for various inter-island flows (these being flows between Calapan City–Batangas City and Calapan City–Metro Manila). To complete the model, origin-destination populations and estimated travel times have been input into the rest of the formula, to calculate the total number of inter-island trips occurring throughout MIMAROPA. Travel times between m_1 and m_2 to estimate to value of '*r*' takes into account all modes used to complete a journey within an O–D pair (for example, the travel times of all known RoRo/fast ferry and bus/van services are calculated as an average for every modal segment in a journey), route length (on land or on water), and average wait times to transfer between modes to complete a journey (calculated by dividing the total number of published services over a 24 hour weekday). Journeys to Puerto Princesa City involve the use of intermodal flights (shown in Figure 6), due to a lack of formalized ferry services between Palawan and other provinces and O–D pair distances that well exceed the region's mean. As the majority of destinations in the study area are headed for the National Capital Region and Batangas City, they are also represented in Table 3 and shown in Figure 6.

Table 1. Mean statistics for regional cities vs. small townships.

Trip descriptor	Regional city (*N* = 46)	Small township (*N* = 40)
	Mean statistic	
Distance from origin to destination	202 kilometres	380 kilometres
Travel time	5.98 hours	10.21 hours
Last inter-island trip made	84.69 days	110.94 days
Number of return trips made 'yesterday'	2.57 trips	2.63 trips
Number of trip modes used 'yesterday'	1.24 modes	1.80 modes
Number of provinces travelled to within the last year	3.11 provinces	3.03 provinces

Table 2. Significant relationships in the bivariate correlation analysis

Variable A	Variable B	Pearson Correlation between A and B and Sig. (2-tailed)		Inferences between A and B
1. How easy or hard people find it to access transport	Total trips made yesterday	−0.338	0.003	When a person finds it harder to access transport, they take fewer trips.
2. Importance of independence from others for transport	Total trips made yesterday	−0.274	0.025	When a person is increasingly dependent on others for travel, they take fewer trips.
3. How easy or hard people find it to pay for transport costs	Importance of having options to travel	0.240	0.047	When a person finds it harder to pay for transport costs, they place greater importance on having more travel options and more affordable transport services.
4. Importance of independence from others for transport	Importance of affordability, getting to places quickly, options and on-demand travel	0.445–0.644	0.000	The importance of independent travel is linked to affordability, efficiency, travel choices and travel availability. All of these factors can support a sense of personal mastery.
5. How easy or hard people find it to get to places quickly	Importance of being able to get around reliably and how easy or hard it is to pay for transport costs	0.281–0.584	0.031–0.000	People that find it harder to reach places quicker place more importance on reliability and transport costs.
6. How easy or hard it is to travel when a person wants to	How easy or hard it is to pay for costs of travel, getting to places quickly and accessing transport services	0.517–0.674	0.000	People find it harder to travel when they are unable to pay for transport and when transport services are not available.
7. How often a person travels to another island province in MIMAROPA per year	How easy or hard it is to travel when a person wants to	−0.246	0.045	The easier a person finds it to travel, the more likely they are to undertake inter-island travel within the region.
8. How often a person travels to the National Capital Region per year	How often a person travels to another island province in MIMAROPA per year	0.247	0.025	When a person visits the National Capital Region more frequently, the more likely they are to also travel to other island provinces in MIMAROPA.

Table 3 and Figure 6 show that intra-regional trip volumes within MIMAROPA (discounting O–D pairs to Puerto Princesa City due to reliance on air travel), are some of the lowest in the matrix (for example, Calapan City to Odiongan or Boac and Boac to Odiongan), when compared to trips bound for destinations outside the region (for example, Calapan City, Boac or Odiongan to Metro Manila or Batangas City). Despite short geographic distances between some of MIMAROPA's provinces, the actual travel distances between them are much longer, because out-of-region intermodal transfers are required to reach neighboring island provinces in the broader hub-and-spoke network. For example, trips from Calapan City to Boac typically require a passenger to transfer between land and sea modes at Batangas City and Lucena, both critical interchanges in the established network, making the overall journey time around 7.8 hours. Similarly, journey times between Calapan City and Odiongan are also long (around 20.5 hours, due to infrequent services at the interchange node in Batangas City), impacting on patronage levels in the gravity model (estimated at only 2,417 trips per annum in 2014).

5.3. Alternative Gravity Model with Prioritized Ports Activated

The travel time variable in the gravity model can be changed to reflect an increase in direct port-to-port ser-

Table 3. Gravity model results for MIMAROPA in 2014.

Proportional fitting	Origin (population)	Destination (population)	Distance between m_1 and m_2	Travel time between m_1 and m_2	Annual number of trips between m_1 and m_2
***G* (constant)**	m_1	m_2		***r***	***F***
0.0165	Calapan City, Oriental Mindoro (785,602)	Metro Manila, National Capital Region (11,855,975)	185 kilometres	283 minutes	(1,918,894)
0.0165	Calapan City, Oriental Mindoro (785,602)	Batangas City (2,377,395)	79 kilometres	130 minutes	(1,823,481)
0.0165	Calapan City, Oriental Mindoro (785,602)	Boac, Marinduque (229,636)	231 kilometres	468 minutes	13,590
0.0165	Calapan City, Oriental Mindoro (785,602)	Odiongan, Romblon (283,930)	232 kilometres	1234 minutes	2,417
0.0165	Calapan City, Oriental Mindoro (785,602)	Puerto Princesa City, Palawan (771,667)	775 kilometres	421 minutes	56,435
0.0165	Boac, Marinduque (229,636)	Metro Manila, National Capital Region (11,855,975)	204 kilometres	394 minutes	289,380
0.0165	Boac, Marinduque (229,636)	Batangas City (2,377,395)	152 kilometres	338 minutes	78,848
0.0165	Boac, Marinduque (229,636)	Odiongan, Romblon (283,930)	463 kilometres	1442 minutes	517
0.0165	Boac, Marinduque (229,636)	Puerto Princesa City, Palawan (771,667)	843 kilometres	562 minutes	9,257
0.0165	Odiongan, Romblon (283,930)	Metro Manila, National Capital Region (11,855,975)	416 kilometres	1227 minutes	36,893
0.0165	Odiongan, Romblon (283,930)	Batangas City (2,377,395)	333 kilometres	1104 minutes	9,138
0.0165	Odiongan, Romblon (283,930)	Puerto Princesa City, Palawan (771,667)	832 kilometres	1395 minutes	1,858

Note: The trip numbers in brackets closely reproduce statistical data obtained by the Philippine Ports Authority.

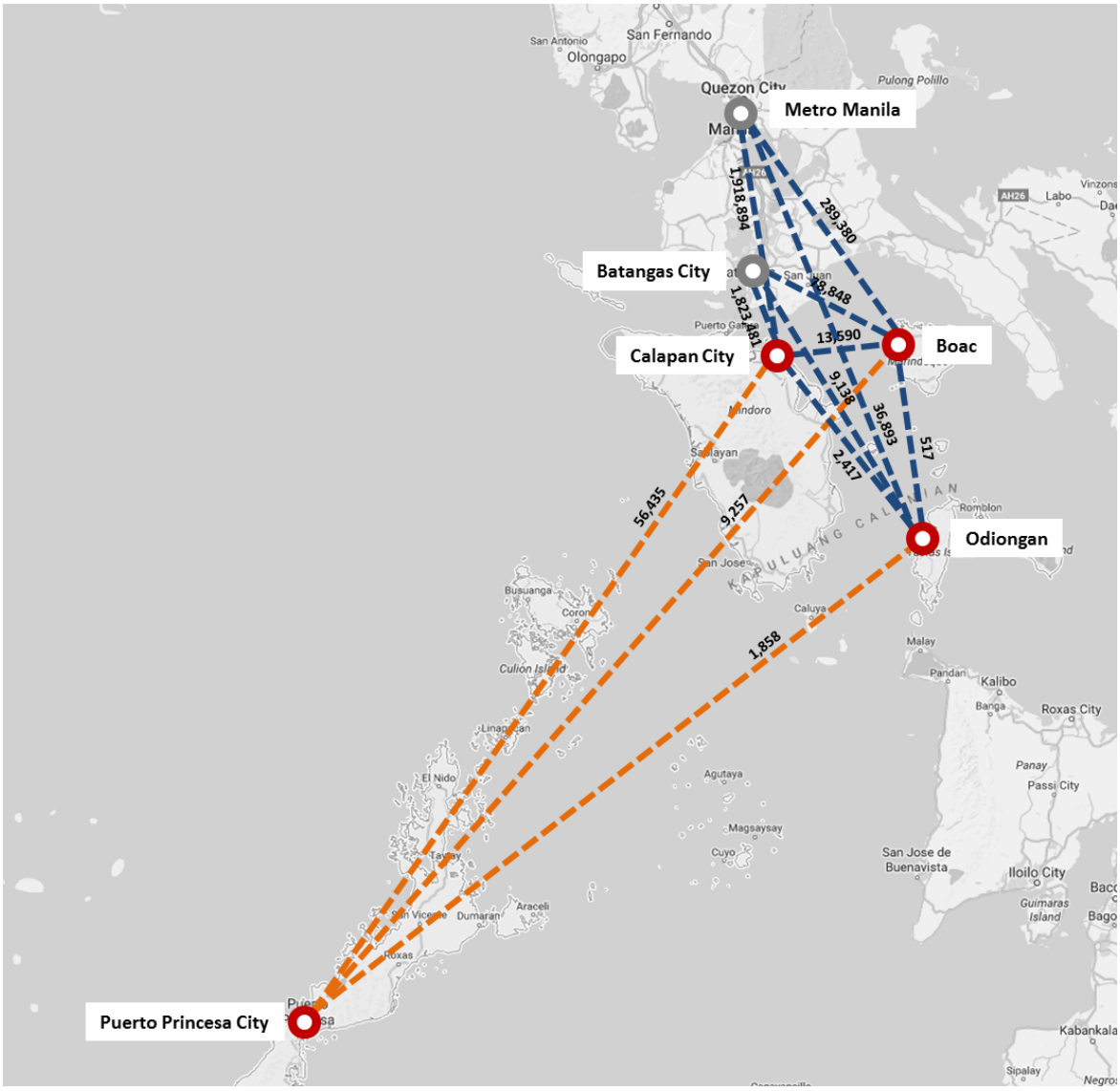

Figure 6. Selected gravity model trip distribution for MIMAROPA.

vices to facilitate a localized polycentric transport network that supports MIMAROPA's RDP objectives and bridges social capital. The model can then estimate the additional number of trips generated with each new (faster/shorter) connection. Table 4 estimates the additional volume of trips generated with the inclusion of 20 RoRo services per day for selected O–D pairs that best reduce intra-regional travel times and reduce the number of required intermodal transfers for smaller/rural townships.

The alternative gravity model suggests that activating parts of a localized polycentric transport network can substantially reduce travel times and generate new trips, promoting stronger regional integration and reducing the risk of transport-related social exclusion in small townships. For example, a point-to-point connection between Boac and Odiongan can reduce average travel times by 18 hours and generate an estimated 12,114 trips, which is around 23 times greater than existing volumes. Similarly, notable increases in trip volumes and reductions in average travel times can be found for Calapan City to Odiongan and Calapan City to Boac (see Table 4). With the three port-to-port linkages from Table 4 activated (with an evenly distributed service frequency of 20 RoRo services per day), MIMAROPA's intra-regional trip volumes are projected to increase substantially, from 16,524 trips per annum to 86,972 trips per annum. Figure 7 illustrates the differences in trip volumes for these O–D pairs through the existing and alternative gravity models.

6. Discussion and Conclusions

This study's travel survey provides support for an association between improved personal travel opportunities, for inter-island travel and connecting local trip making, and a reduced risk of transport-related social exclusion. It has highlighted mobility barriers faced by residents of more remote islands, drawing attention to some of MIMAROPA's socio-spatial challenges in transport terms.

Table 4. Alternative gravity model results.

Origin	Destination	Existing number of trips generated between O–D pair	Annual new number of trips generated between O–D pair with 20 direct RoRo services per day	Existing O–D travel time	New O–D travel time	Reduction in O–D travel time
Boac, Marinduque	Odiongan, Romblon	517	12,114	1,442 minutes	327 minutes	1,115 minutes
Calapan City, Oriential Mindoro	Boac, Marinduque	13,590	39,939	468 minutes	273 minutes	195 minutes
Calapan City, Oriential Mindoro	Odiongan, Romblon	2,417	34,919	1,234 minutes	327 minutes	907 minutes

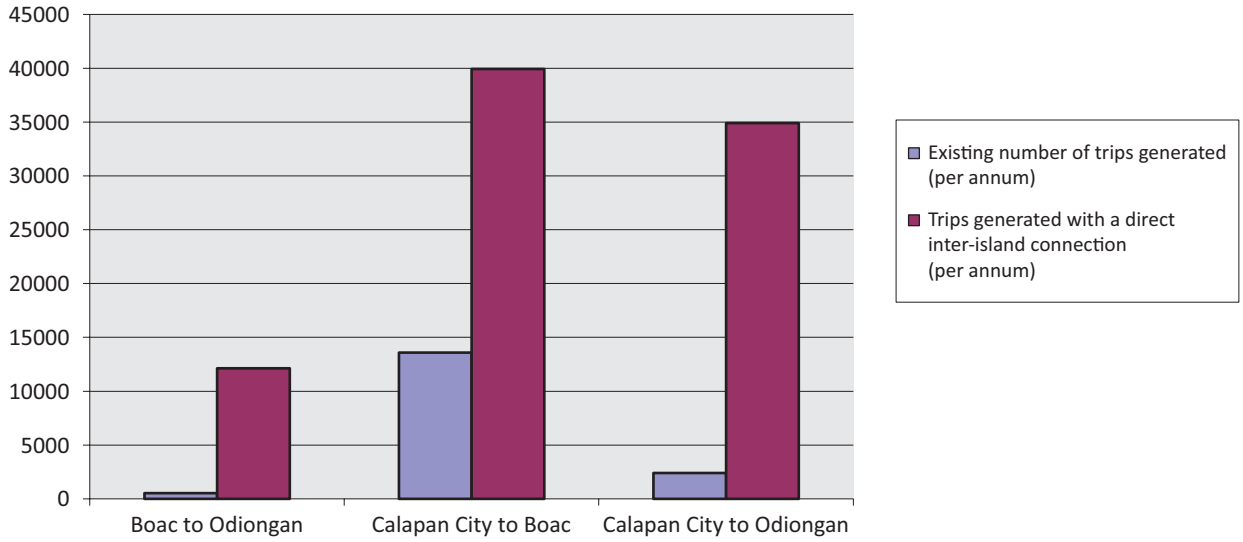

Figure 7. Existing and alternative inter-island trip volumes for MIMAROPA.

This has been supported by the development of a simplified gravity model that highlights the way poor travel opportunities, such as indirect connections, pose a constraint to inter-island travel, particularly for residents of smaller islands. The survey results draw attention to the importance of inter-island travel where improvements to these transport services will be likely to improve opportunities for some people at risk of social exclusion. It will be important to also address local land transport to improve connections to the ports, as part of a process of building bridging social capital and thus social inclusion. The improvement of local transport will also have the added value of increasing the capabilities of those not wishing to travel between islands but participate in a local economy and social opportunities.

The projected increase in inter-island trips in the alternative gravity model suggests that there is potential for improved social and economic participation if intra-regional travel times/distances are reduced, as part of the government's suggested improvement strategy to activate inter-island trips (NEDA, 2014). However, there is some question about whether the projected increase in travel volumes will be sufficient to entice private operators to provide more formalized water-based services on a fully commercial basis. Arguably, where the gravity model estimates origin-destination movements at, say, 100,000 per year or greater, private operators are more likely to ply regular and frequent inter-island services to support these trips, as they currently do from Calapan City and Boac to Metro Manila, Batangas City and Lucena (see Figure 6).

However, the significance of trip growth modelled in Figure 7, as a result of new links and services, should not be ignored. For social exclusion to be addressed, the establishment and implementation of minimum inter-island service levels may be required (for example, 20 ferry services per day), to guarantee access for those at risk of being excluded in remote areas. This approach is sometimes taken in setting urban public transport base service levels. The government should consider calling for expressions of interest to provide affordable intra-regional transport services, with proponents to indicate

the scale and nature of any assistance that might be required to do so. This level of assistance can be considered by government, alongside its assessment of the benefits of increased social and economic participation by relatively socially excluded communities, in deciding whether to proceed with the initiative.

The survey/gravity model study methodology can be refined and applied more widely in the region, providing MIMAROPA's RDP and other regions within the Philippines with a basic methodology to identify locations of significant socio-spatial disadvantage and groups likely to be at risk of exclusion because of poor transport opportunities. The gravity model can also help in the assessment of the economics of transport service improvements, through its capacity to project how trip making might change under improved travel circumstances. Increasing sample sizes and expanding the sampling method to capture a wider range of demographic segments at greater risk of social exclusion, such as those who do not have adequate or sufficient employment or people/areas with comparatively high levels of poverty incidence, should be early priorities. As part of this process, the survey should be applied in more remote settlements, such as interior communities, where social assessments may be undocumented. Finally, a refinement of the approach to this study should allow for additional variables to be modelled, such as land and air-based transport modes.

The work that is discussed in this article is of considerable importance to the Philippines if it is to join the international movement for achieving the Sustainable Development Goals. Understanding the local issues that facilitate barriers to the achievement of economic, social and environmental outcomes is necessary in order to understand actions needed for goal achievement. This article's methodology presents a simple and practical way to gain insights into transport network limitations in areas where critical transport data is incomplete. It should also be useful in shedding light on transport elements of international development efforts in other archipelagic countries, such as Indonesia, Fiji, the Solomon Islands, Vanuatu and Papua New Guinea. More broadly in the Philippines, similar investigations of this scale could be exercised in Samar, Leyte and Mindanao-Sulu areas, if political and security conditions allow. Armed with this knowledge, the Philippines will be able to join in the international collaborative partnerships being formed to support and assist in target outcomes, along with some some 114 nations that have already sought the United Nations' help in localizing implementation efforts (Birch, 2017). Indeed, transport policy can be used as a pivotal force to achieve desired economic, social and environmental outcomes, particularly through the reduction of social exclusion (Stanley, 2016).

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Disclaimer and Conflict of Interests

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Article

Visualizing the Impacts of Movement Infrastructures on Social Inclusion: Graph-Based Methods for Observing Community Formations in Contrasting Geographic Contexts

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Abstract
In this article we describe some innovative methods for observing the possible impacts of roads, junctions and pathways (movement infrastructures), on community life in terms of their affordances and hindrances for social connectivity. In seeking to observe these impacts, we combined a range of visualization research methods, based on qualitative points-data mapping, graphic representation and urban morphological analysis at local and global geographic scales. Our overall aim in this study was to develop exploratory methods for combining and visualizing various kinds of data that relate to urban community formations in contrasting urban contexts. We focused our enquiry on the perspectives of adolescents in two urban contexts: Liverpool, UK, and Medellín, Colombia. While they contrast in their geo-political and cultural characteristics, these two cities each present polarized socio-economic inequalities across distinctive spatial patterns. We found that adolescents in these cities offer generally localized, pedestrian perspectives of their local areas, and unique insights into the opportunities and challenges for place-making in their local community spaces. We gathered the communities' local perspectives through map-making workshops, in which participants used given iconographic symbols to select and weight the social and structural assets that they deemed to be significant features of their community spaces. We then sampled and visualized these selective points data to observe ways in which local community assets relate to infrastructural affordances for movement (in terms of network integration). This analysis was based on the theory and method of Space Syntax, which provides a model of affordances for movement across the urban network over various scales of network configuration. In particular, we sought to determine how city-scale movement infrastructures interact with local-scale infrastructures, and to develop methods for observing ways in which these interactions have positive or negative consequences for community formations.

Keywords
movement infrastructures; participatory methods; urban morphology; Space Syntax; visualization research methods

Issue
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1. Introduction

Urban communities take shape in specific spatial contexts, involving complicated interplays of relationships among people and things in the urban environment (Gans, 2002, 2006; Logan, 2012). On an everyday level, people shape their urban environments by way of structural and social assets such as roads, open spaces and landmarks. The movement infrastructures that connect people and environments include roads, street networks, pathways and junctions across local, urban and regional scales (Batty, 2013; Hillier & Vaughan, 2007; Sampson,

Morenoff, & Gannon-Rowley, 2002; Urry, 2002). These scales of movement overlap along street segments, which we see when city-wide traffic convergences on local spaces. In some contexts, this overlapping helps people connect to the city network, and in other contexts it gets in the way of community life. For this reason, the social and structural assets from which urban communities are formed are inter-dependent with situated, contextual urban forms (Debertin & Goetz, 2013; Gwyther, 2005; Hillier & Hanson, 1984).

Individuals and social groups often use the intelligible properties of assets to navigate their way or achieve their sense of place. For this reason, movement infrastructures are relational to communities' needs within the urban environment, forming *boundaries*, *thresholds* and *interfaces*, with the potential to *divide*, *connect* and *allow interaction* (Palaiologou & Vaughan, 2012). Given the relational complexity of these infrastructures, the specific ways in which they impact on community life (both positively and negatively) are often overlooked by urban professionals. For example, ostensibly 'trivial' streets actually serve as significant inter-connections among community groups (Grannis, 1998, 2009), and occasional places for stopping, chatting or playing become important anchors for community life (Power, 2007, pp. 58–59).

In this article we seek to observe how city-scale infrastructure impact on community formations at the local scale. Movement infrastructures can also 'severe' communities through a 'chain of effects' relating to physical barriers and cognitive stress (Anciaes, Boniface, Dhanani, Mindell, & Groce, 2016), bearing both conceptual and physical properties (Hillier, 2007, pp.67-68; O'Brien & Psarra, 2015). These can relate to perceived boundaries that enforce stereotypes of 'us' and 'them' in the urban landscape (Sibley, 1995). Even within homogenous urban contexts, this sense of place is not fixed, but varies according to, for example, a person's age, gender, level of ability, socio-economic standing or stage in life (Lupton, 2003). For example, intensively normative, class- and place-bound community formations have been observed among adolescents (Hanley, 2017; McKenzie, 2015).

In our recent research at University College London, we sought to address some methodological challenges in understanding the 'relational complexity' of urban community spaces. We focused on the experiences of community formations in contrasting urban spatial contexts among groups of 11–19 year-olds. We focused on these groups primarily because their views are often not included in formal urban planning processes (cf., UNESCO, 2002). However, their experience of urban spaces is likely to combine notions of 'rational choices' (for example, their friendships), with those of imposed rules (for example, their obligation to attend school). As such, this group would not fit some standard socio-economic methodologies for understanding urban community formations (Miller, 1992). For this reason, our research focused on the methodological challenges of observing urban community formations among young people, combing morphological, demographic and qualitative data.

We have configured some innovative visualization methods from which to observe community formations and their urban contexts, which we outline below. The participatory section of the research revealed that movement infrastructures feature as one type of asset among many others within the sampled community formations, across all age groups and socio-economic contexts. Other dominant features included open spaces, such as public parks and leisure facilities, shopping areas, industry and sites of pollution, and local schools. We focus the present analysis and discussion on what these methods might show about impact of movement infrastructures (roads, streets, junctions and pathways).

2. Methods

The aims of the research posed a methodological challenge in bringing together an understanding of community perceptions of their local spaces and the spatial dynamics of the wider urban network. We addressed this challenge by gathering community perspectives through participatory workshops (described in detail in O'Brien et al., 2016), and by using Space Syntax as a theory and method of urban morphological configuration, based on the notion of affordances for 'natural' movements across street networks. These affordances are termed 'movement potentials' within the Space Syntax literature (Hillier & Hanson, 1984; Hillier & Iida, 2005). The scripts generated to display the findings of the workshops and applied network models, as described throughout this article, can be freely accessed via an online repository.[1]

2.1. Areas of Study

Our aim in this section of our research was to compare community formations in contrasting contexts. We selected field sites in Liverpool, UK, and Medellín, Colombia, which offered opportunities to address comparative experiences of community formations in transforming urban environments. The sites' widely different geographic and cultural environments provide contrasting contexts to our study (Robinson, 2016). Each city is a non-capital, medium-sized conurbation, presenting morphological characteristics of grid-pattern, inner suburban street networks and low-density peripheries. In stark contrast to Liverpool, Medellín is situated inland, bearing peripheral topographic elevation with widespread unplanned settlements. Each city also bears radial road networks that have formed around riverside settlements, and have shaped the overall spatial dynamic in both instances (cf., O'Brien & Griffiths, 2017).

Liverpool is the UK's third city by regional population. While enjoying higher than-average economic growth in the period 2009–2014 (Liverpool City Council [LCC],

[1] https://github.com/laligave/Visualizing-Community-Inequalities

2016a), the city has among the highest levels of multiple deprivations of any UK local authority (LCC, 2015). The Liverpool region is 'a place of contrast and social and spatial disparities' (Sykes, Brown, Cocks, Shaw, & Couch, 2013), bearing a range of spatial inequalities reflected in zonal concentrations of wealth and poverty (Sykes et al., 2013, p. 6). The city region can be characterized historically as an area of prolonged industrial decline, reflected in higher-than-average unemployment (currently 5.1%) neighbourhood dereliction (Leeming, 2013), and low business density (LCC, 2013). There are signs of economic renewal in the region: the Mersey estuary region is now attracting massive brownfield infrastructural investments, with groundwork currently under way.

Medellín is the second city of Colombia, a country that experiences among the highest levels of socio economic inequalities in Latin America. Medellín has been characterized historically by high levels of deprivation, serious crime and social isolation (Hylton, 2007). The city has, in recent years sought to overcome socio-spatial and economic inequalities through several infrastructural initiatives. These include a peripheral transport network, cable car system and an outdoor escalator that helps to integrate the deprived hillside neighbourhood of Comuna 13 (cf., Brand & Dávila, 2011; Drummond, Dizgun, & Keeling, 2012). While levels of multidimensional poverty in the city have lowered overall in recent years (Medellín Cómo Vamos [MCV], 2016a), rising living costs have led to an increase in reported experiences of poverty in the city's poorer neighbourhoods (MCV, 2016b).

To observe aspects of urban community formations within these urban contexts, we selected areas to represent a range of socio-economic contexts. Figure 1, below, shows the areas where the map-making workshops were conducted in Liverpool. These workshops were undertaken at schools within zones presenting a range Index of Multiple Deprivation (IMD) scores (DCLG, 2015). These statistics are organized by Lower Super Output Areas (LSOAs) that represent surveys of approximately 800–3000 people (a detailed description of the selection is provided in O'Brien et al., 2016). These provide measures of relative deprivation in the surroundings of each school. Note, for example in the figure, how the North Liverpool Academy community coincides with moderate to high multiple deprivations, while the Blue Coat Community coincides with moderate to low multiple deprivations.

In total, 246 participants engaged in the workshops, including 34% male and 66% female students. The total number and gender distribution of the surveyed students are also depicted in the pie charts of the Figure 1. Note a bias in the sampling towards female participants, which was the result of voluntary engagement with the project and not of deliberate sampling.

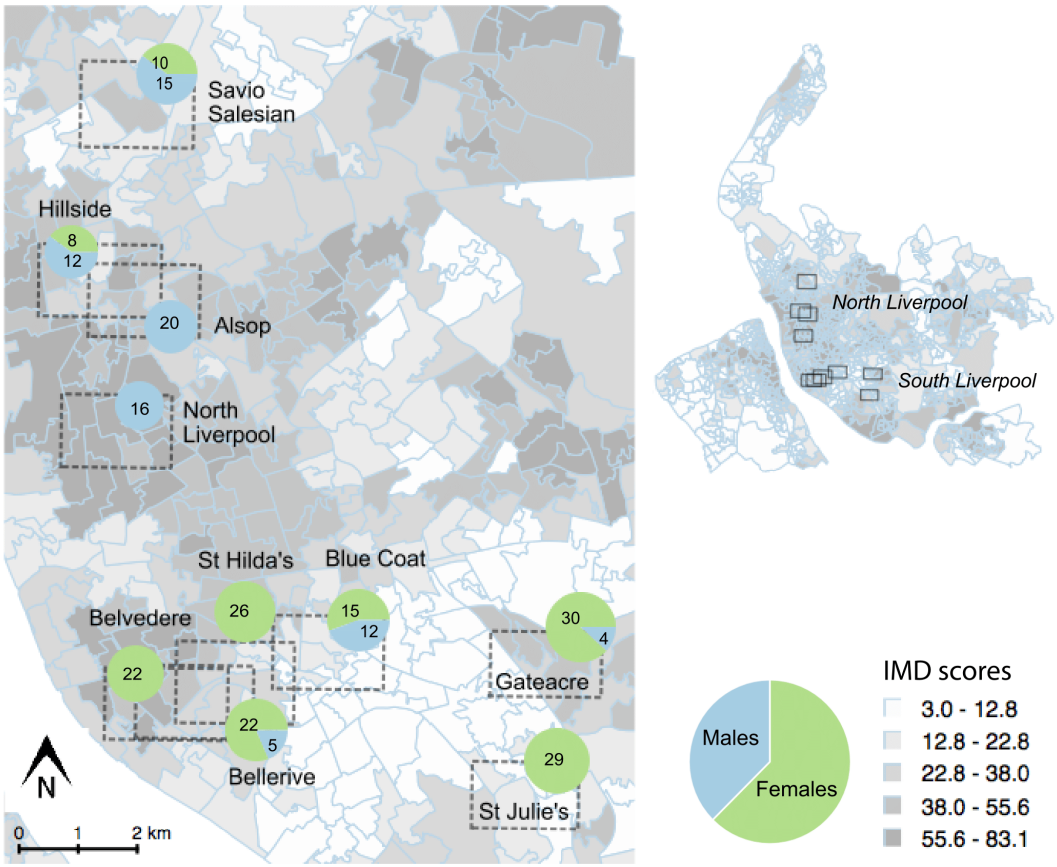

Figure 1. Locations of communities sampled over socio-economic status in Liverpool, UK (based on IMD; low-to-high values shown on a dark-to-light ramp). Pie graphs displaying number and distribution of participants in each workshop site.

In the case of Medellín, shown in Figure 2, the areas of study were located in the local government districts (or *comunas*) of Belén and San Javier. The neighbourhoods within each *comuna* appear classified according to an index derived from the elective *Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales* (SISBEN surveys, 2015), which measures relative vulnerability with respect to quality of life (See Appendix for more details). Overall, it is possible to observe in Figure 2 that the neighbourhoods with higher relative vulnerability according to the SISBEN index are located in the north and west peripheries of the city. From the districts of study, the neighbours of Belén are more heterogeneous in terms of relative vulnerability.

During the workshops, the participants worked first on maps of the complete district, but also on maps of specific groups of neighbourhoods within each *comuna* (see 5 and 3 subareas for Belén and San Javier, respectively). In total, 170 participants engaged in the activity, including 48% male and 52% female students. The pie charts in the Figure 2 display the disaggregation of the participants in each subdivision. Note, for example, that the subarea 1 of San Javier has the highest number of surveyed students, which was the result of the selection that each participant made to work on a specific subarea.

2.2. Community Workshops

In gathering data pertaining to the community perspective, we adapted the ethnographically based approach of Rural Community Appraisal, which helps to equip participants in analysing and describing their own 'realities' (Chambers, 1997). To achieve this, we invited participation among 11–19 year-olds through the cooperation of secondary schools in Liverpool and the Parques Biblioteca in Medellín, which are a system of libraries that offer cultural programmes for the local schools. We devised and ran a series of workshops, located at school facilities in Liverpool and library facilities in Medellín. The workshops engaged the participants in brief introductions to urban planning and design using city-scale maps, which helped their understanding of how interventions impact on community life. As most participants were children, it was not possible to gather data about individual circumstances. However, an assumption was made that the participants had general experience of typical social, structural and environmental characteristics of their local areas.

In Liverpool, the participants worked with local-scale maps, in which the cartography located the workshop site at the centre of an approximately 2km^2 area. Partici-

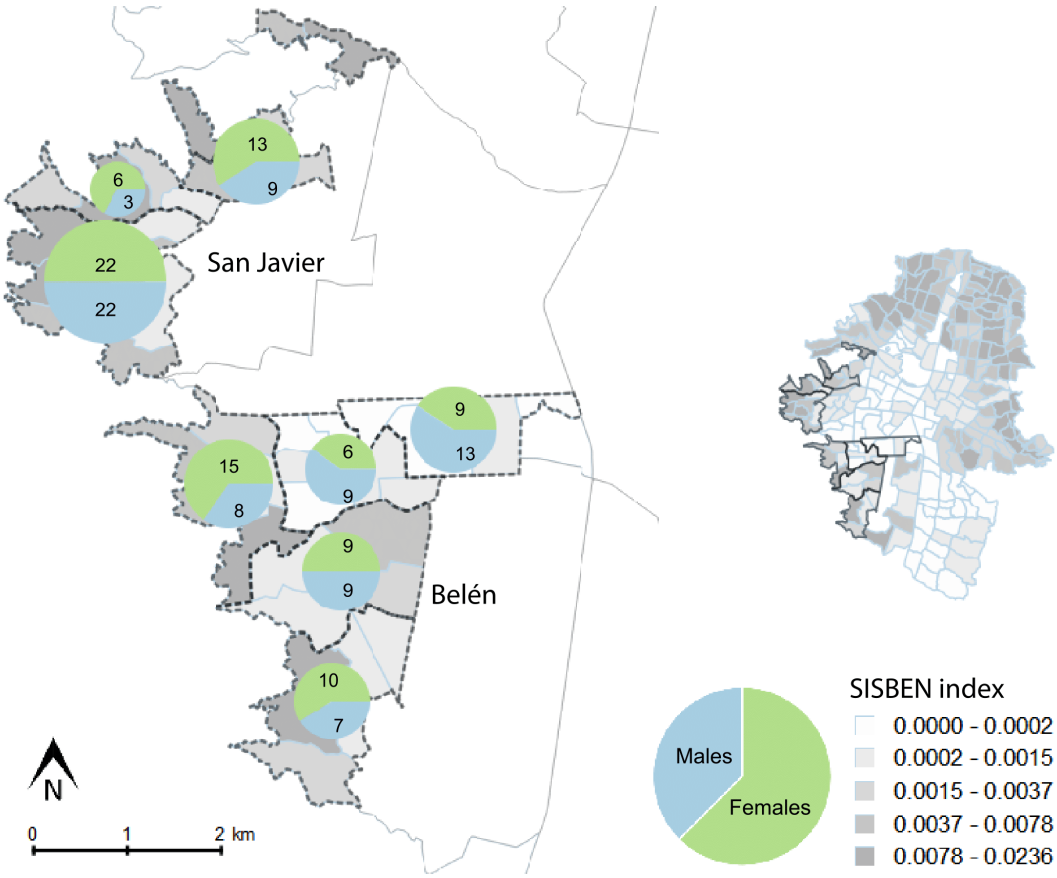

Figure 2. Locations of communities sampled over socio-economic status in Medellín, Colombia (based on an index derived from SISBEN surveys; low-to-high values shown on a dark-to-light ramp). Pie graphs displaying number and distribution of participants in each workshop site.

pants used well-known 'emoticon' symbols (Figure 3), to associate basic emotions and experiences in specific urban environments. The participants were free to represent and locate using the provided symbols (see further details in O'Brien et al., 2016).

For the Medellín case, the provided iconographic stickers are illustrated in Figure 4. An early consultation with community organizers prompted the investigators to offer site-specific icons to enrich the descriptions associated to the features with positive and negative connotations. Specifically, symbols to represent problems with rubbish, pollution, physical boundaries, as well as different experiences at day and night. These symbols were used by the participants to select the features of their local areas with positive and negative connotation, including those within the comuna and the subarea that each participant selected.

Following the selection of the features of the local areas that deemed significant for community formations in both case studies, all participants were invited to fill out a table to list and describe the emoticons and icons they used on their maps. For example, a 'shocked face' emoticon relating to a major junction was described as 'Can't get across, too much traffic!'. This allowed the investigators to identify structures or places in terms of their affordances and hindrances for social connectivity.

Finally, all the maps were scanned into a GIS and points-data were digitalized and tabulated by gender, age-group, urban type ('road', 'open space', and so on), the specific name of the selection, and any text description were this was available. All data were aggregated to reveal distributions of icon weights and grouped based on their 'positive' or 'negative' connotations, so as to guarantee consistency on the comparison of the case studies. Further research will be conducted to document the specific interpretations realized by the participants in both case studies.

2.3. Urban Morphological Analysis

In order to model the possible impacts of movement infrastructures, the investigators generated a series of morphological models using Space Syntax. Space Syntax is a theory and method that describes the relationship between the configuration of the built environment and people's natural movement around urban forms. The model is based on measurements of distances among network segments, weighted by the depths of angles between segment intersections (the shallower the angle for turning from one street segment to another, the higher the natural movement). Space Syntax's core technology, the Depthmap software application,[2] provides a visual model of any sampled urban street network (or architectural space). The application typically uses a warm-to-cool colour ramp to represent high-to-low values for movement potentials across the network. Depthmap handles two bespoke calculations. 'Choice' represents the probable affordances for movements 'through' the network. 'Integration' represents affordances for 'origin/destination' movements. A useful example of Space

Figure 3. Emoticon stickers used in the Liverpool map-making workshops.

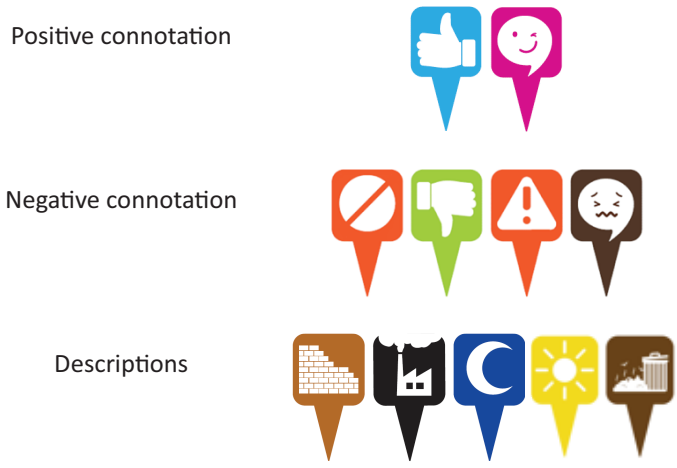

Figure 4. Iconographic stickers used in the Medellín workshops.

[2] https://varoudis.github.io/depthmapX

Syntax in practice is in the representation of a city's Integration core, which shows its overall 'centre of gravity' in terms of movements. We provide case study examples of these in Figures 5 and 6. Low-to-high values are shown on a cold-to-hot ramp, which represent the quintiles were the integration value of each street segment falls.

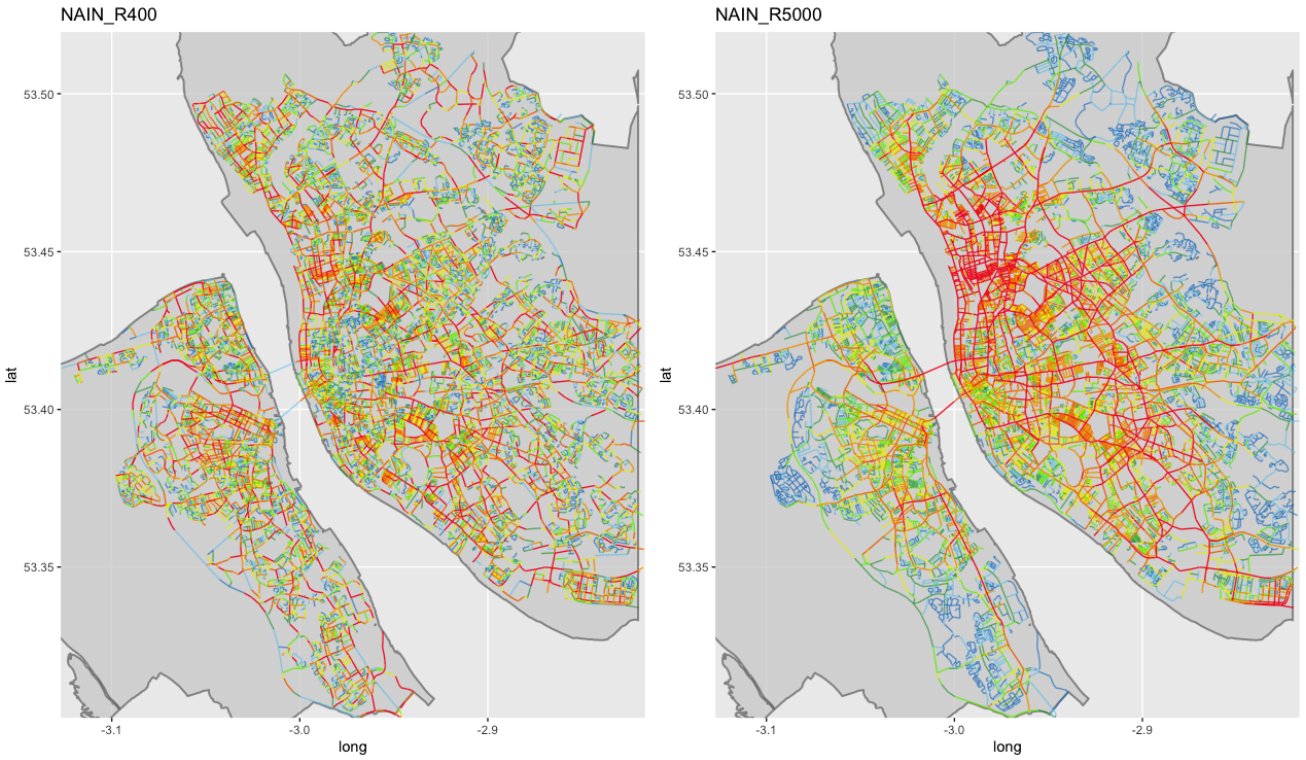

Figure 5. Urban Integration cores for the Liverpool, UK, conurbation. Left: local scale based on 400m; Right: global scale based on 5000m.

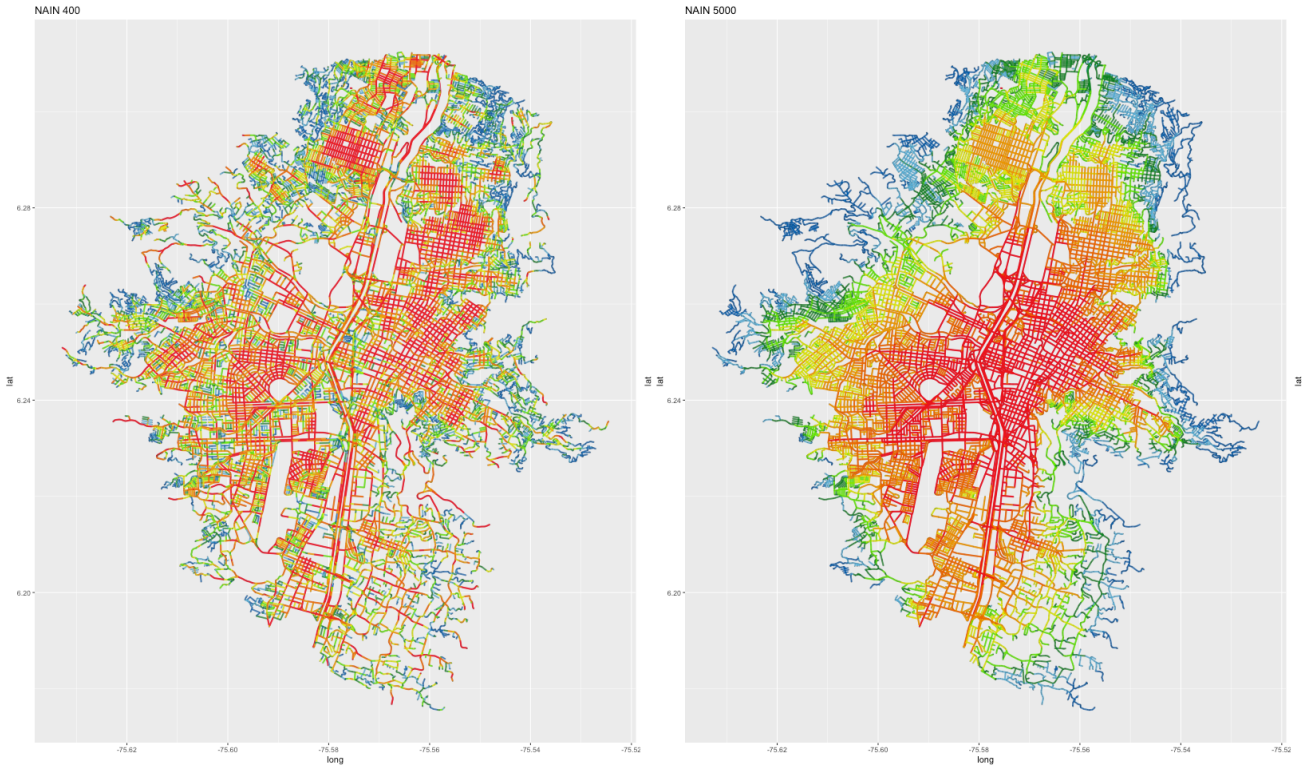

Figure 6. Urban Integration cores for Medellín, Colombia. Follows the format for Figure 5.

3. Results

3.1. Relevant Places Selected by Community

We sought to observe how the features selected by the participants were related in space based on the community perspective. We applied K-nearest neighbor graphs to the data, where the nodes represent the selected local features and the edges the four closest neighbors (see Figures 7–8 and 12–13). The graph nodes are geo-located based on the centroids for each cluster of iconographic symbols arranged by name (for example, the centroids for all points with name 'Princes Park'). The node sizes were adjusted in proportion to the count of icons applied to each feature (%). The Euclidean (shortest path) graph edges represent the 'semantic' distances among the features selected. For example, participants at Bellerive and St Hilda's have attached high significance to local open spaces (coloured yellow; in the Figure 7 they are 1. Sefton Park and 2. Princes Park). Alsop and Hillside have attached greater significance to nearby movement infrastructures (coloured red; 3. County Road and 4. Breeze Hill Roundabout) which in each case seem to mark a functional separation among groups of features within the community's local space. The k-nearest graphs, including all the legends for the local features can be further consulted in the following hyperlink: Liverpool.[3]

In the case of Medellín, it stands out that participants attached high significance to recreational and commercial areas (coloured light and opaque green in Figure 8–left; 1. Sports Centre *UD* de *Belén* in the subarea 1, and 2. Shopping Centre *CC Molinos* in the subarea 2). Participants attached medium significance to nearby water courses in the majority of subareas (coloured red in Figure 8; 3–6 for Belén, and 2–4 for San Javier), which were also defined as spaces associated with contamination and or the sense of insecurity. On the other hand, other elements affording movement as the electric stairs in San Javier (coloured red; 1 in Figure 8–right), are associated mostly with positive connotations and therefore features that afford community integration. In comparison to the local features mentioned above, the streets have relative lower significance (coloured red in Figure 8; 7–12 for Belén, and 5 for San Javier). The k-nearest graphs, including all the legends for the local features can be further consulted in the following interactive links: Belén[4] and San Javier.[5]

3.2. Urban Morphological Analysis

From the Knn graphs, we were able to see how some major roads played a role in community formations. In the next stage of the research, we sought to understand how these roads are configured within the local community

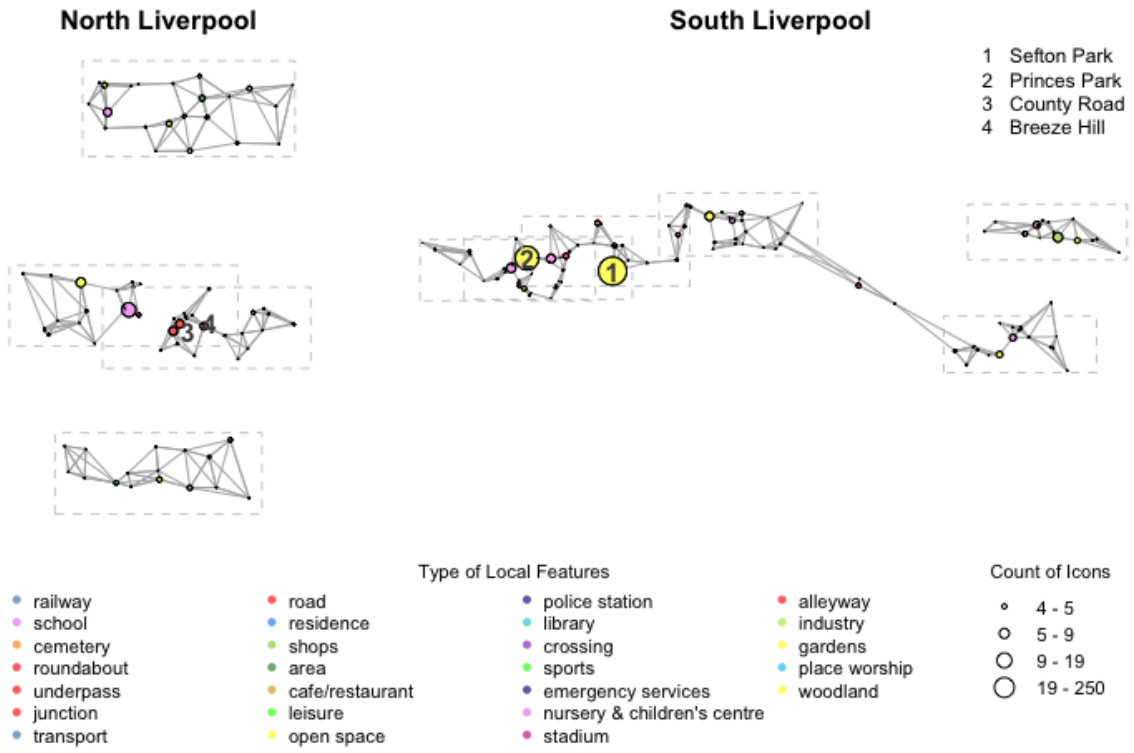

Figure 7. K-nearest neighbour graphs of the Liverpool group of sampled communities.

[3] Interactive web graph (Liverpool) available via: http://tinyurl.com/y93jhwvw
[4] Interactive web graph (Belén) available via: http://tinyurl.com/y9ycmhlt
[5] Interactive web graph (San Javier) available via: http://tinyurl.com/yb47js28

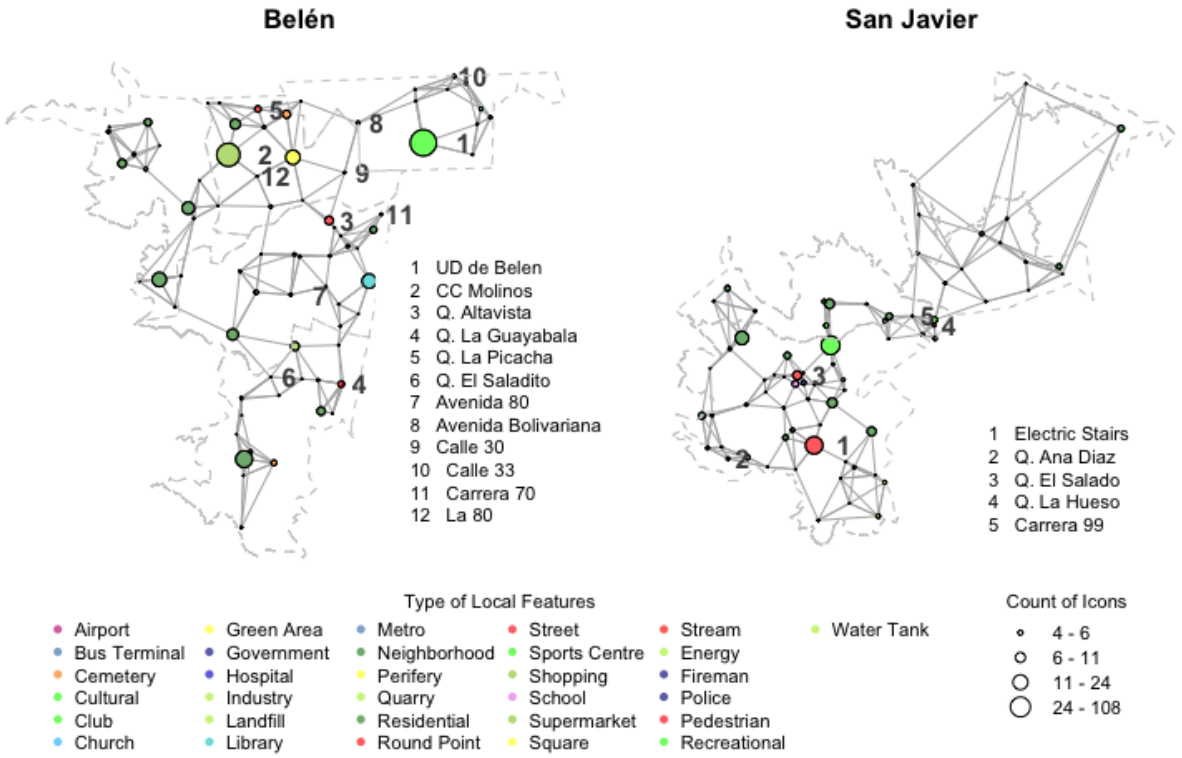

Figure 8. K-nearest neighbour graphs of the Medellín group of sampled communities.

space, including their interactions with the city network. This involved analysis of urban morphological integration at local and city scales based on the Depthmap measurement of Normalised Integration (NAIN). To reiterate, the Integration model demonstrates the likelihood of network segments affording origin-to-destination movements within a certain radius of network configuration. NAIN can be seen as providing a model of spatial accessibility within the network.

We generated urban morphological models based on Integration at radius 400m, 2000m, 5000m and global scale (which were then normalized for comparison; see the examples in Figures 9 and 10 for Liverpool and Medellín, respectively). We then extracted the range

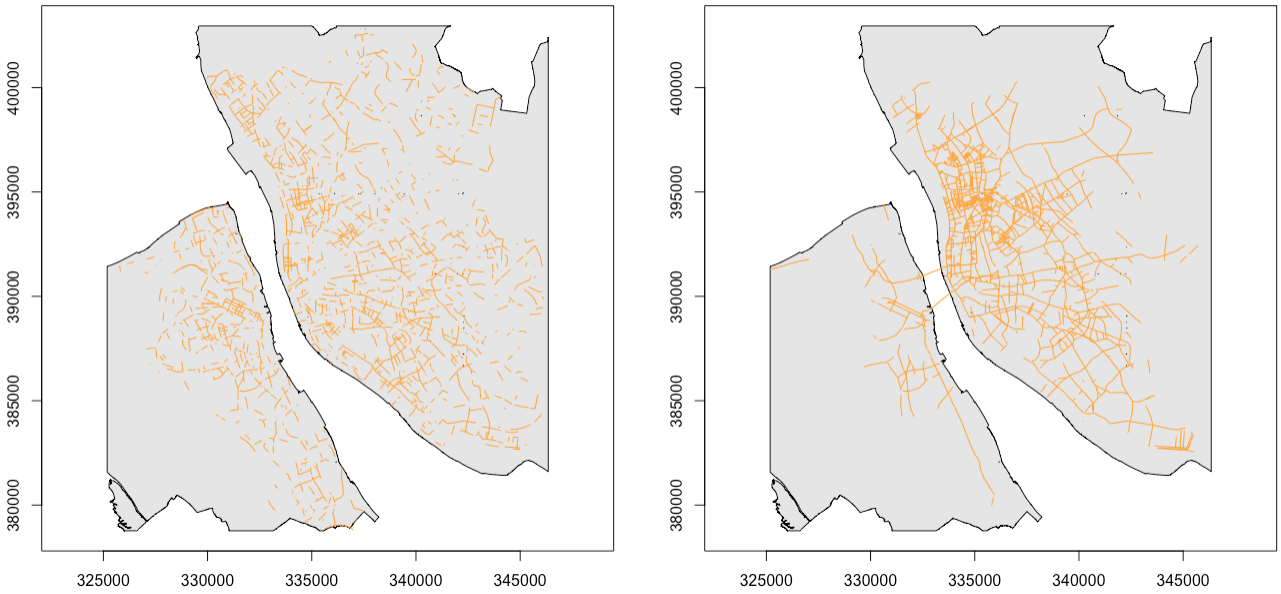

Figure 9. Urban morphological models for Liverpool based on Integration at scales of local (left) and global (right) radii. The maps represent the highest affordances for origin-to-destination movements at these scales (based on the top 20% Integration value range).

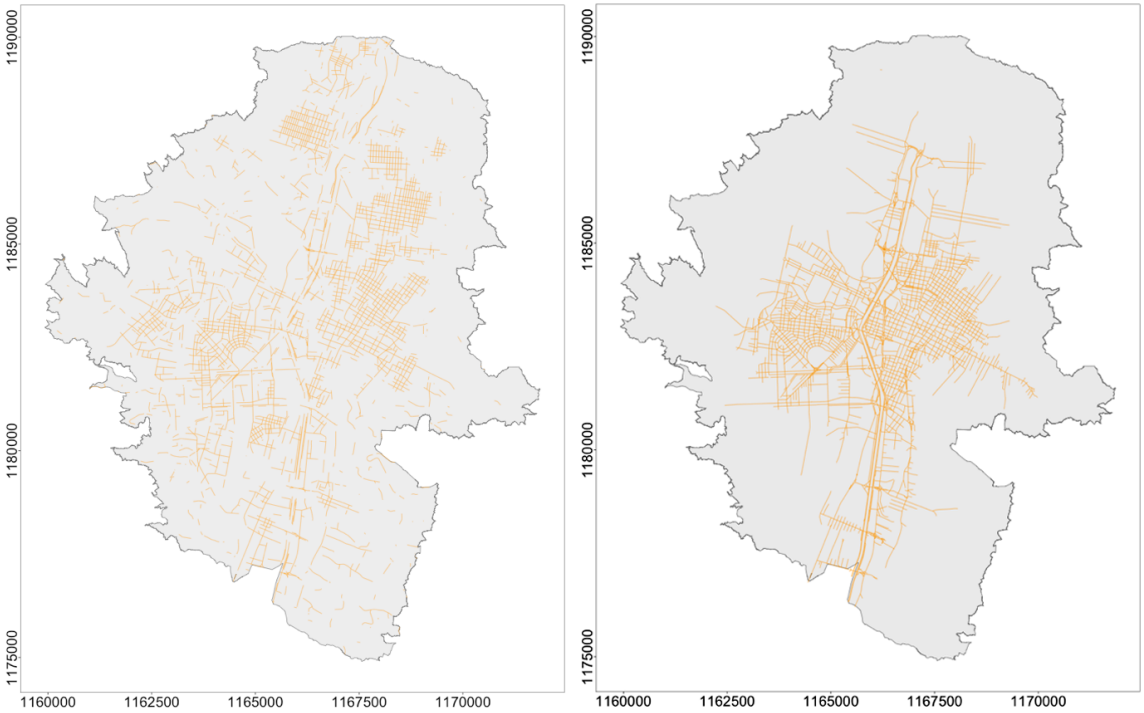

Figure 10. Urban morphological models for Medellín. Formats are as Figure 9.

of network sections at which high-value local segments (400m) overlap with high-value global-scale segments (Figure 11). The purpose of this was to observe the 'potential' impacts of wider-scale movements on local-scale centralities.

3.3. Impacts of Local and Global Movement Infrastructures on Community Formations

The arrays of community sample maps for (Figures 12 and 13) reveal how icons with 'positive' (orange) and

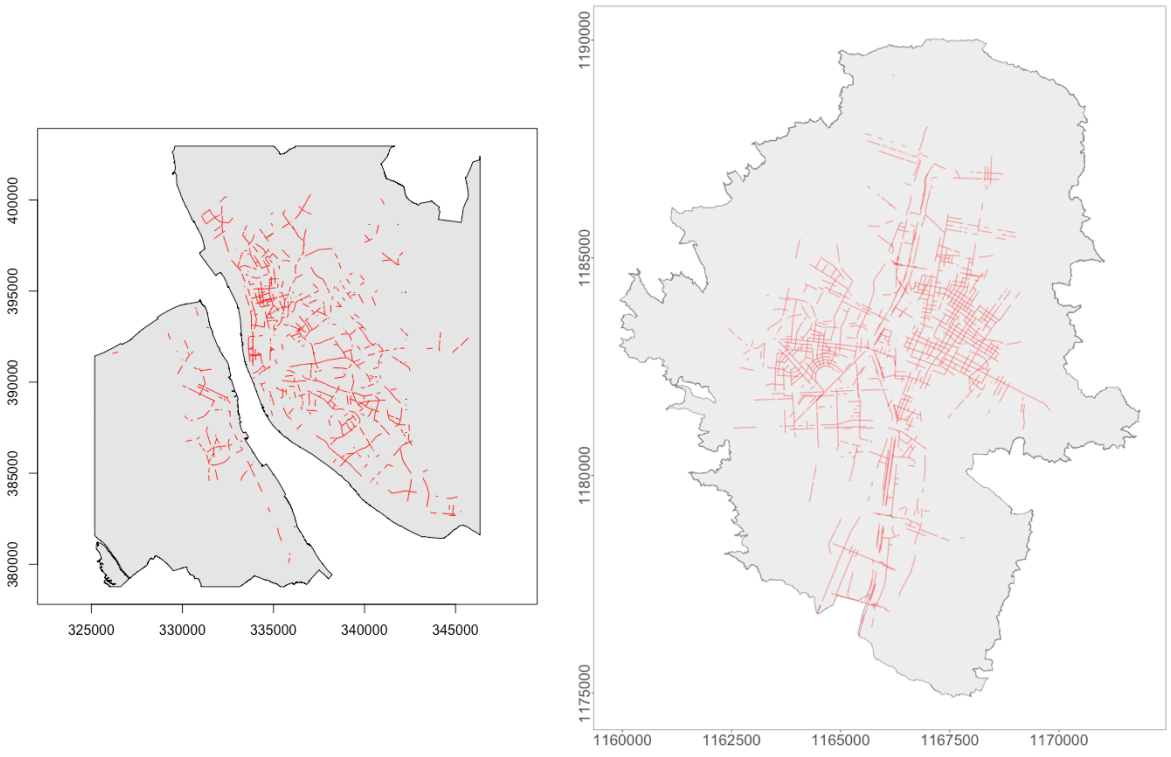

Figure 11. Segments at which NAIN local-scale segments overlap with NAIN global-scale segments for Liverpool (left) and Medellín (right).

'negative' (blue) connotations where applied to movement infrastructures. Communities that share network spaces (such as Bellerive, Belvedere and St. Hilda's, and also Hillside and Alsop in Liverpool, and most of the samples communities in Medellín), present very similar impressions of their local spaces, with each community applying similar weightings to major local infrastuctures, such as busy roads, junctions and pathways running by water courses for the Medellín case. The weights applied to these movement infrastructures where based mainly on negative representations (of 'shock' or 'sad', and so on).

Perhaps surprisingly, the majority of icon weights were applied to movement infrastructures that do *not* tend to converge NAIN local and global scales. We might hypothesise that the communities' respective 'sense of place' (whether based on negative or positive connotations), is affected by movement potentials bearing singular, dominant NAIN-scale segments. We can look at this pattern in different ways. One possible interpretation is that movement infrastructures that converge NAIN scales repel community life. Another is that the participatory methodology has revealed how 'negative spaces' of community life form around non-convergent movement infrastructures.

3.4. Observing Movement Potentials in Relation to Socio-Economic Patterning

Our aim in this section of work was to take a broad survey of the wider urban contexts in which our sample populations were situated. We based this survey on measurements of 'potential' impacts of city-scale centralities on local centralities, in relation to spatial distributions of relative deprivations. We sought to understand how overlaps among local and global NAIN scales might relate to distributions of relative deprivations or vulnerabilities. We addressed this based on IMD ranges (DCLG, 2015) for Liverpool, and the elective SISBEN surveys (2015) for Medellín. See details in the Methods Section and Appendix.

In detail, we measured the total length of segments that feature overlapping movement potentials within square subdivisions (40 × 40 grid), as a percentage ratio of the total length of all segments in each square. This allowed us to measure the degree to which movement infrastructures in a local area interacted across radial distance scales. For example, certain areas might feature high-density street networks, but have few segments interacting with city-scale movements.

The Figure 12, below, shows for Liverpool, the results for the square subdivisions within each Lower Su-

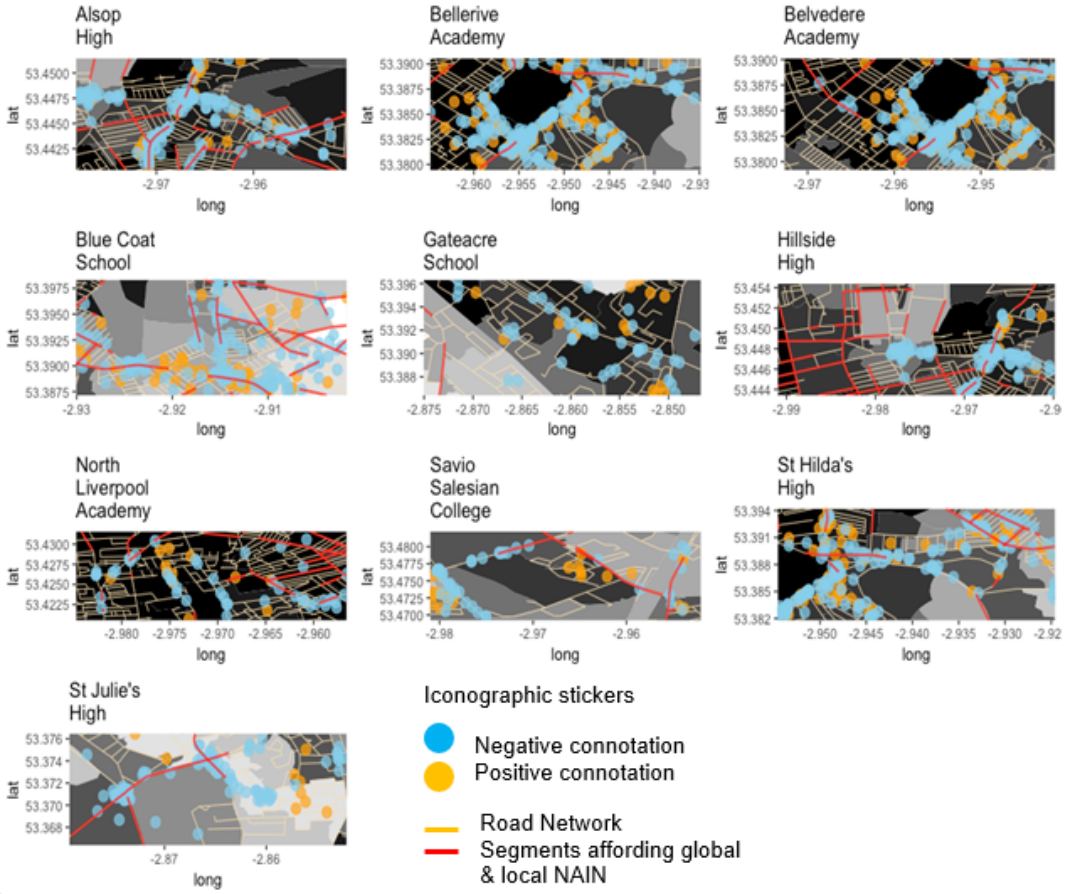

Figure 12. Array of community samples showing extract Depthmap segments overlaid on IMD by LSOA (Liverpool case study). Blue points represent negative weights such as 'sad', 'shocked', etc. Orange represents positive weights such as 'love', 'happy' etc.

per Output Area (LSOA). A choropleth array was generated to represent the segment length counts broken down by IMD score quintiles, which vary across a low-deprivation to high-deprivation range of 2.96–82. In the figure, the distribution of network interaction lengths is color-coded from light (low length count) to dark (high length count). The Figure 13, shows for Medellín, a similar analysis using the SISBEN score quintiles associated to each neighbourhood.

We then applied this sampling process to additional Depthmap models of Medellín, in relation to spatial distributions of vulnerability. We mapped these distribu-

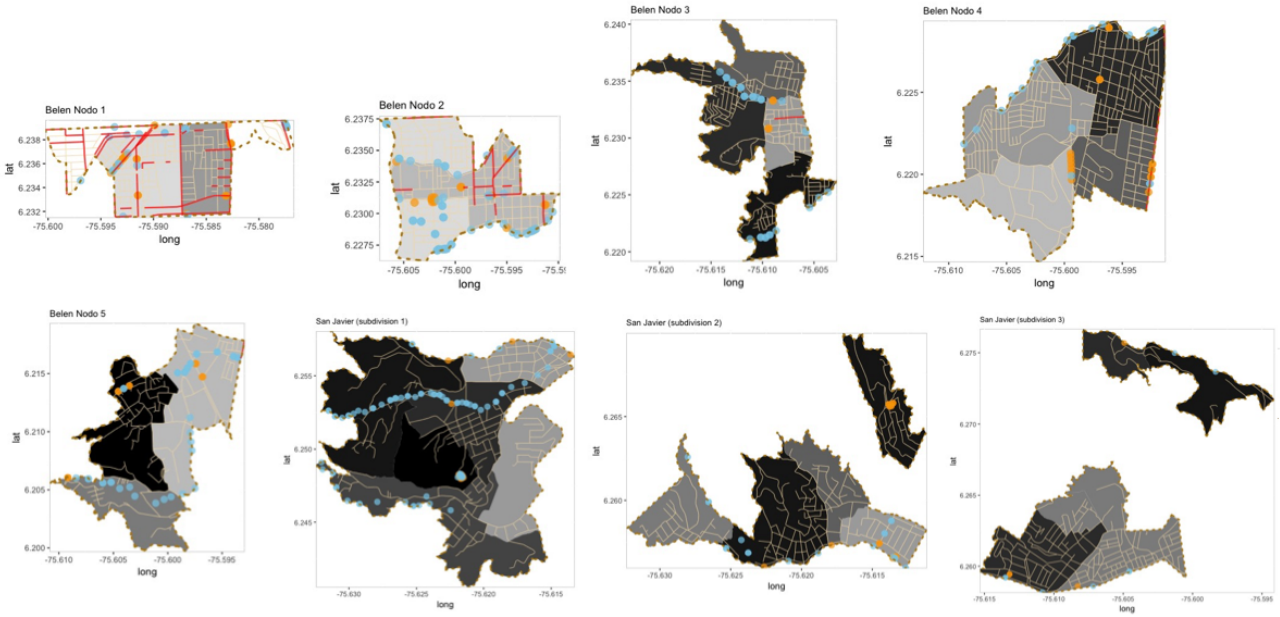

Figure 13. Array of community samples showing network map (Medellín case study). Colour coding as in Figure 9.

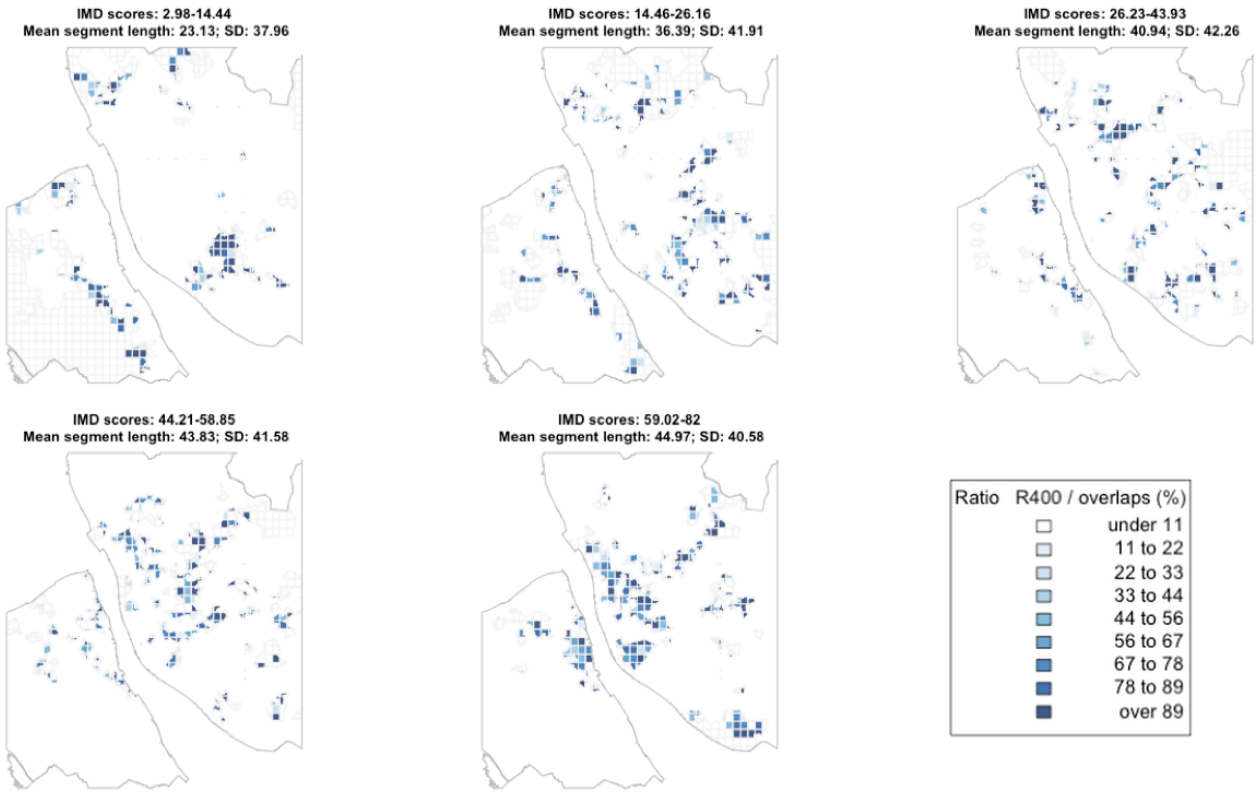

Figure 14. A choropleth array representing total lengths of network segments with 'overlapping' movements in each square subdivision as a ratio (%) of all network segments in that area. The sampling grid (raster) has been clipped based on IMD score quintile ranges. The plots run high IMD score top left to low IMD score bottom right.

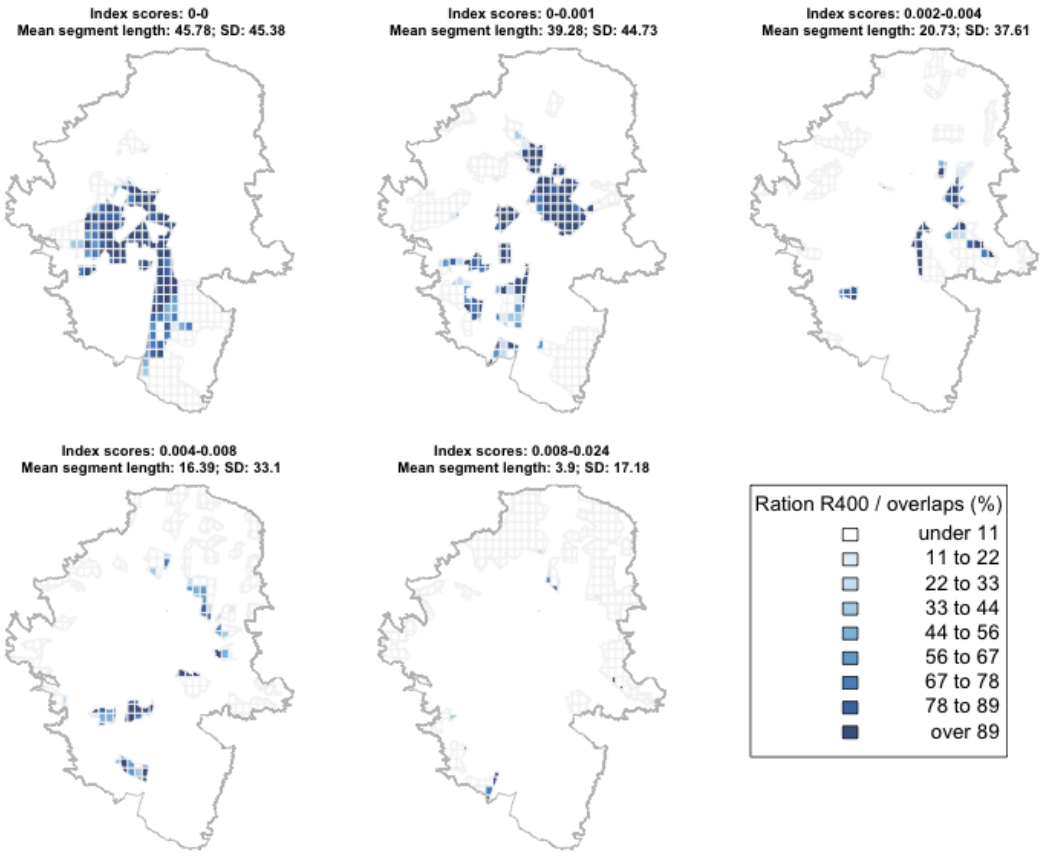

Figure 15. A choropleth array of Medellín based on SISBEN score quintiles, following the same sampling format shown in Figure 12. However, the plots run low vulnerability top left to high vulnerability score bottom right.

tions with the choropleth format described above (see Figure 13). The morphological analysis of interaction among local- and urban-scale centralities in the sample data has revealed the potential impact of wider centralities on local centralities among areas across the range of deprivations or vulnerabilities.

4. Conclusions

Our aim has been to develop innovative methods for observing some possible impacts of movement infrastructures in urban community formations. We argued that urban communities make use of artefacts in their local spaces that, by combining physical and relational properties, are relational to the activities and perspectives of the community members. We wanted to observe how the major presence of roads, streets and pathways in community spaces served to shape the 'sense of place' in that area. We drew from three sources of data: geo-located points-data derived from participatory workshops, socio-economic data from public sources, and urban morphological data pertaining to probabilistic urban-network interactions.

The study participants were invited to mark on the map what structures in their local areas they considered to help or to hinder processes of social inclusion that underpin community formation. We extracted selections of movement infrastructures (including roads, streets and pathways). We found that the impact of movement infrastructures is far from even, and depends highly on the local community context. Following this observation, we took a wider-scale perspective, and found a more common pattern in the general significance of road segments. Among communities where movement infrastructures are more significant overall, they apply greater significance to structures where scales of movement do not tend to converge (based on Integration, representing affordances for origin/destination movements; where 'significance' was reflected in iconographic weights representing overall negative values). In other words, their 'sense of place' in relation to movement infrastructures forms around structures with low or no overlapping between local- and city-scale points of origin/destination.

We also observed the patterning of convergences of Integration scales in relation to distributions of relative deprivation or vulnerability. We found a degree of correlation in the two case-study contexts of Liverpool and Medellín. In Liverpool, high-deprivation areas tend to converge Integration scales, while in Medellín low-vulnerability areas tend to converge these scales. Discounting these indicators of socio-economic status, the convergences seem to relate more to urban morphologies based on dense, rectilinear structures. Areas bearing sparse, non-linear structures such as those typi-

cally found at the urban peripheries tend to have singular, dominant Integration scale. These perhaps represent 'islands' of communities that are segregated in terms of relative deprivation or vulnerability. We draw a hypothesis from this study that movement infrastructures bear highly variegated significance for social inclusion, depending on the communities' specific constitution and circumstances. A follow-up study is required to test this hypothesis, where the investigators can analyse the participants' text descriptions presented by the workshop participants. This will form our next stage of work.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendix

1. Explanation of the Index SISBEN and Its Manipulation for the Research

According to the Alcaldía Mayor de Bogotá D.C. (2015) the SISBEN is a system to identify potential beneficiaries of social programs subsidized by the government of Colombia. For this purpose, each year a survey is applied under request to the citizens that want to apply to these benefits. In the case of Medellín, 1,676.622 people at the urban perimeter of Medellín took the survey during 2015, which represents the 76% of the estimated total population for the city by the National Department of Statistics (DANE, 2009).

The results of the SISBEN survey, which inquires for diverse variables (examples: housing conditions, level of education, access to health, incomes, etcetera), allows to classify the population between a score of 0 and 100 (the lowest, the most vulnerable population) (Alcaldía Mayor de Bogotá D.C., 2015). In order to allocate the subsidizes, each social organization defines specific thresholds. For example, the Ministry of Social Protection (Resolución 3778 de 2012) gives subsidizes to the inhabitants that have a SISBEN score below 54.86.

In the analysis of the urban morphologies in relation to the results of the SISBEN survey, the main challenge encountered is that there is not any index associated to specific geographical entities. On the other hand, the dataset consists on the amount of people that took the survey per neighbourhood and its associated scores classified in 10 ranges.

2. Index Proposed Using the SISBEN Information

For this reason, it was proposed to classify the geographical entities according to the amount of population in each neighbourhood that obtained SISBEN scores below 54.86 (threshold defined by the Ministry of Social Protection) and calculate its percentage in relation with the total amount of population within this score in the city.

3. Why the Selection of SISBEN Dataset

Other sources of population vulnerability are i) the survey of the quality of life realized each year by the municipality (Encuesta Calidad de Vida, ECV) and ii) the socioeconomical classification of the population according to the housing conditions (SEC). The reasons to select the SISBEN survey above these datasets are i) its higher spatial resolution (ECV is only calculated for the *comuna* level, 16 entities in Medellín), ii) its free availability, and iii) the consideration of other variables besides physical ones to classify the vulnerability of population.

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Article

‘Forced Car Ownership’ in the UK and Germany: Socio-Spatial Patterns and Potential Economic Stress Impacts

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Abstract
The notion of ‘forced car ownership’ (FCO), born out of transport research on UK rural areas, is used to define households who own cars despite limited economic resources. FCO is thought to result in households cutting expenditure on other necessities and/or reducing travel activity to the bare minimum, both of which may result in social exclusion. Social exclusion research, on the other hand, has paid much attention to ‘material deprivation’, i.e., the economic strain and enforced lack of durable goods arising from low income. However, the FCO phenomenon suggests that, among households with limited resources, the *enforced possession* and use of a durable good can be the cause of material deprivation, economic stress and vulnerability to fuel price increases. In this study, we use 2012 EU ‘Income and Living Conditions’ data (EU-SILC) to shed light on FCO in two European countries (UK and Germany). Through secondary data analysis we are able to show: the social and spatial patterns of FCO; key differences between FCO and ‘car deprived’ households; the intensity of social exclusion, material deprivation, and economic strain among FCO households; and overlaps between FCO and economic stress in other life domains (domestic fuel poverty, housing cost overburden). The results also show contrasting spatial patterns of FCO in Germany (higher incidence in rural areas) and UK (similar incidence in urban and rural areas), which can be explained in light of the different socio-spatial configurations prevalent in the two countries. We conclude by discussing implications for future research and policy-making.

Keywords
car use; economic stress; forced car ownership; material deprivation; social exclusion; transport

Issue
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1. Introduction

Since the early 2000s, there has been increasing research on the connections between transport and social exclusion, notably in the UK (Lucas, 2012; Ricci, Parkhurst, & Jain, 2016; SEU, 2003) and Australia (Currie, 2011; Currie, Stanley, & Stanley, 2007), but more recently also in other countries such as Germany (BMVBS, 2012). Most of this research has focused on those who are excluded from car ownership and use in developed countries, where levels of car dependence have increased dramatically during the 20th century (Pooley, 2016). Studies have often focused on suburban, periurban and rural areas, where modal alternatives to the private car are less available. ‘Recurring characters’ in transport and social exclusion research include low-income households, older and younger people, women, immigrants and ethnic minorities, people with a disability, and people in unemployment (which collectively form a considerable proportion of the population). All of these groups are less likely to drive cars than the average of the population for reasons including, but not limited to, the affordability of owning and operating vehicles. Interestingly, these are also the groups that are generally identified as more at risk of social exclusion, suggesting the existence of strong linkages between lack of car ownership, transport disadvantage and broader exclusionary processes.

Comparatively little attention has been paid to the forms of transport disadvantage experienced by car users in car dependent societies, where high levels of car use may be required for human needs satisfaction (Mattioli, 2016). A number of studies (reviewed in the next section) have employed the notion of 'forced car ownership' (FCO) to refer to households who, despite limited economic resources, own and use cars as the only viable way of accessing essential services and opportunities. FCO has been linked to a range of negative consequences, including reduced travel activity, cuts to other parts of the household budget and vulnerability to fuel price increases.

This article explores social and spatial patterns of FCO in the UK and Germany. EU survey data allows us to compare the two countries based on nationally-representative, harmonized data, as well as to investigate the links between FCO and social exclusion, material deprivation and economic stress indicators. The article advances previous research in three ways. First, with few exceptions (e.g., Currie, 2011) to date, transport and social exclusion research has engaged little with the quantitative measurement of social exclusion and its sub-dimensions at the household or individual level (although place-based indicators have been developed—see e.g., Curl, Nelson, & Anable, 2011). Arguably, quantitative evidence on transport disadvantage is crucial to persuade policy makers of the relevance of the problem, and can inform the development of targeted policy measures. Second, perhaps because of the lack of harmonized data, quantitative studies comparing transport disadvantage across different countries are still relatively rare. Finally, there is only limited quantitative evidence on the financial sacrifices and economic stress experienced by forced car owners.

Overall, this article aims to demonstrate that the EU-SILC dataset (described in Section 3) is a valuable and currently untapped resource for the quantitative study of FCO and 'car deprivation' in an internationally comparative perspective. By demonstrating how these concepts can be operationalized using EU-SILC data, it opens up a number of interesting directions for future research, as discussed in the conclusions.

The article is structured as follows: Section 2 briefly reviews existing literature on FCO, Section 3 introduces the data source, the case study countries and the data analytical approach, Section 4 presents the findings, which are discussed in Section 5 along with policy implications and directions for future research.

2. Background

The review in this section focuses on empirical studies which have adopted the notion of FCO, and notably on those providing quantitative evidence on its incidence, socio-spatial patterning, and the households' economic stress situation. We also highlight how the notion of FCO has been operationalised in previous research. The goal is to provide a point of reference against which to compare the results of this study.

Currie and Senbergs (2007) find early occurrences of the term 'forced car ownership' in Jones (1987) and Banister (1994), both of which use it to refer to UK rural areas. The first article to quantify the incidence of FCO is Currie and Senbergs' study of Melbourne (2007). Based on 2001 census data, the authors define FCO as households with 'low incomes' (lowest quartile), and 'high car ownership' (two or more cars). They find that 5.7% of households in Outer Melbourne can be considered FCO, as compared to only 1.9% in the inner city. Multivariate analysis of spatial data shows that the share of FCO is negatively related to public transport supply and positively related to distance to activity centres, with opposite effects for the proportion of low income households with no cars.

Based on descriptive analysis of travel survey data for 1996 (and focusing on Outer Melbourne residents only), Currie and Senbergs (2007) suggest that FCO can be typified as "young families with children with a high share of home keepers" (p. 19). They are also overrepresented among households with mortgages and in detached houses. This contrasts with the profile of low income households without a car, which the authors typify as "older (people) living in a single person household with a high share of rented accommodation on a pension" (p. 21). FCO also make the vast majority of their trips by car, make less trips per day and travel shorter distances than other multi-car households in Outer Melbourne, but more than low income households in other parts of Melbourne. The authors take this evidence as suggestive of high levels of expenditure on car use relative to incomes.

Currie and Delbosc (2011) have further investigated the lived experiences of low-income households in Outer Melbourne, based on bespoke survey data. They find that FCO have lower levels of transport difficulties and social exclusion (measured based on a bespoke scale covering income poverty, unemployment and social participation), but higher levels of financial stress than low-income households without a car.

Relevant to this study, a government-commissioned study (BMVBS, 2012) has investigated FCO in Germany based on 2008 national travel data. It defined FCO as households with: i) at least one car, ii) income below the poverty line, and iii) self-assessed good accessibility to shops and/or workplace by car, but not by alternative modes. The results show that 3% of German households are FCO, with the incidence varying dramatically between large cities (0.9%) and small rural municipalities (5.7%).

Curl, Clark and Kearns (in press) have investigated FCO in deprived communities in Glasgow (UK), based on bespoke survey data. They define FCO as households who i) own at least one car and ii) report difficulties to afford at least one of five items (rent, mortgage, household maintenance, energy bills, and food). The findings show that 8.5% of the sample can be defined as FCO in 2011,

with an overrepresentation of households with two or more children.

To conclude this review it must be noted that the use of the term 'forced car ownership' is controversial. In the literature, a number of alternative terms are used to refer to households struggling to afford the running costs of motoring, including, e.g., 'transport poverty' (Gleeson & Randolph, 2002), 'fuel poverty in the transport sector' (Berry, Jouffe, Coulombel, & Guivarch, 2016) and 'car-related economic stress' (Mattioli & Colleoni, 2016). Mattioli (2013) argues that much broader sections of the population are 'forced' into car ownership, and that what is distinctive about 'FCO' is rather that car ownership results in economic stress for the affected households. On the other hand, Currie and colleagues have criticized the notion of FCO for being value-laden and misleading, as it downplays the agency of households who have often made a conscious decision to own vehicles and live in car-dependent areas, in exchange for benefits such as access to affordable housing (Currie & Delbosc, 2011; Currie & Senbergs, 2007). Other authors, however, argue that low-income households have limited choice when it comes to residential location, due to lower purchasing power, but also to other factors such as e.g., reliance on local social networks (Belton Chevallier, Fol, Motte-Baumvol, & Jouffe, in press; Curl et al., in press; Mullen & Marsden, in press; Scheiner, in press). In a nutshell, FCO appears to result from a complex mix of structural constraints and household agency, with an ongoing debate on their respective importance.

While we acknowledge the limitations of the FCO terminology, in this article we use the term to emphasize continuity with previous research, and the fact that our empirical definition is based on data on *car ownership*, rather than car use and related expenditure (see Section 3.3.1 below).

3. Methodology

3.1. Data

Since 2004, the EU-SILC (European Union Statistics on Income and Living Conditions) survey is conducted every year in the member states, and is the data source for the official EU social indicators. EU-SILC is a 'harmonized' survey, i.e., different member states use different survey instruments to collect the data, but follow a common blueprint set by Eurostat, which guarantees the comparability of resulting data. It covers a range of topics including income, housing expenditure, labour market situation and material deprivation. While there is no specific module on transport in EU-SILC, some information is collected as it is relevant to other agendas. In this article, we use the 2012 wave as it includes information on accessibility to public transport services, which is key for our analysis. The sample we use is representative of the population of private households residing in the UK and Germany, although for cost reasons addresses from the Isles of Scilly were excluded from the UK sample frame, and addresses north of the Caledonian Canal in Scotland were under-sampled (note that these areas account for less than 2% of the UK population). The sample size is 10,175 households (18,336 individuals) in the UK, and 13,145 households (23,587 individuals) in Germany. In both countries, all household members aged 16 or more were personally interviewed. Weights have been applied to adjust for probability of selection, non-response, and to reproduce sample population characteristics.

3.2. Case Studies

Our analysis focuses on Germany and the UK. Both are large and rich Northern EU countries with comparable levels of car ownership (as illustrated in Section 4.1), and have seen similar trends towards suburbanisation and car dependence in the 20th century (Mattioli, 2013), although not as dramatically as New-World English-speaking countries such as Australia and the US. There is, however, a number of institutional and regulatory differences between the two countries which must be taken into account when interpreting the findings.

The German model of capitalism is seen as more conducive to the provision of public goods than the liberal model of English-speaking countries (Logemann, 2012). This is particularly apparent when comparing the regulatory setting of public transport in Germany and the UK. In the 1980s, the UK government implemented the privatisation and quantity deregulation of local bus services outside of London, and this has resulted in substantial reductions in patronage levels and public subsidies, while fares have increased (Mees, 2010; Preston & Almutairi, 2013). This may have added to FCO pressures by reducing the quality of modal alternatives to the car. By contrast, in Germany the public sector retains control of quality and quantity of the service and subsidises operating costs to a larger extent than in the UK (Dziekan, 2011). The German model of 'transport associations' has also been successful in providing integrated and seamless public transport services in city-regions (Mees, 2010; Pucher & Kurth, 1996). Finally, as a result of investment in public transport infrastructure, German cities of more than 50,000 inhabitants typically have networks of buses, tramways and regional trains, which compares favourably with the UK (Dziekan, 2011; Shaw & Docherty, 2014). On the other hand, German policies to contain urban sprawl appear to have been less successful than England's (Baing, 2010), which may have increased the need for car ownership and use.

3.3. Approach

3.3.1. A Material-Deprivation-Based Indicator of FCO

A composite indicator of 'material deprivation' is used by the EU to measure levels of absolute poverty (Fusco, Guio, & Marlier, 2013), and is included in EU-SILC. It is

based on the self-reported ability to afford the following necessities:

1. to face unexpected expenses (of an amount equivalent to the monthly poverty line in the respondent's country);
2. one week annual holiday away from home;
3. to pay for arrears (for mortgage or rent, utility bills or hire purchase instalments);
4. a meal with meat, chicken or fish (or vegetarian equivalent) every second day;
5. to keep home adequately warm;
6. to have a washing machine;
7. to have a colour TV;
8. to have a telephone (fixed landline or mobile);
9. to have a car/van for private use.

Households who cannot afford at least three of the nine items are considered to be in 'material deprivation' ('severe' material deprivation if four items or more). The scale includes two sub-components: 'economic strain' (items 1–5) and 'enforced lack of durables' (items 6–9). In the case of durable goods, respondents have to select one of three alternatives: 1) household owns good; 2) household would like to have it but cannot afford it; and 3) household does not own good for other reasons e.g., does not want it or need it. Therefore, it is impossible for a household to report that they own, for example, a car but they cannot afford it.

It is important to note that the selection of nine material deprivation items was validated in a EU-wide survey study which showed that: 1) all items are considered as necessary "to have a decent standard of living" by a majority of the EU population; and 2) within countries, there is a social consensus across social groups (e.g., social strata, age bands) on the fact that these constitute necessities (for more detail see Fusco et al., 2013). Therefore, the material deprivation indicator is meant to "capture a situation of exclusion from a minimum acceptable way of life due to lack of resources" (Fusco et al., 2013, p. 48).

In our analysis, we exploit information on car ownership, material deprivation and reasons for non-car ownership, drawn from the nine variables above, to identify four groups:

- *Forced Car Owners* (FCO): households who own at least a car and are materially deprived. This definition is similar to Curl et al.'s (in press), but is based on the official EU indicator of absolute poverty. We assume that these households trade-off (at least potentially) motoring expenditure against expenditure in other essential areas;
- *Other Car Owners* (OCO): households who own at least a car and are not materially deprived;
- *Car Deprived* (CD): households who do not own cars because they 'cannot afford it';
- *Other Non-Car Owners* (ONCO): households who do not own cars for 'other reasons'.

In Section 4.1 we compare the four groups by means of descriptive statistics and multivariate logistic regression. We use two sets of regression models to show how FCO differ from the average of the population, as well as from 'car deprived' households. This is particularly important since, as discussed in Section 1, people who cannot afford cars have to date attracted most of the attention in transport and social exclusion research.

3.3.2. Descriptive Variables

In Section 4.1, we use two variables to describe the residential location and public transport accessibility of households. A harmonized 'degree of urbanisation' variable is provided in EU-SILC, allowing the comparison of different member states. The variable classifies LAU2s (Local Administrative Units Level 2, corresponding to municipalities or equivalent units) in three categories, based on grid cells of 1km^2 (Eurostat, n.d., pp. 3-4):

- *densely populated areas (cities)*: at least 50% of the population lives in 'high density clusters' (i.e., continuous grid cells with a density of at least 1,500 inhabitants per km^2 and a minimum population of 50,000);
- *intermediated areas (towns and suburbs)*: less than 50% of the population lives in rural grid cells and less than 50% lives in high density clusters;
- *thinly populated areas (rural)*: more than 50% of the population lives in grid cells outside of 'urban clusters' (i.e., clusters of contiguous grid cells of 1km^2 with a density of at least 300 inhabitants per km^2 and a minimum population of 5,000).

In the 2012 wave, respondents were asked to rate the 'accessibility of public transport'. Accessibility was defined in terms of physical and technical access and appropriateness of timetables, and respondents were instructed not to take into account quality, price and similar aspects. Therefore, the resulting variable is best interpreted as a (self-reported) measure of access *to* public transport, rather than as an indicator of the accessibility to services and opportunities provided *by* public transport.

In Section 4.2, we profile FCO and other groups based on a range of indicators of social exclusion and economic stress drawn from EU-SILC. Definitions are provided below (unless otherwise stated the source is Eurostat, 2017).

The main EU social policy indicator is the number of people 'at risk of poverty and social exclusion' (AROPE). A household is considered AROPE if any of the following applies:

- *income poverty*: equivalised net income (after social transfers) is less than 60% of the national median;
- *'severe' material deprivation*;
- *'very low' work intensity* (WI). WI is defined as the ratio between the number of 'worked' and 'work-

able' months, in the 12 months preceding the interview, for working age members. It ranges between 0 ('jobless household') and 1, with values lower than 0.5 defined as 'low', and 'very low' if less than 0.2.

While no official definition of 'in-work poverty' at the household level is provided by the EU (Ponthieux, 2010), in our analysis we define the 'working poor' as income-poor households with non-zero work intensity.

Recent research on transport affordability and car-related economic stress has highlighted the links and overlaps with issues of housing and domestic energy affordability (see, e.g., Cao & Hickman, in press; Li, Dodson, & Sipe, in press; Mattioli, 2015; Mattioli, Lucas, & Marsden, 2017; Ortar, in press). In our analysis, we explore the relationships between these different forms of economic stress, based on two indicators. EU households are considered to be in 'housing cost overburden' if total housing costs (net of housing allowances) represent more than 40% of disposable income (net of housing allowances). 'Fuel poverty' is a term used in the UK and the EU to refer to the inability to afford adequate domestic energy services, with a notable focus on heating. Drawing on Thomson and Snell (2013), we define fuel poor households as those reporting at least one of the following: 1) 'cannot afford to keep home adequately warm', 2) arrears on utility bills in the last 12 months, and 3) presence of leaks, damp or rot in the dwelling.

4. Results

4.1. Social and Spatial Correlates of FCO

In 2012, 6.7% of UK households and 5.1% in Germany were FCO (corresponding to roughly 600 unweighted observations in both national samples). The total share of households with cars was at very similar levels (77–78%) in the two countries. Overall, the distribution of households across the four groups (first row in Table 1) was also remarkably similar.

Table 1 shows how the prevalence of FCO and the three other groups varies across different sectors of the population. The row variables in Table 1 correspond to the independent variables used in the regression models in Table 2 below. The variables cover socio-demographic (household composition, age, gender, and immigrant status), economic (income and work intensity) and spatial factors (degree of urbanisation, accessibility to public transport), as well as mobility difficulties (operationalised as presence of household members with limitations in activities because of health problems). Previous research has found these factors to be associated with low-income, car ownership and use (e.g., Lucas, Bates, Moore, & Carrasco, 2016; Mattioli, 2014; Stokes & Lucas, 2011). Previous studies have also suggested a relationship between FCO and access to (detached) home ownership, often backed up by mortgages (see Section 1; Dodson & Sipe, 2008; Walks, 2015). To investigate these relationships we include tenure and type of dwelling in our analysis.

The descriptive results in Table 1 show that in both countries FCO are overrepresented among households with children, in the middle age bands (40s and 50s), in the bottom 40 percent of the income distribution, as well as among households with mobility difficulties and home-renters. FCO is high among jobless households but also among households with low (and, in the UK, medium) work intensity.

With regard to differences between countries, Table 1 shows that FCO are overrepresented among large households and immigrant households in the UK, but not in Germany. Conversely, in Germany FCO are overrepresented in thinly populated areas and among households reporting difficult access to public transport, while no such difference is observed in the UK—in fact, the incidence rate of FCO is virtually the same across different type of areas.

'Car deprived' households account for approximately 11% of households in both countries, and have both similarities and differences with FCO (Table 1). CD are similarly overrepresented in the bottom 40% of the income distribution, among jobless and low-work-intensity households, as well as among tenants and households with mobility difficulties. However, CD differ from FCO in a number of respects: they are overrepresented among single-person and young households, as well as in densely populated areas and among those reporting easy access to public transport. In Germany, they are overrepresented among households without a working age member. Also, in both countries they are strongly overrepresented among households living in flats—whereas the incidence of FCO is relatively similar across types of dwelling.

The logistic regression Models 1 and 3 model the probability of belonging to FCO, as opposed to any other group in our classification (Table 2). The results broadly confirm the findings in Table 1, with some qualification. In both countries, there is no statistically significant effect of household size, once other factors are controlled for. The presence of children is significantly associated with FCO in the UK, but not in Germany. Also, after controlling for confounding effects, households with low working intensity are more likely to be FCO than both jobless households and households with a higher WI factor. In both countries, there is a statistically significant net effect of tenure, as outright owners have the lowest (and private market tenants the highest) probability of FCO. Finally, the models show a significant net association between FCO and type of dwelling, with the probability highest for households living in semi-detached housing (in the UK) or small blocks of flats (in Germany).

In Germany, households without working age members are significantly less likely than other households to be FCO, while households with a female 'household respondent' are more likely once other factors are controlled for.

Table 1. Distribution of 'car ownership/material deprivation' indicator in different social groups. Percentage values [unweighted sample size in square brackets] (EU-SILC, 2012).

		UK						*Germany*					
		FCO	**OCO**	**CD**	**ONCO**	***Total***	***[n]***	**FCO**	**OCO**	**CD**	**ONCO**	***Total***	***[n]***
	TOTAL	*6.7*	*70.2*	*10.6*	*12.5*	*100*	*[10095]*	*5.1*	*72.8*	*11.5*	*10.6*	*100*	*[12982]*
Household size	1	5	52	17	26	*100*	*[2917]*	5	53	22	20	*100*	*[3770]*
	2	5	79	8	8	*100*	*[3604]*	4	83	6	7	*100*	*[5096]*
	3	9	75	9	7	*100*	*[1476]*	6	87	4	(3)	*100*	*[1598]*
	4+	11	78	7	4	*100*	*[1846]*	5	91	(2)	(2)	*100*	*[1715]*
Minor children	0	5	70	10	15	*100*	*[6785]*	4	70	13	13	*100*	*[9498]*
	1+	11	71	12	6	*100*	*[3058]*	7	83	6	4	*100*	*[2681]*
Work intensity	Jobless household (0)	13	27	36	24	*100*	*[1026]*	11	30	42	17	*100*	*[879]*
	Low WI (0–0.5)	18	47	22	13	*100*	*[530]*	12	63	16	(9)	*100*	*[533]*
	Medium WI (0.5–1)	9	80	6	5	*100*	*[2236]*	5	85	6	4	*100*	*[3571]*
	High WI (1)	5	82	5	8	*100*	*[2772]*	4	79	6	11	*100*	*[2925]*
	No working age member	3	69	9	19	*100*	*[3279]*	3	69	13	15	*100*	*[4271]*
Age of HR*	$16–29^{+}$	7	51	27	15	*100*	*[696]*	(5)	57	21	17	*100*	*[574]*
	30–39	9	70	11	10	*100*	*[1556]*	5	73	12	10	*100*	*[1392]*
	40–49	9	72	10	9	*100*	*[1980]*	6	76	10	8	*100*	*[2490]*
	50–59	9	77	6	8	*100*	*[1701]*	6	74	12	8	*100*	*[2563]*
	60–69	5	79	7	9	*100*	*[1720]*	4	73	14	9	*100*	*[2536]*
	70+	(2)	67	9	22	*100*	*[2190]*	3	73	9	15	*100*	*[2624]*
Health-related activity limitation	No members	5	77	9	9	*100*	*[6432]*	4	76	9	11	*100*	*[6613]*
	1+	11	58	13	18	*100*	*[3411]*	7	68	15	10	*100*	*[5566]*
Immigration status of HR	No immigration	6	73	9	12	*100*	*[8770]*	5	73	11	11	*100*	*[11443]*
	Immigration	10	58	16	16	*100*	*[1073]*	(5)	69	15	11	*100*	*[736]*
Sex of HR	Male	6	77	8	9	*100*	*[5438]*	4	80	8	8	*100*	*[7819]*
	Female	7	62	14	17	*100*	*[4405]*	6	62	17	15	*100*	*[4360]*
Equivalised disposable income quintile	Lowest	12	47	24	17	*100*	*[2032]*	10	37	36	17	*100*	*[1905]*
	Second	11	58	14	17	*100*	*[2092]*	8	65	14	13	*100*	*[2391]*
	Third	7	71	8	14	*100*	*[2020]*	4	81	5	10	*100*	*[2609]*
	Fourth or highest	2	89	2	7	*100*	*[3699]*	2	89	1	8	*100*	*[5274]*

Table 1. Distribution of 'car ownership/material deprivation' indicator in different social groups. Percentage values [unweighted sample size in square brackets] (EU-SILC, 2012). (Cont.)

		UK						*Germany*					
		FCO	**OCO**	**CD**	**ONCO**	***Total***	***[n]***	**FCO**	**OCO**	**CD**	**ONCO**	***Total***	***[n]***
Degree of urbanisation	Densely populated	7	65	13	15	*100*	*[5094]*	3	61	18	18	*100*	*[4410]*
	Intermediate	7	74	9	10	*100*	*[3198]*	6	80	8	6	*100*	*[4959]*
	Thinly populated	6	84	3	7	*100*	*[1551]*	7	82	6	5	*100*	*[2810]*
Dwelling type	flat (building ≥10 dwellings)	(4)	37	26	33	*100*	*[593]*	5	54	21	20	*100*	*[2442]*
	flat (building <10 dwellings)	7	46	23	24	*100*	*[1137]*	6	68	14	12	*100*	*[4603]*
	semi-detached house	8	72	9	11	*100*	*[5685]*	3	89	(3)	5	*100*	*[1945]*
	detached house^{+}	3	91	(2)	4	*100*	*[2428]*	4	91	(2)	3	*100*	*[3189]*
Accessibility to public transport	Easily	7	70	11	12	*100*	*[8086]*	4	70	13	13	*100*	*[9462]*
	With difficulty	7	71	8	14	*100*	*[1757]*	7	82	7	4	*100*	*[2717]*
Tenure status	Outright owner	2	82	5	11	*100*	*[3443]*	2	90	3	5	*100*	*[3481]*
	Owner paying mortgage	6	89	2	3	*100*	*[2980]*	4	91	(1)	4	*100*	*[2842]*
	Rent at market rate	11	53	20	16	*100*	*[1264]*	7	58	18	17	*100*	*[4917]*
	Rented at reduced rate/free	12	35	27	26	*100*	*[2156]*	6	57	24	13	*100*	*[939]*

Notes: percentages based on 20 to 49 unweighted observations are shown in brackets; within each category of the row variables, the distributions in the two countries are statistically different at the 5% level (chi-square test), except for categories marked with superscript $^{+}$ (statistically different at the 10% level); * in EU-SILC the 'household respondent' (HR) is generally the person responsible for the accommodation.

Table 2. Parameter estimates for the logistic regression for the probability of FCO (EU-SILC, 2012).

	Country	UK				Germany			
	Model	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
	Outcome	**FCO**		**FCO**		**FCO**		**FCO**	
	Base outcome	**Rest of the sample**		**CD**		**Rest of the sample**		**CD**	
Variable (reference category)	Level	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Household size (ref. cat.: 1)	2	0.191	0.153	0.741***	0.199	−0.075	0.135	0.618***	0.176
	3	0.183	0.208	0.807***	0.280	0.041	0.223	1.188***	0.290
	4+	0.148	0.226	1.056***	0.295	−0.292	0.267	1.241***	0.388
Minors (ref. cat.: 0)	1+	0.352**	0.165	0.432*	0.241	0.192	0.199	0.107	0.271
Work intensity	Low WI (0–0.5)	0.531***	0.188	0.514**	0.224	0.417*	0.214	0.691**	0.269
(ref. cat.: Jobless household)	Medium WI (0.5–1)	0.282	0.179	1.111***	0.216	−0.082	0.190	0.620***	0.231
	High WI (1)	0.321*	0.177	0.864***	0.238	0.184	0.189	0.876***	0.251
	No working age member	−0.176	0.268	0.483	0.370	−0.430*	0.256	−0.083	0.298
Age of HR	30–39	0.419**	0.204	0.661***	0.240	0.277	0.243	0.030	0.293
(ref. cat.: 16-29)	40–49	0.496**	0.204	0.988***	0.237	0.431*	0.233	0.271	0.283
	50–59	0.546**	0.219	1.280***	0.279	0.400*	0.226	0.302	0.288
	60–69	0.406	0.289	0.780**	0.389	0.152	0.265	0.388	0.323
	70+	−0.569	0.389	0.129	0.456	−0.144	0.314	0.193	0.375
No of members with health-related activity limitations (ref. cat.: None)	1+	0.985***	0.113	0.514***	0.155	0.595***	0.113	0.232	0.150
Immigration status of HR (ref. cat.: No)	Yes	0.289**	0.144	0.091	0.191	0.140	0.202	−0.192	0.249
Sex of HR (ref. cat.: Male)	Female	−0.104	0.101	−0.734***	0.151	0.260**	0.106	−0.175	0.140
Equivalised disposable income	Second	−0.148	0.126	0.332**	0.169	−0.082	0.132	0.435***	0.167
quintile (ref. cat.: lowest)	Third	−0.626***	0.142	0.359*	0.212	−0.900***	0.168	0.395*	0.220
	Fourth or highest	−1.754***	0.183	0.419	0.257	−1.899***	0.201	0.984***	0.297
Degree of urbanisation (ref. cat.:	Intermediate	0.027	0.108	0.376**	0.151	0.723***	0.131	1.151***	0.158
Densely populated)	Thinly populated	0.135	0.150	1.201***	0.253	0.804***	0.152	1.311***	0.204

Table 2. Parameter estimates for the logistic regression for the probability of FCO (EU-SILC, 2012). (Cont.)

	Country	UK				Germany			
	Model	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
	Outcome	**FCO**		**FCO**		**FCO**		**FCO**	
	Base outcome	**Rest of the sample**		**CD**		**Rest of the sample**		**CD**	
Variable (reference category)	Level	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Dwelling type (ref. cat.: flat (building ≥10 dwellings))	Flat (building <10 dwellings)	0.639**	0.288	0.825***	0.319	0.231*	0.135	0.377**	0.154
	Semi-detached house	1.140***	0.269	1.519***	0.297	0.205	0.226	0.369	0.354
	Detached house	0.547*	0.312	1.992***	0.403	0.141	0.211	0.511*	0.301
Accessibility to public transport (ref. cat.: Easily)	With difficulty	0.200	0.127	0.218	0.191	0.317**	0.123	0.370**	0.185
Tenure status (ref. cat.: Outright owner)	Owner paying mortgage	0.692***	0.192	1.344***	0.305	0.567***	0.186	0.800**	0.367
	Rent at market rate	1.274***	0.208	−0.018	0.284	0.899***	0.191	−0.368	0.293
	Rent at reduced rate/free	1.138***	0.186	−0.005	0.262	0.581**	0.231	−0.559*	0.330
	Constant	−4.939***	0.382	−4.240***	0.454	−4.245***	0.328	−2.719***	0.423
McFadden's Pseudo R^2		0.17		0.26		0.13		0.23	
N		9,843		1,699		12,179		1,577	

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

The logistic regression Models 2 and 4 (in Table 2) model the probability of belonging to FCO, rather than the 'Car Deprived' group. The goal here is to identify factors that might lead households struggling to afford the costs of motoring to buy and use cars, despite having to curtail expenditure in other essential areas. The goodness of fit for these models is higher than for Models 1 and 3, suggesting that in both countries FCO differ more from CD than from the average of the population. A complementary explanation is that the model picks up the factors associated with car ownership, controlling for material deprivation (note that roughly 70% of CD households in both countries are materially deprived).

In both countries, the models show a positive association between household size and the probability of FCO. This is in contrast with Models 1 and 3, where the coefficients are insignificant. This suggests that FCO households are not larger than the average household, once other factors are controlled for, but they are larger than CD households. Work intensity and income also increase the probability of FCO, as compared to CD, although in the UK the probability peaks for households with 'medium' work intensity. A similar pattern is observed for income, with the highest coefficient values for households in the second and third quintile of the distribution. With regard to spatial factors, in both countries lower levels of urbanization and detached housing increase the relative probability of FCO.

Models 2 and 4 also highlight a number of differences between the two countries. In the UK, the relative probability of FCO, as compared to CD, is higher in the middle age bands, peaking for household respondents in their fifties, but no significant age effect is observed for Germany. Mobility difficulties and a male household respondent increase the relative probability of FCO in the UK, but not in Germany. Conversely, difficult access to public transport significantly increases the odds of being FCO (rather than CD) in Germany only.

It is interesting to note the differences in coefficient values between Models 2 and 4, on one hand, and Models 1 and 3. In both countries, the results suggest that FCO are typically poorer, less employed, and more likely to rent than the average of the population. However, they are typically richer, more likely to be employed, and to have mortgages than CD.

Having looked at the social and spatial factors associated with FCO, in the next section we sketch the profile of 'forced car owners' in terms of social exclusion.

4.2. Social Exclusion, Material Deprivation, Economic Stress and Indebtedness among FCO

Table 3 shows how the groups identified by the 'car ownership/material deprivation' indicator compare with respect to the indicators of social exclusion and economic stress defined in Section 3.3.2. Values for the full national samples (in the rightmost column) are very similar in the two countries confirming that they are well-suited for comparison. The exception is higher rates of housing cost overburden in Germany, which has a greater proportion of home-renters.

Unsurprisingly, for most indicators, 'Car Deprived' households show the highest, and 'Other Car Owners' the lowest values. FCO rank second to CD on most indicators, yet in both countries approximately 60% of FCO are AROPE, 30% are in 'severe' material deprivation, and 30-40% are income poor. While only approximately 20% of FCO are jobless in the two countries, the prevalence of low work intensity and in-work poverty is higher for FCO than CD. In both countries more than 60% of FCO can be considered 'fuel poor', with values considerably higher than any of the other groups. The percentage of FCO reporting 'housing cost overburden' is also higher than the population average, and close to the values observed for CD households.

Table 4 provides more detail into material deprivation, showing 'deprivation rates' (i.e., the percentage of households to whom the item applies) for each necessity covered by the indicator. For the purpose of this table, we compare FCO (which, by definition, are materially deprived) with materially deprived (MD) households who do not own cars (regardless of reasons for non-car ownership). A priori, we would expect FCO households to be better off than the comparison group, as in both countries they have higher average income (shown in the last row), although this is still much lower than for the full national sample.

As expected, levels of 'enforced lack of durables' are much lower among FCO—in both countries, only approximately one in twenty FCO households cannot afford one or more durables (other than the car), as compared to ca. 20% among other materially deprived households. However, levels of 'economic strain' are very similar in the two groups, and sometimes even higher among FCO.

In both countries, more than 90% of FCO are unable to face unexpected expenses or to pay for a week annual holiday. 20 to 50% of FCO in the UK also report arrears on payments. Notably, in both countries the proportion of household reporting arrears on 'hire purchase instalments or other loan payments' is higher among FCO than among other materially deprived households (note that the item covers all types of commercial credits including loans for the purchase of cars). The second-to-last-row of the table presents complementary information on this type of debt, showing the percentage of households agreeing that it constitutes a burden for them: in both countries, this percentage is substantially higher among FCO, and particularly so in the UK where virtually one in two households find this debt to be burdensome.

Finally, the results confirm the finding of high levels of fuel poverty among FCO: in both countries, virtually half of them cannot afford to keep home warm, and in the UK more than 50% of FCO are in arrears on utility bills.

Table 3. Indicators of social exclusion and economic stress: incidence among the groups (percentage values).

	UK					Germany				
	FCO	**OCO**	**CD**	**ONCO**	**Full sample**	**FCO**	**OCO**	**CD**	**ONCO**	**Full sample**
At risk of poverty or social exclusion (AROPE)	60	14	69	38	26	62	12	75	35	25
Severe material deprivation	34	—	45	5	8	29	—	40	(4)	6
Income poor	31	11	42	23	17	41	10	63	31	20
Jobless household	18	4	32	20	10	19	4	33	14	9
Low work intensity (0–0.5)	16	4	13	6	6	12	4	6	(4)	5
Working poor	19	5	14	7	7	19	5	13	7	7
Fuel poverty	79	15	49	22	23	66	12	36	19	19
Housing cost overburden	13	5	19	12	8	35	15	44	31	21

Note: percentages based on 20 to 49 unweighted observations are shown in brackets.

Table 4. Material deprivation, perceived burden of debt, and income for FCO and other materially deprived households (percentage values, income in local currency).

	UK			Germany		
	FCO	**MD, no car**	**Full sample**	**FCO**	**MD, no car**	**Full sample**
Cannot afford to face unexpected financial expenses	99	99	41	97	98	37
Cannot afford one week annual holiday away from home	91	92	28	91	94	24
Unpaid arrears on mortgage or rent payments	26	27	3	12	11	2
Unpaid arrears on utility bills	51	57	8	19	21	3
Unpaid arrears on hire purchase instalments or other loan payments	19	13	2	10	(6)	1
Cannot afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day	47	53	9	69	71	10
Cannot afford to keep home adequately warm	46	46	8	44	36	5
Cannot afford at least one among: washing machine, colour TV, telephone	(4)	17	2	(5)	22	2
Cannot afford a car/van for private use	—	72	11	—	80	11
Repayment of debts from hire purchases or loans is ‘somewhat’ or a ‘heavy’ burden	49	29	23	32	15	17
Average equivalised disposable income	14,772	11,723	22,206	13,930	10,035	21,332

Note: estimates based on 20 to 49 unweighted observations are shown in brackets.

5. Discussion and Conclusions

Several messages can be drawn from our analysis. First, in both countries the socio-demographic profile of FCO deviates in a number of respects from that of ‘car deprived’ households, and from the recurrent characters of transport and social exclusion research. FCO are relatively more likely to include children and employed adults in the middle age groups, to be on low-to-middle incomes and to have a mortgage. This profile is consistent with previous research from Australia, suggesting that in developed countries FCO tends to affect similar households—although the finding that FCO often have only low levels of work intensity suggests a potential new direction for future research.

Second, our analysis shows contrasting spatial patterns of FCO between Germany—with higher incidence in rural areas, and for those with difficult access to public transport—and the UK—with similar incidence in urban and rural areas, and across levels of public transport ac-

cessibility. The UK situation contrasts with previous research, which has tended to see FCO as an eminently suburban or rural problem (see Curl et al., in press, for an exception). There are three possible explanations for this finding. First, it must be noted that the 'degree of urbanisation' variable employed here is defined at the municipality level, meaning that certain lower-density suburban areas can be classified as 'dense areas', as long as more than 50% of the population in the municipality resides in a high density cluster. Second, unlike Australia and most continental EU, in the UK deprivation is relatively concentrated in inner cities and urban areas (Eurostat, 2015), and this tends to offset the 'spatial gradient' of FCO (Mattioli & Colleoni, 2016; Mattioli et al., 2017). Finally, the lack of a 'public transport accessibility effect' in the UK may be linked to the deterioration of public transport quality and service levels post-deregulation. As noted above, the accessibility variable used here is best interpreted as measure of access to public transport stops. If public transport services are poor quality and expensive, even those with easy access to stops may be 'forced' into car ownership. This may be particularly true for low-income households if the transit network is not sufficiently suited to their commuting patterns, particularly in suburban areas.

Overall, however, our analysis shows remarkable similarities between the two countries with regard to incidence and socio-demographic patterns of FCO, and this is also broadly true for levels of social exclusion and economic stress. Thanks to the richness of EU-SILC, we have provided a more detailed picture of the possible impacts of FCO than previous research. We find that FCO have lower overall levels of social exclusion and material deprivation than households who cannot afford cars. This, and the fact that FCO have higher incomes, are more likely to be employed and to have mortgages than CD, could be used to argue that their car ownership is not really 'forced' but rather the result of 'choice'. However, our analysis also shows that FCO are worse off than CD in a number of domains, including in-work poverty and fuel poverty. While enforced lack of durables is very rare among FCO, their levels of economic strain are very close to those of other materially deprived households, and this despite higher incomes. This may suggest that the possession and use of an expensive durable such as the car (whether 'enforced' or not) can result in deprivation and economic stress for households with limited resources. Notably, we find suggestive evidence that FCO may forego spending on home heating to afford car use, although demonstrating a direct link between the two will require further research.

Also, our findings are suggestive of a relationship between FCO and household debt. FCO are relatively likely to have unpaid arrears, including possibly for car loans. They are also more likely than other households to report burdensome levels of debt from hire purchases or loans, with this being more pronounced in the UK. This dovetails with the recent findings of Walks (in press), who has found a positive relationship between levels of car dependence and household debt burdens, notably for car loans, among low-income households in Canadian city regions. Our results also show that FCO households are more likely than CD to carry mortgages, and less likely to rent at reduced rates. One possible interpretation is that, for many FCO households, slightly higher income levels mean that they cannot qualify for social or subsidized housing, and thus have to find accommodation in the private market, which often means taking up debt in the form of mortgages. Overall, our findings confirm that the links between FCO and the financialization of the housing and automobile markets is a promising area for future research.

With regard to policy implications, previous research has emphasised the need for compact city development and improved public transport provision, in order to reduce the need for car ownership and use (e.g., Currie & Senbergs, 2007; Dodson & Sipe, 2008). These points remain important, and our analysis provides further evidence to support them. On the other hand, our findings suggest that, at least for some, the achievement of (partial) inclusion in the employment and housing domain depends on expensive (and potentially unaffordable) car ownership and use. At the same time, FCO may result in households foregoing expenditure on other important necessities (e.g., home heating) and carrying burdensome levels of debt. Overall this calls for more joined-up policy thinking to ensure that social inclusion in key areas, including transport, is not achieved off the back of 'hidden' forms of economic stress, material deprivation and indebtedness. This suggests that initiatives in non-spatial, non-transport areas of policy-making (such as housing, employment, welfare, and credit regulations) may have role to play in mitigating the FCO problem. These may be particularly relevant in countries such as the UK, where FCO does not appear to be an exclusively rural or periurban issue.

To conclude, this article has demonstrated how the concept of FCO can be operationalised using EU-SILC data. This data has been collected since 2004, and includes more than 28 countries. This opens up a number of research opportunities which go beyond what presented here. It makes it possible to conduct comparative research on e.g. how the 2008 economic crisis and its aftermath have impacted on levels and patterns of FCO in countries with different levels of GDP, motorisation, and trajectories of development. Also, EU-SILC includes a longitudinal component, and this could be used to investigate the effect of life events (including changes in economic circumstances) on transitions to/from FCO and 'car deprivation'.

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Conflict of Interests

The author declares no conflict of interests.

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Article

Understanding Capabilities, Functionings and Travel in High and Low Income Neighbourhoods in Manila

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Abstract
Transport plays an important role in helping people to access activities and participate in life. The availability of transport networks, the modes available, new infrastructure proposals, and the type of urban development can all impact on and change activity participation, and hence contribute to social equity in the city. This article uses surveys in low and high income neighbourhoods in Manila, the Philippines, to assess the social equity implications of differential access to transport. The analysis demonstrates how the theoretical framework of the Capability Approach (Nussbaum, 2003; Sen, 1985, 1999, 2009) can be used to assess what individuals might be able to access (capabilities) versus their actual travel (functionings). The spatial patterns of travel and access to activities are assessed, demonstrating significant differences by gender, age, income and neighbourhood, in terms of travel mode and cost of travel; health, physical and mental integrity; senses, imagination and thoughts; reasoning and planning; social interaction; natural environment; sustainable modes; and information. This approach to assessing the transport dimensions of social equity offers much potential, based not only on access to resources or consumption of mobility, but also in the opportunities that people have in relation to their activity participation. The case study context is also informative, with Manila providing an example of an Asian city with high levels of private car usage, high levels of congestion, and large spatial and income differentials in travel and associated social equity.

Keywords
Capability Approach; income; Manila; mobility; neighbourhood; social equity; transport; travel

Issue
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1. Introduction

The first Human Development Report (United Nations Development Programme, 1990) was published almost three decades ago, and since there have been various attempts to improve levels of social equity, over many contexts internationally. The focus has been on putting people at the centre of the development process, i.e., aiming to create the conditions for people to enjoy long, healthy and rewarding lives, rather than simply pursuing increases in Gross Domestic Product (GDP). But understanding levels of social equity, the multi-dimensionality of this, and the potential solutions, has proved complex. Social equity is viewed as a fair access to opportunities, livelihood, education, and resources, with social justice as the fair and just relation between the individual and society, including the distribution of wealth, opportunities and social privilege (Mella Lira & Hickman, 2017). Spatial patterns of social equity still vary greatly between and within countries—and it is not always ob-

vious what should and can be improved and how. Some countries and cities have become more inequitable over the last few decades, with inadequate resources available to maintain even minimum standards of living. Inequity is now widely seen as moving beyond the accumulation of wealth, incorporating issues such as participation in activities, employment, education, and other factors, such as literacy, life expectancy, health, and well-being. Perhaps there has been less discussion concerning the role of transport in supporting social equity; however, effective transport seems fundamental to many of the issues being faced—with transport required to facilitate participation in activities. Travel is not usually an end in itself, but provides one of the means to access what people value. In addition, active transport, through walking and cycling, has many direct health benefits (Woodcock et al., 2009).

This article uses the Capabilities Approach (CA), developed by Amartya Sen (Sen, 1985, 1999, 2009) as a theoretical framework to understand the differences in travel and participation in activities. It applies CA, using surveys in high and low income neighbourhoods in Metro Manila, the Philippines.[1] The contribution of the article is to understand the opportunities that people have and aspire to, and what they actually achieve, relative to accessing activities, and to examine how this is distributed by gender, age, income and neighbourhood. These issues are seen as important in a context such as Manila, where the activities that individuals might be able to or like to access, relative to their actual travel, are likely to be very uneven across population cohorts and spatially. Individuals do not always take up the theoretical opportunities on offer. The use of the accessibility that is available, via different transport networks, might not be straightforward—with some modes not used for issues such as cost, status, comfort and safety. The political and cultural structure of society is critical to travel and social equity—enabling only a limited set of choices at the individual level. As Sen (2009, p. 227) states:

> In assessing our lives, we have reason to be interested not only in the kind of lives we manage to lead, but also in the freedom we actually have to choose between different styles and ways of living.

The article hence develops an approach to apply CA in relation to travel, assuming that the context of Manila might be associated with unequal access to travel and participation in activities. Reflections are given on the implications of using CA as a framework for assessing the social equity impacts of transport systems.

2. The Capabilities Approach and Travel

Transport can be an important factor in helping to develop socially-equitable societies, with the different types of infrastructure, such as highway, public transport or walking and cycling networks, tending to be used by different cohorts in society. A diverse literature has examined the potential relationships between transport and social equity, social exclusion, and wider issues such as social capital and well-being, including the barriers to access experienced by different groups (such as Church, Frost, & Sullivan, 2000; Currie et al., 2009; Currie & Stanley, 2008; Delbosc & Currie, 2011; Lucas, 2004, 2012; Preston & Rajé, 2007; Social Exclusion Unit, 2003; Stanley, Hensher, Stanley, & Vella-Brodrick, 2011). Accessibility analysis and planning have been usefully applied in practice, particularly in Global North contexts, to examine the impacts of transport strategies and projects (Ashiru, Polak, & Noland, 2003; Dong, Ben-Akiva, Bowman, & Walker, 2006; Geurs, Boon, & Van Wee, 2009; Geurs, Zondag, De Jong, & De Bok, 2010; Hansen, 1959).

CA offers a complementary way of examining these issues, focusing on the opportunities that people have, and the realisation of these opportunities, in accessing activities. There is much use of CA in wider fields, notably in development studies (see Comin, Qizilbash, & Alkire, 2008, and many others); but little in transport planning, despite much potential for application. Some research is beginning to emerge, in developing the conceptual framework for use in transport (Beyazit, 2011; Hananel & Berechman, 2016; Martens, 2017; Mella Lira & Hickman, 2017; Nahmias-Biran, Martens, & Shiftan, 2017; Nordbakke & Schwanen, 2014), and applying this through case studies (Nordbakke, 2013; Ryan, Wretstrand, & Schmidt, 2015).

The central concepts used in CA are:

- Capabilities: representing the "alternative combinations of doings and beings that are feasible to achieve", i.e., what real opportunities are available for people to do and to be (Sen, 1999, p. 75);
- Functionings: the "various things a person may value doing and being" (Sen, 1999, p. 75), with the realised functionings representing what a person actually achieves and how. These might include elementary activities, such as being adequately nourished, being in good health, avoiding early morbidity; to more complex activities or personal states, such as taking part in activities and community life, having self-respect and being happy.

In transport, this distinction can be useful in allowing us to understand the opportunities available in a particular context and also how this relates to actual participation in activities. The realised functioning element (what a person actually does) is perhaps the easiest to measure, represented by the actual travel and participation in activities. The travel part of this is well used in transport planning, with analysis often focused, for example, on actual vehicle kilometres travelled or mode share. Capa-

[1] The analysis was carried out as part of the British Council Newton Fund Institutional Links project on Sustainable Cities and Resilient Transport (University of Oxford, UCL and De La Salle University, 2015–2017).

bility (the real opportunities, concerning what the person is substantively free to do) is more problematic to measure with an easy metric. It can be viewed as the level of accessibility available (Martens, 2017), but perhaps can be further developed, beyond the aggregate level, as the individual opportunities for travel and participation in activities. Hence the theoretical, aggregate 'physical' accessibility might be modified by issues such as the type of available infrastructure, built form, social and cultural norms, and individual characteristics—and these give the individual a unique capability set. The 'real' opportunities are also difficult for individuals to assess, as they might not be aware of the full or relative range of opportunities on offer. Capability should, however, cover the potential and aspiration to access different activities within particular contextual constraints.

The capability is hence viewed as the substantive freedom to achieve different activities and lifestyles, i.e., the combinations of different possibilities from which the person can choose. For example, a person with a high income may choose to have a similar level of mobility (functioning) to a person with a lower income, but have a very different capability set in that they could choose to be much more mobile. The realised functionings are modified again relative to the capability set according to individual characteristics such as income, disability, education and aspiration. In practice, a higher income is likely to lead to a higher realised functioning in mobility and participation terms. The value in using such a distinction is that this may lead us to understand why certain levels of accessibility—even improved levels of public transport, pedestrian or cycling accessibility—are not being used. The evaluative focus for assessing the social impacts of transport can hence be widened beyond the realised functionings to consider issues of capability. This is perhaps most evident when considering different city or national contexts, where the political, institutional and cultural constraints can be very different, including the use of transport systems.

In terms of applying CA, Sen avoids outlining a basic list of capabilities and giving weights to different capabilities. His reasoning is that different capability sets will be relevant to particular groups in different settings. Others argue that CA is most useful when applied as an evaluative approach and we attempt to build on this in relation to transport. Nussbaum (2003) provides a list of 10 central human capabilities which can be used as the basis for discussion on factors (beings and doings) that may be important in a particular context. These include: life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play; and control over one's environment.

A third core concept in CA is agency, and this is defined as someone who acts and brings about change (Sen, 1999, pp. 18–19). This can be interpreted at the individual or societal levels, including the role of institutions and organisations within particular political and cultural contexts. The agency aspect is important in helping to structure and shape the potential for capabilities and functionings. Sen further distinguishes this in terms of opportunity freedom (what opportunities or abilities individuals have to achieve) and process freedom (the process through which activities might happen) (Sen, 1999, p. 17).

CA is interpreted and applied in many different ways in the literature, and most often in relation to development studies. Analysis on deprivation and advantage using CA is focused on capabilities or functionings rather than utility or commodity, hence there is a human-centred and multi-dimensional, pluralistic emphasis. Assessment can incorporate measurement, but more often is focused on qualitative discussion, and is usually focused on either functionings or capabilities, and rarely both together (Comin et al., 2008). The objective of development is seen as the expansion of capabilities, hence there is a concern with changing practice and generating policies and activities which may increase capabilities (Sen, 1999). It is assumed that the functionings would increase alongside the increased opportunities.

Figure 1 interprets and applies CA in the transport context, illustrating how a capability set (including a positive journey experience, such as bodily health, integrity, emotion, affiliation, and access to activities) may be available to an individual, yet only a more limited set of functionings are realised, dependent on ability, income and other potential barriers to take up. Some capabilities may be only partly taken up, e.g., through working part-time; or even be more fully taken up than initially envisaged, e.g., by caring for an elderly relative. Hence there are theoretical, maximum opportunities available, and only some of these are used by the individual. The level of aggregate accessibility may be higher than the capability set—offering a theoretical level of choice to participate in activities that is not always possible to take up. The agency dimension is largely interpreted here at the structural level, including the governmental institutions which may, for example, favour a particular set of infrastructure investments and interventions. This leads to the transport systems and built environment—and frames the available opportunities. The actions of institutions lead, in part, to the opportunities available and help to create the cultural and social norms of travel and participation in activities.

If this is related to a hypothetical example, say investment in a new transport project, it can be seen that levels of accessibility may improve. Alongside, the capability set may increase, including the number and scale of capabilities. Functionings may also increase, depending on the particular context and barriers to take up. There are also issues of adaptive capacity, where individuals modify their beliefs and actions to the context they find themselves in. Individuals hence can normalise both their capabilities and functionings, e.g., the full range of potential opportunities may not be understood or realised.

CA therefore has potential as a conceptual framework which can be used to help understand and repre-

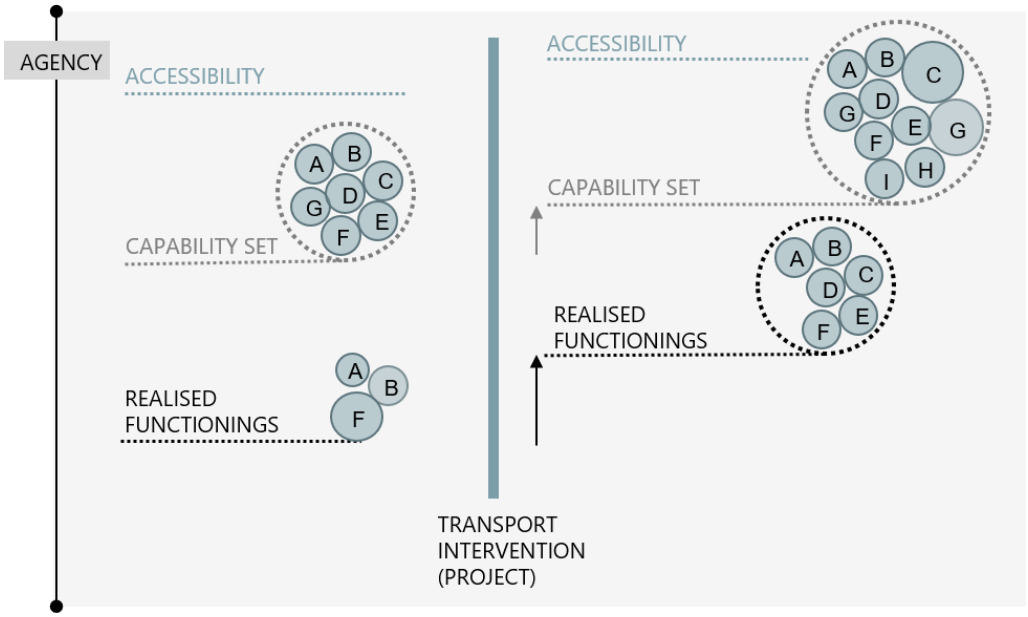

Figure 1. Potential changing functionings and capabilities in relation to a transport project (developing Ryan et al., 2015).

sent travel and activity participation. It could be used alongside accessibility analysis to help understand why and how individuals and societies may participate in activities relative to the barriers to take up. It could be used in social equity impact assessment to understand how proposed infrastructure projects may affect individuals and neighbourhoods. Further research is possible to develop the themes, examining and applying the different concepts, perhaps with most potential through the use of case studies. A more conventional analysis, focused on changes to levels of mobility, such as vehicle kilometres travelled, traffic volume or mode share, in comparison, gives only a limited view of the impacts of transport investment, usually interpreting mobility as a commodity to be consumed. A more human-centred and multi-dimensional analysis can potentially offer greater insights on the social impacts of transport.

3. Case Study Neighbourhoods and Survey Approach

The case study neighbourhoods chosen to explore these issues are drawn from Metro Manila, the Philippines (a large urban area, rapidly growing from a population of 1.6 million in 1984, to approximately 12.9 million people in 2015, and estimated to reach 14 million in 2030). There is an urban land area of 614 km^2, and high population densities of 21,000 persons/km^2 (Philippine Statistics Authority, 2015).[2]

Metro Manila's diverse and hazard-prone geography—poor transport systems, including high levels of traffic congestion, poor quality public transport, very poor walking and cycling facilities, and dispersed urban population—result in very unequal access to travel and activity participation; challenges to urban life and human development. The private-dominated system of infrastructure provision leads to some types of transport projects being developed, often privately financed urban highway schemes, and extensive public transport networks are very difficult to provide. The metropolitan area is an example of splintered urbanism (Graham & Marvin, 2010)—where infrastructure provision, transport and urban development lead to fragmented urban experiences and large levels of social and spatial inequality.

The Philippines is seen as medium scale on the Human Development Index (HDI) (with a HDI score of 0.682; 114 out of 188 countries) (United Nations Development Programme, 2016). Per capita GDP in Metro Manila is relatively low at 183,747 Philippine Peso (Php) (£2,877.56 GBP as at June 2017) (National Statistical Coordination Board, 2013), but this is the highest of the regions in the Philippines. There are an estimated four million slum dwellers (informal settlements) in Metro Manila (Roy, 2014), hence distribution of wealth is very uneven. The richest 10% of the population account for 30% of consumption and the poorest 10% just 3%. The Gini Index[3] is 0.398 (Human Development Network, 2003).

High and low income neighbourhoods were surveyed in Metro Manila (Figure 2). The high income group were interviewed with an online survey, including residents in exclusive villages from around Manila. Respondents were found via university students, staff and wider contacts, using snowball recruitment. This is a useful method where respondents are difficult to find. A variety of high income neighbourhoods were used to source the high

[2] As a comparison, Greater London has a population of 8.7 million, land area of 1,572 km^2, and population density of 5,518 persons/km^2 (Office for National Statistics, 2015).

[3] The Gini Index is a measurement of the income distribution of a country's residents. This number, which ranges between 0 and 1 and is based on residents' net income, helps define the gap between the rich and the poor, with 0 representing perfect equality and 1 representing perfect inequality. The World Gini Index is around 0.61; Denmark and Sweden at around 0.25.

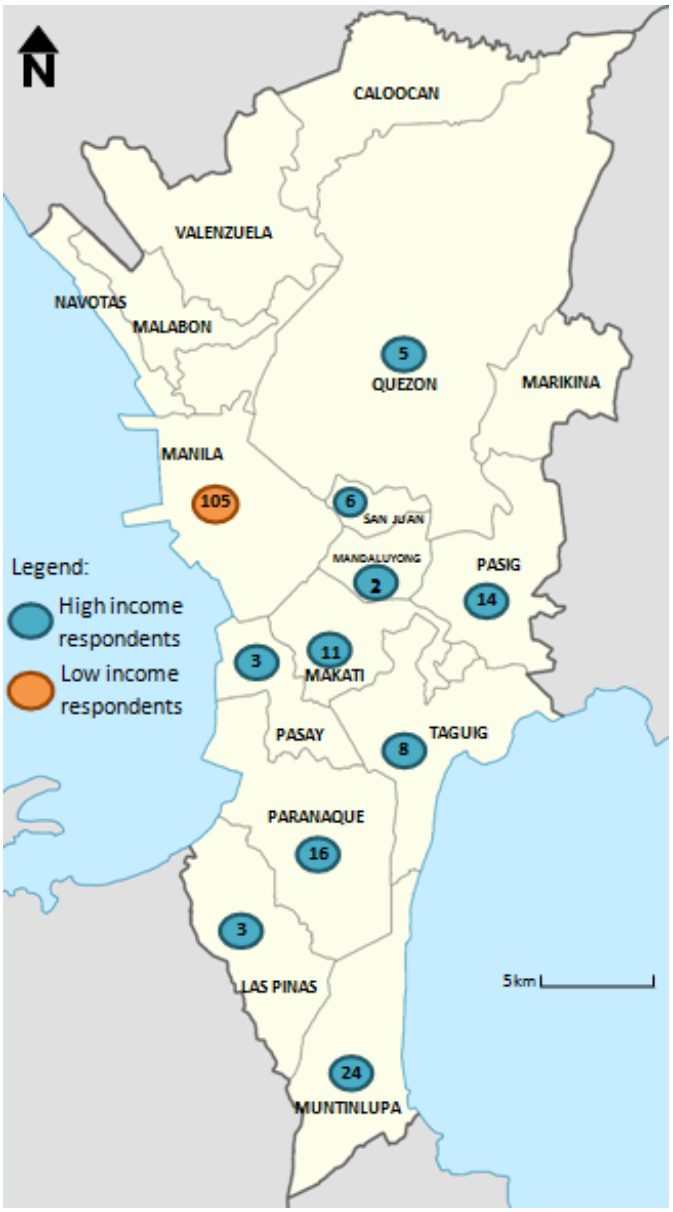

Figure 2. Case study neighbourhoods (high and low income).

income group, again due to difficulty in identifying survey respondents in one neighbourhood. The validity of the survey, in terms of understandability of questions and coverage, was checked initially by members of the academic team involved in the research project and then via a small pilot (n = 10) with students at De La Salle University.

Respondents from the high income neighbourhoods generally live in large lots and houses, often with swimming pools and access to private leisure clubs (Figure 3). These exclusive subdivisions were established between the 1940s–1980s; examples are Forbes Park and Urdaneta Village. Houses usually have separate maid's quarters, their own common security personnel, and most own several private vehicles. For exclusive villages near the central business district (CBD), the price could range from Php 150,000 to Php 500,000 per square metre of land,[4] depending on the year of build. A large house might sell for around 300 million Php (£4.7 million GBP). While in other areas further from the Makati CBD, this could range from Php 70,000 to Php 100,000 per square metre of land. These exclusive villages were not converted into commercial uses given their proximity to some of the shopping and business areas of the Makati central business district and the attractiveness for residential living. 102 valid questionnaires were gathered from these high income neighbourhoods.

For the low income neighbourhoods, face-to-face surveys were conducted with respondents in five neighbouring barangays in the Sampaloc District (Figure 4), adjacent to De La Salle University. Surveys were easier to gain in this area, as there were many university students

[4] 150,000–500,000 Php per square metre = £2,350–7,800 GBP (Great British Pounds) per square metre (June 2017 exchange rate).

Figure 3. Forbes Park exclusive subdivisions in Makati City (Source: Teoalida, n.d.).

Figure 4. Low income neighbourhood in Sampaloc District (Source: Dreamstime, n.d.).

living here and initial contact was easy to make. Again, snowball recruitment was used. Face-to-face interviews were used to carry out the surveys, instead of the process being online. Not all those being surveyed had easy access to the Internet, hence face-to-face interviews were more appropriate. The same survey was used in the high and low income neighbourhoods, hence it is unlikely that the technique of online and face-to-face delivery affects results, but the impact of this is unknown.

Sampaloc is an old residential neighbourhood; many of the houses are old and dilapidated, and some of these residences have become boarding houses for students. Some residences have converted their ground floor into commercial space for restaurants or stores catering mostly for local residents. Others have replaced their old houses and constructed apartment buildings with four or more storeys for rent to students. There are private car owners in this area, but they usually use the street to park their vehicles as the lot is used for living space. The street in front of the house also sometimes serves as an extension to the house, for example where laundry may be done, or even as an outside liv-

ing room where people will sit on benches and talk with neighbours. There are also pockets of informal settlers in the area, usually on vacant lots which were not properly secured by their owners. A court order would be required to remove the settlers. The cost of a lot with a structure here would range from Php 35,000 to Php 75,000 per square metre[5] depending on the age of the house or structure on it. Rent for a flat is available at around 10,000 Php per month (£160 GBP per month). A total of 105 valid questionnaires were gathered from Sampaloc. The number of surveys undertaken is low, certainly for quantitative research, but this reflects the context where these were carried out—it is relatively difficult to gain survey respondents in both the high and low income neighbourhoods in Metro Manila. The analysis can be seen as exploratory, with scope for more detailed analysis to follow up some of the initial findings.

4. Survey Questions

The surveys included questions on individual and household characteristics, primary and secondary mode of travel (used to access work or main activity), followed by individual views against a range of central human capabilities, covering issues such as travel experience and access to activities. The question themes are based on the list of central human capabilities developed by Nussbaum (2003), but modified to fit the transport and urban planning context in Manila more clearly. Responses are given for desired levels (capability) and actual levels (functioning), using a five-point Likert scale (1 bad; 5 good). The survey is quite lengthy, including 75 questions covering individual characteristics and seven key categories of impact. The survey took around 20 minutes to complete. An example question is given below:

- Capability: What is your desired level of comfort while you are using your primary transport mode?
- Functioning: How do you assess the levels of comfort that you experience while you are using your transport mode?

Following the earlier discussion on applying CA in transport, we rely in the survey on the individual viewpoint of desired level of transport or participation in activities to reflect capability. This may not always relate well to real opportunities, but gives us a view of perceived desired opportunities. Further research can test varied approaches here, including attempts to assess real and relative opportunities—but this is a complex concept and difficult to explain to respondents. The following central human capabilities are used, covering the journey experience, access to activities and also associated well-being:

1. Health, physical and mental integrity:
    - Level of stress
    - Level of physical activity
    - Closeness to other transport users
    - Levels of air pollution
    - Levels of security (not being assaulted, robbed or harassed)
    - Levels of comfort
2. Senses, imagination and thoughts:
    - Feelings associated with different modes (such as freedom, insecurity, functionality, enjoyment, health and status)
    - Enjoyment of primary and secondary mode
3. Reasoning and planning:
    - Access to current employment
    - Public transport provision and access to visiting relatives, recreational activities, cultural and sporting activities, etc.
    - Range of transport modes
    - Affordability of transport modes
4. Social interaction:
    - Level of social interaction
    - Feeling of discrimination
5. Natural environment and sustainability:
    - Presence of natural elements
    - Access to sustainable transport modes
6. Information:
    - Quality of interchange
    - Access to information on transport modes
7. Travel to work and other activities:
    - Level of access
    - Range of employment
    - Commute time

Examining issues such as these allows us to consider the different dimensions of social equity as related to the transport system, the experience of travel and participation in activities. The issues are broader than those usually considered through social impact assessment, including criteria such as senses, imagination and thought; reasoning and planning; and level of social interaction. All of these are potentially important social impacts associated with different transport infrastructure. In particular, the analysis allows us to explore the differences between opportunities and aspiration and realised activities. Hence, neighbourhood types, with high and low incomes, are examined to assess whether there are differences in travel and activities by population cohort and spatially.

5. Analysis

There are clear differences between the two neighbourhood types across many of the individual characteristics (Table 1). In the low income neighbourhood, there are more males (60% relative to 55% in the high income neighbourhoods); a different age profile, with less in the 18–24 group (30% relative to 53%) but more aged 35–54 (34% relative to 28%); lower educational attainment, with fewer at graduate level (42% relative to 70%);

[5] 35,000–75,000 Php per square metre = £542–1,160 GBP per square metre (24 May 2017 exchange rate).

Table 1. Descriptive statistics.

		High Income Neighbourhoods (n = 102)		Low Income Neighbourhood (n = 105)	
Individual Characteristics		Frequency	Percent	Frequency	Percent
Gender	Male	58	55.1	58	60.4
	Female	44	41.9	38	39.6
Age	Less than 18	1	1.0	11	10.5
	18–24	54	52.9	31	29.5
	25–34	11	10.7	16	15.2
	35–54	28	27.5	36	34.3
	55–64	7	6.9	8	7.5
	65 or more	1	1.0	0	0.0
Highest Education Attainment	Primary school	2	2.0	5	4.8
	Secondary school	26	25.5	48	45.7
	Professional technical	3	2.9	8	7.6
	Undergraduate	59	57.8	42	40.0
	Postgraduate	12	11.8	2	1.9
Employment	Full-time	56	55.0	65	61.9
	Part-time	3	2.9	17	16.2
	Student	36	35.3	23	21.9
	Unemployed and others	7	6.8	0	0.0
Monthly Income (Php)	< 10,000	30	29.4	36	38.7
	10,000–25,000	11	10.8	50	47.6
	25,001–40,000	7	6.9	7	6.7
	40,001–55,000	4	3.9	0	0.0
	55,001–70,000	1	1.0	0	0.0
	> 70,000	49	48.0	0	0.0
Driving License	Yes	85	83.3	26	24.8
	No	17	16.7	79	75.2

	High Income Neighbourhoods (n = 102)		Low Income Neighbourhood (n = 105)	
Household Characteristics	Mean	SD	Mean	SD
Number of adults in household	5	2.8	4	2.0
Number of children in household	1	1.4	2	1.9
Average monthly transport cost (Php)	5,425	6,542	1,339	1,799

		High Income Neighbourhoods (n = 102)		Low Income Neighbourhood (n = 105)	
Transport Mode		Frequency	Percent	Frequency	Percent
Primary Transport Mode	Private Cars	81	79.3	4	5.7
	Motorcycles	0	0.0	7	10.0
	Taxi	1	1.0	1	1.4
	FX Taxi	7	6.9	0	0.0
	Buses	2	2.0	11	15.7
	LRT/PNR	6	5.9	24	34.3
	Tricycles	0	0.0	22	31.5
	Cycling	0	0.0	1	1.4
	Walking	5	4.9	0	0.0

Table 1. Descriptive statistics. (Cont.)

		High Income Neighbourhoods (n = 102)		Low Income Neighbourhood (n = 105)	
Transport Mode		Frequency	Percent	Frequency	Percent
Secondary Transport Mode	Private Cars	28	27.5	2	2.6
	Motorcycles	0	0.0	7	9.1
	Taxi	39	38.2	1	1.3
	FX Taxi	5	4.9	1	1.3
	Buses	10	9.8	5	6.5
	LRT/PNR	4	3.9	13	16.8
	Tricycles	4	3.9	21	27.3
	Cycling	2	2.0	2	2.6
	Walking	10	9.8	25	32.5

Notes: Taxi; FX Taxi (shared White Van taxis, typically for long distance commuting); LRT (Light Rapid Transit), PNR (Philippine National Railway); Tricycles.

a lower monthly income (86% below 25,000 Php per month relative to 40%; and 0% above 70,000 Php per month relative to 48%[6]); much lower use of the private car (6% relative to 79%) and higher use of Light Rapid Transit (LRT) and Philippine National Railway (PNR) systems (34% relative to 6%), and tricycles (32% relative to 0%), all as a primary mode. The high educational attainment levels reflect the method of survey delivery—students from De La Salle University were used to gain contacts and gradually find responses. The large differences in incomes and modes used illustrate the large social inequity in Metro Manila.

Figure 5 shows boxplot diagrams of the aggregated capabilities and functionings for the low and high income neighbourhoods. Responses are aggregated to give a combined capability and functioning score across 12 questions, covering level of stress for primary transport, physical activity, closeness to others, air pollution, security, comfort, access to current employment, range of employment in neighbourhood, range of mode options, access to sustainable transport modes, social interaction, and level of information. The other variables are not used due to multicolliniarity and missing data. The maximum possible aggregate score is therefore 60, for both capabilities and functioning, with a maximum score of 5 under each question. The higher aggregate scores reveal a general increased level of travel experience and access to activities. The boxplots illustrate the distribution of the data by neighbourhood, giving the median (central dark line), interquartile range (box), first and third quartile (edge of box), 1.5 times the interquartile range (the whisker), and minimum and maximum data and outliers (circles).

The high income neighbourhoods appear to have higher levels of both functionings and capabilities, and particularly functionings, relative to the low income neighbourhoods. It is argued that income plays a significant role in shaping capabilities and functionings at an individual level. In other words, lower income groups are likely to have lower rates of participation in various key life activities and are most likely to experience social exclusion. This is what we would expect, and a similar finding to previous literature (Preston & Rajé, 2007; Social Exclusion Unit, 2003), but measured in a different way in terms of aspired and realised activities—both of these are related to income. This seems a fundamental finding: the current transport systems in Metro Manila are disproportionately affecting lower income groups in social terms. This is also in view of individuals demonstrating adaptive preferences—they are likely to internalise their particular circumstances, choose within a narrow choice set of activities, and not always be aware of the greater possibilities on offer. An important conclusion to be made is that the agency dimensions, i.e., the organisations developing transport strategies and programmes, are not supporting the lower income cohorts to the extent that they might. Perhaps a different set of infrastructure investments are required to support the lower income groups, as well as interventions in urban planning. Again, these issues could be examined with further research, including using different case studies and neighbourhoods.

Table 2 gives additional analysis using the more detailed responses against each dimension on the capability list. Chi-squared tests are used to examine the differences in responses across different population groups with categorical data (gender, age and income) and also spatially (by neighbourhood). The only exception is monthly transport costs, which is continuous data, and an F-test is used to compare mean deviations. Statistically significant findings are indicated with an asterisk.

When examining differences by gender in relation to the 26 indicators, there are only three statistically significant results. Males and females have different perceptions of being assaulted, robbed or harassed (actual) when they are using their primary mode of transport; and levels of social interaction (desired and actual).

There are a number of significant differences by age. Closeness to other transport users (actual), level of trans-

[6] 25,000 Php = £392 GBP; 70,000 Php = £1,098 GBP (June 2017).

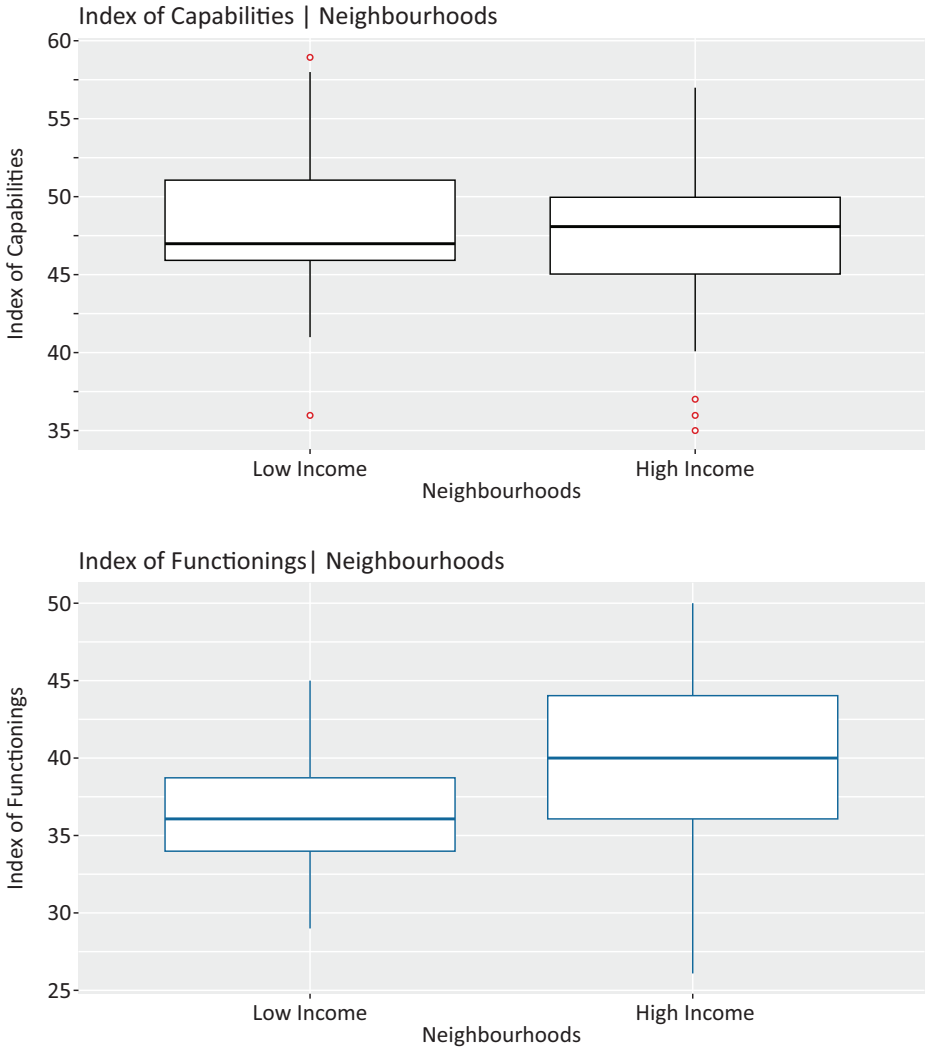

Figure 5. Box plots of index of capabilities and functionings for high and low income neighbourhoods.

port options available (actual), accessibility to transport modes (actual), level of information available (actual), accessibility to employment in local neighbourhood (actual) and monthly transport costs are significant. Examining this in more detail, it is found that people aged between 18–24 are mostly satisfied with the proximity to other transport users when driving cars or taking taxis/FX taxis, but when travelling on public transport, such as LRT/PNR or buses, they tended to feel uncomfortable; the same applies to cycling and walking. Young and middle-aged people are more likely to report having more choice of transport options available to them, when carrying out daily activities, compared with teenagers and older people. Young people are more likely to have access to job opportunities in their local neighbourhoods compared to middle-aged and older people. In addition, older people spend the highest amount on transport costs for their daily commute, followed by middle-aged groups, while the younger generation spend the least on travel costs.

Analyses of the differences by income groups and neighbourhoods (chosen largely by income) yielded many more statistically significant results—almost all of the 26 human capability dimensions, across desired and actual, are significant. Many of these are highly significant ($p < 0.001$), particularly between neighbourhoods, including level of physical activity, closeness to other transport users, level of air pollution, security, enjoyment when travelling, accessibility to employment, and level of information available to choose different modes. It can therefore be argued that the parameters of income and location have very significant impacts on individual capabilities and functionings. Of course, the interpretation is complex here—infrastructure, income and travel are closely related. The availability of different types of infrastructure leads to particular types of travel, with the use of infrastructure unevenly distributed over different income groups. But, in addition, the availability of income increases the travel possibilities and the potential to access opportunities. Hence, there are multiple relationships at work, with different factors working in multiple directions.

Table 2. Summary test statistics (Chi-squared and F Test) for capabilities and functionings.

	Gender	Age	Income	Neighbourhood
1. Health, Physical and Mental Integrity				
Level of stress (actual)_1.a	6.564	29.223	33.069*	43.229***
Level of stress (desired)_1.b	3.901	17.067	26.044	23.620***
Level of physical activity (actual)_1.d	4.841	21.576	51.290***	55.532***
Level of physical activity (desired)_1.e	1.686	20.673	53.998***	50.834***
Closeness to other transport users (actual)_1.f	3.520	32.103*	44.734***	65.564***
Closeness to other transport users (desired)_1.g	1.071	25.361	48.007***	99.961***
Level of air pollution (actual)_1.i	4.164	29.897	26.290	38.143***
Level of air pollution (desired)_1.j	4.191	25.758	45.805***	61.794***
Level of security (not being assaulted, robbed or harassed) (actual)_1.k	12.671*	19.648	25.835	47.240***
Level of security (not being assaulted, robbed or harassed) (desired)_1.l	3.174	10.117	60.253***	49.465***
2. Senses, Imagination and Thoughts				
Level of enjoyment when travelling (actual)_2.i	5.705	21.837	48.704***	71.398***
Level of enjoyment when travelling (desired)_2.j	4.591	27.962	29.087	25.326***
3. Reasoning and Planning				
Level of accessibility to employment (actual)_3.a	5.572	22.381	55.086***	71.824***
Level of accessibility to employment (desired)_3.b	3.283	18.709	13.401	18.566***
Level of transport options available (actual)_3.f	5.605	32.737*	23.392	71.791***
Level of transport options available (desired)_3.g	1.606	16.443	27.459	17.222**
4. Social Interaction				
Level of social interaction (actual)_4.a	9.502*	22.435	22.635	51.062***
Level of social interaction (desired)_4.b	9.526*	24.652	25.597	43.207***
5. Natural Environment and Sustainability				
Level of accessibility to sustainable transport modes (actual)_5.c	5.383	32.934*	29.841	58.607***
Level of accessibility to sustainable transport modes (desired)_5.d	0.883	16.782	31.384*	34.178***
6. Information in Transport				
Level of information available to choose alternative transport modes (actual)_6.e	6.435	47.852***	32.600*	41.759***
Level of information available to choose alternative transport modes (desired)_6.f	4.480	25.023	49.500***	28.580***
7. Commuting to Work and Productive Activities				
Level of accessibility to employment in your local neighbourhood (actual)_8.c	0.823	74.702***	34.965*	63.811***
Level of accessibility to employment in your local neighbourhood (desired)_8d	3.493	8.379	25.418	25.841***
Commuting Time	4.413	35.905	54.150*	29.027***
Monthly Transport Costs[(a)]	0.449	3.676**	N/A	37.664***

Notes: n = 191; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; [(a)] as this is a continuous variable, an F-test is used. All other variables are categorical and, as such, a Chi-squared test is applied.

6. Conclusions

Transport plays an important role in helping people access activities and participate in life—it is an important factor in human development. But, much of the current transport investment benefits certain cohorts in society, usually the higher income groups, relative to others—and this is experienced in some cities and neighbourhoods more than others. This article has demonstrated how CA might be used in the transport context, using a case study of Metro Manila. It attempts to show what individuals might be able to do and their actual travel and how these might be distributed by population group and spatially. There are critiques of CA and the use of concepts of opportunity, instead of the more orthodox focus on welfarism (the extent to which people's preferences are satisfied). CA is also very difficult to apply, with measurement of opportunity open to different in-

terpretations, and is complex empirically (Alkire, 2008; Sugden, 2001). But, the Manila context seems to demonstrate that both capabilities and functionings are potentially important. A person's inclusion in and quality of life is not merely a matter of what he or she achieves, or the mobility that is consumed, but also is related to the options available. There is not always a 'genuine' choice of the good life on offer, more a constrained set of options from which to choose (Sen, 1985). The exploratory analysis in this article demonstrates that there are significant differences for travel and activity participation by gender, age, income and neighbourhood; including issues such as travel mode and cost; health, physical and mental integrity; senses, imagination and thought; reasoning and planning. The neighbourhoods studied have very different forms of access to the transport system, the experience of travel, and to the activities this helps reach.

The theoretical framework of CA helps us to understand these issues and can be used to assess what opportunities are available to individuals and what they might like to access (capabilities) versus their actual travel (functionings). The local political and institutional context (agency) helps to explain what transport infrastructure and systems are available to individuals, how the urban form has been developed, and, to an extent, what the societal cultures and norms might be, e.g., whether it is acceptable to walk, cycle, use public transport, or whether the private car is the aspirational mode to use. The distinction between capabilities and functionings might seem to be nuanced, but we argue it is important to add this type of analysis to accessibility planning—so that we can further understand why a seemingly good level of accessibility might not be used. In particular, this might be important in a context such as Manila, where use of walking, cycling and public transport is very difficult, uncomfortable, unsafe, and has low status. Hence there are many barriers to using a theoretical level of accessibility. The way we have interpreted capabilities in the surveys is to use this to represent individual aspiration, as related to activities that are feasible to achieve. This could be tested in different ways empirically; and further research could re-examine this issue, perhaps estimating a neighbourhood or societal level of opportunity to travel and participation in activities, using interviews or workshops. This could help to develop a benchmark against which individual functionings could be assessed. In addition, it may be useful to consider different criteria and weighting of criteria, the measurement of adaptive preference by individuals, to compare functionings and capabilities relative to levels of accessibility, and to develop metrics or score thresholds which indicate appropriate or deficient functionings and capabilities. Analysis could be prospective and evaluative—assessing how a project, for example, might lead or has led to a change in opportunity and actual travel.

The application of CA in transport hence has much potential, allowing us to examine the multi-dimensional social impacts of major infrastructure projects and the wider dimensions in using the distinction of capabilities and functionings. This helps us to understand not only the consumption of resources, mobility and accessibility, but also the opportunities that people have in relation to their activity participation. CA does not make the processes of appraisal and evaluation any easier, indeed it makes these much more complex, as there are wider dimensions to be considered. There are many difficulties empirically: in devising surveys that address the wide-ranging social criteria, in explaining the different concepts within CA to respondents, in developing an approach to social impact appraisal that can be scaled up without large resource requirements, and in allowing social impacts to be considered alongside other issues, such as environmental and economic impacts.

The adaptive preference issue is perhaps most difficult—that people may choose their travel and activity participation within a particular set of narrow choice sets, and will not always be aware of the greater possibilities on offer. However, in Manila and elsewhere, differential access to transport and high levels of social inequity remain problematic—and fundamental to human development. Hence, we should continue to refine our approaches to measuring transport's impact on human well-being—and to seek to improve well-being for all groups in society through infrastructure investment. And, as Sen reminds us, this can be considered not only in terms of what people have or can consume, but in terms of what they can do and be.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Mobility-Related Economic Exclusion: Accessibility and Commuting Patterns in Industrial Zones in Turkey

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Abstract
Geographers have long examined the assumption that women are locally constricted and what this means for women taking up of economic opportunities. These studies have provided valuable insights into the understanding of the spatial dimension of social exclusion. However, the investigation of the role of wider economic, physical and social contexts on women's mobility and accessibility constraints has mainly concerned the countries in North America and Western Europe. Through a mixed methods study of two industrial zones in Turkey, this article looks at how women and men from different social backgrounds access the zones with the aim of identifying the specific constraints that women face in their everyday life in accessing economic opportunities. The results show that while gender seems to play a role in the choice of place of residence and the employers' perception of time use, women's socioeconomic and educational backgrounds seem to be more important predictors of their commuting patterns and access to the zones. The study confirms that gendered daily travel patterns are a useful unit of analysis for investigating unequal access to economic opportunities. It further argues that the complex nature of everyday mobilities of women should be interpreted in conjunction with the perceptions of employers on women's work spaces and time use.

Keywords
accessibility; commuting; female labour; industrial zones; labour markets; mobility; Turkey

Issue
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1. Introduction

The role of mobility in enabling access to life-enhancing opportunities has long been a focus of the research on social exclusion in cities (Cass, Shove, & Urry, 2005; Lucas, 2012; Ricci, Parkhurst, & Jain, 2016). One of the most insightful research strands on this topic is the work on gender based explanations of mobility—and accessibility—related social exclusion. This work has often drawn attention to shorter commutes and narrower spatial reach of women in searching for economic opportunities (e.g., Hanson & Pratt, 1995). However, the depth of understanding of this phenomenon outside the North American and Western European contexts is limited (Kwan & Schwanen, 2016; Uteng, 2011). Furthermore, the rising income and spatial inequalities, the changing nature of employment, work and household dynamics call for more recent analysis of the gendered differences in access and commuting patterns (Preston & McLafferty, 2016).

The present article contributes to this debate by providing new evidence on gendered access and commuting patterns in two organised industrial zones (OIZs) in Turkey. The study specifically asks how gender plays a role in shaping access to the OIZs and commuting patterns of different social groups. Using a mixed method research design through the cases of Afyonkarahisar and Şanlıurfa, located in Central and Southeastern Anatolia respectively, the study pays particular attention to the interplay of local actors, household dynamics and workers' perceptions of accessibility to identify the employees' daily time and space constraints. It then goes on to

discuss the implications of these constraints for access to economic opportunities.

Turkey has the lowest female labour participation rate (32,5% as of 2016) amongst OECD countries (OECD, 2017). Given that women's absence is even more prevalent in the production sector, the potential for women to benefit from the job opportunities in the OIZs has become important on the policy discourse (Kalkınma Bakanlığı, 2014). Turkey, therefore, provides us with a context, where it has been recognised that development planning should target increasing women's reach to industrial zones, hence an observation site to explore the complex dynamics of local institutions and daily space-time constraints in women's everyday life. OIZs are also useful—as they are historically seen as 'masculinised spaces'—in revealing the ways of how gender interplays with the dynamics within the workplaces (Wright, 2006). Afyonkarahisar and Şanlıurfa OIZs are of similar size and both include firms operating in female-dominated sectors. They are, however, subject to significantly different economic and social contexts at the provincial level, hence provide varied observations on access to work and commuting patterns that elucidate multifaceted aspects of the phenomenon.

2. Literature Review

There is significant academic interest on the interrelationships between mobility, gender and access to economic opportunities (Hanson, 2010). Many studies show that mobility could be an enabler for women to have better access to economic opportunities (e.g., Dobbs, 2005; Porter, 2008). There is also significant evidence on how constrained mobility and accessibility narrow down the opportunities for women's economic empowerment (Uteng, 2011). It is possible to classify this voluminous literature in terms of its relational focus. One group of studies focus on reporting the distinctive trends in the travel patterns of women and men (e.g., trip purpose and distance and transport mode) (e.g., Kwan & Kotsev, 2015). This research strand has revealed important trends in unequal access of women to different modes of transport that have implications for their participation in society (Peters, 2013). These findings have been subject to a variety of interpretations, such as unequal household roles, emancipation, poverty, cultural contexts, which constitute the second group of studies (Hanson & Hanson, 1981; Law, 1999; Porter, 2008). The third strand of this research has used the broader social, political and cultural implications of these trends to elucidate spatial inequalities in local labour markets (e.g., Hanson & Pratt, 1995; Stuyck, Luyten, Kesteloot, Meert, & Peleman, 2008).

The existing evidence relates mobility—and access—related economic exclusions of women to a variety of factors. Due to multiple tasks to be handled by women, most studies in this area have assumed time as a budget constraint, particularly in European contexts (Friberg, 1993). Some of the research on gendered mobilities also focuses on the features of how women travel to understand the implications of gendered mobilities for sustainability. The main motivation behind these studies has been the understanding of increasing diversity within cities and how to address a variety of social needs in the face of rapid urban development and environmental threats (Levy, 2013). Most of this research has been conducted from a transport studies perspective, in which mobility and accessibility are recognised to be the main factor in enabling access to citywide opportunities, such as access to jobs.

There is significant evidence that women seek to minimise time spent on the journey to work and that they tend to choose jobs that are closer to home (e.g., Anand & Tiwari, 2006; Quiros, Mehndiratta, & Ochoa, 2014). However, there are variations between different social groups. For instance, competing responsibilities for home and work alone do not explain the relatively longer commutes of higher educated women or distinctive characteristics of the commuting patterns of many minority women in New York (Preston & McLafferty, 2016). Moreover, the studies that explain the complex interaction between economic, political and cultural contexts and the space-time constraints in everyday life of women are often limited to North American and Western European contexts. The gendered economic exclusions generated from space-time constraints in everyday life are gaining even more importance in rapidly urbanising regions. It is therefore imperative to understand the mobility-related economic exclusions of women across different social groups and contexts. The empirical focus of this article on the two Anatolian cities that are relatively underdeveloped compared to the rest of the country adds to the understanding of gendered access and commuting patterns.

3. Research Design, Methods and Data

While questionnaire based surveys provide a snapshot of travel trends within a group, they do not take into account the complex nature of everyday mobility and access affected by the local economic, cultural and political factors. A detailed look at the gendered mobilities is only possible through looking at multiple forms of data that can be obtained via a mixed method multiple case study design. The Afyonkarahisar and Şanlıurfa OIZs serve as two useful case study areas to explore, as they are of similar size in terms of both physical capacity and the number of firms, but are located in different economic (e.g., significant differences in employment and participation rates) and social contexts.

The study employed a triangulation of research methods including surveys; and semi-structured interviews with female employees, officers at the OIZ General Directorates, development experts, firm owners and firm managers (May–November 2014). A survey asking for specific residential and travel information together with other socioeconomic background and daily routine

information was conducted in both OIZs. The questions included respondents' means of transport and length of commuting time, whether they changed residential locations to take up their jobs, and how much time they spend on household chores, as well as basic socioeconomic and household data (Carter & Butler, 2008; Quiros, Mehndiratta, & Ochoa, 2014; Schwanen, Kwan, & Ren, 2014). The semi-structured interviews with the employees aimed at understanding the time-related difficulties that female employees face in their everyday life in terms of reaching their job locations. The interviews with the OIZ officers, development experts, firm owners and production managers helped gain a better understanding of the contexts and specify the sectoral focus of the research as well as bring in the employers' perception of women's time use.

Multi-level mixed method sampling was used to select the sectors, firms and employees for the survey. The sectors were identified on the basis of interviews with the OIZ officers and development planning experts at the Investment Offices who provided up-to-date information about the zones. Although the firms employing women were the main targets of sampling, the survey was also conducted with men in the same firms because the study considers 'gender' as a category rather than exclusively looking at women. Firms selected on the basis of purposive sampling were approached following the initial research that identified the firms that employ women. However, due to different company rules and regulations, not all firms took part in the survey. In Afyonkarahisar, 19 firms were approached; 15 of them agreed to conduct the survey with some of their employees. In Şanlıurfa, 22 firms were contacted and 14 of them ran the survey. The number of male and female respondents within the firms was intended to be proportional to the gender breakdown of the employees. However, although the response rate was 321 in Afyonkarahisar, and 221 in Şanlıurfa, some of the questionnaires were either incomplete or invalid. The limitations as such were considered in the data analysis.

The interviews with the employees were conducted in both zones (20 in Afyonkarahisar and 15 in Şanlıurfa). The sample included women with various socioeconomic backgrounds in the textiles, marble, construction, glass and food sectors. Five interviews with high level managers and firm owners in the textile, marble, service, glass and food sectors were held in Afyonkarahisar. In Şanlıurfa, firm owners and production managers of three companies in the textiles sector, and two managers in the metal and service sectors were interviewed. Finally, the two officers at the General Directorates of the OIZs and two experts at the Afyonkarahisar and Şanlıurfa Investment Offices were also interviewed.

The female-dominated sectors in Afyonkarahisar are textiles, communication, marble and food, while textiles and communications include the majority of the women in the workforce in Şanlıurfa. The female dominated sectors in the zones (i.e., services and textiles) are representative of the national population. In Afyonkarahisar, many women also work in the marble sector, particularly in its design part, which requires specific skills. The most relevant development at the time of the research was the upcoming opening of childcare facilities as part of the '*Mom's Work, My Future*' project funded by a nationwide private company. The project aimed at increasing women's share of the employment in the OIZs by providing childcare facilities in the zones.

The description of the survey data is presented in Table 1. The sample of employees in Şanlıurfa OIZs is younger and less educated, earns slightly less and lives in larger households. While the gender ratios are comparable, the married proportion of the workforce sample in Afyonkarahisar is larger than that of the Şanlıurfa OIZ.

4. Findings

4.1. Access to the OIZs

The initial motivation behind establishing OIZs outside the centre of cities has been to move production out

Table 1. Description of the Afyonkarahisar and Şanlıurfa samples.

	AFYONKARAHİSAR		ŞANLIURFA	
	N	Mean	N	Mean
Age (years)	309	30.97	186	25.77
Education (years)	317	11.24	192	9.39
Salary (TL/month)	321	1054.14	214	918.44
Tenure (months)	279	33.12	172	18.44
Household size	307	4.19	185	6.37
Married (ratio)	318	0.53	193	0.33
Number of kids in the household	246	1.47	121	2.45
Number of people dependent on the respondent	203	2.93	125	4.15
Working hours	321	8.72	214	9.05
Household income (TL/month)	213	1849.94	136	1526.62
Gender (1 = Female)	321	0.63	208	0.61

Note: N = sample size.

of cities. The OIZs were even described by one of the interviewees as a successful urban planning tool to reduce air pollution and other negative externalities that affect urban populations. The issues related to geographical accessibility of the OIZs are therefore not surprising. The provision of public transport services to the zones is, however, inadequate in both cities. There were almost no regular public transport services to the zones in the provinces at the time of the research, but the majority of the firms provided free company buses that ran at regular intervals depending on the working hours. There were also commercial minibuses that stopped outside the zones.

One of the key findings in terms of the gendered disparities in geographical accessibility of the OIZs concerns whether the employees changed their residential location as a result of taking up of their jobs at the OIZs. Only 10–15% of the respondents in each sample changed their residential location when they took up their jobs in the OIZs. The majority of those that moved because of the job opportunities were men. The fact that there are no women in either sample, who moved from another city to take up their jobs in the OIZs, is already indicative of the narrower spatial reach of female labour compared to male labour. The very few women who changed neighbourhoods moved for different reasons other than being physically closer to the OIZ.

For example, a 26-year old woman on a minimum wage moved to a neighbourhood that is further away from the OIZ, but is closer to her mother's home, where she drops her child off on the way to work so that her mother can look after her while she is at work. Childcare needs seem to play a role in the woman's choice of residential location as a result of taking up employment at the OIZ. Another woman who also moved to a slightly remote neighbourhood when she was first employed at the OIZ is unmarried and lives with her relatives, whom she goes to work with. She mentions that going to work safely with her relatives is important to her family. These factors (i.e., being closer to childcare, going to work safely) in the choice of residential location due to employment reveal the multi-dimensional aspects of the spatial distribution of female labour.

The issues related to the geographical accessibility of the OIZs seem to affect the employees in different ways. As can be seen in the survey results, the dependence of the workforce on company buses is significant, which is expected given the lack of adequate public transport services (see Table 2). In both samples, the proportion of women who use company buses is higher by around 7-8% and the overall use of company buses ranges between 83% and 98% amongst male and female employees in both cities. A significant share of the women indicated that they would not work at the OIZ if company buses were not provided. Only 38% of the male respondents agreed with the statement in Afyonkarahisar, while this goes up to 78% in Şanlıurfa. The higher share of women who agreed with the statement may be due to their lack of willingness to take commercial minibuses that do not take them directly to the factories, but stop just outside the zones. Moreover, the share of the men who drive to work is slightly higher than that of women in Afyonkarahisar—something that may contribute to explaining why the male employees are relatively less dependent on company buses in the Afyonkarahisar OIZ. The gender differences in the dependence on company buses and the use of private cars almost disappear in Şanlıurfa, particularly amongst the manual unskilled labour-

Table 2. Description of the journey-to-work in the Afyonkarahisar and Şanlıurfa OIZs.

	Female		Male		Total	
	N	Mean	N	Mean	N	Mean
AFYONKARAHİSAR						
Total travel time (minutes)	201	69.68	120	63.16	321	67.24
If company bus wasn't available, I wouldn't go to work (1 = Agree)	201	0.61	120	0.38	321	0.52
I wish I could just walk to work	201	0.27	120	0.18	321	0.24
Use of private car (ratio)	201	0.02	120	0.08	321	0.05
Use of company bus	201	0.90	120	0.83	321	0.87
ŞANLIURFA						
Total travel time	127	68.43	81	56.90	208	63.67
If company bus wasn't available, I wouldn't go to work	109	0.84	69	0.78	178	0.82
I wish I could just walk to work	109	0.44	69	0.39	178	0.42
Use of private car	127	0.02	81	0.02	222	0.02
Use of company bus	127	0.98	81	0.90	222	0.92

Notes: Transport mode was indicated in all of the questionnaires, but some of the questionnaires did not include the information on travel time. Travel time for these responses (20 questionnaires in Afyonkarahisar and 25 questionnaires in Şanlıurfa) was assumed to be the same with that of the respondents coming from the same neighbourhoods. The questionnaire also included minibuses, buses and walking in the list of transport modes with the aim of obtaining complete information on door-to-door travel to work, but very few respondents answered this question correctly (e.g., a 5 minute walk to the bus stop, where company buses leave, etc.). The analysis therefore included only the main transport modes used by the respondents.

ers. This might yield insights into the importance of social group on dependence on the company buses.

We can also see clear trends in the overall perception of access to the OIZs. How the women see the ease of getting to the OIZ varies depending on their social groups (i.e., socioeconomic characteristics such as occupational status), particularly in Şanlıurfa. A middle-aged married woman holding a managerial position at a textile firm points out that the OIZ used to be far away from the centre of the city, but that it is no longer the case. A female accountant with relatively higher household income and no children, who gets a lift from her husband to get to work every day, shares this view by referring to company buses provided by the firms. A single female accountant working for a firm in Şanlıurfa that does not provide a company bus gets a lift from a close colleague (in place of a company car). When asked about the flexibility, she says, "When I am late, the company car waits for me." One of the older female managers said that the accessibility of the OIZ is even better compared to other workplaces in the city. The commonalities amongst all these positive attitudes are that these women come from relatively better socioeconomic backgrounds and have access to private transport. The situation differs for women who do not have access to alternative means of transport. All unskilled workers including cleaners and cooks interviewed in both cities list access to the OIZs as one of the main concerns, if not the biggest. Women working in firms that provide no company buses or company cars share this view on accessibility. In fact, in one of the smaller firms in the food sector, the female manager mentioned that although her employer gives her a lift if she wants it, she would prefer using a company bus as she thinks it gives her more independence.

Finally, it is worth noting the diversity of employers' thoughts on employing women in general, and their perceptions of women's access to OIZs more specifically for the significant consequences on women's working conditions. The owner of a large company, which employs only one woman as a cook, says that having female employees is a hassle for them by pointing out the immediate need for separate company buses for women and that they cannot take the responsibility for employing women. Not all firm owners agree, though. In fact, many of the owners, particularly in Şanlıurfa, emphasised that they wish they could employ more women, mainly because they are more obedient and disciplined. However, it was also mentioned that single women are more preferable because of the potential issues the employers see with married women with children, including taking time off work. This suggests strong assumptions over women's daily time use and priorities. All these observations regarding the image of female workers in the eyes of the employers in terms of work and mobility spaces have significant implications for female employees' working conditions.

4.2. Commuting Times

As seen in Table 3, the average commuting time is generally higher for women than men in both samples. This is not consistent with the general observation that women

Table 3. Commuting times.

		Average commuting time (minutes)			
		Afyonkarahisar		Şanlıurfa	
		Male	**Female**	**Male**	**Female**
Marital status	*Single*	70	75	54	70
	Married	59	64	58	56
Education	*Primary*	55	55	57	65
	High School	65	76	55	74
	University	72	78	65	75
Occupation	*NM unskilled*	80	89	69	96
	M unskilled	57	54	57	68
	M skilled	60	46	n.a.	50
	NM skilled	59	55	43	40
Age (yrs)	*0–18*	n.a.	58	60	69
	19–27	71	74	56	69
	28–34	61	73	64	70
	35–45	56	61	51	55
	46–55	48	50	65	20
Tenure category	*Less than a year*	58	75	57	67
	1–2 years	68	68	45	89
	More than 2 years	65	53	65	58

Notes: NM: non-manual; M: manual.

are likely to have shorter commutes. However, given that the location of jobs is the same for both genders in these samples and the alternatives to the jobs in OIZ are likely to be fewer in small cities like Afyonkarahisar and Şanlıurfa, shorter commuting times in general may not be meaningful to examine. However, the average commuting time for men and women broken down by other social categories yields interesting results.

Amongst the occupational groups, the largest difference in the Afyonkarahisar sample is between the female and male manual skilled workers (Table 3). The female employees in this group commute less than the men in the same occupational group. Women with high school education commute longer. These descriptive gender differences in commuting times accounting for occupational and educational levels already yield important results. The nonparametric statistical tests offer significant associations between commuting times and occupational groups and education levels. A Kruskal-Wallis test was conducted to determine whether the commuting times of women and men varied as a function of the socioeconomic categories. The results showed that in Afyonkarahisar, the occupational groups of the women relate to their commuting times ($\chi 2(3) = 26.6$, $p < 0.01$), with unskilled female workers having higher mean ranks of commuting time (123.03 minutes for non-manual unskilled workers, 85.53 minutes for manual unskilled workers, 63.88 minutes for manual skilled workers and 82.45 minutes for non-manual skilled workers). There also exists a statistically significant positive correlation (Spearman's rho = 0.153, $p < 0.05$) between educational levels and commuting times amongst the female workforce of the Afyonkarahisar OIZ, while tests revealed insignificant results for men.

In the Şanlıurfa sample, there are significant gender differences in the average commuting times between men and women ($p < 0.05$). Accounting for the socioeconomic and household attributes, descriptive statistics yield further insights. Single women commute longer compared to single men, but commuting time is roughly the same for married men and women. The most important one is the significant difference in commuting times between unskilled female and male workers. While non-manual unskilled women travel for around, on average, 96 minutes to get to work, this figure goes down to 69 minutes for non-manual unskilled men. Moreover, female workers with more education commute longer compared to men in the sample. In Şanlıurfa, the same statistical tests also confirm commuting times of the female employees varied as a function of their occupations ($\chi 2(3) = 10.8$, $p < 0.05$) with a mean rank travel time of 62.28 minutes for non-manual unskilled workers, 67.19 minutes for manual unskilled workers, 39 minutes for manual skilled workers and 17.6 minutes for non-manual skilled workers. In contrast with Afyonkarahisar, no statistically significant correlation exists between education and commuting times for women in Şanlıurfa, and similar to Afyonkarahisar, there is also no statistically significant difference in commuting times amongst occupational groups within the male workforce.

The general perception of time use in everyday life reveals important differences amongst women from different educational and socioeconomic backgrounds. The women in higher social groups (i.e., educated, holding managerial positions with higher incomes) emphasise the time constraints they face in their everyday life, particularly in terms of balancing home and work responsibilities. Especially the young married women mention the extra burden they feel in terms of the household responsibilities. One of the newlywed women particularly points to the uneven distribution of household tasks between her and her husband and attributes this to society's expectations placed upon women. The situation changes for women in lower social groups (i.e., occupational groups): time becomes a constraint in reaching life-enhancing opportunities (e.g., vocational training and education) that would translate to more social mobility through getting better paid jobs that require specific skills. Many women holding low-paid, unskilled jobs stressed the need and desire for further training or continuing their education, but the lack of time emerged as an issue. When asked about the time-related constraints they face in their everyday life, young women working in low-paid jobs especially expressed a desire to attend training courses that would allow them to work independently.

Finally, time spent on commuting appears to be an important concern for firms, as they assume that it influences the productivity of workers. A senior level office manager in Şanlıurfa lists shorter commuting distance as one of the main benefits of moving operations from İstanbul to Şanlıurfa: "at least 1–2 hours is spent on commuting in İstanbul, while in Şanlıurfa the longest distance would be 45 minutes without any delays. The employees perform better." Such a view echoes the previous evidence on how workers' (private) time is recognised as a direct input for the productivity of firms (Wright, 2006). However, the daily lives of different groups of women are more complex than this. Indeed, a 35-year old single woman with university education working in the Şanlıurfa OIZ has two more jobs located far away from each other. She describes her day during term time:

> I wake up, prepare breakfast, get ready for work, walk to the bus stop for 10 minutes, take the company bus…leave work to give some private tuition….Everyone in the household [she lives in a household of six] is financially dependent on me. I need other jobs.

Another female employee at a textile firm in Şanlıurfa with university education is doing her second (distance) degree. She spends most of her time on Sundays with her children, and then she does the housework until early in the morning. When considering such complex and intense daily routines of the women, the assump-

tions made by employers with regards to women's time use have significant adverse implications for widening access to economic opportunities for women.

5. Discussion

Through the cases of Afyonkarahisar and Şanlıurfa, this article examined the commuting and accessibility patterns of women and men from different social backgrounds in the industrial zones in Turkey. The study particularly focused on whether and how gender plays a role in differences in access to the OIZs. The simultaneous analysis of qualitative and quantitative data revealed several key trends in terms of access to work, daily mobility patterns and wider reach to economic opportunities. Women do seem to make different choices about how to choose their place of residence for various reasons, such as being closer to childcare. This indicates the multidimensional nature of the spatial distribution of female labour. Moreover, women tend to have higher levels of dependence on free mobility services provided by their employers (i.e., company buses), especially in Afyonkarahisar. Despite the complex and unpredictable nature of everyday life of the female employees, the (male) employers' assumptions regarding women's time use as a result of life course changes also entail gender dimensions. It could, therefore, be argued that gender plays a role on the men and women's access to the zones in different ways.

However, women's socioeconomic and educational backgrounds seem to be more important predictors of commuting patterns than gender, while this is not the case for men. This difference tends to persist in the perceptions revealed by the study. How women see the accessibility of the OIZ varies depending on their social groups, particularly in Şanlıurfa. Women with higher social status and those with alternative (private) means of transport to get to work do not see any problems with accessing the OIZs. Women in this group perceive the daily time constraints arising from their household responsibilities as a pressing issue hence see the time spent on commuting as a more important constraint. Time becomes an issue for the women in lower social groups only when considering their desire to access to training and educational opportunities that would provide them with the means to higher social mobility (i.e., through getting better paid jobs). It is therefore possible to argue that time acts as a daily constraint for women in higher social groups, while its impacts upon the women in lower social groups in terms of reaching life-enhancing opportunities.

The results of the study seem to have two broader conceptual implications. First, while the gendered daily travel patterns provide a useful unit of analysis, they should be put in a wider context, whereby the economic, cultural and physical factors that affect work and mobility spaces of women can be identified. Most of the existing literature emphasise the implications of the negotiations that women have to make in private spheres for their participation in public life (e.g., Levy, 2013). The article demonstrates that a multi-scalar analysis of women's daily travel patterns reveals the significance of the socioeconomic dimension of women's access to work and wider opportunities. Second, the complex nature of everyday mobilities of women in lower social groups and their dependence on company buses should be interpreted in conjunction with the perceptions of employers. The employers' assumptions regarding the necessity of gendered mobility spaces and life course of women will prove problematic for these women's access to economy and eventually for social inclusion. Moreover, the perception of women's time use as a direct input for production presumes homogeneity amongst different social groups that may hinder varying vulnerabilities of female employees in the zones. It is, therefore, important to go beyond investigating the transport-specific characteristics of women's commutes (Peters, 2013; Uteng, 2011). Future research should evaluate the work-related mobilities of women in the wider governance and cultural contexts and bring in additional units of analysis, such as perceptions.

As can be seen from the combined explanatory power of the multiple forms of data, future research should use mixed methodologies to reveal the actual space-time constraints of women through daily mobility. Moreover, multi-level modelling of travel patterns should provide more detailed insights into different scales of spaces in which women work and live. As McDowell (2009) argues, even the study of small places like workplaces requires analysis of the contextual spatial processes. The study also reveals that the actual and perceived accessibility may change across different social groups; it should therefore be considered in future studies. From a policy perspective, top-down policies at the local level are likely to ignore the daily time-space constraints of women in different social groups. It is therefore imperative to identify the needs of the local women through participatory means, particularly of those needing to advance their skills for social mobility. Specifically, given the desire of the unskilled women holding low paid jobs to have access to training and educational opportunities, the provision of educational facilities in the zones has the potential to contribute to social mobility.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

The Kindness of Strangers: Exploring Interdependencies and Shared Mobilities of Elderly People in Rural Japan

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Abstract
For over forty years, most residents in rural areas of Japan have relied on private vehicles to meet their mobility needs. Today, however, the rapid ageing of the population, coupled with low birth rates and migration of young people to urban areas, is posing a variety of new transport challenges. Most notably, the proportion of drivers to non-drivers is getting smaller. This means that non-drivers who relied on family and neighbours for trips in the past, as well as elderly residents who give up their licenses, have fewer people to drive them. Current policy debates tend to focus on technological "solutions", and underestimate the complex social, cultural and inter-personal relationships which underlie transport dependencies in these environments. Using a qualitative semi-structured survey, the current study explores the current mobilities of older people living in a small rural district in Shimane Prefecture, Japan. The resulting analysis reveals how cultural attitudes and social norms affect the ways in which older people manage their mobilities.

Keywords
ageing; cultural attitudes; driving; elderly; Japan; mobility; transport; older people; rural transportation; social exclusion

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1. Introduction

As recently noted by the United Nations, "Population ageing—the increasing share of older persons in the population—is poised to become one of the most significant social transformations of the twenty-first century, with implications for nearly all sectors of society" (United Nations, 2015). Not only is *the share* of the population over the age of 65 rising in relation to the rest of the population of most industrialized countries, but the *absolute number* of elderly people is increasing rapidly as *life expectancies increase*. These three trends—the growing share, the rising number, and the increasing longevity of people—are bringing issues related to the mobilities of older people to the centre of public policy debates in high and middle-income countries.

Japan is at the forefront of these demographic transitions. In 2015, the number of people aged 65 or more exceeded 33 million, or a little over one in four persons; of this 33 million, close to 10 million were aged 80 or more (Government of Japan, 2017a). At present, Japan has the longest life expectancy in the world, averaging 86.8 years for women and 80.5 years for men in 2015 (WHO, 2017). Meanwhile, falling birth rates and conservative immigration policies resulted in negative population growth between 2010 and 2015, the first such contraction since the population census began in 1920 (Government of Japan, 2017b). Rural areas, particularly in prefectures outside of

major metropolitan areas, have been ageing and facing depopulation at faster rates than urban areas.[1]

These trends are having profound effects across all dimensions of Japan's economy and society, not least in the area of transport. For example, mobility and access issues relating to older people are featured with increasing regularity in the national media, with three issues in particular attracting public attention: the safety record of "senior drivers" (officially 65 years or older); the growing number of "public transport white spaces" ("*koukyo kōtsu kuuhaku chiiki*", or areas where residents have no access to public transport); and "shopping refugees" ("*kaimono nanmin*", or people who can't access shops for food and other daily necessities).

These issues are not particularly new (Mosely, 1979), nor unique to Japan (Mollenkopf, Marcellini, Ruoppila, Széman, & Tacken, 2005). But what makes this particular moment in Japan's rural transport history critical is that it marks the convergence of several concurrent and interrelated factors. One is that local governments are under intense budgetary pressure to reduce their support for the few public transport services which are still running in remote and rural areas. Another is that local shops in rural areas are on the verge of disappearing altogether, as shopkeepers themselves are ageing and face difficulties in sustaining their businesses due to economic, health and logistical reasons, such as the inability to drive to wholesale markets to restock their shops. But perhaps most significantly, the first "baby boom" generation (born shortly after the Second World War) are now entering the 75+ age group and are expected to stop driving in the next ten years. This is significant not only because the absolute number of non-drivers will increase, but because the majority of these "new" non-drivers are men who have provided escorting services for their wives and parents for the last forty to fifty years. The impact of their "retirement" from driving, therefore, has wider repercussions than simply the cessation of driving for these individuals.

In this regard, the government, as well as local communities and social service providers, have been trying a variety of different transport and social service delivery models to support the mobility of older people and to guarantee them access to their daily needs. For example, the government retains some regulatory control over private bus companies to ensure the operation of routes deemed essential for severely depopulated areas. In 2006, it amended the national Road Transport Vehicle Law to allow greater flexibility in their operations (for example, flexible routing and scheduling) (Akiyama & Yoshida, 2009). As a result, over 1,250 municipalities (including villages and towns) were running community bus services by 2015 (out of a total of 1,718), while about 360 had started demand-responsive shared taxi services (Government of Japan, 2017c).[2] In May 2016, the government also began a pilot test of an Uber-type taxi service in a remote area of Kyoto prefecture, followed by another pilot in August 2016 in a remote area of Hokkaido prefecture (Nikkei, 2017).

The academic community is also actively researching older people's mobilities. Not only in Japan but in other countries as well, there has been a notable rise in the number of academic papers on the mobility and access needs of elderly people since around 2000 (see Chikaraishi, 2017). However, the literature is dominated by quantitative studies which tend to treat the elderly as a fairly homogenous group with homogenous transport needs. Furthermore, the majority of papers focus on the *individual mobilities* of older people, rather than shared (or intra-household) mobilities. This may be because they mainly draw on data from North America, Europe and Australia, where the majority of older people live in single generation households, unlike the case of Japan where many older people still live in multigenerational households (Government of Japan, 2017a). Another common assumption is that older people prefer driving to other modes of transport (Alsnih & Hensher, 2003), but as noted above, historically driving has been a highly gendered skill in Japan, and even today most women over the age of 75 use a combination of private vehicles (mainly as passengers), public transport, and non-motorized modes (walking and cycling).

In order to better understand the mobilities of older people in rural Japan, it is worth suspending some of these assumptions and asking the people themselves about how they perceive their own mobilities. In this regard, the current article presents the findings of a qualitative study on the mobilities of older people living in Nijo, a small rural district located in Shimane Prefecture, western Japan. The study looked at older people's corporeal mobilities outside of home, and explored three basic questions: first, *why* do older people travel?; secondly, *how* do they travel?; and thirdly, *how do they perceive this travel?*, particularly their dependence on other people for mobility. The research framework drew on the literature on rural transport; the mobilities of older people; transport-based social exclusion and accessibility; and to a limited extent, the "new mobilities" paradigm.

The article is structured as follows. The next section presents a review of selected literature on the mobilities

[1] Administratively, Japan has 47 prefectures which are divided into "*shi*" (city) and "*gun*" or "*choson*" (rural counties) (according to population size and density); "gun" and "choson" are further divided into towns and villages. However, these categories do not necessarily reflect "urban" and "rural" characteristics (many city boundaries, for example, encompass rural districts). The term "rural" as used in the present article is closest to Rath's (2009) functionalist definition of rural Japan, meaning "those areas which are less populated and developed, where the chief occupation is agriculture or forestry, and where these livelihoods and the environment encourage the inhabitants to live cohesively with one another and with nature" (Rath, 2009).

[2] Community buses are defined as those passenger bus services which are independently planned and operated under the authority of local governments. Most are run by professional transport service providers. Demand-responsive shared taxi services are usually small vans carrying up to 11 people (including the driver); are reserved in advance; and do not have to follow a fixed route (Government of Japan, 2017c).

of older persons. The third section describes the research site, while the fourth section describes the methodologies used. The fifth section presents the findings, while the article ends with concluding remarks and suggestions for future research.

2. Review of the Literature

As noted above, the mobilities of older people have captured the attention of researchers from a variety of transport-related disciplines. Most "traditional" studies focus on differences in travel patterns between older people and other age groups (trip distances, number of trips, trip complexity, and so on), or look at differences among older people, such as by gender (Su & Bell, 2012), age (Alsnih & Hensher, 2003), or activity (Hahn, Kim, Kim, & Ulfarsson, 2016). Researchers have also been interested in how age-related changes in physical and cognitive capacities affect the ability to utilize transport technologies, particularly driving. Meanwhile, geographers, urban planners and environmental gerontologists are concerned with how age-related changes, particularly health and physical attributes, interact with the built-environment to affect the ability of older people to negotiate infrastructure or access public transport (e.g., Lin et al., 2014).

Although there is some evidence to the contrary (see Alsnih & Hensher, 2003, on the recently-retired), there is a general consensus that ageing is associated with a *loss of mobility*. A growing number of studies therefore focus on the *consequences* of this loss of mobility. Many studies show, for example, that loss of mobility (for example, as a result of driving cessation) leads to lower participation in out-of-home activities, which in turn is associated with lower (subjective) assessments about quality of life and well-being (Banister & Bowling, 2004; Metz, 2000; Mollenkopf et al., 2005; Nordbakke & Schwanen, 2013; Spinney, Scott, & Newbold, 2009; on driving cessation see, for example, Marottoli et al., 2000).

Researchers on social exclusion have also studied the relationship between mobility and the subjective well-being of older people (for example, Stanley, Hensher, Stanley, & Vella Brodrick, 2011), but take a broader view by linking transport disadvantage to other forms of disadvantage (Delbosc & Currie, 2011; Lucas, 2011; Stanley, 2011). By linking mobility outcomes to social outcomes, social exclusion researchers firmly situate the issue of access to transport within a broader social policy agenda (McDonagh, 2006; Stanley, 2011). In this regard, the social exclusion framework offers tremendous potential for analyzing the mobilities of older people because it appreciates the many different factors affecting individuals' access to transport (Church, Frost, & Sullivan, 2000), and could potentially accommodate the different scales of mobility which are affected by ageing (Webber, Porter, & Menec, 2010).

However, in the quest for "policy relevant research" and generalizable results, the main theoretical push within the social exclusion literature appears to have been the development of indicators to measure transport disadvantage and social exclusion (Geurs & van Wee, 2004; Lucas, 2011; Pyrialakou, Gkritza, & Friker, 2016; Schönfelder & Axhausen, 2003). Thus, despite calls for a greater use of individual level data to understand social exclusion (Grieco, 2003; Kamruzzaman & Hine, 2011; Preston & Rajé, 2007), most studies treat "the elderly" as one of several groups at risk of exclusion. Studies which analyze social exclusion and mobility in rural areas also share this tendency (for example, Kamruzzaman & Hine, 2012; Smith, Hirsch, & Davis, 2012). Furthermore, these studies do not look in detail at how older people interact with other people (such as family members), or how they themselves may be choosing to be excluded from what would be considered "normal" social activities. The few exceptions are mostly qualitative studies, such as Shergold and Parkhurst (2012) who conducted a mixed methods study on self-reported social exclusion of older people in Southwest England and Wales and found that "accepting lifts" had a number of negative aspects, such as having to adjust to the lift-giver's timetable, or privacy issues when going to medical appointments. This points to a gap in the literature, because if the request for mobility support is mediated "by their perception of what is possible or reasonable to expect", then it is likely to influence people's travel decisions (Farrington & Farrington, 2005).

Meanwhile, some behavioural transport researchers have explored intra-household interactions from the perspective of joint activity participation, joint travel arrangement, household resource allocation, task and time allocation, and role specification (Zhang, Timmermans, & Borgers, 2004). Most studies focus on the transport behaviours of couples or parents providing escorting services to children, with only a few looking specifically at older people (Zhang & Fujiwara, 2006), and one looking at the impact of elderly care on care-givers' time use behaviour (Chikaraishi, Zhang, & Fujiwara, 2012). While these studies help to show how people's transport patterns are affected by other people within the same households, they don't explain how these behaviours are negotiated, nor the complex social and cultural norms which frame these shared mobilities.

In this regard, the current study aims to add to the small but growing body of literature which uses qualitative and mixed methods approaches to understand travel behaviour (see review by Mars, Arroyo, & Ruiz, 2016). It has similar objectives to the study of rural transport in the Republic of Ireland by Ahern and Hine (2012), in that it is motivated by a desire to first better understand the actual mobilities of older people in rural areas of Japan, and second to better understand how older people themselves perceive their mobility options. To capture both of these aspects, this research employed two types of coding: the first used a provisional coding list based on the seven types of factors identified by Church et al. (2000) which potentially affect the mobility of socially excluded people, and the second used values coding to try to cap-

ture the particular attitudes and values underlying older people's mobilities. The findings reported in this article focus specifically on those related to the shared mobilities of older people.

3. Description of Research Site

Nijo is located 18–20 km from the center of Masuda City (population circa 47,000 in 2017), Shimane Prefecture, and consists of five subdistricts (Asaka, Kamikurodani, Kurosu, Katuragahira, and Kashibara) (Figure 1). Like other rural areas of Japan, its population has been declining steadily over the past few decades, as has the number of households (Figure 2). As of early 2017, it had an estimated population of around 500 people living in 210 households, with subdistrict populations ranging from about 200 in Kamikurodani, to only 25 in Asaka.

In line with national trends, Nijo has also steadily aged, with an estimated 46% of the population now over the age of 65 (Figure 3). As can be seen, women outnum-

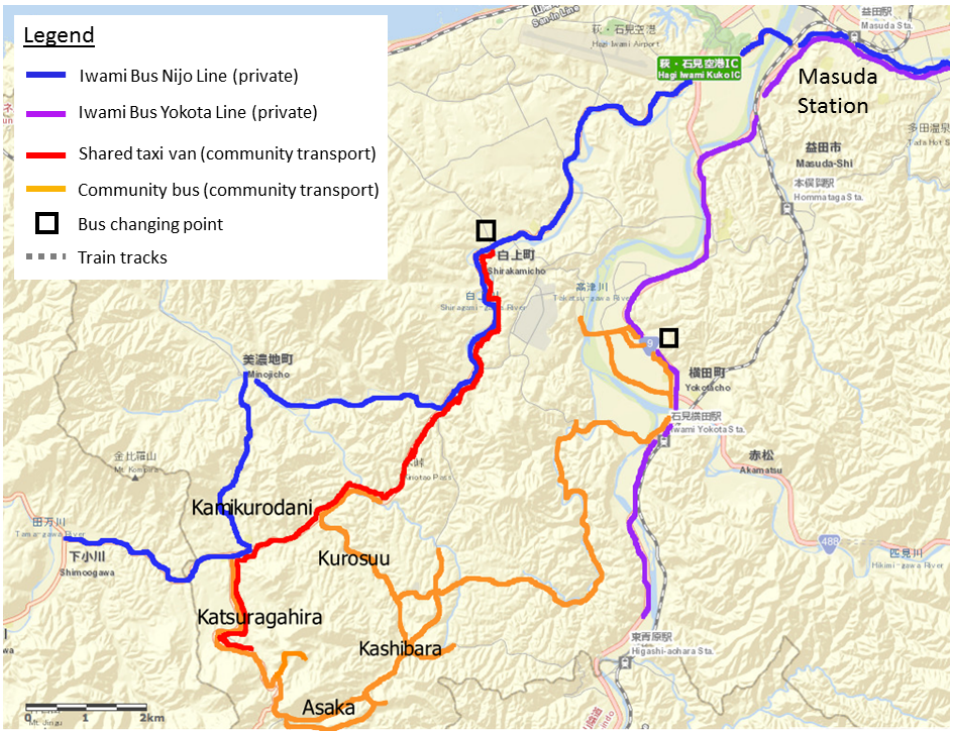

Figure 1. Map of Bus links between Nijo and Masuda City Centre. Source: Authors using ArcGIS basemap (Esri Japan, Esri, HERE, Garmin, INCREMENT P, NGA, USGS (c) Esri Japan).

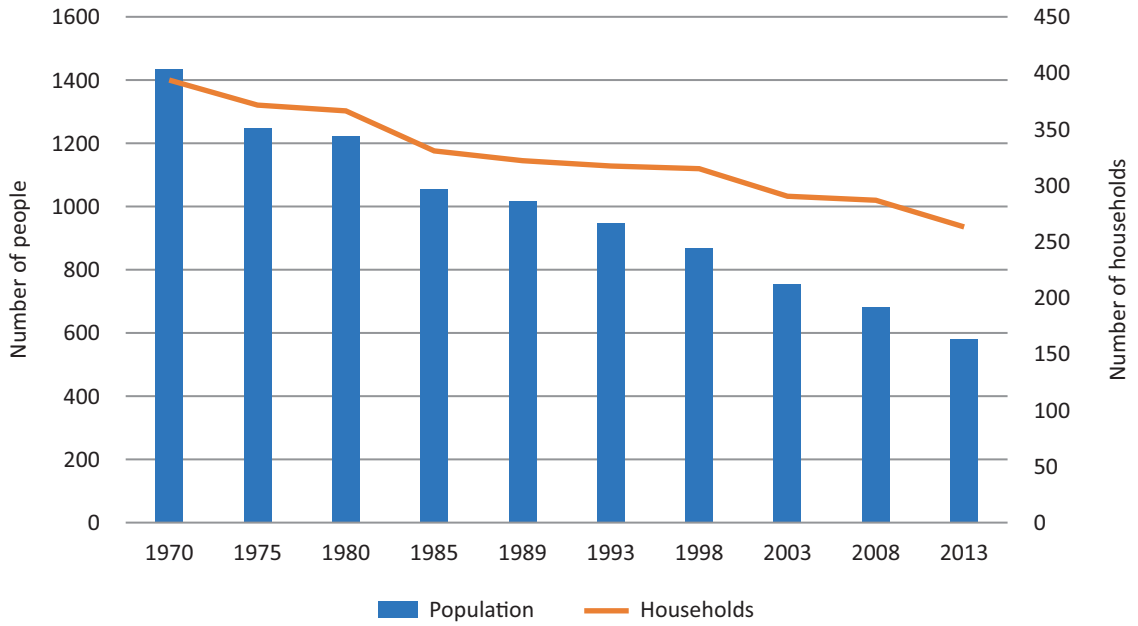

Figure 2. Population and number of households in Nijo, Masuda City. Source: Nijo Community Association (2015).

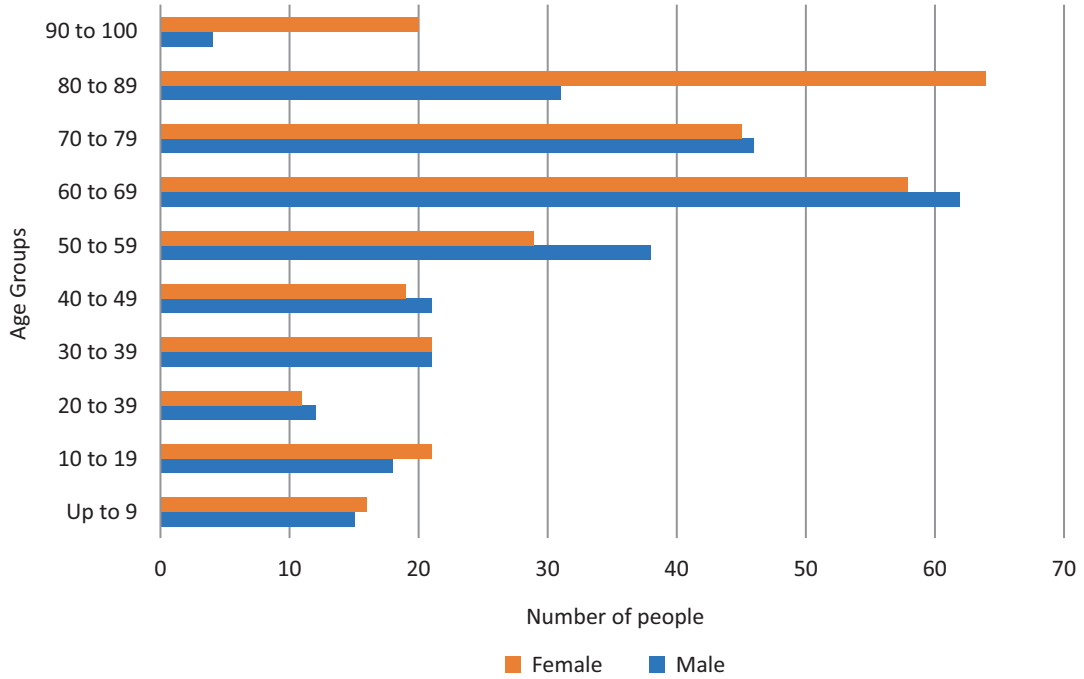

Figure 3. Population of Nijo by age group, male and female (2015). Source: Nijo Community Association (2015).

ber men in the 80–89 and 90–99 categories. According to a district-wide survey conducted in 2014, 1 person, 2 people or 3–5 people households constituted roughly one third of the population respectively, while 30 households reported having more than six people (Nijo Community Association, 2014). The majority of working age people commute to Masuda and surrounding areas by car for work, while the older population are mostly engaged in agriculture (rice and vegetable farming) near their homes.

The area is considered mountainous, with road elevations in Nijo ranging from 50 to over 300 meters above sea level. One prefectural road and several local roads link the five subdistricts to each other and to Masuda City. Most households are located along or within 10 metres from some kind of road. Within subdistricts, it is common to find several houses clustered together, but distances between houses can range from a few metres to 100 (or more) metres, depending on the subdistrict. For example, some houses in Kamikurodani are clustered around the old shopping street, where a few shops, the community centre, post office, Japan Agricultural Co-operatives' office, and the junior high and elementary schools are located, but in other subdistricts households are scattered over a wider area, separated by paddy and vegetable fields.

Apart from households where no one drives, most households (even single person) own more than one vehicle. This is because residents prefer to use "light" trucks (with engines up to 660 cc) for carrying agricultural products and tools, and drive "ordinary" cars for other business and social excursions. A private bus company provides a service five or six times a day through two of the subdistricts to Masuda (where the hospitals, supermarkets, and DIY stores are located), while the three other subdistricts are served by community transport services one or two times per day (depending on the day). Community transport passengers have to transfer to the private bus once en-route, and again at Masuda station to go to the hospitals. Another community bus service runs within the district once a week, so that residents can access the local health clinics and post office.

4. Research Design and Methodologies

4.1. Interview Protocol

After an initial two-week period of direct observation, a semi-structured interview protocol was drawn up. Face to face interviews with older residents (65 and above) were then conducted over a four-week period in May/June 2017. The protocol consisted of three core questions, namely:

1) why do you travel? (for what purpose, which included where they travel to);
2) how do you travel? (travel mode, with whom they travel);
3) how do you feel about your travel? (particularly how they feel about arranging travel; how they feel about asking other people for lifts; and who they would call for transport in an emergency).

As it was expected that most interviewees did not drive, the research design also included interviews with family members and neighbours who supported older people's mobilities in order to triangulate the data. However, there was a general reluctance to invite the re-

searcher back to meet other family members, and requests for telephone numbers of family members were politely declined. It was also logistically difficult to secure formal interviews with family members or neighbours as most of them worked in Masuda and came back in the evening. Family members and neighbours were therefore engaged in informal conversations (for example, at community events outside of home). The researcher also had informal conversations with other people in the community, including shop-keepers, community leaders, local government staff, visiting nurses, and the local hairdresser.

4.2. Sampling Method

The sampling methods used were purposeful and snowball, partly to ensure that all five subdistricts were represented, and also because there is a general feeling of mistrust of outsiders amongst older Japanese people, who have become the target of money swindling scams set up by organized crime groups in recent years. The initial contact for the first six interviewees was through the personal introduction of community leaders. Another five interviewees were met at social events, while two further women were approached without introductions. Snowball sampling was used to identify other older people who could be interviewed. This led to four additional introductions, bringing the total to 17 persons. At this point the data appeared to reach saturation point and data collection (formal interviews) was stopped (Fusch & Ness, 2015).

4.3. Coding Processes

Fourteen formal interviews were recorded and transcribed (three respondents did not want to be recorded), and then two coding processes were used to analyse the interviews. As a first step, factors associated with transport-based social exclusion as identified by Church et al. (2000) were used as the basis of a *provisional coding* list (Saldaña, 2016). In brief, these factors are 1) physical exclusion; 2) geographical exclusion; 3) exclusion from facilities; 4) economic exclusion; 5) time-based exclusion; 6) fear-based exclusion; and 7) space exclusion (see Church et al., 2000, for a description of these factors). In the course of doing the first round of coding, several additional issues emerged, leading to a revision of the original list (Table 1), and the data was recoded. A second round of coding using *values coding* (Saldaña, 2016) was then conducted on the original transcripts to try to capture cultural attitudes and social norms influencing how people perceived their transport options, including asking other people for lifts.

5. Findings

5.1. Profile of Respondents

The initial analysis separated people by gender, driving status (non-drivers and drivers), and household composition (living with drivers; living with non-drivers; living alone) (Table 2). The ages of respondents varied, with 69 being the youngest and 92 being the oldest. All respondents could walk, though one recently had an operation and was not able to walk very far. Of the total 17 respondents, 14 were women and 3 were men.

As it was relatively unusual for women to get driving licenses until the 1970s, it was not surprising to find that 13 out of the 14 female interviewees had never driven a car in their life. In the past, these women relied on their husbands or public transport to travel. The one exception was the youngest woman (69), who had gotten a driving license following the death of her husband some thirty years before, but who had given it up recently after a traffic accident. One woman drove a scooter for short distances from her home to the Community Center and bus stop. The two women who lived with non-drivers had husbands who had recently given up their licenses following (non-traffic) accidents. All three men (aged 79, 85 and 92) still drove on a daily basis.

Table 1. List of final provisional codes (adapted from Church et al., 2000).

Type of factor	Description
Physical factors	Physical barriers, such as vehicle design, affect access to transport services (this also includes personal attributes which affect a person's abilities to manage such barriers)
Geographical factors	Distance or topographical factors affect access to transport services
Economic factors	Costs of travel affect travel frequency or limit access to facilities
Time-related factors	Length of travel time; demands on time, such as household duties and institutional and coupling constraints (Hägerstrand, 1970) affect use of transport services
Fear or safety factors	Fears for personal safety affect people's use of public spaces and transport services
Information-related factors	Lack of, or unintelligible, information affects access to transport services
Social networks and cultural factors	Social networks, social norms and cultural factors affect people's access to or use of transport services

Table 2. General profile of respondents.

	Gender		Driver living with non-driver	Driver living alone	Non-driver living with driver(s)	Non-driver living with non-driving spouse	Non-driver living alone	Subtotal
	F	M						
Kurosuu	4	1		1	2	1	1	5
Kashibara	1	1	1				1	2
Kamikurodani	4				3	1		4
Katsuragahira	3	1		1			3	4
Asaka	2						2	2
Total	14	3	1	2	5	2	7	17

5.2. Why Older People Travel—And How

Most interviews began with the question "why do you travel?", followed by "how do you travel?" (Table 3). As all of the male respondents drive, the following discussion is focused on the responses of the interviewed women.

5.2.1. Travel for Health

All interviewees responded that their primary reason to travel was to visit hospitals, health clinics or dentists in Masuda. Women living with drivers used a mix of private (family) and bus services. A common pattern was to be driven by their children (or sons and daughters-in-law), who dropped them at the hospital on their way to work in the morning, and to take the bus back on their own. This was because they didn't want to wait until the evening to return home. Women not living with drivers normally used the bus. Several also said that their (non-resident) children occasionally drove them if they had time to come pick them up, or were visiting during the weekends or holidays.

5.2.2. Travel for Shopping

The second most common reason for travel was shopping. However, almost all respondents said that they rarely go to Masuda for the sole purpose of shopping (unless accompanying family), but might do so in conjunction with a hospital visit. Many respondents emphasized that they try to do their shopping locally. The reason for shopping locally, however, was not only due to the geographic proximity of shops, but also out of loyalty to the shop-keepers: a common statement heard was "as long as there are local shops, (we should) do our shopping there", usually followed by "I've been obliged to Mr. X (the shop-keeper) for a long time" ("*naganen X san ni osewa ni nattekimashita*").

The women also ask family (both in-household and non-resident) to buy products which are not available locally or are too large or heavy to carry on the bus. Several women noted that they were visited by family members on a regular basis (between every week to every few months, depending on where family members lived). For example, one woman showed me a large stock of food

Table 3. Purpose and mode of travel.

	Non-driver living with family or near family	Non-driver living alone/with non-driving spouse/not near family	
	Regular	Regular	Occasional
Health (regular visits)	Family Bus	Bus	Family (if visiting)
Health (emergency)	Family (if available) Ambulance Neighbours	Ambulance Neighbours	Family (if visiting)
Shopping (food)	Family Bus (in conjunction with hospital visit)	Bus (in conjunction with hospital visit)	Family (if visiting)
Shopping (other goods)	Family		Family (if visiting) Friends (if invited) Neighbours (if invited)
Community and social activities	Family	Bus, Members of community (such as Niko Niko Kai)	

and drinks which had been bought by her son after her doctor had told her not to walk too much; he (or his son) came every weekend from Hiroshima, about 2.5 hours drive away, to restock provisions.

A few respondents mentioned that if asked by a neighbour whether they needed anything from a particular store, they sometimes requested specific items. For example, one woman said that she sometimes asked her neighbour to pick up seedlings from the garden centre, but only if he asked her first. She would never initiate the request.

5.2.3. Travel for Social Activities

Two women mentioned that they sometimes take part in the weekly gatherings of "ground golf" organized by the "Old People's Club", which is within walking distance of their houses. But most said that at their age, they rarely went out to see friends or for social purposes. When asked whether they would go out more if transport could be arranged, none of the women directly said that they wanted to. Most saw going out, particularly on long trips, as a burden and/or bothersome activity ("*mendokusai*"). Women in their 80s especially stressed that they didn't want to travel far or go on overnight trips anymore, with one explaining that "if something should happen, it will be a big inconvenience ("*meiwaku*") for my family."

However, when discussing one of the respondents with a younger woman (who was not in the sample and is a friend through their interest in sewing), she noted that "whenever I ask her (the older woman) if she would like to go out, for example to the haberdashery shop, she jumps and says: "I'll go, I'll go!". So whether these women would go out more often, if invited, is difficult to gauge from this study.

In this regard, it is worth noting that in rural areas of Japan, older women are not in the habit of "socializing" in the Western sense of visiting other people's houses or going out to eat. Rather, they take part in occasional community activities. Several respondents, for example, mentioned that they participated in the monthly gathering of the Niko Niko ("smiling") Club, where the "younger" old people (mostly retired and in their 60s and early 70s) prepare lunch and group activities for the older people.

5.3. Provisional Coding Results: Selected Factors Affecting the Shared Mobilities of Older People

5.3.1. Geographical Factors

For women living with drivers, geographical factors did not seem important when requesting lifts from family members. However, this could be because respondents' primary purpose of travel was to attend medical appointments in Masuda (where most people commute to for work), and because children are also expected to care for their parents (see Section 5.4.1 below). Women living alone or with non-drivers were unwilling to call their families for lifts to go to Masuda (or unable to when their children lived in Tokyo or Osaka) and preferred to use the bus. Given that it is a hilly area, it was expected that respondents would mention topographical factors (for example, difficulty in accessing bus stops), but those who used the bus did not mention this aspect, except to say that in the winter they had to be more careful.

5.3.2. Time-Related Factors, Including Coupling and Institutional Constraints

Most respondents who used the community bus noted that it took a long time. This is because the route traverses the whole district and involves changing to the private bus, which makes for a journey time of 60 to 90 minutes, compared to driving directly, which takes only 20 to 30 minutes. Meanwhile, women who lived with drivers were conscious that they were "asking" their children for a lift, and therefore adjusted their travel around their children's work schedule, even if it meant that they had to wait longer at the hospital before their appointments.

However, time at the station, where the private buses returned from, was seen as a bigger inconvenience than the journey time for both women living with drivers and those without drivers. For example, when early morning appointments were finished, they sometimes waited more than two hours at Masuda Station to catch the return bus. Some women used this time for shopping, eating lunch, or chatting with people at the bus stop, but one woman complained that she couldn't walk due to a bad hip and just sat at the station. In another case, the woman explained that she had arranged to meet three different doctors during her last visit to the hospital, but ran out of time and had to cancel one appointment in order to catch the return bus. In this regard, the institutional constraints imposed by the schedules of hospital appointments and return buses were of greater concern than the actual time taken to travel.

5.3.3. Social Networks and Cultural Factors

Apart from family excursions, the main social activity involving mobility was participating in the monthly Niko Niko Club. However, invitation to this Club is limited to older people living in the precinct of the former elementary school (which has been closed for more than ten years). The husbands of the "younger" women who organize the club (and who are mainly in their 70s) provide chauffeuring services for the older people and take pride in this role: one man noted that "without us, these gatherings couldn't take place". In contrast, most women who live outside of this precinct said that they had generally stopped attending outside social activities; one said that she was no longer interested because such activities were "for the younger people".

5.4. Values Coding Results: Attitudes towards Shared Mobilities and Interdependencies

After the first round of coding, it became clear that social norms and cultural attitudes have a significant bearing on older people's mobilities, particularly whether people ask others for lifts. In order to address this point, a second round of values coding was conducted which tried to explore the values and attitudes underlying the responses.

5.4.1. Interdependencies between Older People and Family Members

In general, there was a strong sense of "using my own legs for as long as possible", a sentiment shared by both women and men. However, in the case of medical appointments, women living with drivers did not mind asking their family for lifts because it is expected that children will take care of their parents. At the same time, these women seemed aware of their dependence on their children. Those living with their children were engaged in household tasks such as cooking, cleaning, looking after their grandchildren, gardening and farming. One woman (89) explained that she woke every day at 4:30 to prepare breakfast for her son and daughter-in law (in their late 50s/early 60s) and granddaughter (early 20s). So she did not mind "using" ("*tsukau*") her family to go to the hospital when they were off from work.

Some women, both living with drivers and not living with drivers, also said they were sometimes invited out "for a drive" by family members. For example, several mentioned that their children or grandchildren had taken them out for a meal on Mother's Day, while another woman said that one of her grandsons took her and her husband (also over 80 years old) out for a "drive" every month.

5.4.2. Interdependencies between Older People and Non-Family Members

A common theme which emerged from the interviews was the reluctance of older people to feel obliged or beholden to other people. Asking non-family members for help, when a person has the option of asking family members, is also generally viewed as being socially unacceptable. Even for medical emergencies, all respondents said that they would first ask their family members or call an ambulance rather than ask their neighbours for help. For example, one woman who lived alone described how a few months ago, she had been in so much pain that she could barely crawl, but instead of calling for an ambulance, a neighbour or her younger sister (who lives in Masuda), she stayed in bed for one week and ate cold rice which she had happened to cook the night before. When asked why she hadn't contacted anyone for help, she said she didn't want to cause any worry ("*shinpai sasetakunakatta kara*"). Meanwhile, another woman said that in an emergency: "I call a taxi. Everyone is busy, (so) if I call a taxi, I can ask them without constraint ("*kiganenaku*", or without being afraid of troubling someone else)"

However, several respondents said that they *might* ask their neighbours in an emergency if they could not contact their family. For example, one woman recounted that, when her husband had tripped and fallen on the ground near their house one month before, she had immediately rushed to a neighbour's house for help. A few women also acknowledged that as they got older, they needed to learn to accept help from others. For example, while recounting that on a recent trip back from hospital, the taxi driver had very kindly carried her husband into the house, one woman said: "(We) have to be obliged to others really, or we can't live when we get old" ("*konotoshidewa osewa ni naranyara, yatteikaremasen*").

In this regard, an interesting example of mutual exchange was given by the leaders of the Niko Niko Club, who explained that the monthly gatherings were a kind of "duty fulfillment" ("*ongaeshi*") to "all these people who took care of us when we were young" ("*kawaigattekureta hito*"). In this situation, the older people seemed comfortable "to be indebted" to this younger generation, many of whom they had known when they were growing up.

5.4.3. Interdependencies between Older People and Other Older People

One of the most surprising findings from the interviews was the extent to which older people were assisting other older people with their mobility needs. A particularly striking example was the 79 year-old man who drove his physically disabled younger brother (in his late 60s), five days a week, from their house to the bus stop where he was picked up for his job at a social welfare organization (which grows vegetables for sale). Another example was the youngest (69 year-old) woman who had become something of a spokesperson for people using community transport, for example negotiating changes to the route to make it easier for one of her neighbours to catch the bus.

On the other hand, older people are also aware of the safety risks associated with older drivers. When asked whether anyone in her neighbourhood helped her to travel, one woman said:

> Yes, Mr. A. always stops and offers a ride when he sees me walking—But I would never get in a car with him. If you see a white light truck (the kind frequently used by older men in Nijo), think 'Danger!'

5.4.4. Views of the Younger Generation

Although it was not possible to formally interview the family members and neighbours involved in the mobilities of older people in Nijo, the informal conversations revealed some interesting insights. One was with the

daughter of the 85 year-old man in this study. She noted that the issue of older drivers was a serious one (her father had had two "small" accidents in the last year, which he had not mentioned during his interview), but said it was difficult for drivers to offer lifts to people outside of their families "in case there's an accident". This view was shared by several other younger people; one said that she might give a lift to someone she knew well (for example, if she saw an older person waiting at the bus stop), but would probably not invite him or her otherwise.

The reluctance of older people to be "indebted" to others also makes it tedious for drivers to offer lifts, because the older people try to "repay" them in some way. Another younger woman noted that:

> I often see my (elderly) neighbour (walking), but don't want to offer to help her because if I do, she then feels obliged to give me something or repay me in some way and it creates a lot of fuss. So I just don't say anything.

A staff member of the Community Centre (in her late 30s) brought up another issue, which was that she hesitated to offer lifts to older people because these days, the boundaries between "being kind" and "being overly concerned" ("*osekkai*", which is considered a nuisance) were increasingly blurred. She noted that:

> It used to be when you offered help, 80% of the time it was considered a kindness and 20% of the time it was considered a nuisance, but today the ratio has changed and it is now 20% kindness and 80% nuisance.

6. Concluding Remarks and Areas for Further Research

The present study explored the mobilities of older people in a small rural district in western Japan using a qualitative approach, allowing older people to describe their mobilities and how they perceived their current mobility situation in their own words. While not representative of older people in Japan, the study provides some insights into the everyday mobilities of older people, particularly the influence of cultural attitudes and social norms on older people's willingness to depend on other people to meet their mobility needs.

The study confirmed that there was a significant difference in the mobility options of women and men; all male respondents still drove, while none of the women drove cars. The primary purpose of travel was to go to health facilities, while the travel modes of women varied between those living with drivers, and those living alone or with non-drivers. In both cases, respondents used a mixture of both private and public transport, although women living alone or with non-drivers had much fewer opportunities to avail of family members for lifts. The study further revealed the important role of older people (in this context, mostly men) in supporting other older people's mobilities.

To analyse how respondents perceived their mobility situation, the present study employed a combination of coding methods. The provisional coding list adapted from Church et al. (2000)'s factors influencing transport-based social exclusion served as a useful framework for analysing the interviews; not to judge whether respondents were "excluded" or not, but as a lens through which to consider the different issues affecting older people's mobilities in a comprehensive way. From the perspective of shared mobilities and interdependencies, time-related factors and cultural attitudes emerged as common themes. To explore these attitudes further, a second round of values coding was conducted, which found that while respondents did not mind asking family members for lifts to go to medical appointments, there was great hesitation when it came to asking neighbours. This seemed to stem from a widely shared reluctance to feel "indebted" to other people. Such a "psychological" barrier is probably related to how older people form/modify/maintain their social networks and communicate with members of these networks in their daily lives. This suggests the importance of community networks in promoting shared mobility in rural areas; measures encouraging such networks may therefore be helpful for supporting older people's travel needs.

While many studies are now being conducted on the mobilities of older people, they seem to underestimate the *agency* of these people in negotiating their mobilities. Despite being of advanced age, all of the respondents were still active in their own ways, and most seemed content with their current transport situation, regardless of their household composition. The non-drivers (women) were aware of inconveniences such as not being able to travel when and where one liked, but nobody complained as such: the general attitude was that "it can't be helped, this is the countryside". Furthermore, the findings also demonstrated the importance of *contextualizing* transport research to avoid the risk of imposing assumptions about travel behaviours which are not applicable. While not denying the importance of social activities for maintaining well-being, the findings suggest that the value attributed to mobility is heavily dependent on the cultural (and indeed, individual) context, as is the meaning of "independence" (Schwanen, Banister, & Bowling, 2012). Several respondents expressed the desire to take care of their own mobilities ("use their own legs" as much as possible), but "dependence" on family members was not necessarily seen in a negative light; people appeared to have different roles, depending on their abilities and social expectations. This suggests that there is significant scope for further research drawing on the transport histories and cultural contexts of a wider variety of countries (Cresswell, 2016).

Given the important role of private vehicles in rural areas of Japan, any consideration of the mobility options of older people in rural Japan should include both private and public transport modes. In the absence of an expansion of public transport, the solution to securing mobil-

ity in rural areas may lie in better uses of existing transport, such as new ways of sharing private cars. However, asking for lifts is a kind of travel behaviour choice which is mediated by cultural and social factors. This aspect of mobility has not been sufficiently dealt with in the literature. It is therefore suggested that further research is needed, both qualitative and quantitative, on culturally appropriate platforms or means of exchange (both monetary and non-monetary) to facilitate the asking for lifts.

Having discussed the findings, it should be noted that the study has several limitations. As noted in the literature review, many studies assume that ageing is associated with a loss of mobility, and many have found that older people associate the loss of mobility with a loss of welfare. Although a conscious effort was made to avoid bias throughout the research process, these assumptions informed the research design, such as the focus on dependencies during the values coding process. Some degree of researcher bias may have therefore affected the analysis of the interviews. Another limitation was that the general mistrust of outsiders raised significant barriers to accessing respondents. Though prior discussions and the involvement of community leaders facilitated introductions to older people, the researchers underestimated the challenges of arranging interviews with family and neighbours. Such interviews would have allowed the researchers to triangulate the data; any future study should consider more carefully how to integrate this aspect into the research design.

There is insufficient space in the present article to elaborate on culturally specific terms related to the "dependency" of the respondents or the underlying sentiments which are rooted in wider social values of Japanese society. Further consideration of these aspects is necessary to fully appreciate the motivations behind the travel behaviours of older Japanese people. In this regard, the time is ripe for "traditional" transport researchers to work more closely with qualitative researchers in other disciplines to develop a better understanding of the mobilities of older people in specific cultural contexts. For example, gerontological geographers are interested in the "spatialities of ageing", in terms of how older people themselves perceive these changes (embodiment), and how they manage them in relation to others (Schwanen, Hardhill, & Lucas, 2012). Meanwhile, the "new mobilities" literature (Sheller & Urry, 2006) has shown that qualitative methodologies are useful for understanding the different ways in which mobility, social relations and well-being interact (Hodgson, 2012). In view of the significant differences in the epistemological backgrounds of the various disciplines (Vannini, 2010), further theoretical work is needed to bridge these differences.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Transport Infrastructure and Social Inclusion: A Case Study of Tourism in the Region of Gilgit-Baltistan

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Abstract
Until the building of the Karakorum Highway (1958–78), the region of Gilgit-Baltistan, Pakistan, was extremely isolated, thus preserving distinct cultural traits. The few tourists accessing the area were primarily experienced mountaineers. The highway was established to provide a land link with China, principally as a result of turbulent geo-political rivalry. Once built, however, the road created a connexion to the outside world and allowed for many more visitors to the region. Whilst the road was not built with tourism in mind, it allowed easier access for tourists and necessitated the development of a service sector to provide for those using the road. As a consequence, a once subsistence and self-reliant economy became monetised, and modern consumer goods were introduced to the region. Increased access and mobility has facilitated change in the Gilgit-Baltistan, contributing to a degree of social inclusion not previously possible. Whilst there are multiple drivers of change observed here, tourism has provided an important means by which some of the more profound changes have occurred. Local people have adapted their livelihoods to the new, monetary economy resulting in a decline in traditional agricultural practices. More importantly, however, tourism has enabled the outside world to enter into the consciousness of local people. Visitors have become conduits of change and the world is now viewed via technologies made possible by the spoils of tourism. The road has also allowed for much easier movement of local people out of and back to Gilgit-Baltistan, thereby facilitating increased social inclusion with the wider world.

Keywords
development; Gilgit-Baltistan; mobility; Pakistan; road; social inclusion; tourism; transport

Issue
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1. Introduction

With the growth of technology and increased levels of wealth, social systems have become more open. In the past, it was relatively uncommon for people to move far from where they lived. Industrialisation resulted in urban drift and people became more integrated into monetary economies (Hussain, 2017). In some parts of the world, the opportunity to move elsewhere was also restricted by physical geography. Despite a wide variety of social structures, isolated groups relied on all the inhabitants for survival. Even someone at the bottom of the social hierarchy had a function that helped the community to maintain itself. At the same time, most members of such societies were excluded from participating in the world beyond the immediate environs.

Adopting an entirely qualitative approach, this study explores the changes that have occurred in selected communities in Gilgit-Baltistan, a once isolated area that was afforded much easier access to the outside world by the building of a highway, opened in 1978. By enhancing the opportunities for spatial mobility, members of a commu-

nity can simultaneously reduce their levels of inclusion within the home community and increase inclusion with the outside world. This article demonstrates how the integration of isolated regions with the outside world is facilitated through the development of transportation infrastructure, and how such infrastructure has monetised societies and resulted in both physical and digital inclusion in the re-ordering of those societies. People become involved in the social world beyond their geographic location in three primary ways. First, by physically entering it through travel away from the place of origin. Second, people from outside can migrate or enter the local community more easily bringing outside ideas and goods with them. Third, by integrating with the outside world, a community can move from a subsistence economy to a monetised one, which enables members to purchase goods, such as televisions, radios and mobile telephones which provide easy access to information and new ideas from places elsewhere. What is important about consumer goods is not their ownership but access to the levels of inclusion they allow. A whole community may have access to these goods even though only *some* members of the community own them.

This article examines the issue of social inclusion in Gilgit-Baltistan using factors including income and employment, isolation, political participation and citizenship, and access to transport, education, healthcare, goods and services (Kenyon, Lyons, & Rafferty, 2002). What will be shown here is that social systems have undergone a profound, externally generated, change. How individuals respond to those changes will impact on the benefits, or otherwise, that they receive and their levels of social inclusion. It will also be shown that social inclusion and exclusion may, in some circumstances and places, not follow the usual understanding of social inclusion.

2. Research Site

The exemplar used here is the region of Gilgit-Baltistan, (see Figure 1), at the junction of the Karakoram, Himalaya, Hindukush, and Pamir mountain ranges. The region, more than 70,000 square kilometers in area, was formerly known as Gilgit Agency or Northern Areas, and remains a disputed territory claimed by both Pakistan and India. Gilgit-Baltistan is administered by Pakistan. The isolated nature of the area and its inhabitants make it unique as every valley has distinct features (Khalid, 2006).

Geopolitical circumstances in the latter half of the 20th century resulted in the construction of the Karakoram Highway—a high mountain road through this

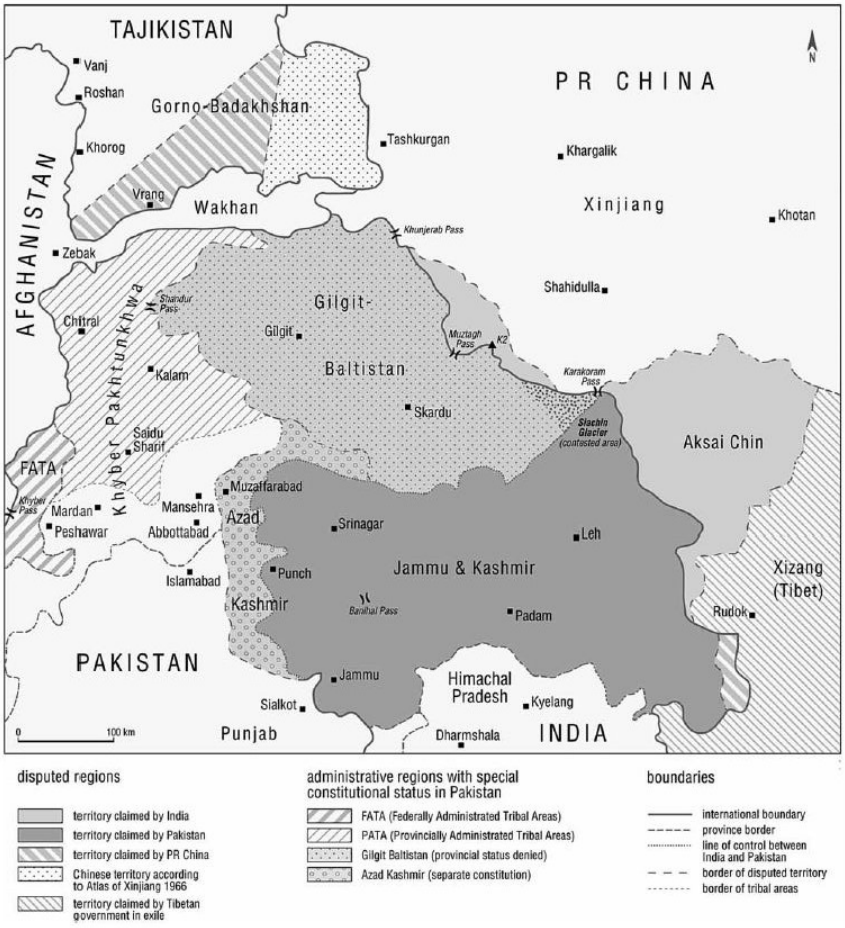

Figure 1. Disputed territories and constitutional peculiarities in Western High Asia (Source: Kreutzmann, 2015).

remote terrain—followed by political reforms, which rapidly increased the population (Kreutzmann, 1991, 2015). According to the census of 1998 (Pakistan), the population of Gilgit-Baltistan was 8,720,000. The census of 2017 (Pakistan) recorded a population of 14,920,000 [unofficial results], an increase of 71% with a growth rate of 3.5% per annum (Ali, 2017).

The highway not only allowed for the movement of local people but also access for tourists, both domestic and international. The region holds much ecological, archaeological and cultural diversity which makes it popular with visitors. Gilgit-Baltistan used to receive more than 100,000 international tourists annually (before 9/11), but this number decreased to 4,524 per annum (2013) due to the wave of terrorism in Pakistan (Rana, 2014). However, there has been an increase in domestic tourist flows after political reforms in Gilgit-Baltistan followed by the completion of the Karakoram Highway improvement project in 2015. For instance, annual domestic tourist inflow increased from 50,000 per annum (on average), before 2014 (Rana, 2014), to 600,000 per annum in 2015 and an expected tourist inflow of over 1,000,000 in 2016 (Hussain, 2016). As a result of the influx of visitors, local people who had once survived with subsistence agriculture are able to provide services for travellers and receive monetary payment, enabling them to purchase goods which have added another layer of inclusion with the outside world. The majority of international tourists who visit Gilgit-Baltistan are adventure seekers such as mountaineers and hikers. Baltistan is a hub for adventure seekers as four out of five 8000m peaks in Gilgit-Baltistan (total 14 in the world) are in Baltistan.

The Karakoram Highway through Gilgit-Baltistan was constructed between 1958 and 1978, to connect Xinjiang (China) with Islamabad (Pakistan) for trade and security purposes (Kreutzmann, 2015). The opening of the Karakoram Highway has resulted in some loss of uniqueness in the area with numerous ecological and social changes due to rapid population increase and much greater dependency on external food sources (Pakistan & IUCN, 2003). The new infrastructure has resulted in the social inclusion of isolated communities in Gilgit-Baltistan with the external world by providing access to transportation, including access to private cars. Conversely, it is also argued that access to transport infrastructure and private cars are the enemy of community solidarity and results in social exclusion (Barry, 1998). Such a notion of transport infrastructure development may ultimately enhance social inclusion at regional and national levels, yet may also serve to undermine social inclusion locally.

3. The Concepts of Social Inclusion and Exclusion

The concepts of social inclusion and social exclusion are widely recognised, however, the concepts have been vaguely defined, and understood in numerous ways (Church, Frost, & Sullivan, 2000; Kenyon et al., 2002; Lucas, 2012). Litman (2003, p. 2) argues that:

> Social inclusion refers to people's ability to participate adequately in society, including education, employment, public services, social and recreational activities. Social exclusion refers to constraints to adequate participation.

Percy-Smith (2000) argued that an individual or a group is socially excluded if one or more of these factors is compromised.

Social exclusion is dynamic in nature and it depends on the level of social inclusion (Atkinson & Hills, 1998). Levitas et al. (2007, p. 9) define social exclusion as:

> The lack or denial of resources, rights, goods and services and inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social cultural or political arenas. It affects both the quality of life of individuals and the equity of cohesion of society as a whole.

While the concepts of social exclusion and poverty share much in common, Lucas (2012, p. 106) states that social exclusion 'reaches beyond the description of poverty to provide a more multidimensional multilayer and dynamic concept of deprivation'. It is reasoned that where poverty:

> implies an absolute or relative access to material welfare, social exclusion [is] a broader concept which usually implies that some people or households are not just poor but that they have additionally lost the ability to both literally and metaphorically connect with many of the jobs, services, and facilities that they need to participate fully in society. (Church et al., 2000, p. 197)

Folwell (1999, p. 12) argued that mostly it is not clear what researchers measure when they refer to poverty. It is important to understand, and promote citizenship, public consultation and access to policy making (Burchardt, Le Grand, & Piachaud, 1999).

4. Transport Infrastructure and Social Inclusion

Physical mobility may lead to social inclusion by providing access to opportunities such as services and social networks(Kenyon et al., 2002). Hence, it is important to understand to what extent mobilities lead to social exclusion and the overall well-being of individuals (Church et al., 2000). Wachs and Kumagai (1973) identified that lack of physical mobility is a major contributor to social and economic inequality. Church et al. (2000) argue that the poorest and most transport disadvantaged segments of a society are the most socially excluded. In suburban

areas in Australia, for instance, distance is considered to be the major barrier to economic and social inclusion (Currie, Stanley, & Stanley, 2007). Such barriers will alienate individuals from access to education, commerce, leisure, cultural activities, health care and social welfare (Church et al., 2000). It is possible that many segments of a society may have access to transport but be socially excluded whilst others may be transport disadvantaged but socially included (Currie & Delbosc, 2010).

The development of transport infrastructure, such as roads, can have a large impact on economies (Owen, 1959). Olsson (2009) argues that improved roads will lead to direct effects in the form of reducing travel times and costs, and improved reliability. Transport improvement stimulates and enables the use of resources rather than creating innovations (Garrison & Souleyrette, 1996). This is done by facilitating production processes, land use, and marketing which will lead to reducing trade costs and using resources more effectively and adapting new technologies. Lakshmanan and Chatterjee (2005) argue that such facilitations will enable people to do an old thing in new ways and new techniques will emerge leading to social and economic advances. Peters (2000) states that improved transport infrastructure will benefit the whole society by reducing the cost of production and transportation as we live in a society where modern economies are not based on bulk production but, rather, rely on flexible and on-time deliveries using technological innovations.

Another concept that is closely linked with transport-related social inclusion is tourism mobilities. Hannam, Butler, and Paris (2014) argue that the tourism industry is intimately involved with the movement of a range of materials. This concept is widely recognised and can be noticed in the work of Gill, Caletrío, and Mason (2011); Hannam (2006); Hannam et al. (2014) and Richardson (2013). Tourism mobilities encompass the movement of people, objects, intangible thoughts, use of technologies, and information across the whole world through public space (Hannam et al., 2014). Tourism is integral to economic and political development processes of everyday life (Hannam et al., 2014) because of the large scale of the movement of people, objects, and information (Oswin & Yeoh, 2010). For instance, the increased movement of tourists in Gilgit-Baltistan is a consequence of transport infrastructure and automobilities which has created the potential for more freedom of movement for local people and connected them, both socially and economically, with the outside world (Hussain, 2017).

Furthermore, tourism mobilities can also be viewed from a geopolitical perspective in relation to a nation's foreign policy which may affect the movement of people across borders and may lead to conflicts (Hannam et al., 2014). Gilgit-Baltistan is a prime example which has witnessed many conflicts since 1947 resulting in the shutting down of the ancient trade routes between Gilgit-Baltistan and Kashmir and Ladakh. This has led to social exclusion, by causing the isolation of the whole region of Gilgit-Baltistan until the Karakoram Highway was built, which connected Gilgit-Baltistan with Pakistan.

Church et al. (2000) argue that the social exclusion approach to understanding transport disadvantages will assist policymakers in recognising and comprehending the multidimensional nature of the subject and the issues associated with it. This can be done by investigating seven features of transport systems which contribute to social exclusion, including physical exclusion, geographical exclusion, exclusion from facilities, economic exclusion, time-base exclusion, fear-based exclusion and space exclusion (Church et al., 2000). The real value of transport impact studies is to identify the circumstances under which various social and economic changes occur in certain areas (Olsson, 2009). In a tourism context, it is important to understand how tourism has influenced the level of access to goods and services, costs, time and seasonality factors when influencing destination communities.

5. Digital Social Exclusion

Helsper (2008) argued that the nature of the link between digital exclusion and social exclusion is poorly understood and there is little theoretical development in this regard. Anderson and Tracey (2001) state that people tend to dip in and out of technology, such as the internet, depending on their need and use of the technology which might result in social exclusion or social inclusion based on resource use of the digital infrastructure, access, skills, attitudes and extent of engagement with technologies. Furthermore, it is also claimed that community members, who are socially deprived, have limited access to digital resources such as information and communication technologies (ICT), i.e., the internet, which often results in advanced economies being information sources (Helsper, 2008).

Phipps (2000) argues that electronic communications are not causing social exclusion, but lack of access to such communication may have potential to exclude individuals or groups by polarisation and creating numerous divisions among people in a community. This segregation in a society is based on who has access to information, who are information rich and who are information poor (CoMPRIS, 1998, cited by Phipps, 2000).

6. Tourism and Social Inclusion

Tourism in the mountain communities of Nepal has transformed the functions of traditional human settlements since Nepal opened its borders in the1950s (Nepal, 2005). As one illustration of this, the Nepali census in 1981 shows that 97% of the population was dependent on agriculture. Twenty years later this dependence had dropped to 66% (MOAC, 2001). Nepal is a landlocked region which offers mountaineering, rock-climbing, adventure activities, a rich culture, biodiversity and history (Gurung, 2012). Tourism started in the 1960s af-

ter the establishment of the international airport. Harrison (2001) argues that improved roads and other infrastructure have provided easy access and attracted international tourists. Tourist inflow has replaced traditional trade practices, subsistence farming and animal husbandry with tourism-based economies (Espiner, Stewart, & Lama, 2017; Nepal, 2005). With an increase in numbers of international tourists, rural communities in Nepal diversified agricultural produce and are now growing more cash crops keeping in mind the taste of tourists. The number of shops and accommodation businesses that have started due to increases in the number of tourists (Gurung, 2012) has gone from 6000 in 1962 to 600,000 in 2010 (MoTCA, 2010). Before the introduction of digital/electronic communication, the only way to communicate was in person or via word of mouth, hence there was limited contact with the outside world (Gurung, 2012). Now, mobile phones and internet services are common. Gurung (2012) illustrates this with the example of the remote village of Jomsom which is now connected with the rest of the world.

In Gilgit-Baltistan, transport infrastructure has influenced and shaped livelihoods in tourism destinations such as the settlement of Hushe, the last settlement before one enters into the wilderness of the Karakoram mountain ranges in Baltistan. Host communities have diversified livelihood strategies, which include abandonment of traditional livelihood methods, and destination communities have benefited from the tourism industry in the form of electricity, phone and television facilities (Hussain, 2017). It can be argued that people who have not diversified their sources of livelihood are more vulnerable to social exclusion compared to those who have. Diverse sources of livelihood might be considered more socially inclusive. For an area such as Gilgit-Baltistan, the question of social inclusion/exclusion may not be so simple. Much depends on the level of individualism that is created by more diversified livelihood strategies. The literature on social exclusion noted above relates to levels of deprivation. It is possible to be poor but not deprived.

7. Research Gap

Transport-related social exclusion is a multifaceted and dynamic concept which addresses issues related to accessibility and the processes, including institutional arrangements, that limit social inclusion (Ricci, Parkhurst, & Jain, 2016). The current research literature shows that a lack of access to transport facilities prevents access to social services such as jobs, learning, healthcare, and leisure (SEU, 2003). Further, much of the literature on social inclusion addresses concerns in the context of developed countries where the concept of transport refers to public or private transportation systems such as buses and trains. In the rural developing country context, transport infrastructure can refer to a proper walking track where riding an ox, horse or a mule is considered a luxury. In such settings, the development of simple link roads can make a huge contribution towards social inclusion by providing access to markets and diversifying livelihood opportunities. Such social inclusions may also provide access to opportunities such as jobs, education, healthcare, and leisure. Hence, there is a need to understand the social inclusion and exclusion in a developing country context and find ways to address the problem related to transport infrastructure development. It is important to understand how different strategies adopted by various segments of the society influence social inclusion or exclusion (Ricci et al., 2016).

8. Research Methods

Deeply rooted in participants' personal knowledge and lived experiences, qualitative research methods such as interviews and observations in natural settings have been widely used to understand the nature of livelihood, community, and culture (Denzin & Lincoln, 2008; Patton, 2002; Ritchie, 2013; Snape & Spencer, 2011). In the current study, empirical data were collected via semi-structured open-ended interviews. In total, 98 interviews (face to face) were conducted in Gilgit-Baltistan between January and April 2016. The fieldwork locations included Gilgit, Skardu, Khaplu, Hushe, Shigar, Askole and Islamabad. Research participants comprised nine government representatives, 28 community organisation representatives, and community leaders, 14 household heads and seven participants from tourism enterprises such as accommodation, food, transportation, activities, and tourism beneficiaries (tourists providing direct scholarships). Cultural norms necessitated that the interviews were primarily undertaken with men (95), although a small number (3) of women were included as participants. As a result of this research constraint, the current sample cannot represent the impact of change on women. Interview length varied from 30 to 60 minutes. Interviews were conducted in Urdu, Shina, Balti, and English. All interviews were recorded with the help of a digital voice recorder and then translated and transcribed. Translator services were acquired for four interviews only. The research uses pseudonyms to ensure participant anonymity. The data were analysed by dividing the empirical material into small units of meaning themes (focused coding) through the process of codification (Goulding, 2002). Axial coding was then used to find a higher level of abstraction which specifies relationships and its basis for theory construction (Spiggle, 1994). Empirical data was coded into themes such as the consequences of roading infrastructure on livelihoods, tourism and its impacts on traditional lifestyle and income sources.

9. Results and Study Findings

This section explains the status of social inclusion in Gilgit-Baltistan, using factors introduced by Kenyon et al. (2002), before and after transport infrastructure development.

9.1. Income and Employment

Historically, in Gilgit-Baltistan, subsistence farming, animal husbandry, and barter trade were the main means of making a living. Trade was carried out on and along various branches of the ancient Silk Route—for which Gilgit had been a staging post for caravans to and from many destinations.

Adventure tourists started visiting the region in 1955–60, after the first ascent of K2 in 1954. At that time, Fokker aircraft used to operate from Rawalpindi to Skardu (Ozi, Aleem). 'Because of no roads three or four expeditions used to come. It was very difficult and dangerous for both tourists and porters. There was six days trek to Askoli [only 114 Km away from Skardu] and they (tourists) had to carry their ration for six days' (Ozi, a household head). 'Tourists had to carry everything as there were no facilities available. Sometimes, we had to carry some 1000 loads (25kg per load)' (Hareef).

After the road was completed, the physical mobility has led to numerous job opportunities. For instance, travelling to cities to sell services increased household income. 'People used to go to Gilgit, as the road came to Gilgit first' (Aqi, a community organisation representative) and when the road came to Skardu people started going to Skardu for labouring jobs (Ajjad, Usa) and then the road came to Khaplu and now vehicles can come to Hushe.

> I myself have carried 25 kg load from Gilgit to Hushe. I used to go to Skardu for labouring jobs…and now, the road has brought facilities to us. The road is very beneficial. (Aved, a household head)

Community leaders argue that before the road there was no concept of a job, money or wages as there was no formal government or private system to create jobs (Her, Shiq). 'I had worked as a shepherd before I went to Rawalpindi. We had to bring the muck of livestock to our homes to make fire' (Ustaq, a restaurant manager).

With the road, whoever has money can get everything they need which is how the awareness about money developed (Hmad, a private transport operator). Aja, a community leader, believes that with money, people can provide facilities and comfort their families and won't feel poor which is seen as a big change, a sentiment shared by others: 'Poor people have got jobs now and rich people continued farming which has made us all equal' (Azahir, a household head); 'Money is generated by providing services to tourists, working for a contractor and getting a job after getting an education' (Aqi, a community organisation representative).

9.2. Isolation

Most of the study participants recall that before the construction of the road, people moved around the region via a narrow walking track, which had been formed by repeated and prolonged use. Sometimes people had to climb a mountain, cross difficult and dangerous mountain passes and glaciers, and then cross rivers which were hazardous during the flood season because there were no proper bridges.

'When we asked our forefathers, they haven't even travelled past Khaplu [60km away] and my father has travelled as far as Skardu [150km away]' (Ulfiqar, a cook). Travelling was mainly on foot. 'Our forefathers have told us that they had to use bird feathers to wrap their feet because of blisters' (GhulamH, a community leader). People used to walk barefoot and there were no shoes. When they got blisters, they would rest after every 5–6 km. Sometimes they would stay at someone's place (Han, a private transport operator). 'It used to take 15–20 days to reach Srinagar from Khaplu and people had to carry rations on their backs…so, what would they have brought from there? People died on their way. There are many graves on the way to Kashmir' (Amal, a hotel manager).

Historically, Gilgit-Baltistan used to trade with Ladakh, Kargil, and Kashmir. There were trade routes from Skardu to Ladakh via Khaplu, Skardu to Kargil, Gilgit to Kashmir via Astore. After partition and the Jammu-Kashmir conflict, these trade routes were shut down and the area became more isolated (Alman).

Following the establishment of the Karakoram Highway, the region of Gilgit-Baltistan was connected with communities beyond their geographically defined localities. Our participants reported that before the road 'people were confined to their place and did not know much about their surrounding areas. People used to engage in local cultures and work in the field' (Yed, household head). 'People used to suffer a lot and now we can go wherever we want to go with the help of transport' (Haikh, household representative). 'People used to wear woollen clothes and now there are so many varieties out there. Which is because of the road. Whatever fashion is being adopted [in cities] come into these markets and things have become part of local lifestyle' (Asim, a community leader). 'Now, every hour a vehicle arrives at our doorstep with groceries. It used to take three days from Khaplu to Skardu; now it takes two hours' (Hmed, a household head).

One community organisation representative argues that the biggest change resulting from the development of roading infrastructure is the change in livelihood resources, their nature, and uses.

> In the old days, people's houses were close to the mountains because resources were there. People used to keep livestock, bring grass/hay, wood etc and people wanted to live close to the resource because it was easy. Since road network people started coming close to the roads, because resources started coming from here. Now, wood comes via road, flour comes via the road, grass/hay comes via road and now people have changed their living pattern. Hence the road

> has played a vital role. The importance of the road is such that it takes you close to the resource. (Hah, a non-government organisation representative)

With roads, there has been an interaction between people from cities and remote areas and people have experienced different cultures: 'We have seen changes in people, their behaviour, a way of understanding, approach, and tolerance because of interaction with other people who are more developed' (Azir, representative planning and development). Such interaction with people from other places has increased awareness about dispensaries/health clinics, schools and other community facilities. 'Some valleys were conservative and used to think that their village was the whole world' (Asool, a non-government organisation representative). Gradually, because of awareness and observing the benefits of roads people asked to extend the road to their area as wheat, which was a luxury, became available in shops because of the road (Umtaz, an engineer). Now, everyone wants to be connected with the regional, national and international market to benefit from the road (Li, government representative).

A further illustration of enlarged social inclusion for the people of Gilgit-Baltistan was observed by our respondents in the sense of curiosity and craving for learning from travellers. It is believed that 'good habits from visitors were adopted which resulted in the development of the society' (Azir, planning commission representative). This process of learning started from the time when road construction started, through meeting Chinese contractors and labourers. 'Gradually people became aware of each other's culture, food and skills and so on, which were exchanged during the whole process of the construction of a road' (Asir, representative planning, and development).

> We witnessed the change right in front of us. They would not take a bath for months. If a person is standing there you could smell him. When they saw our people, our way of living, they started adopting gradually….Our canteen contractors were instructed to bring everything from down country and put it on sale for labourers. you would be amazed to know that they even bought lipstick, talcum powder etc. now, their culture is the same as any other part of Pakistan—almost the same. (Umtaz, an engineer).

Roads have increased social interaction with people from all over the region and beyond. 'Roads have opened up landlocked area otherwise people would not meet others and their ideas would not change' (Ahan).

9.3. Political Participation and Citizenship

During British rule (1840–1947), Gilgit-Baltistan was used by the British to keep an eye on Russian expansionism (Kreutzmann, 2004). The British governed Gilgit-Baltistan indirectly through local rulers called Raja. These Rajas were the sole authority and first point of contact to whoever wanted to access this region. According to our informants, the Raja's job was to collect taxes on agricultural produce, manage or control news and information, movement and migration and facilitate any visitors (Han, Zam, Asharat). During the Raja system, the public was not allowed to question any decision made by the Raja (Asharat). People were suppressed and were not even allowed to leave the periphery without formal permission from the Raja (Asharat, Faraz). Since the partition of the Indian-subcontinent in 1947, Gilgit-Baltistan's political status has remained in limbo due to the unresolved Kashmir issue, since 1948. Pakistan adapted and continued the princely state ruling system in Gilgit-Baltistan. In 1971, the Raja system was abolished because of political reforms in the Pakistan (Herbaz). However, citizenship for the people of Gilgit-Baltistan is denied by Pakistan and the constitution of Pakistan defines Gilgit-Baltistan as a disputed territory. Gilgit-Baltistan has no representation in the national assembly of Pakistan (Rshad, Asharat).

According to the resolution of the United Nation (UN) in 1948, both India and Pakistan were asked to withdraw their troops from both Gilgit-Baltistan and Kashmir and conduct a referendum and let people decide their fate. But both countries are reluctant to do so due to the geographic location of the area, water resources, and other natural resources. While the formation of the road did not change the political status of Gilgit-Baltistan there has been an increase in awareness about its disputed status. Many respondents commented on this disputed political status. For instance, one respondent argued that 'if Gilgit-Baltistan is not part of Pakistan then how come China became the neighbour of Pakistan? (Rashad). Many others questioned why. Pakistan is collecting royalty fees from climbing expeditions in Gilgit-Baltistan if the area is not part of Pakistan.

9.4. Access to Transport, Education, Healthcare, Goods, and Services

According to many of our informants, prior to the construction of the road, only the young and healthy could travel and bring some necessary items such as farming tools and rare consumer items such as salt. It used to take about 15 days for the return trip from Tisarto Skardu [70km] (Ida, a shopkeeper), around one month to Gilgit [250km] (Han, a private transport operator), and 40–45 days to Kargil [approximately 250km] (Adi, a porter). It was argued that 'the distance was not great but there was no proper road hence it used to take time' (Shiq, a community leader) (see Figure 2). This is because there was no transport system, no bridges which restricted people's movements and migration (Haikh, a household head). Some 'people went to Kashmir and Ladakh and saw the roads and other facilities and told people here. That is how the concept of the road came' (Anish, a household head).

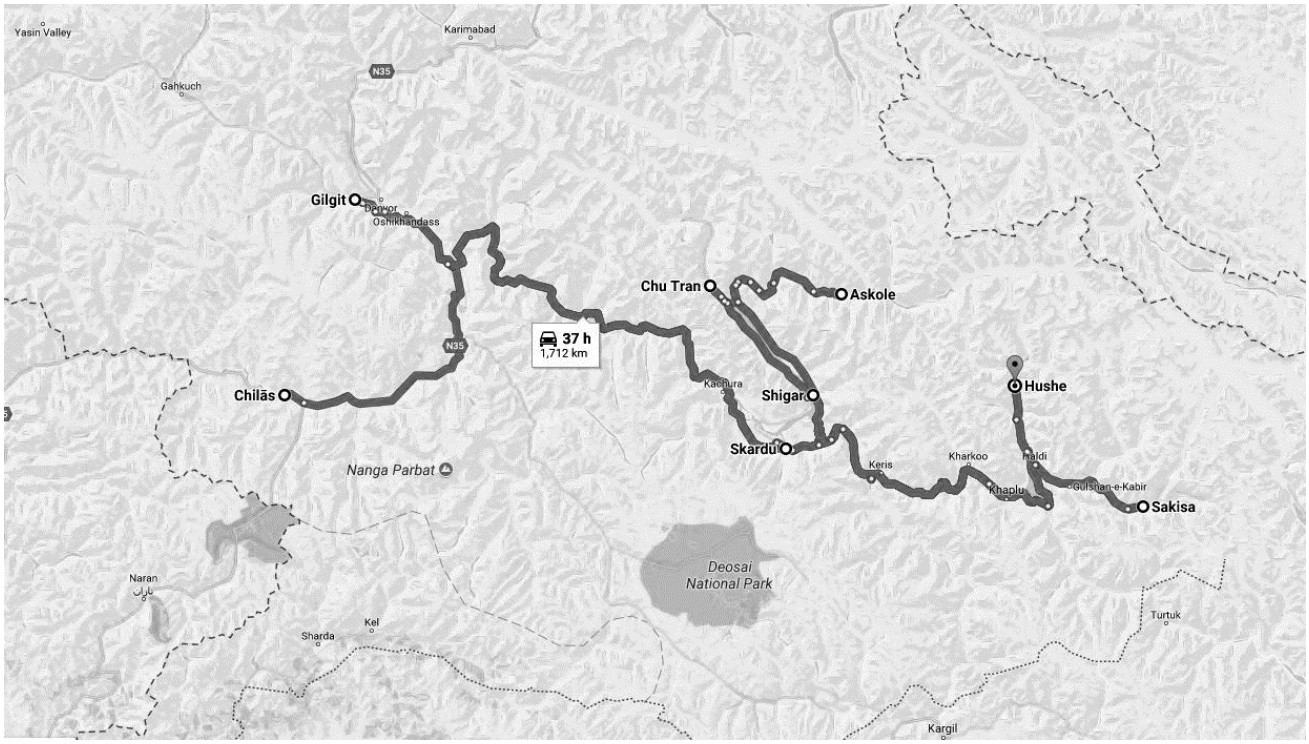

Figure 2. Field trip route in Gilgit-Baltistan (Source: Google maps).

> I realised the importance of the road once I had to travel on foot from Tiser to Skardu by carrying 30 to 40 kg of walnuts and dried apricots. I traveled for seven days and then I reached Skardu….I rested for three days, sold the dry fruits, purchased some light goods and came back in seven days. Now we can reach Skardu in only three hours. (Adi, a porter)

Because there was no proper road, very few people used to come to Gilgit-Baltistan. 'One story is that Marco Polo went to China through this area' (Shiq). Historic evidence suggests that in 1887 Colonel Younghusband successfully attempted to cross Mustagh pass, which was closed for about fifty years due to ice advancement. The second proper attempt was made in 1903 by Aug. C.F. Feber who crossed Mustagh pass from the Askoli side and hired local guides and porters (Ferber, 1907). However, due to the installation of aviation services in Gilgit and Skardu, followed by the war of 1948, a few adventure tourists started coming to climb mountains such as K2. An Italian expedition visited Skardu in 1954 and successfully summitted K2 for the first time. This laid the foundation of mountaineering in the history of Gilgit-Baltistan.

Furthermore, only traditional healthcare treatments were practised, and medics were rarely available to everyone because of travel constraints (Asrat, Han). Similarly, there were no formal education facilities available. People had to migrate to cities to seek education, which is why very few people had access to education (Shiq, Herbaz, Amel).

The completion of the road in 1978 opened a new window in the history of Gilgit-Baltistan by providing an easy opportunity for the people of Gilgit-Baltistan to travel beyond their immediate geographies. Meanwhile, the road removed the sense of isolation, inaccessibility and travel constraints and provide an opportunity for outsiders to explore this remote region. Such physical mobilities provided an extraordinary prospect for both hosts and guests to learn from each other by connecting Gilgit-Baltistan with the outside world which resulted in social inclusion. Road infrastructure developed in the last three decades has altered the lives and livelihood of these people in significant ways. There has also been a significant increase in awareness about different aspects of life due to the arrival of numerous vehicles.

According to one participant (Hsan, a transport representative), the painful act of carrying heavy loads on backs has come to an end and deliveries are made to your doorstep. In addition to the food and material goods delivered by the road, the new infrastructure also brings changes from the outside through exchange of culture, education and language (Hah, a non-government organisation representative). The road is the medium through which development has arrived and the areas have seen schools, hospitals, electricity, and markets created (Irdos, Hsan, GhulamA, Azahir, Brahim). It is reasoned that because of these facilities huge changes have occurred in the living standard of people (Hmad, a household head). A progressive change in cleanliness conditions, diet, clothing fashion, business, and education is observed (Azir, Hah, Usa, Aza, Adi).

'After the construction of the road, various people came here, we have learned Urdu and English, and about different food and clothing' (Adi, Ozi). 'Awareness about

education has increased because of interaction with visitors as people realise the benefits as an educated man in society enjoys good social status' (Aja, a community leader). 'The road brought huge benefits for us...there was no school here...this school, the high school, the girls' school—all happened in my lifetime. This all happened just because of the road' (Adi, a porter).

There was a trend that one family member would migrate to a city such as Lahore and Rawalpindi to generate income and remit to his household which leads to a convenient and easy lifestyle' (Shraf). Some families migrated as a whole to educate their children. 'All of my family is here for the sake of education' (Asim, a community leader). However, due to improvement in roads and availability of job opportunities, such migration trends are changing.

> At any one time, 8000 vehicles run on the Karakoram Highway. Thousands of passengers buy a ticket, stay in a hotel buy food etc, which makes this journey significant for people living along the Karakoram Highway (Hsan, a transport operator representative).

Increased accessibility to, and awareness of previously remote communities of Gilgit-Baltistan has, in part, led to an improvement in education and healthcare facilities due to the special interest of the government, non-government organisations and tourism enterprises (Hah, Shiq, Hanna). Now, almost every union council has got a dispensary and a school (Hah, Amal, Hanna). Moreover, due to the development of transport infrastructure, people are starting new businesses, including many in the tourism sector. All new tour companies are owned and operated by young and educated local people who see tourism as the primary source of income for Gilgit-Baltistan (Asharat, Adpara, Aba).

9.5. Perceived Impacts of Karakoram Highway

As discussed above, our respondents recall numerous benefits of the roads. There is a consensus among many respondents that road infrastructure has resulted in increased tourism as compared to the past. Before roads were built, people used to carry loads to meet their basic survival needs. After the transport infrastructure was improved, tourism numbers—especially mountaineers and trekkers—have increased requiring other services, such as porter facilities. This demand for porters attracted people from subsistence farming to a monetary economy. Now, carrying a load has become the means of making a living for the majority of the people of our study setting.

'Tourism has become the source of income and now we have a government tourism department. In tourist destinations like Askoli and Hushe, more than 90% of the people are affiliated with tourism' (Azahir). Household heads argue that because of poverty and instant payment by tourists, more people started working as porters (Hanna, Azahir, Aved). Months of hard work in the field were replaced with a few hours of tourism labouring jobs, which would enable the workers to buy groceries (Aved, a household head). Such facilitation provided by the road and tourism has diverted people from agricultural activities (Ashraf, a shopkeeper). Now, most of the farm labour is undertaken by women while men go with tourists to earn money (Ahan, a female student). It is observed that the traditional practices of land development are not being practised anymore and the limited agricultural land is being utilised for building tourism amenities (Ohammad, Hmad, Hanna, Aved). People started developing hotels and restaurants which have provided numerous job opportunities and transportation services have facilitated travel which is easy and fast (Aba, a tour operator). These changes have facilitated social inclusion with the outside world by enabling contact with visitors and through the purchase of goods, which provide other forms of contact, with the money earned from tourists.

Furthermore, a transport operator (Hsan) argued that 'when foreign tourists visit, they buy food, handicrafts, and stay in a guest house, which benefits many local people'. Lots of markets have formed, colleges have been established, people came and the tourism industry has improved, expeditions came. Lots of healthcare facilities came here because of the formation of the Karakoram Highway (Irdos, a contractor).

'Many tourists come as volunteer teachers and people have learnt many things from them. Tourists have educated many people here. Some stayed…for two to three years' (Amid, a tour operator). A tourist has opened a hospital in Arando and she sends medicines regularly (Ustafa, a porter). Working with tourists and interaction with tourists have made people self-sustained financially and affected traditional lifestyles. It is believed that people are not dependent on anyone because of tourism (Iaz, camp manager).

It is believed that use of mobile phones and other electronic devices have caused social inclusion with cities, which was possible after the formation of roads.

> Earlier, to contact a Gora (tourist) and ask about their program (arrival) we used to go to Skardu [150km away]. If we had to send an email, then we had to go to Rawalpindi [770km away]. Now, we can contact them from here [Hushe]. (Ozi, a guide, and household head)

However, it is argued by many respondents that strategically located Gilgit-Baltistan is a land lock region and the Karakoram Highway is the only way in and out which has made people dependent on the highway. For instance, after the completion of the Karakoram Highway project, residents of Gilgit-Baltistan were given a subsidy on nine consumer goods including wheat, sugar, and oil. Government and community organisation representatives argue that such subsidies have diverted the concentration of people from agriculture towards services or wage earnings. Money earned and spent on goods was consid-

ered as an easy option compared to farming (Asharat, a hotel owner). Government representatives believe that the people's dependency on the Karakoram Highway has made them vulnerable as the Highway is prone to natural and manmade disasters.

> If the road is blocked there will be a shortage of food items. Our dependency is on the Karakoram Highway and there is no place else all vegetable shops are closed…we conducted a survey PKR 1.5 billion worth of dairy products comes into Gilgit from down country in one year. (Azir, planning commission representative)

> Because of the blockade of the road for two or three days, many types of problems took place, which includes the problem of gas, flour, eatable…You can say that this Karakoram Highway is a lifeline for Gilgit-Baltistan. (Hsan, a transport operator representative)

Government and community organisation representatives argue that Gilgit-Baltistan can be self-sufficient by irrigating barren land and there will be no need for subsidies. According to one estimate, the population density of Gilgit-Baltistan is 10–12 households per square kilometer and only 0.01% of the land is cultivable out of 72,000 square kilometers. Furthermore, houses, shops, and plazas are now being built on that 0.01% of the land. That land is being divided among siblings and no one has developed new land (Asir, representative of planning and development). Community organisation sources claim that 1.5% land is usable. However, there is a consensus that the land can be developed with little effort (Asir, Alman). The sense of community has been lost which was driving force for agricultural land development for community's wellbeing.

> No new water channel has been made in Gilgit since the formation of two historic water channels by Dadi Jawari around 700 years ago. There is no such scheme in the Annual Development Plan. Which is why agricultural land is diminishing and we are becoming more dependent. (Asir, representative of planning and development)

Furthermore, there was acknowledgment among participants that the road has altered the peace in the area as residents previously belonged to a single ethnic group and there was a local governance system (Han). It is also believed that roading infrastructure has caused many social transformations. People of Baltistan, in older times, were simple and trusting but now people are becoming clever after observing people in cities (Sghar, a porter). There has been a decrease in love, respect, and relationships (Sghar, Isar). The old sense of community in isolated villages is being diminished with the arrival of the highway. Connection and inclusion with the outside world could have a social impact on support from within the community during times of crisis. This explains the idea of simultaneous reduction of inclusion at one scale alongside an increase at another scale.

In addition to the many acknowledged benefits of the road, participants recognised important changes in culture, including consumption patterns. 'There was no concept of lunch at 12 pm. We only used to eat two times a day, breakfast and dinner. Now, everything has changed' (GhulamH, community leader).

> Before the road, we used to eat Khachi, Summa (simple local dishes, without spices), dried vegetables, and apricot meals. Now, all of those things are gone. Now, everyone makes sweet and salty tea and all sorts of vegetables. Things which are common in cities have arrived here and there has been a lot of change in what we eat. (Hmed, a household head)

It is believed that road has brought in change from outside and influenced our culture (Ozi, Azahir). Traditional dresses are being replaced with modern dresses. One can buy a quality dress for PKR 150 (Her, a cook) and 'people do not wear woollen clothes anymore, instead, they wear Pants-Shirt (European clothing) and Shalwar-Kameez (Pakistani clothing) (Iaz, camp manager).

> Outsiders came here, and we went there and saw different dresses and we got influenced. If tomorrow, this road to Ladakh and Kashmir is opened we will see Ladakhi culture here and you will see Gilgit-Baltistan culture in Ladakh. Look at the people of Hunza. Because of trade with China, they are adopting Xinjiang culture. (Azmi, a community leader)

By observing different cultures and interacting with people it is argued that local culture is dying, an obvious negative impact of roads noted by many respondents. A non-government organisation representative argues that change is part of the development and that that the loss of some of the old traditions is not altogether bad (Asool).

10. Conclusion

The Karakorum Highway has resulted in profound changes to Gilgit-Baltistan. Communities that were once isolated and insular have now become integrated with the outside world. Consequently, there has been a major shift in how social inclusiveness can be viewed. As discussed above there has been a transformation in income, employment, political participation and citizenship, access to transport, education, healthcare, and availability of goods and services. In contrast to research on social inclusion in the developed world, the ramification of roads in isolated regions can be viewed quite differently, at least in the early stages of changing societies. Rather than disadvantaged people feeling socially excluded by being at the end of a road, having a road at all provides

a sense of social inclusion with the rest of the world. Furthermore, while some of the local population do not own modern electrical technology, they do not suffer the degree of exclusion reported in the literature. This is because they have access to the technology. They know people within the community who own these things and are able to use them. Visitors, whether they are domestic working tourists or international recreational tourists, add to that sense of inclusion. Similarly, the increased wealth that visitors provide for local people increases the sense of social inclusion. This may be due to a stronger sense of community within the villages of Gilgit-Baltistan that has yet to break down into individualistic attitudes of the West. The obvious question that arises from this is whether Gilgit-Baltistan is in a transitional phase from a traditional subsistence economy to a consumerist society where social inclusion and exclusion is a result of wealth, health, and access, or whether forms of social inclusion and exclusion are culturally based. The examples from Nepal, which has been going through the changes described here for a longer period, seem to suggest that it is cultural, but that is still a moot point.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Analysing the Role of Social Visits on Migrants' Social Capital: A Personal Network Approach

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Abstract
There are concerns that migrants may be embedded in far-flung networks with support being less collective. The spatial dispersion of their relatives and friends would result in fragmented networks with lower solidarity and lower mutual trust than densely connected networks based on geographical proximity. This may be particularly true for migrants who rarely meet their relatives and friends face-to-face. Yet, it is unclear what role, if any, distant visits play in migrants' social capital. This article examines these issues using representative data from Switzerland and a combination of network and sequence analysis. Results show that migrants have more spatially dispersed networks, which, in turn, are associated with higher number of emotional support ties compared to respondents with spatially close networks, yet they are characterised by low cohesion and low trust. Distant visits only partly moderate the influence of spatial dispersion on social capital. People who frequently visit or host their far-flung relatives and friends have more transitive networks and fewer supportive ties than those who see them less often, but they do not have higher trust in them. Overall, distant visits have relatively little impact on social capital, suggesting a network effect that goes beyond dyadic relationships.

Keywords
distance; migration; network geography; personal networks; sequence analysis; social capital; social network analysis; social support; social visits; travel

Issue
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1. Introduction

Migration and diaspora research has long established that intimate networks of support and affection can exist across vast physical distances (e.g., Baldassar & Merla, 2013; Cronin, 2015; Ryan, Sales, Tilki, & Siara, 2009). With the increasing affordability of transport and telecommunications, individuals exchange love, affection and care with people who are living in different cities, regions and countries. There is also evidence that new internet-based technologies expand opportunities for individuals and families to sustain intimacy over long distances by facilitating a sense of being close and familiarity with each other's daily routines (Dekker & Engbersen, 2014; Uy-Tioco, 2007; Valentine, 2006).

While emotional attachment with people living far apart can persist, migrants may develop personal networks, in which support is more individualised and less

collective. Within such networks, migrants' 'significant others', i.e., the people they consider important, be they relatives, friends, colleagues, neighbours or members of various groups or associations, would be less likely to know and meet each other than within networks largely based on physical co-presence and geographical propinquity (Larsen, Axhausen, & Urry, 2006; Wittel, 2001). Internet and mobile phones would be central for migrants in producing individualised networks, through what Wellman (2001) calls 'person-to-person' connectivity. Migrants, embedded in networks of weak or no ties between their significant others, or clusters of significant others, developed in different places, and often in different social contexts, would have *bridging* social capital as opposed to *bonding* social capital defined as networks characterised by cohesion, mutual trust and strong ties between its members (Coleman, 1988). Their spatially and socially fragmented personal networks would be less likely to enforce mutual obligations, norms and effective sanctions than densely connected personal networks characterised by greater homogeneity and higher normative control (Coleman, 1988; Putnam, 1993). On a positive side, these fragmented networks would provide diverse resources, novel information and autonomy to migrants (Burt, 2009; Granovetter, 1973).

The influence of migration and physical distance on social capital may, however, be moderated by social visits. Previous research has shown that occasional travel and face-to-face meetings are crucial for sustaining strong ties over distance (Elliott & Urry, 2010; Larsen et al., 2006) and migrants who regularly visit and host their significant relatives and friends may put them in touch with one another. For instance, when migrants frequently host or visit their parents, intimacy may be established between them and migrants' partner and children. Migrants may also travel long distances to stay involved in densely connected groups of relatives or old friends in their place of origin. Ali and Holden (2006) have illustrated the central role played by post-migration tourism among Pakistanis living in the UK in maintaining strong ties and meeting social obligations with diasporas in the homeland.

Studies like Ali and Holden (2006) linking migration and more regular forms of mobility, such as social visits, are rare. To the authors' knowledge, no study has been proposed to analyse the joint effect of migration and distant visits on the size, structure and geography of personal networks. This article addresses this knowledge gap by examining personal networks in Switzerland using survey data from a representative sample of people living in Switzerland in 2011 and born in 1950–55 and 1970–75. Here, social capital is conceptualised as consisting of three dimensions: (1) the degree of trust in the members of one's personal network; (2) the size and (3) structure of one's emotional support network. People with high social capital refer to those who have many emotional support providers and high trust in their network members (see De Carlo & Widmer, 2011, for a discussion about trust as social capital). Drawing on social capital literature (e.g., Coleman, 1988; Putnam, 1993), we distinguish two main types of social capital in terms of network structure. *Bonding* social capital refers to cohesive emotional support networks. In this kind of network, all members tend to support each other emotionally, which enforces bounded solidarity and mutual trust (see Figure 1 on the left). By contrast, *bridging* social capital refers to sparsely connected emotional support networks. In this kind of personal network, respondents tend to occupy a central position between their network members who hardly support each other emotionally (see Figure 1 on the right). In other words, bridging social capital is not identified here by the specific presence of weak ties, but by the absence of strong (i.e., emotionally supportive) ties.

In this study, migration is conceptualised holistically as individual histories. Migrants are defined as individuals who lived far from their birthplace most of their lives. Using the life history calendar method, retrospective data about moves were obtained. Sequence analysis techniques are used to identify typical patterns of residential mobility histories. This is a relevant measure, since it is well known from migration studies that social bonds are strengthened (and so more likely to be maintained) as length of residence increases (e.g., Lub-

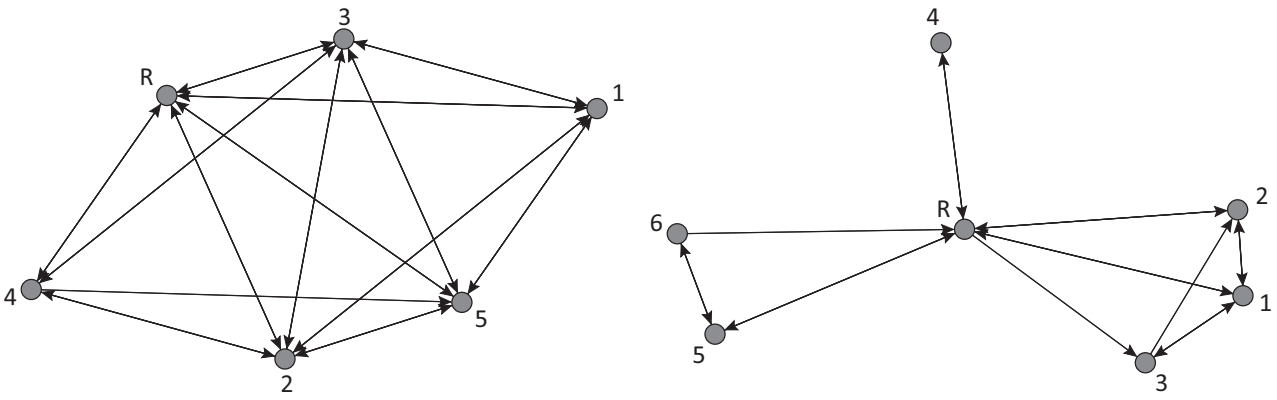

Figure 1. Bonding and bridging social capital. Reading: An arrow from A to B indicates that A provides emotional support to B (from the respondent R's point of view).

bers et al., 2010; Magdol & Bessel, 2003). This study investigates how respondents' social capital is influenced by residential mobility histories, the spatial dispersion of their personal networks and social visits from or to their network members. We first examine whether migrants have higher bridging social capital than respondents who remained close to their birthplace. We then evaluate whether frequent visits between respondents and their far-flung network members moderate the influence of spatial dispersion on social capital.

2. Theoretical Background and Previous Research

Many scholars in the field of mobility and social network research argue that today's social life is less based on propinquity within the immediate neighbourhood and more on connectivity, due to profound transformations in technology, work and lifestyle (Larsen et al., 2006; Rainie & Wellman, 2012; Urry, 2007; Wittel, 2001). In this 'network sociality', personal relationships are fluid and changing as people move to different milieus and life projects. Social obligations to friends and family are more a matter of negotiation and choice than strict determination by the social structures and norms. This networked pattern would be even more marked for migrants who would build new relationships and negotiate social obligations to existing ones across multiple places. Empirical studies show complex changes in migrants' personal networks, which reflect their selection and adaptation processes in the new environment. Using longitudinal network data on 25 Argentinian immigrants in Spain, Lubbers et al. (2010), for example, showed a high turnover in migrants' relationships, with a strong tendency toward transitivity (tendency that one's friends' friends are likely to become one's own friends). However, the overall composition, size and structure of networks appeared to be relatively stable over time. Using a nationally representative sample of core personal networks from Switzerland, Viry (2012) showed that spatially dispersed networks had a bridging structure. But he also found that long-distance ties were more transitive than local ones. The two effects of distance acted in the opposite direction and tended to cancel each other out.

In a networked social life, virtual and physical mobility is central (Urry, 2007). Information communication technologies facilitate a sense of involvement in the daily lives of loved ones and offer ways to exchange thoughts, emotions and feelings, intimacy and sometimes care (telecare) over large geographical distances (Uy-Tioco, 2007; Valentine, 2006). However, mediated interaction cannot fully substitute for face-to-face moments and physical intimacy because of its disembodied nature (Boden & Molotch, 1994; Valentine, 2006). Occasional visits are necessary, as being physically together involves touch, body language and rich conversation that help maintain intimacy and trust. Social visits also signal commitment. Visiting or hosting friends and relatives requires people to set aside not only a specific time but also a shared physical place. Finally, social obligations also require intermittent co-presence, for example for attending important social events, such as birthdays and celebrations.

Yet, regular travel requires important resources of money, time, good health, access and skills (e.g., Axhausen & Kowald, 2015; Kaufmann, Bergman, & Joye, 2004; Urry, 2012). Individuals who lack these resources may have difficulties in maintaining strong relationships over large distances. Several surveys have stressed the decay of support and care with the increase of spatial distance (e.g., Mok, Wellman, & Carrasco, 2010; Mulder & van der Meer, 2009). Some significant relationships are therefore likely to turn non-significant after migration. Conversely, because migrants need close-by strong relationships to regularly share pleasurable moments and create a sense of home, they are likely to develop new significant relationships in the place of destination. Empirical evidence suggests that peripheral relationships (extended kin, neighbours, co-workers, distant friends) are more vulnerable to physical distance than relationships with parents, children and siblings, with strong friends lying in between (Lubbers et al., 2010; Pollet, Roberts, & Dunbar, 2013; Widmer & Viry, 2017; Wrzus, Hänel, Wagner, & Neyer, 2013). These differences are explained by the normative power and density of connections that enforce mutual obligations within families, and, to some extent, strong friendship groups.

3. Hypothesis

Three hypotheses are explored in this study:

(i) Because migrants are likely to maintain significant ties with family and friends in their places of origin, we expect that respondents who have moved longer distances from their birthplace have more geographically dispersed networks, which in turn are associated with bridging social capital. These migrants would occupy a central network position in which they would bridge geographically distant network members or clusters of network members.

(ii) We expect that distant visits to or from far-flung network members mitigate the effect of spatial dispersion on bridging social capital. Individuals who regularly visit and host their significant relatives and friends are more likely to put them in touch with one another than those who meet them less often. In the other direction of causality, migrants are likely to travel long distances to stay involved with cohesive groups in their place of origin, such as parents and siblings or groups of old friends. Respondents who frequently visit or host their far-flung network members are thus expected to have more bonding social capital (and therefore less bridging social capital) than those who meet them less often.

(iii) Finally, we expect that frequent distant visits are associated with high social capital. Because maintaining strong relationships over distances requires travel and face-to-face contacts, we hypothesise that individuals who regularly visit and host their significant relatives and friends are expected to report higher trust in them and have more emotional support providers than those who meet them less often.

A conceptual model summarising the relationships between the key variables is presented in Figure 2.

4. Data and Measures

The data come from the Family tiMes survey conducted in Switzerland in 2011. A representative sample of 803 men and women living in Switzerland and from two birth cohorts (1950–55 and 1970–75) were selected from the population register of the Swiss Federal Statistical Office (response rate: 55%). Face-to-face (CAPI) interviews were conducted at respondents' homes by trained interviewers of a survey institute. The questionnaire included two main instruments: (1) a Life History Calendar (Morselli et al., 2016) to collect retrospective life course data in various life domains, such as family, work and residential location; and (2) the Family Network Method (Widmer, Aeby, & Sapin, 2013) for collecting information on the composition and structure of the respondents' personal networks.

The Family Network Method belongs to instruments measuring cognitive networks. In such instruments, a given individual, usually referred to as *ego* or the *focal person*, is asked to report the relationships existing between all individuals in a group (Krackhardt, 1987). Various studies have successfully used a cognitive network approach for studying not only face-to-face interactions but also discussion networks (Marsden, 1987), friendship ties (Pittinsky & Carolan, 2008), advice and instrumental support provision (Krackhardt & Kilduff, 2002), emotional closeness, support and liking (Freeman & Webster, 1994; Kenny, Bond Jr, Mohr, & Horn, 1996; Widmer, 2016) or leadership and hierarchy (Brands, Menges, & Kilduff, 2015). Overall, the aim of such studies is not so much about testing the accuracy of non-behavioural measures of interactions (Coenders, Kogovšek, Hlebec, & Coromina, 2014), but rather to see how cognitive patterns about interactions relate to critical dimensions of social embeddedness such as social class, gender, statuses and roles in various organisations or groups (Brands, 2013).

In this study, personal networks refer to the set of individuals, the so called *significant others* or *alters*, who are considered meaningful or important in some regard by the respondent, and the emotional support ties existing between them from the respondent's point of view (Widmer, 2016; Widmer et al., 2013). Personal networks are related to the social, emotional and symbolic significance of network members for the respondent. Such significance may or may not be associated with regular interactions, either face-to-face or by telecommunication. Personal networks are therefore not necessarily interactive networks. Respondents were asked to nominate their significant others, be they relatives, friends, colleagues, neighbours or members of various groups or associations, using the following name-generator question: 'Over the past year, who are the individuals who have been very important to you, even if you have not get on well with them?' [authors' translation]. Respondents could mention up to twenty people. They were also asked to report the frequency of contact (both face-to-face and mediated) with each of them in six categories (1. Daily or almost daily, 2. Several times a week, 3. Once a week, 4. Several times a month, 5. Several times a year, 6. Never or almost never) and the degree of trust respondents had in these people in five categories (1. Absolute trust, 2. Great trust, 3. Some trust, 4. Little trust, 5. No trust at all). Additionally, respondents were asked to report who provides emotional support to whom within the network (0 = No, 1 = Yes), both between respondents and network members and among network members. The question was: 'Among the persons you cited, who provides emotional support to you if needed?'. The same question was then asked in turn for each cited person, for instance 'who provides emotional support to person B if needed?'.

4.1. Migration

Sequence analysis was used to capture residential mobility behaviours holistically. Based on the Life History Calendar, the residential postcodes from birth until the time of interview were collected for each semester of age for all respondents. The road distance (in km) between the residence and the birthplace was inferred using routing software modelling the Swiss road network and grouped into five categories (1. 0–10 km, 2. 11–40 km, 3. 41–100 km, 4. 101–500 km and 5. abroad). We constructed individual sequences and computed the degree of dissimilarity between pairs of individual sequences (Gauthier, Bühlmann, & Blanchard, 2014). We then ap-

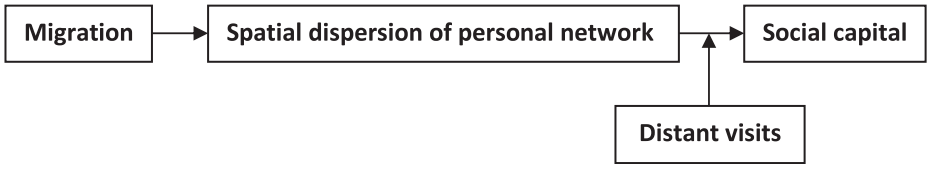

Figure 2. Conceptual model of the relationship between migration and social capital.

plied a clustering procedure to these dissimilarity scores to group together similar sequences and produce a typology of migration histories. Standard quality indices identified an optimal five-type solution (Rousseeuw, 1987), which is presented as chronograms in Figure 3. The x-axis indicates respondents' age (in semesters) and the y-axis indicates the relative distribution of the five distance categories at a given age. The first type ('0–10 km', 38%) is composed of individuals who spent most of their life in their birthplace or at a distance of a few km from it. The individuals grouped in the second type ('11–40 km', 19%) moved mainly between ages of 16 and 30 to locations that are up to several tens of km away from their birthplace. In the third type ('41–100 km', 13%), relocation occurs slightly earlier (between ages 15 and 25) and at a greater distance than the previous type. The fourth type ('101–500 km', 12%) reveals a similar pattern regarding the timing of move, but is characterized by a relocation within Switzerland of at least 100 km from the birthplace. Finally, the fifth type ('Abroad', 18%) is composed of individuals who migrated to Switzerland, mainly between the ages of 15 to 35. Most of these individuals did not subsequently move far from their first location in Switzerland. In this study, we define migrants as individuals who moved and lived far from their birthplace for a significant period of their lives. We can therefore consider individuals of types 5, 4 and, to some extent, 3 as migrants.

4.2. Social Capital

The degree and type of social capital was measured by six network indices. (1) The personal network size is the number of 'very important' persons cited by the respondents. (2) The number of emotionally supportive ties is the number of significant others who were perceived by the respondents as giving them emotional support. (3) Respondents' trust in their significant others was measured by averaging the degree of trust in each network member on a scale ranging from 1 (no trust at all) to 5 (absolute trust). (4) Network density is the ratio of existing emotional support ties to the total possible. This index captures the overall network cohesion. (5) Network transitivity indicates the proportion of transitive triads in the network. A transitive triad is a group of three network members (including or not the respondent), where if X gives emotional support to Y and Y gives emotional support to Z, then X also gives emotional support to Z. Triads with no or only one tie were not included in the calculation. Transitivity is another index of network cohesion, which reflects the tendency of network actors to form cliques. Transitivity has been proved to play an important role in the process of tie formation over time (e.g., Lubbers et al., 2010). (6) Respondents' betweenness centrality indicates the extent to which respondents occupy a central position, where they bridge their otherwise disconnected significant others in the emotional support network. Respondents with high social capital refer to those who have high trust in and many emotionally supportive ties with their network members. Respondents with high bonding social capital refer to those who have high scores of density and transitivity and low score of betweenness centrality. Conversely, respondents with high bridging social capital display low scores of density and transitivity and high score of betweenness centrality. Because these six measures were not normally distributed (see Appendix A), they were dichotomized at the median into high versus low scores to be used as dependent variables in regression models. Appendix B displays measures of the strength of association between the dichotomized variables.

4.3. Network Spatial Dispersion

Based on the residential postcodes of network members (as reported by respondents), the road distance (in km) between the respondents and their significant others was inferred using the routing software. The spatial dispersion of personal networks was measured as the natural logarithm of the average road distance between the respondents and their significant others. A threshold distance of 500 km was used between respondents and their significant others living abroad, which is about the greatest road distance between any two locations in Switzerland. We used the natural logarithm to reduce the effect of transnational networks, as we expect that absolute changes in distance are more important for short distances than long distances. The logarithm was also used to counter deviations from normality and reduce the bias because we do not know the exact distance to network members living abroad. The average network spatial dispersion was 2.5 ln km (median = 2.6 ln km, sd = 1.9 ln km range: 0–6.2 ln km).

4.4. Distant Visits

Distant visits were measured as the average number of ln km travelled per year by ego and their significant others to meet each other. This index captures the extent to which network members activate their travel resources (especially in time and money) and make the effort to physically meet despite geographical separation. It was derived from the road distance and frequency of face-to-face contact between respondents and their significant others. We first recoded the frequency of face-to-face contact as the number of visits per year (e.g., weekly = 52 visits per year) and multiplied this number by the natural logarithm of the road distance between the respondent and the significant other (abroad = 500 km; same postcode = 0). Scores were then summed across the significant others and normalised by dividing by the number of significant others who do not have the same postcode as the respondent (non-null distance). The average index score was 126.6 ln km (median = 59.7 ln km, sd = 210.8 ln km, range: 0–1864 ln km). Because of the way the index is constructed, its correlation with networks spatial dispersion is relatively high (Kendall correlation coef-

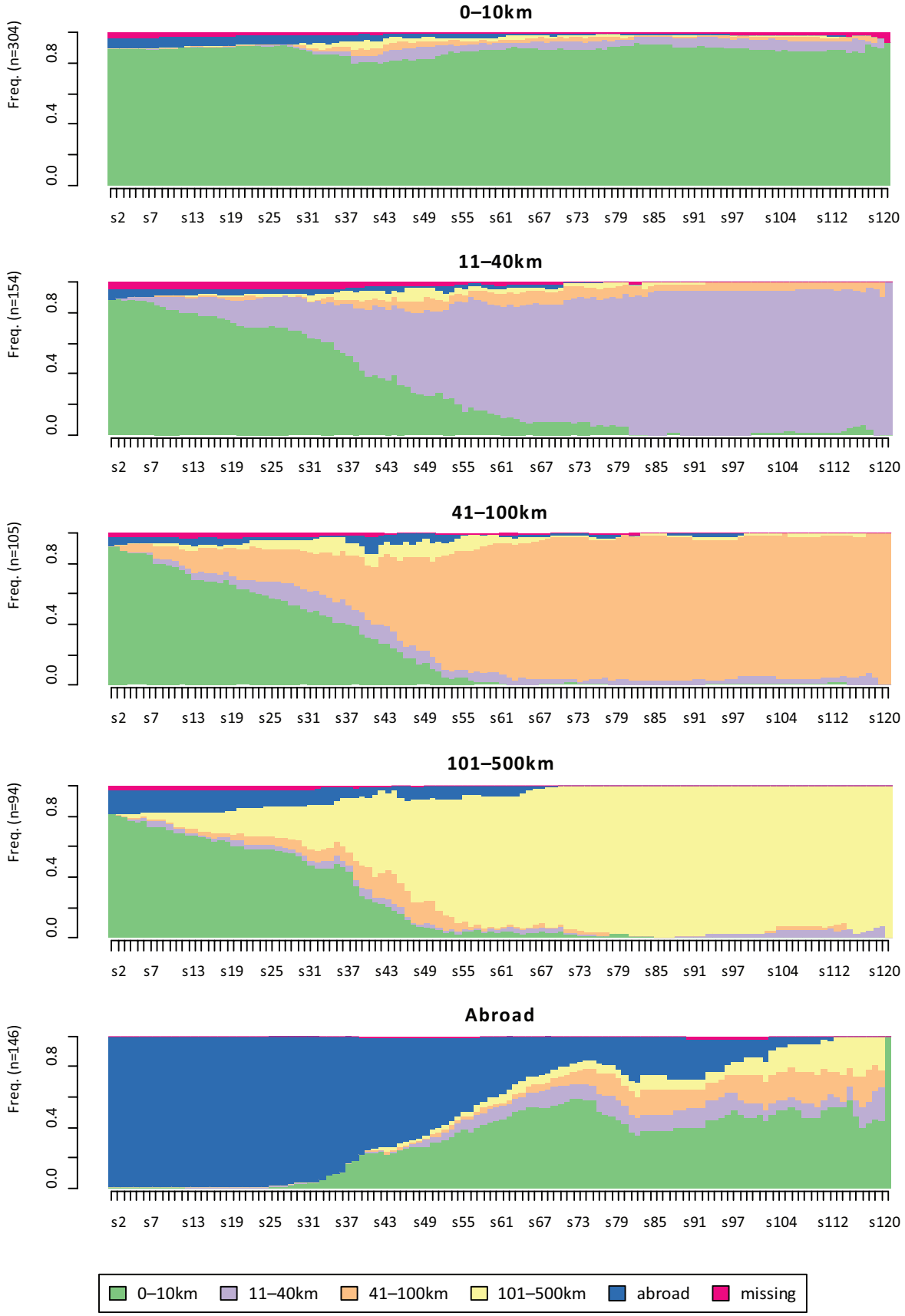

Figure 3. Typology of migration histories.

ficient = 0.36, p = 2.2e-16). In particular, respondents who live very close to relatives and friends have a low score by definition, because they do not need to activate their travel resources and make much effort to meet them physically. By contrast, the index varies significantly among respondents with more spatially dispersed networks, depending on the number of long-distance visits. Taking the logarithm of distances has the same advantages as for the network spatial dispersion (see above).

This index has three drawbacks. First, it only includes information on social visits between respondents and their significant others. Data on social visits between all network members were not available. Second, it is impossible to know whether it was the respondents or their significant others who physically travelled. Third, strictly speaking, the index is not the average number of ln km travelled per year, since respondents may only need one visit to meet several significant others who live together (or close by). This may be especially true for visits to very distant significant others. Since the data do not include information about whether significant others lived together or not, we cannot exclude multiple-counting errors. At the same time, the solution of counting only once the visits to different people living in the same place (same postcode) is problematic, because individuals who travel to a specific place do not necessarily visit all their significant others living there and because it is not necessarily the respondents who travelled but their significant others. We also tested some cruder measures of distant visits (average number of visits at a distance greater than a certain threshold, e.g., 40 km) and finally rejected them, because they did not yield more meaningful results.

4.5. Control Variables

Respondents' socio-demographics, the duration of relationships and network composition were included as control variables in the analysis, since the literature shows that these factors are significantly related to both migration and social capital. Respondents' socio-demographics include sex, birth cohort, level of education, activity rate, civil status and citizenship (see Appendix C for the sample description). The duration of relationships was measured by the average number of years respondents had known their significant others. The composition of personal networks was measured using a clustering procedure based on the types of relationships between respondents and their significant others (e.g., brother). 48 respondents (6%) were excluded from the analysis, because they mentioned no or only one important person. Seven types of network composition were identified (see Appendix D): (1) female friends (25%); (2) nuclear family (partner and children) (23%); (3) family of origin (parents, siblings and partner) (13%); (4) siblings (12%); (5) male friends and partner (11%); (6) extended kin (8%); and (9) colleagues (7%).

5. Results

Table 1 shows the results from a linear regression model to test the effect of migration history on the spatial dispersion of personal networks. Network composition and socio-demographic variables are included as other predictors of network spatial dispersion. Results indicate that migrants have more spatially dispersed networks than those who lived in, or close to, their birthplace most of their lives. Compared with respondents who lived in the immediate vicinity (within 10 km) of their birthplace, those who lived 40 km or more from where they were born and international migrants had more geographically spread out networks, regardless of the composition of their personal networks. Respondents who cited a relatively high proportion of extended kin, siblings, parents, and to a lower extent colleagues and female friends, had more spatially dispersed networks than those who mainly cited their partner and children. In contrast, respondents with more male friends had on average relationships closer in space. A high level of education is also positively associated with spatially dispersed networks. Finally, divorced or widowed people and foreigners had on average more distant significant others than married and Swiss people, respectively.

Tables 2 and 3 show the results from logistic regressions using social capital indices as dependent variables. In Models 1, the network spatial dispersion, migration history, network composition and socio-demographic variables are included as predictors. Models 2 and Models 3 add distant visits and the interaction effect between distant visits and network spatial dispersion, respectively. The interaction effect aims to test whether distant visits have different effects on social capital depending whether respondents have spatially dispersed or spatially close networks. Because the number, strength and structure of social relationships may directly influence spatial dispersion and social visits, these regression models cannot be regarded as strictly causal, but as a way to study associations, with both causal directions possible. For example, transitive networks may encourage social visits but social visits can also contribute to network transitivity. Likewise, densely connected personal networks may discourage individuals to move away, but, conversely, physical distance can cause lower network density.

Results from Models 1 indicate that network spatial dispersion is strongly associated with social capital, when controlling for network composition and duration of the relationships. Respondents who live on average far from their significant others tend to have larger networks and more support providers than respondents who live closer to them. Yet, they have a lower degree of trust in their significant others and more sparsely connected networks (low density and low transitivity). They hold a central position between their geographically distant network members who are less likely to support each other than in local networks. Results also show that mi-

gration history has little effect on social capital. This is also true when the network spatial dispersion is removed from regression models (not shown). However, we observe a tendency towards increased transitivity among respondents who have moved long distances from their birthplace. In particular, international migrants have significantly more transitive networks than individuals who remained close to their birthplace, when controlling for the network spatial dispersion. This confirms earlier findings that migrants tend to develop transitive ties in the new location and are more likely to maintain transitive ties than non-transitive ones at the place of origin (Lubbers et al., 2010; Viry, 2012).

Models 2 and 3 indicate that, overall, distant visits have relatively little impact on social capital. Contrary to our expectation, distant visits do not mitigate the influence of spatial dispersion on network density and social trust. In particular, people who are frequently visiting or hosting their far-flung network members do not trust them more than those who see them face-to-face less often. In line with our expectations, however, results from Models 3 show that distant visits mitigate the influence of spatial dispersion on network transitivity. Distant visits to or from network members living on average far away are related to high transitivity. Frequent visits to people living on average close by are conversely associated with low transitivity. Models 3 also show that frequent visits impact differently the number of emotional support ties received by respondents, depending on the network spatial dispersion. Those who frequently visit or host their geographically distant network members have significantly fewer support providers. Because of resource constraints, individuals may be unable to frequently travel to more than a few significant people living far away. Conversely, frequent visits tend to impact positively the support received when network members

Table 1. Linear regression of the network spatial dispersion (ln km) (beta coefficients).

Migration histories (Ref. 0–10 km)	
11–40 km	.22
41–100 km	.67**
101–500 km	1.01***
Abroad	1.15***
Network composition (Ref. Nuclear family)	
Female friends	1.01***
Family of origin	1.23***
Sibling	1.38***
Partner and male friends	.13
Extended kin	1.39***
Colleagues	1.12***
Duration of relationships	
Sex (Ref. Male)	
Female	.13
Birth cohort (Ref. 1950–55)	
1970–75	−.09
Level of education (Ref. Low secondary)	
Upper secondary	.68
Vocational	.51*
University	.94***
Activity rate (Ref. Full-time)	
Part-time (51–80%)	−.03
Part-time (50% or less)	.04
Self-employed	.16
Non-active	−.19
Civil status (Ref. Married)	
Divorced or widowed	.42*
Single	.13
Citizenship (Ref. Foreigner)	
Swiss	−.54*
R^2	.1985***

Notes: Non-active: non-employed, unemployed, retired, invalid; N = 686, * p < .05, ** p < .01, *** p < .001.

Table 2. Logistic regressions of social capital (beta coefficients).

	Network size			Number of supportive ties received			Trust in network members		
	1	2	3	1	2	3	1	2	3
Network spatial dispersion	.24***	.25***	.26***	.25***	.25***	.28***	−.11*	−.11*	−.12*
Distant visits		−.0004	.0000		−.0002	.0021		.00	−.0013
Network spatial dispersion x distant visits			−.0001			−.0006*			.0003
Migration histories (Ref. 0–10 km)									
11–40 km	.24	.24	.24	.13	.13	.12	.04	.04	.05
41–100 km	.17	−.18	−.18	−.39	−.40	−.39	−.34	−.34	−.34
101–500 km	−.37	−.38	−.38	−.14	−.15	−.11	.04	.04	.02
Abroad	−.15	−.17	−.17	−.55	−.56	−.53	.46	.46	.46
Network composition (Ref. Nuclear family)									
Female friends	−.49	−.47	−.47	−1.28***	−1.27***	−1.29***	−.31	−.31	−.30
Family of origin	.04	.04	.02	−.70	−.70	−.76*	.23	.23	.26
Sibling	−.73*	−.74*	−.75*	−1.58***	−1.59***	−1.60***	.03	.03	.04
Partner and buddies	−.84*	−.87*	−.87*	−1.78***	−1.80***	−1.78***	.65*	.65*	.65*
Kinship	.35	.35	.33	−.84*	−.84*	−.91*	−.43	−.43	−.40
Colleagues	.03	.06	.04	−1.23**	−1.21**	−1.30**	−1.13**	−1.13**	−1.09**
Duration of relationships	.04***	.04***	.04***	.03***	.03***	.03***	.02**	.02**	.02**
Sex (Ref. Male)									
Female	.39	.38	.38	.56*	.55*	.56*	.16	.17	.16
Birth cohort (Ref. 1950–55)									
1970–75	.57**	.58**	.58**	.87***	.87***	.90***	−.03	−.03	−.04
Level of education (Ref. Low secondary)									
Upper secondary	−.01	−.02	−.03	.91	.91	.86	−.40	−.40	−.38
Vocational	.29	.30	.30	.52	.53	.49	−.55	−.55	−.54
Tertiary	.37	.36	.36	.66	.66	.62	−.63	−.63	−.62
Activity rate (Ref. Full-time)									
Part-time (51–80%)	.32	.31	.30	−.04	−.05	−.10	−1.04**	−1.04**	−1.01**
Part-time (50% or less)	.41	.40	.40	−.41	−.42	−.39	.27	.27	.26
Self-employed	−.05	−.05	−.06	−.15	−.15	−.18	−.16	−.16	−.15
Non-active	−.27	−.29	−.30	−.31	−.32	−.35	−.33	−.33	−.32

Table 2. Logistic regressions of social capital (beta coefficients). (Cont.)

	Network size			Number of supportive ties received			Trust in network members		
	1	2	3	1	2	3	1	2	3
Civil status (Ref. Married)									
Divorced, widowed	.09	.09	.09	.09	.09	.10	−.35	−.35	−.36
Single	−.09	−.10	−.10	−.17	−.17	−.18	−.06	−.06	−.06
Citizenship (Ref. Foreigner)									
Swiss	.71*	.73*	.72*	.73*	.73*	.70*	−.01	−.01	.01
N	686	686	686	686	686	686	685	685	685
Log-Likelihood intercept only	−475.2628	−475.2628	−475.2628	−445.9167	−445.9167	−445.9167	−474.0106	−474.0106	−474.0106
Log-Likelihood full model	−419.8933	−419.3965	−419.3171	−379.6671	−379.5438	−377.5497	−434.1549	−434.1549	−433.5031
MacFadden R^2	0.1165	0.1175	0.1177	0.1486	0.1486	0.1533	0.0841	0.0841	0.0855

Notes: Non-active: non-employed, unemployed, retired, invalid; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Logistic regressions of social capital (beta coefficients).

	Network density			Network transitivity			Betweenness centrality		
	1	2	3	1	2	3	1	2	3
Network spatial dispersion	−.21***	−.22***	−.23***	−.23***	−.25***	−.29***	.15**	.13*	.16**
Distant visits		.0003	−.0004		.0005	−.0024*		.0006	.0019
Network spatial dispersion x distant visits			.0002			.0008*			−.0004
Migration histories (Ref. 0–10 km)									
11–40 km	−.35	−.35	−.35	−.25	−.25	−.25	−.11	−.11	−.11
41–100 km	.05	.06	.06	.03	.04	.04	−.26	−.25	−.25
101–500 km	.10	.11	.10	.36	.37	.33	−.37	−.35	−.34
Abroad	.27	.29	.29	.71*	.72*	.72*	−.42	−.40	−.39
Network composition (Ref. Nuclear family)									
Female friends	−.66*	−.67*	−.66*	−.69*	−.72**	−.69**	.96***	.94***	.92***
Family of origin	−.24	−.23	−.21	−.70*	−.70*	−.63*	.64*	.64*	.60
Sibling	−.14	−.13	−.13	−.65*	−.62*	−.61*	.42	.45	.44
Partner and buddies	−.29	−.27	−.27	.02	.05	.04	.68	.73	.69
Kinship	−.35	−.34	−.33	−.82*	−.81*	−.73*	.26	.27	.23
Colleagues	−2.17***	−2.19***	−2.17***	−1.18**	−1.21**	−1.12**	.88*	.84*	.80*

Table 3. Logistic regressions of social capital (beta coefficients). (Cont.)

	Network density			Network transitivity			Betweenness centrality		
	1	2	3	1	2	3	1	2	3
Duration of relationships	−.01	−.01	−.01	.01	.01	.01	−.03**	−.03**	−.03**
Sex (Ref. Male)									
Female	.12	.13	.13	−.32	−.31	−.31	.39	.41	.41
Birth cohort (Ref. 1950–55)									
1970–75	−.38	−.39	−.39	−.36	−.37	−.39	−.18	−.18	−.16
Level of education (Ref. Low secondary)									
Upper secondary	−.27	−.27	−.26	−.35	−.35	−.32	.40	.39	.40
Vocational	−.48	−.48	−.47	−.52	−.54	−.52	.29	.26	.27
Tertiary	−.44	−.44	−.43	−.77*	−.77*	−.75*	.46	.45	.46
Activity rate (Ref. Full-time)									
Part-time (51–80%)	−.38	−.38	−.36	−.30	−.30	−.24	.27	.27	.25
Part-time (50% or less)	.21	.22	.22	.20	.21	.19	−.05	−.04	−.03
Self-employed	.20	.20	.21	.13	.13	.16	−.33	−.35	−.36
Non-active	−.42	−.41	−.40	−.02	.00	.03	−.39	−.37	−.38
Civil status (Ref. Married)									
Divorced, widowed	−.04	−.04	−.04	.01	.02	−.01	.10	.11	.12
Single	.48	.49*	.49*	.70**	.72**	.73**	.09	.09	.09
Citizenship (Ref. Foreigner)									
Swiss	−.17	−.18	−.17	−.05	−.07	−.03	−.08	−.10	−.11
N	686	686	686	686	686	686	625	625	625
Log-Likelihood intercept only	−475.4990	−475.4990	−475.4990	−474.6561	−474.6561	−474.6561	−433.2098	−433.2098	−433.2098
Log-Likelihood full model	−435.3570	−435.0439	−434.8271	−423.9000	−423.2359	−420.0171	−392.5131	−391.7540	−391.1012
MacFadden R^2	0.0844	0.0851	0.0855	0.1069	0.1083	0.1151	0.0939	0.0957	0.0972

Notes: Non-active: non-employed, unemployed, retired, invalid; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

live on average close by. When the interaction effect is included in the model, the effect of social distance on the number of emotional support ties becomes positive ($\beta = .0021$) and significant at $p < .1$ level (significance level not shown in the table because $p > .05$).

6. Discussion

Physical distance and travel play a crucial role in building trust and support relationships with and among significant relatives and friends. As obvious as this statement might be, insight into how migration, social visits and physical distance are related to social capital has been lacking so far. With this article, we analysed personal networks in Switzerland and we aimed to better understand this issue by investigating whether social visits moderate the effects of distance on social capital.

The strong influence of physical distance on social capital is confirmed by the results of our analysis. Migrants have more spatially dispersed networks, which, in turn, are associated with a higher number of emotional support ties compared to respondents with spatially close networks. This is in line with previous research on family networks (Widmer & Viry, 2017), which shows that large networks require people to build and maintain significant relationships beyond their most proximate environment. But at the same time, individuals with more spatially dispersed networks have lower trust in their significant others. They also have higher bridging social capital than those with spatially close networks: they occupy a more central position between their significant others who are less likely to emotionally support each other. Migration measured by the residential distance from birthplace over the life course proved to have little effect on social capital when controlled for spatial dispersion, type and duration of relationships.

Only mixed support was found for the hypothesis that distant visits mitigate the effect of spatial dispersion on social capital, in particular by bringing migrants' geographically distant relatives and friends together. In line with our expectation, people who frequently visit and host their far-flung relatives and friends have more transitive networks than those who meet them less often. The predicted positive relationship between distant visits and number of supportive ties revealed to be more complex than expected. Frequent long-distance social visits are related to fewer emotional support ties, possibly because travelling long distances requires important resources and effort, which is restricted to only a few significant people. But the impact of social visits strongly differs depending on the network spatial dispersion. When associated with spatially closer networks, frequent visits are related to larger and non-transitive support networks. In contrast with far-flung networks, there seems that frequent visits to relatives and friends living at short or medium distance is less about bringing important people or circles together than cultivating a large and fragmented network of significant people.

Contrary to our expectations, our results do not provide evidence that people who are frequently visiting or hosting their far-flung relatives and friends are embedded in networks of higher density and higher trust than those who see them less frequently. Distant visits have little effect on network density, network size and social trust. A possible explanation is that social visits do not adequately capture the collective process by which family and friendship networks establish norms of solidarity and reciprocity, and a strong sense of togetherness at a broader spatial scale. Families and friends may establish these norms through regular social visits but also shared practices, routines and narratives (Finch, 2007), such as in some diasporas, military or seafaring families, for example. Studies on transnational families have documented that intimacy and a collective sense of family can persist without necessarily intermittent co-presence among people, through mediated interaction, emotional and material expressions of care (e.g., Drotbohm, 2009; Parreñas, 2005; Uy-Tioco, 2007). Social visits and travel as measured in this study, may better capture connectivity and meetings with significant people on a dyadic basis (for a critical view, see Bissell, 2013; Holdsworth, 2013). Multi-local living with significant relatives and friends spread out in multiple locations may also make it more difficult for migrants to bring these people in touch with one another despite intensive travel. Interestingly, the absence of any effect of distant visits on trust suggests a network effect that goes beyond dyadic relationships (Coleman, 1988). Finally, existing literature suggests that individuals are more likely to travel further to visit parents, siblings and children, whereas significant relationships with friends and colleagues are more likely to be local (e.g., Pollet et al., 2013; Widmer & Viry, 2017), which is also confirmed by our data. Distant visits would then play a more important role in maintaining cohesion within the family of origin than in bringing together different social circles.

This study focused on face-to-face meetings and emotional support between respondents and their significant relatives and friends. We did not investigate mediated interaction and other forms of care and support, nor did we include social visits and trust for all network dyads or migration history for all network members. Moreover, we aggregated relational measures at the network level and did not use a multilevel approach to analyse the relationships at both the dyadic and network levels. Such investigations would be ideal using appropriate data. Nevertheless, our study has revealed novel insights into the change of personal networks resulting from migration and physical distance. In our globalised societies, individuals who nurture strong relationships with relatives and friends over large distances may rely on more people for emotional support. They might also exploit various resources and novel information from different geographical contexts to their advantage. But there is also a risk that they cannot benefit from a cohesive social group, which promotes a strong sense of security, group

identification, bounded solidarity and mutual trust, and this despite intensive travel. The lack of support and risk of social isolation may be particularly high for disadvantaged and vulnerable populations who are remote from their proximity networks, such as poor migrants or single mothers of young children living far from their relatives.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendices

Appendix A. Descriptive statistics of the network size, network structure and trust in network members before dichotomization.

Statistics	Mean	Median	SD	Range	Kurtosis	Skewness
Network size	3.74	3.50	2.24	0–17	8.16	1.55
# Support ties	4.4	4	2.02	1–17	7.45	1.39
Trust	4.51	4.67	0.58	1–5	7.81	−1.60
Network density	0.62	0.6	0.27	0–1	2.05	−0.22
Network transitivity	0.67	0.75	0.35	0–1	2.38	−0.79
Betweenness centrality	0.28	0.17	0.30	0–1	2.64	0.85

Appendix B. Measures of the strength of association between the network size, network structure and trust after dichotomization.

	Network transitivity		Betweenness centrality		# Support ties		Trust		Network size	
	V	Chi^2	V	Chi^2	V	Chi^2	V	Chi^2	V	Chi^2
Density	0.57	256.47***	0.25	51.88***	0.04	1.08	0.34	91.07***	0.14	16.787***
Transitivity			0.58	265.61***	0.05	2.07	0.28	65.00***	0.09	6.63**
Centrality					0.30	72.43***	0.14	16.50***	0.22	37.91***
Support ties							0.09	6.73***	0.62	313.65***
Trust									0.04	1.08

Notes: V = Cramer's V; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Appendix C. Sample description.

		N	%
Sex	Male	397	49
	Female	406	51
Birth cohort	1950–55	340	45
	1970–75	413	55
Level of education	Low secondary	87	11
	Upper secondary	53	7
	Vocational	508	64
	University	148	19
Activity rate	Full-time	382	49
	Part-time (51–80%)	77	10
	Part-time (50% or less)	95	12
	Self-employed	125	16
	Non-active	108	14
Civil status	Married	578	72
	Divorced or widowed	109	14
	Single	116	14
Citizenship	Foreigner	144	18
	Swiss	659	72

Note: Non-active: non-employed, unemployed, retired, invalid.

Appendix D. Type of network composition (average number of citations).

	Female friends	Nuclear family	Family of origin	Sibling	Partner and male friends	Extended kin	Colleagues
N	188	174	98	93	82	65	55
Cluster size (%)	25	23	13	12	11	8	7
Partner	0.36	1.00	0.95	0.62	1.00	0.63	0.58
Father	0.13	0.03	0.78	0.05	0.04	0.14	0.09
Mother	0.25	0.20	0.87	0.19	0.10	0.18	0.05
# Sons	0.41	1.03	0.23	0.14	0.02	0.34	0.42
# Daughters	0.42	1.10	0.19	0.17	0.05	0.37	0.25
# Brothers	0.10	0.07	0.15	0.81	0.00	0.15	0.13
# Sisters	0.13	0.08	0.23	0.95	0.01	0.38	0.00
# Kin	0.33	0.03	0.06	0.03	0.02	2.06	0.20
# Female friends	1.10	0.13	0.29	0.45	0.26	0.32	0.44
# Male friends	0.40	0.18	0.21	0.30	1.22	0.35	0.40
# Other non-kin	0.10	0.02	0.14	0.02	0.00	0.11	1.69

Notes: Kin includes uncles, aunts, in-laws, cousins, godparents, grandparents, grandchildren, collaterals, and fictive kin. Other non-kin include colleagues and others; Reading: 36% of respondents in the 'female friends' composition type mentioned a partner. On average, they cited 1.1 female friends.

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Article

Navigating Urban Life in Lisbon: A Study of Migrants' Mobilities and Use of Space

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Abstract
Besides a more general concern over transport infrastructure, its quality and availability, mobility is also a pre-condition for city dwellers to access urban resources, facilities, employment, local services and leisure. Moreover, mobility allows urban inhabitants to uncover a city's potentialities and to fully participate in urban life. Migrants, nevertheless, face the issue of learning to do mobility in a new environment together with the urgency for settlement, finding work, making personal connections and attending to the mundane needs of everyday life that require one to move about. This article looks at migrants' urban mobilities in Lisbon, Portugal, from two perspectives. First, we look at migrants' urban knowledge and skills and at how they employ their abilities to use Lisbon's urban resources. Second, we address some of the ways place-specific urban resources of a religious nature sustain and are sustained by various (im)mobility practices. More specifically, we look to a suburban mosque run by Guinean migrants and to a Sikh Gurdwara. This mobile/place-based contrast points to the variegated (and often overlooked) forms of mobility (or lack of) that are put to practice by migrants and to how they shape the everyday of migration journeys and their capacities to enjoy city-living.

Keywords
integration; migrant; mobility; navigation; religion; transport; urban; wellbeing

Issue
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1. Introduction

The challenges and possibilities associated with living in cities have gained momentum within social scientific research. Although the urban form has been a long-standing source of debate in scholarly accounts, it seems that what is particularly new about a recent trend in urban writings has to do with a perceived need to understand and analyse the mobilization of hitherto 'academic' concepts and ideas by urban populations themselves as they growingly frame their claims and complaints by recourse to terms such as, for example, 'the right to the city' or 'gentrification'. The ways these once academic-only concepts have reverberated into social debates and media coverage opens up a whole research agenda signalling a renewed interest for the urban question that has transcended academia and been incorporated into the grammar of everyday city living.

A key debate regarding dwelling in urban settings is that of how people move about in space. Urban mobility has figured in many academic and non-academic accounts which problematize, for instance, the sustainability of driving cultures, claims for the creation or improvement of cycling and other alternative transport infrastructures, or the footprint of everyday transit and so on. Yet, urban mobility has a less visible (and far less studied) side which is its intersection with migrant integration concerns. As urban inhabitants, immigrants confront

many of the urban issues met by native populations, but they also face the question of learning to do mobility in a new environment together with the urgency for settlement, finding work, making personal connections and attending to the mundane needs of everyday life that require one to move about.

It is this interface between urban mobility and migrant integration that we address in this article. We depart from the premise that the making of urban mobilities is a fundamental aspect to be taken into account when thinking about migrants' urban lives. Urban mobility, as we reflect in the following paragraphs, is both a primary need for migrants to access urban resources and services, as it is also a producer of migrants' social and spatial connectedness toward the city. Mobility is a means to an end, but, as the 'new mobilities' paradigm has put it (Sheller & Urry, 2006), it is also more than that: it creates socialities, affinities, knowledge and, for these reasons, it may help us look at migrant emplacement from a mobile vantage point.

We structured the article along the following lines. First, we present some of the ways in which urban mobility has intersected with migration and integration scholarship. We focus on empirically informed studies which provide tools for linking urban mobility and migrants' wellbeing. Second, we present our two case studies from Lisbon, Portugal. The first case study looks at migrants' urban mobilities as a learned skill and, in so doing, unpacks the ways mobility knowledge materializes into specific mobility practices. We rely on qualitative data produced by migrants of various origins and situate it in the context of their urban expertise. Participants were recruited as to ensure a broad spectrum of migration profiles (origins, length of stay, neighbourhood of residence, etc.), responded to in-depth interviews, drew mental maps and completed time-space diaries. The second case study addresses some of the ways place-specific urban resources of a religious nature sustain and are sustained by various (im)mobility practices. More specifically, we look to a suburban mosque run by Guinean migrants and to a Sikh Gurdwara. We explore how the Islamic community on the city's edge provides in situ social solidarity as a way to circumvent both social and spatial exclusion in the light of mobility constraints. In contrast, we turn to the Gurdwara to unpack its role as a place of connection in shaping Punjabi migrants' residential and everyday mobilities. This mobile/place-based contrast aims to elucidate the variegated (and often overlooked) forms of mobility (or lack of mobility) that are put to practice by migrants and how they shape the everyday of migration journeys and their capacities to enjoy city-living. The article ends with a brief reflection on the potentialities afforded by this perspective.

2. Migration, Urban Mobility and Wellbeing

Since the 'mobility turn', the social sciences have moved away from viewing urban mobilities as mere byproducts of social life to looking at them as *producers* of complex spatial and social configurations. Opening the 'black box' of mobilities has not only brought to light the activities that take place during movement ('dwelling in motion'), but, by considering mobility as an activity in itself, revealed that 'mobilities are everywhere' (Cresswell, 2006) and that we should pay close attention to 'the complex interdependencies between, and social consequences of, such diverse mobilities' (Urry, 2000, p. 185).

Although migration scholars seem not to have 'bought into' the mobilities paradigm in its entirety (King, 2012, p. 143), there is a growing body of research on the nexus between urban mobility and migrant integration. A frequent claim is that moving about is how migrants become 'grounded in the local through their everyday practices' (van Riemsdijk, 2014, p. 963). Van Riemsdijk (2014), for example, has looked at place-making and explored how urban geographies and belonging are intertwined for skilled migrants in Oslo. Myers (2008) addressed the performative aspect of emplacement among asylum seekers in Plymouth. Her research pointed to the ways through which ordinary skills such as wayfinding and orientation function as important *homing devices* for recently arrived individuals. Sampson and Gifford (2010) have focused on settlement processes of young refugees in Melbourne and on how their moving through urban space afforded remedies for previous traumatic experiences, something they named 'therapeutic landscapes'.

The proliferation of terms such as migrant emplacement, groundedness, situatedness or spatial integration, all aiming to grasp the variegated relationships between migrants and their presence in and movement through local territories testify to the critical roles everyday geographies play in settlement processes, as emotional geographies (Davidson, Bondi, & Smith, 2007) are constructed and homeliness is ascribed to new localities (Ahmed, Castañeda, Fortier, & Sheller, 2003). Although this growing body of research has opened the 'black box' of migrants' urban mobilities, we believe that not enough attention has been accorded to the link between migrants' urban mobilities and the material urgencies of settlement, such as finding accommodation, work, or simply learning to navigate a still unfamiliar territory. While most studies tend to focus on the creation of affective ties between migrants and their place of settlement (place-making, home-making, belonging, identity etc.), we direct our attention here to the practicalities of emplacement.

These (perhaps more) immediate needs, or preconditions for city-living, have been investigated from other angles and in other literatures, not necessarily pertaining to immigrant integration concerns. Studies on mobilities and wellbeing, for instance, have advanced relevant lines of enquiry that may be applied to contexts where migrant integration is aimed. As Stanley, Hensher, Stanley and Vella-Brodrick (2011) have noted, 'wellbeing is not just something people desire because it feels good, but also because it is associated with a range of

other highly valued outcomes', which may range from health and social interaction to having access to relevant resources and services, housing and professional occupation. Such 'openness' of wellbeing research to social and individual outcomes that involve both the use and the navigation of urban life can, in turn, help to frame some of the preoccupations of migration and integration scholarship.

Urban space and the ways it is practised have ranked high in specialized literature as determinant aspects of wellbeing. As Schwanen and Wang (2014, p. 835) argue, several research projects have shown that factors such as density, degree of urbanization, city size and accessibility to transport infrastructure are indicators of urban wellbeing, although results differ across studies. Transport mobility is often considered a key indicator and has been explored in many contexts, although research has almost exclusively employed samples of older people (Stanley et al., 2011, p. 790). A growing consensus points to the need to widen the populations and groups studied (and include women, children, ethnic minorities, etc.), as to account for intersectional causation, but also to undertake more close-up accounts of the ways urban mobility conditions inhabitants' engagements with the urban resources and experiences deemed relevant by individual participants, rather than the ones defined a priori by experts (Nordbakke & Schwanen, 2014, p. 107).

This article responds to a perceived call for more nuanced, qualitative explorations of inhabitants' mobilities. As we delve into the 'mechanics' (Knowles, 2010) of migrants' spatial practices in Lisbon, our aim is to understand how migrants provide themselves with a certain number of urban resources (Asselin, Dureau, Giroud, Hamadi, & Marcadet, 2005, p. 64). As we demonstrate in the following sections, considering migrants as urban inhabitants who, in different ways and resorting to various (mobility) strategies, *do* manage to live urban lives is to accord them their agency as city dwellers, without producing voluntarist narratives of migrant integration. To unpack the knowledge and skills employed by migrants to find jobs or affordable accommodation, or to circumvent spatial exclusion, postcode discrimination or neighbourhood stigma, for instance, is to engage analytically with structural constraints, if only from the perspective of those affected by such issues.

A crucial concern for both migration and wellbeing scholarships is the individual's ability to manage basic everyday needs by recourse to urban mobility. Knowles and Harper (2009), for example, have shown how the navigational aspects of British migrants journeying through Hong Kong unravel their social worlds and expose their spatialities of privilege, Whiteness and lifestyle migration. Parallel to that, within wellbeing research, Ryff (1989) contended that finding and creating a surrounding context suiting one's personal needs and capacities (Nordbakke & Schwanen, 2014, p. 111)—what Ryff called 'environmental mastery'—was one of the six key dimensions of wellbeing. What links these contributions together is an understanding of the human-environment interaction that acknowledges individuals' capacities to mobilize a city's resources *as their own resources*, which suggests a 'softening' of the boundary between self and space. As urban space and its resources and capacities enter the realm of 'what is within reach' (as opposed to 'what is out there'), individuals are able to work urban space from within. In fact, Seamon (1979, p. 101) had already described such process as a *tendency towards mergence*, because 'there is a break in the boundary between person (self) and world (non-self); in figurative terms, the person merges with his [sic] environment'.

Such sensitivity to one's surroundings is learned through action, Seamon argues, 'Movements become familiar when the body performs them several times and incorporates them' (1979, p. 48). Borrowing from Merleau-Ponty's *Phenomenology of perception* (1962), where the author states that:

> Motility, then, is not, as it were, a handmaid of consciousness, transporting the body to that point in space of which we have formed a representation beforehand. In order that we may be able to move our body towards an object, the object must first exist for it, our body must not belong to the realm of the 'in-itself'. (1962, pp. 138–139)

Seamon argued that such mergence leads to a sense of 'at-easiness' impacting individuals' wellbeing and quality of life. In other words, it is the active practising of urban space through mobility that enables city-dwellers, migrants or non-migrants, to develop a practical resourcefulness, with which they become equipped to tackle the demands of everyday life. Yet, the experiences afforded by urban space may also impact the long haul of migration journeys, as we will show later in the article.

Mobility, as this article contends, plays a critical role in allowing for that state of mergence, or integration. We will now proceed our empirical illustrations in a twofold way: first, we show how migrants mobilize knowledge and skills in order to do mobilities; second, we look at how migrants convoke urban mobilities in order to carry out activities and attend to the urgencies of settlement.

3. Lisbon Tricks: Urban Skills and Migrants' Mobilities

This section explores the links between migrants' urban knowledges and how they crystalize into particular forms of doing mobility. We address more specifically the embodied knowledges articulated by migrants in Lisbon and the extent to which they retranslate into urban practices and experiences. We do so by resorting to a qualitative, EU-funded fieldwork carried in Lisbon in 2015 and 2016 for which 25 migrants of various origins, ethnicities and socio-economic and legal statuses were inquired through in-depth interviews, mental maps and time-space journals. Participants were selected following a purposive-sampling logic, as one of our aims was to understand

how the various and overlapping categories of migrant integration research (such as age, gender, nationality, education, occupation, etc.) played out in migrants' urban geographies of practice. All the interviews which appear in this article were conducted in Portuguese.

When we first introduced the topic of our research project to Tiago, a national of Sao Tome and Principe living in Lisbon since 2008, he immediately told us about the first time he took a train in Lisbon. Having only used the metro before, he expected the train's doors also to open automatically, which they did not. 'No one left at that station so the doors kept shut and I missed my stop' he said laughing. 'That was something I quickly learned; I'll never forget it'. These banal practicalities of public transit, as they ingrain themselves into urbanites' ways of moving about, constitute part of the unreflexive practice of everyday life (Binnie, Edensor, Holloway, Millington, & Young, 2007). Anecdotal when seen as an isolated event, these mobility skills add up to afford urbanites a sense of 'at-easiness' with urban space that Seamon (1979) held to be a crucial signifier of human spatial integration.

But Tiago's stories of navigating Lisbon also brought to light some of the intricacies between urban mobilities and questions of race and (postcolonial) migration:

> I was never the kind of person that hangs out where there's only white people….I only go to the bars where there are other black fellows. If there are two bars one next to the other and in one there are blacks and in the other whites, of course I go to the black one; if I can help a fellow African, of course I will. This whole racism and xenophobia thing is something that only those (Africans) who have been here for a long time have experienced. That is because they arrived at a time where there were very few black people here. Today, if you don't want to be humiliated you always have an option: there's a black bar and a white bar. Period.

Tiago's account is not only a story of ethnic solidarity, but one of a racialized city where he performs racial mobilities in order to avoid being discriminated against. As Knowles (2003, p. 42) has argued, ethnicity is also construed 'in a moving sense of place and social landscape'. Mobility here—and knowing where there are 'black bars' and how to find them—is part of a repertoire of spatial strategies mobilized by Tiago as a way to access an African/hospitable Lisbon. His racialized geographies involve the places he prefers to go to, but also those which he avoids. Martim Moniz, the most ethnically diverse neighbourhood in central Lisbon, happens to be one of such places. Tiago used to visit a friend who lived there and was searched by the police a couple of times, 'hands on the wall and everything' as he said, 'that's why I try not to go there anymore'. The very notion of embodied knowledge could not be more literal than in this case where Tiago's body was inspected by police officers who imprinted a 'no-go zone' onto his personal geographies.

Doing mobility always entangles practical knowledge, which is produced, learnt and mobilized by urban dwellers. Nevertheless, mobility knowledge does not always retranslate into actual mobility practices. In a study conducted with Korean Christian immigrant women living in Los Angeles, Shin (2011, p. 2356) noticed how 'these women's mobility resources, such as cars and knowledge, are not transformed into freedom of mobility for them'. Shin argued that both the specificities of Los Angeles' urban structure and the highly structured and gendered roles these women lived did not leave much room for experiencing freedom in urban mobility despite their possession of significant mobility potential or, as Kaufmann (2002) defines it, *motility*.

A similar argument may be used to describe the feeling of 'entrapment' experienced by Zie, a Chinese woman living in Portugal since 2002. Zie runs a convenience store and a restaurant with her husband. During our conversation, she demonstrated a deep understanding of which were the best and the worst neighbourhoods in Lisbon to open a Chinese restaurant and a shop. Zie herself admitted often going to other similar shops owned by Chinese migrants in Lisbon to see the level of prices practised. Despite this fine business-oriented reading of Lisbon neighbourhoods, Zie told us she hardly ever leaves her own neighbourhood.

> I live 10 minutes from here [the shop]. Walking. We park the car in front of the shop. The restaurant is just over there….All must be very close. The schools [where her children study], the shop….I know this area very well.

When asked if she would like to live elsewhere in Lisbon, Zie replied 'no, no; I prefer to live close to the shop'. It is evident that for her spatial proximity between work and home is more than a mere preference; it *frames* her and her family's activity orbit: they all live, work, study and shop within a 1km radius. And although in the past Zie had explored the commercial potentialities of other districts in Lisbon, nowadays she does not feel confident and has no need to actually trespass this limited, yet familiar territory. So much so that when asked about the two neighbouring districts (both within less than a 15-minute walk from her shop), Zie said 'I don't know them. It's just work and home'. Despite the specific reasons leading to Zie's 'entrapped' spatial practices (and their particular consequences), her condition might be paired with that of older Portuguese residents, mainly the ones living in the historical neighbourhoods in Lisbon, where restrictions to mobility (both in terms of physical capacities and transport infrastructure) have kept elderly populations isolated from the rest of urban life and, therefore, heavily dependent on care and external support, a topic always in vogue in local news.

On a different note, Jessica, a Cape Verdean dentist, experiences a radical disjunction between home and the workplace. Her many residential mobilities and various

workplaces (both previous and contemporary) located in non-contiguous neighbourhoods in Lisbon have forced her to rely on a car for everyday mobility. 'I try to avoid driving whenever I can, I really like walking, but going to one workplace to the other and carrying my materials with me is something I could not do without a car', she said. The quotidian crisscrossing of Lisbon has made Jessica develop a rich repertoire of routes and places. When asked to draw a mental map of *the Lisbon she used*, Jessica drew the following image (Figure 1).

At the centre of her 'map', she locates her home neighbourhood. From that starting point, she selects and organizes areas in Lisbon based on her practical needs: to the left, she lists the places she goes to for a night out; in the centre, where she goes shopping; on the top right, she arranged the places she frequents for leisure activities; and finally, on the bottom right, the two clinics where she works at the moment.

Rather than a representation of Lisbon's landscape, Jessica's scheme is better understood as a *taskscape*, a term coined by Ingold (1993) to describe the tapestry of dwelling activities, which sew together time and space. Jessica's drawing is the product of the sum of various journeys accumulated in time, exposing her habitual practices and choices. Her selecting, emphasizing, reorienting and juxtaposing of urban resources testify to her ability do 'bend' urban space to a given purpose (Buhr, 2017a), making it a function of her own needs.

The three examples presented here provide a glimpse into the relationship between the making of migrants' mobilities in Lisbon and the mobilization of practical knowledges and skills. It matters *how* we get to places (Ahmed, 2006), and looking at the ways migrants do mobilities exposes how they manage everyday urban life in the face of the various structural limitations faced, such as racism, spatial entrapment, urban functional zoning and home/workplace disjunction, for instance. This perspective illuminates the question of migrant integration and its intersections with well-being and spatial confidence (Koskela, 1997), as migrants narrate, whether through interviews or drawings, what they actively do with urban space, in order to enjoy it or to circumvent its constraints.

4. Faith-Based Urban Resources: Place and (Im)Mobility

In this section, we explore the links between migrants' urban mobilities, faith and place-based urban resources and the material needs of everyday life. We draw on fieldwork, carried out between 2012 and 2014, in the ambit of a wider research project. In particular, we look at life in and around two migrant places in the city—a Sikh Gurdwara and a suburban mosque[1]—and reflect on some of the ways they respond to migrants' mobility practices and facilitate migrant emplacement in the city.

We turn first to the suburban mosque, located in a suburb at the very extension of Lisbon's urban sprawl. The pioneer West African Muslim migrants we interviewed moved to this area in the 1990s, attracted by lower house prices and employment in construction in the municipality. These residential spatial patterns are closely related with the specific phase of urban expansion at their time of arrival in the city. At the time, residential mobility to the suburb signified a positive integration trajectory and accumulation of assets as many bought their own homes facilitated by easy access to credit. It was in one of these homes that the mosque first began, until the local Muslim population outgrew the space. It now occupies a converted garage in a rear courtyard blurring the line between secular and sacred space. The lack of signing or symbolism means the only visible indications of the significance of the place are the religious rituals and practices of local Muslims that flow over

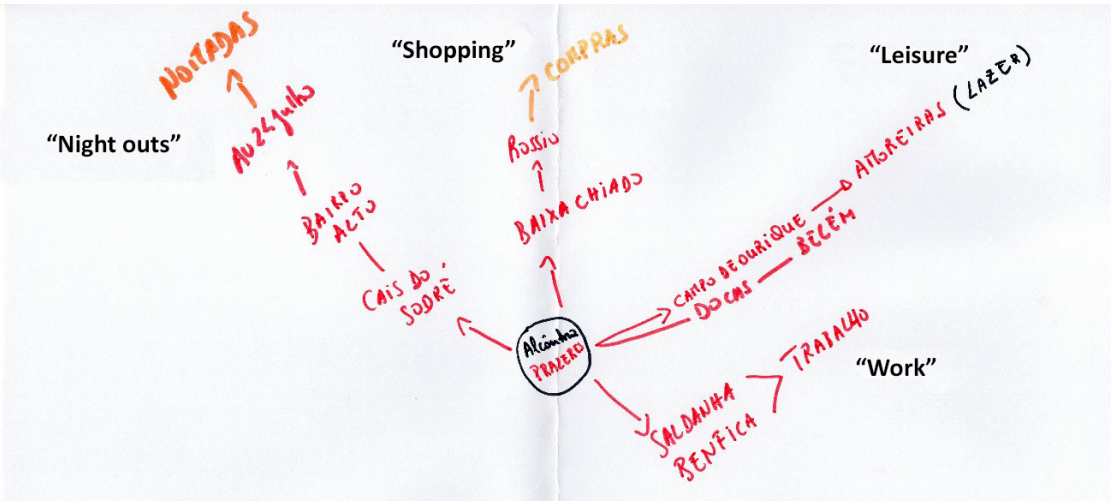

Figure 1. Jessica's mental map.

[1] 25 in-depth interviews were conducted in the former and 39 in the latter.

into the public sphere, such as lingering after prayers or discarded shoes on the street. After family reunification, the needs of everyday life became more spatially anchored. As the religious leader describes, a sister association was established in the same square to provide faith-based welfare provision in compensation for rudimentary social services (Ley, 2008; Winkler, 2008), and to address specific migrant needs.

> We arrived to the area and there were things missing, our children were with us, wives, we began to think of the future. First about Islam, but this wasn't enough. I'm not very well educated, my son has homework and I can't help. We saw many difficulties and we needed a place to meet them.

Early mobility to the suburban periphery spatially matched employment opportunities in construction. However, in the aftermath of the economic crisis, in which the construction sector was severely affected, the spatial context offered little flexibility to pursue work opportunities elsewhere. A growing sentiment of isolation or spatial de-connectedness from the city was evident in the narratives of the interviewees. In the context of high levels of unemployment, transport become unaffordable and distance increased in a time-space decompression.

> Now I feel trapped here, I could jump the ticket barrier and, I do sometimes, but I'm afraid of getting caught and being landed with a fine. Transport is too expensive. I can't afford the train to go to Lisbon.

Access to informal employment networks was hindered and a perceived spatial mismatch between residence and employment opportunities was central in the interviewees' accounts:

> You can't arrange work here anymore. You need to go to Lisbon just to look for work, to go and come back takes so much time and money! If I could I would move to Amadora [an intermediate municipality before the city of Lisbon]. Someone there would pass me information about a job because there is a lot of movement there. It's a meeting place, not just for Guineans but loads of nationalities.

The narratives above demonstrate not only the critical role of the spatial context in understanding mobility capacity, but also the importance of individual socio-structural embeddedness. Furthermore, the gap that can exist between knowing how to do mobility and being able to do it attests to mobility as 'a structuring dimension of social life' (Kaufmann, Bergman, & Joye, 2004, p. 754).

As lessening urban mobility circumscribed everyday geographies to the neighbourhood, new local spatialities and knowledge developed, with the mosque assuming particular importance, as Ibrahim describes:

> Now that I don't work, I know the neighbourhood inside out, upside down. Before it was just on Saturday and Sunday, I was only here on the weekend, I didn't really pay attention to the place….It won't do to enter into the café here. I go in and the owner asks "yes, do you need something?" Then I can only stay here on the street, in the shopping centre. So I end up spending my time in the mosque, then going for a walk.

Mobility was not only affected at the local level, but across scales as economic marginalization, in some instances, led to onward migration reiterating other findings (McGarrigle, 2016; Esteves, Fonseca, & Malheiros, 2017). Edmundo told us that 'there are many empty homes in the area; they left for the UK, Germany'. In contrast, various interviewees described the in-situ social support from the mosque and Islamic association. This helped to alleviate hardship in the short-term but not fundamentally change it due to the scope of intervention at the very local level. Intra-community social solidarity came in different forms as evident in the following accounts:

> I am sick, or I miss or can't buy my medicines, so they talk in the mosque….Pull together, and get what I need.
> I stayed in the mosque at the beginning after they closed my house and I cleaned it in exchange.
> They offer me food, vegetables, rice, spaghetti. I never imagined my life would come to this.
> I get help here to deal with my social welfare papers without having to travel to Sintra.

Despite the physical restrictions on mobility and dependence on local community support, entrapment propelled spatial imaginaries beyond the limits of the everyday. Vincent, who had migrated from Guinea Conakry in the early 2000s, elaborates:

> All the work that we came here for has stopped. All I can think about is my "terra," I wouldn't be so touched there, even in a crisis, my mum and dad are there, family to support me. I imagine being with my family working in the fields.

The same sentiments were present in other interviewees' discourses, which encompassed narratives of return and onward migration.

Now turning to the Sikh Gurdwara, the first point of contrast is its accessibility. In 2010, the Gurdwara moved to a new location, in a vacant factory, close to the last stop on the metro line, which connects directly to the city. As one leader elaborates:

> We felt the first location [of the Gurdwara] was much too far for people to get to, they had to walk for ages. We looked for something close to a metro stop so that people can come more easily and more frequently.

The relocation of the Gurdwara brings to mind Ingold's (2006) assertion that place does not exist as location but as the juncture of different trajectories—in this case encompassing day-to-day and migration journeys. Indeed, the Gurdwara is a site where the local arrangements of everyday life in Lisbon are negotiated, responding to the primary needs of new migrants arriving to the city to find work and accommodation. Networking with local Punjabi business men and other migrants provides an entry point into the urban labour market (McGarrigle & Ascensão, 2017). One interviewee described this in the following way:

> The first port of call is to the place in the city where you know you will receive help, with a job, a house and the rest.

It functions in a network of places, as a node or muscular matter where many tendons connecting to other spaces dispersed across the city converge—namely places of work, which include grocery, phone shops and restaurants. Of course, support is available *in situ* through cultural and religious resources and practices such as *langar*, which provides the community with daily food. However, the local employment networks that intersect in the Gurdwara produce new spatial behaviour and urban mobilities. In contrast with the very local reach of the welfare offered by the suburban mosque, the urban resources obtainable at the Gurdwara result in the creation of new routes through the city and networked territories that enmesh ethnic solidarity with the vulnerability of newly arrived migrants. Of course, this is precisely due to differences in modes of labour market insertion between both groups. In practice, business owners, who rely on new migrants as a source of low-cost labour, define the rules of initial movement. For instance, Ritam was introduced to a restaurant owner through contacts made at the Gurdwara when he first arrived in Lisbon.

> I moved to Paço de Arcos [an area on the Lisbon coast/estuary] with my boss, another cook and a chef, all together in the same house. It was a big house. Our boss paid everything, rent, we ate at the restaurant, we worked every day it was really complicated.

Later after gaining new skills and abilities to navigate the city and the urban labour market, Ritam moved further out of the city to Cascais on the coast then to the city centre, where he continues to work in an Indian restaurant. His residential mobility made him more aware of urban borders, between the inner city and the suburbs, and different diurnal rhythms, opening up new possibilities for him in the city. He began to explore the nighttime city and try out nightlife in the bars and clubs of downtown Lisbon. His more experimental urban experience uncovers the variegated places in which migrant identities unfold, showing the multiplicity of migrant spatialities (Brickell & Datta, 2011; Kochan, 2016). Again, Ritam illustrated this when spoke of how he manages cultural and religious expectations with his experimental experiences.

> I only have Sunday free, that's when I go to the Gurdwara. I wake at 9.00 and then after 2 or 3 in the afternoon I take a bath and then later I go out with my friends, to drink. But in the Gurdwara I never say, nobody says.

His range of spatial connections involve skill and negotiation—in this case the boundaries of religious expectations.

The two migrant places of worship we explored in this section both operate as urban service hubs for different groups of migrants, yet they are distinctive due to their different spatial reach. While this highlights the critical role of the spatial context in understanding mobility capacity, such contexts are not ahistoric and have been produced by conditions of arrival and the distinct modes of incorporation and organization of both communities in the city.

5. Conclusions

We have seen that mobilities may serve different functions to migrant urbanites and how using certain key urban resources often implies the production of particular circuits and circulations that entangle ethnic/religious solidarity, similar spatial positionalities, or the need to satisfy common everyday needs, for example. Yet, the practice of urban mobility is not a given, as if it were readily (and equally) accessible to everyone to answer to the problem solving requirements of everyday urban life. Mobility is also something we learn to do and that requires a constant manipulation and re-adjustment of skills and knowledge (Buhr, 2017b).

Nevertheless, as the examples provided here indicate, while competence is essential for doing mobility, practical knowledge does not inevitability result in mobility practice. Looking at mobility potential, or motility, can certainly reveal important aspects relating to quality of life and wellbeing (Kaufmann et al., 2004, p. 753), but it is the examination of both mobility potential *and* actual mobility practices that provides a more thorough account of the ways migrants do manage to navigate urban life even when facing various forms of urban inequality.

Thinking about migrant emplacement in terms of individuals' capacities to mobilize a city's resources *as their own resources* has allowed us to grasp migrants' active roles in terms of managing the urgencies of settlement, but also the constraints and opportunities often materialized in the shape of urban structure, residential location, and their own positionalities within their networks and within the socio-economic spectrum. In fact, some of our findings have shown how contextual change (i.e., economic crisis), inasmuch as it impacted migrants' mobility practices and limited access to services and provi-

sions, also re-shaped migrants' migratory plans to a point where onward migration appeared as a possible solution.

To excavate the interface between urban mobility and migrant integration is to open up avenues for thinking what migrants need urban space for but also what kinds of resources and possibilities cities make available for them. Tracing migrants' urban mobilities exposes a complex relationality between self and environment and directs our attention to the everyday, banal requirements of urban life that are, nevertheless, the very substance of migrant integration.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

Transport-Based Social Exclusion in Rural Japan: A Case Study on Schooling Trips of High School Students

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Abstract
The well-being of young people—particularly aspects such as physical and mental health—has become an increasing concern for Japan's government due, in part, to the aging and declining depopulation that Japan has been experiencing in recent years. Considering this, a survey of well-being and travel-to-school behavior was carried out in four high schools of Hiroshima Prefecture, Japan; between May and September 2016 with 1,017 valid samples. The respondents' ages vary between 15 and 19 years old. We argue that transport-based social exclusion results from not only situations of transport disadvantage, but also reduced or deteriorated individual well-being. Here, well-being is measured by using constructs grouped into three main categories: happiness, healthy lifestyle propensity, and social exclusion. We found the following potential issues of transport-based social exclusion: residents in depopulating areas experience lower levels of well-being than people in non-depopulating areas. Travel times longer than 30 minutes have negative effects on happiness, traffic safety perception, health conditions, and personal health habits. Bicycle users tend to experience higher levels of well-being in general, whereas bus and car users tend to experience less in comparison. Special attention should be paid to improving affordability and flexibility of bus services for students.

Keywords
depopulation; high school; Japan; rural area; social exclusion; student; transport; well-being

Issue
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1. Introduction

In Japan, students' commute to school has certain particularities in comparison to other (mainly western) countries. Children are expected to make the journey on their own starting in the first grade of elementary school (CBS News, 2015) and, in addition, schools commonly discourage parents from dropping children off by car and even cycling to school in a few cases (Kidd, 2013).

In elementary school, the trip to school is mostly within walking distance, and in fact it is quite common to hear of students who walk to school every day, despite a fairly long distance from home (NILS, 2017). Particularly in urban areas, there are several schools within walking distance for children, although the districts and distances to and from school are decided based on the local characteristics of each municipality (Mori, Armada, & Willcox, 2012).

In the Tokyo metropolitan area, it has been estimated that the walk to school likely takes less than 20 minutes for a child attending a public elementary school (Kawano, 2016). Nevertheless, the daily home-school trip is likely to become longer once children enter high schools. In large urban areas, taking public transportation for a 2-hour commute to school is not uncommon for children (Guo, 2013; Johnson & Johnson, 1996). Tagaya

et al. (2004) find average times of 75.5 minutes and Honda, Genba, Kawakami and Nishizono-Maher (2008) find average times of 55 minutes for schooling trips, respectively, which is considered to be longer than the average home–school trip time of public high school students in the Tokyo metropolitan area. In addition, after junior high school, students attend schools based on standardized high school entrance examination scores. Thus, some students may have to travel great distances in order to attend the school which was determined by their test scores (Johnson & Johnson, 1996). In addition, Japanese high school students do not drive cars (Johnson & Johnson, 1996) and the car is still chosen by a very small percentage of students (6%) for their daily commuting (Japan Guide, 2000).

A large number of rural areas in Japan are currently facing serious depopulation issues. Consequently, maintaining public transport in depopulating areas has become increasingly difficult. With this in mind, there is still little understanding regarding how this affects the well-being of students in rural areas. In order to fill the gap in existing studies, in this paper we aim to understand, in greater detail, the home-school travel behavior in rural areas of Japan from the perspective of well-being and social exclusion and discuss the implications of the analysis results. Hence, our research questions can be summarized as follows: 1) are residents in rural (depopulating) areas experiencing lower well-being than residents in urban areas? 2) If so, are these differences attributable to a poorer accessibility or provision of public transport services?

2. Literature Review

In this section, we review literature related to the concepts of transport disadvantage and social exclusion both separately and combined. We also explore how these issues are reflected in young Japanese who travel to school, our population group of interest.

2.1. Links between Transport Disadvantage and Social Exclusion

Transport has been identified as a key factor in the economic and social development process as it facilitates the movement of people and goods, thereby promoting trade and "better standards of living through improved access to markets, employment, health, education and social services" (Lucas, 2011, p. 1321).

Transport disadvantage has been commented by Schwanen et al. (2015, p. 126) as "a relational and dynamic outcome of a lack of access to basic resources, activities and opportunities for interaction…and of a lack of influence on decision-making in the context of transport policy and governance". Although transport disadvantage and its links to social exclusion has been a theme of much recent work, this relationship has not been explored across different geographic contexts (Delbosc & Currie, 2011). Furthermore, transport disadvantage can be both absolute and relative, and it occurs at both individual and collective levels (Schwanen et al., 2015). Herwangi, Pradono, Syabri and Kustiwan (2015) argue that the study of transport disadvantage can be grouped into studies related to marginalized people, the condition of a particular area, and the implementation of transport policy in general. Additionally, mobility-related exclusion has been defined as:

> The process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or in part to insufficient mobility in a society and environment built around the assumption of high mobility. (Kenyon, Lyons, & Rafferty, 2002, pp. 120–121)

It has also been considered that in outer-urban areas transport disadvantage is the result of a range of intersecting factors including poor public transport infrastructure, a higher proportion of low-income households, and the need to travel further distances in order to get to places of employment, services, and activities (Rosier & McDonald, 2011), including the quality and conditions of education in remote and isolated areas (NIER, 2012). Moreover, the built environment only has indirect effects on (travel) satisfaction through influencing commuting characteristics (Ye & Titheridge, 2017). Therefore, it is likely that transport disadvantage will have a greater impact on social exclusion and well-being in remote areas than in (more) accessible urban areas (Delbosc & Currie, 2011). Nevertheless, transport disadvantage and transport-related social exclusion are not necessarily synonymous with each other (Lucas, 2012).

2.2. Social Exclusion and Life-Related Issues for Young People in Rural Japan

In isolated (i.e., rural and mountainous) areas of Japan, school buildings and equipment are generally poor, cultural and traffic conditions are at a disadvantage and the quality of education offered there can hardly be compared to that in urban areas. For these reasons, the Japanese government has been sustaining efforts to reduce the disparities in education between isolated and non-isolated areas (NIER, 2012).

The study of social exclusion issues contributes to a better understanding of the nature and extension of these disparities that negatively affect young people's well-being. Abe (2010, 2012) recognizes 8 dimensions of social exclusion that are reflected in the Japanese context: lack of basic needs, material deprivation, exclusion from systems, lack of activities, housing deprivation, lack of social relations (social capital), subjective poverty and income poverty.

Some of these social exclusion issues that specifically affect young people have become of interest for researchers in recent years. Mental health issues such as

depression have become prevalent and there is interest from government and institutions in preventing them by targeting behaviors promoting health, acquisition of social support, and high self-esteem, etc. (Takakura & Sakihara, 2001).

Vocational high school students and upper graders were strongly associated with accumulation of health-risk behaviors such as cigarette smoking, alcohol use and sexual intercourse clustered. (Takakura, Nagayama, Sakihara, & Willcox, 2001). In addition, issues related to those health practices and social support were negatively related to present and persistent depressive symptoms (Takakura & Sakihara, 2001).

2.3. High School Students and Travel to School Issues

Remarkably increasing attention has recently been paid to youth-related issues by more and more researchers in various disciplines, such as education, social science, psychology, health, medical science, etc. (Zhang, Chikaraishi, Xiong, Jiang, & Seya, 2016). Some studies have recently focused on understanding young people's behavior (Takakura et al., 2001; Takakura & Sakihara, 2001; Ichikawa & Nakahara, 2007) by addressing high school students'-related issues more specifically. On a global scale, a variety of studies have covered topics related to the benefits of active travel to school (Broberg & Sarjala, 2015; Mackett & Paskins, 2008; Pont, Ziviani, Wadley, & Abbott, 2011; Timperio et al., 2006; Trapp et al., 2011), and the importance of promoting modal shift for school trips (Hodgson, Namdeo, Araujo-Soares, & Pless-Mulloli, 2012; Murtagh, Rowe, Elliott, McMinn, & Nelson, 2012; Oglivie, Egan, Hamilton, & Petticrew, 2004).

The effects of long commutes on well-being have been largely discussed, with unclear or contradictory results. Since the journey from home to work (school in our case) and back is an important aspect of modern life, it affects people's well-being and demands difficult decisions (Stutzer & Frey, 2008). For instance, Tagaya et al. (2004) found that commuting duration influences the waking time and sleep duration of adolescents, whereas long commuting duration is the environmental factor that showed strongest association with short sleep duration. On the other hand, other studies do not find a clear relationship between school-home commuting time and total sleep time for Japanese high school students (Honda et al., 2008).

Among school teachers in Tokyo, findings have revealed that long-time commuters were more likely to sleep less, exercise less, and work less time, leading to the recognition that strategies are required to improve the healthy lifestyle for long-time commuters (Nomoto, Hara, & Kikuchi, 2015). It was also pointed out that, while some students sleep or study during their long commute, public transportation also provides a chance for socializing with peers (Johnson & Johnson, 1996).

Moreover, different travel modes provide travelers with specific situations that involve different levels of physical activation and exposure to social interaction (De Vos, Schwanen, Van Acker, & Witlox, 2015). As previously mentioned, walking to school is a common practice in Japan. Although walking to school was not originally intended as an intervention to promote physical activity, unintended positive health outcomes from this practice can be observed, such as maintaining one of the lowest prevalence of childhood obesity in the world, a policy that likely benefits schoolchildren in terms of their levels of physical activity (Mori et al., 2012).

3. Methods

This section focuses on describing how the data for this empirical study were collected, as well as a description of the information that has been collected.

3.1. Data Collection

Surveys were conducted in four different locations (i.e., high schools) of Hiroshima Prefecture, Japan. The red and pink areas of the map in Figure 1 depict which municipalities in Hiroshima Prefecture have been recognized by the national government as "depopulating". Three schools are located in depopulating areas of the prefecture: *Chiyoda* (137 respondents), *Yoshida* (296 respondents) and *Mukaihara* (151 respondents); whereas *Kamo* high school is located in Higashi-Hiroshima city (433 respondents), which corresponds to a non-depopulating area.

The high schools who agreed to cooperate with our survey distributed the questionnaire and the instructions among their first, second and third grade students respectively. The age for students in high school is between 15 and 19 years old. The questionnaire included questions regarding the daily trip to school, well-being, and specific social exclusion aspects of interest (Perez-Barbosa & Zhang, forthcoming).

In Table 1, the population in the locations of study in 2011 and 2017, as well as the population density in 2017, can be observed, according to information from the respective municipal governments. In our locations, all the depopulating areas have a low population density. It should be noted that in the most densely populated area, population is still growing while in the least densely populated areas the population is decreasing.

3.2. Measures of Transport Disadvantage and Transport-based Social Exclusion

Generally, high-school students in rural areas of Japan must usually travel longer distances in order to get to their respective institutions than their urban peers. Additionally, the distance to facilities such as a train station, a bus stop, a medical institution or a post office have been included as criteria to calculate the degree of remoteness and isolation of the schools in mountainous areas in Japan (NIER, 2012). These types of issues are considered

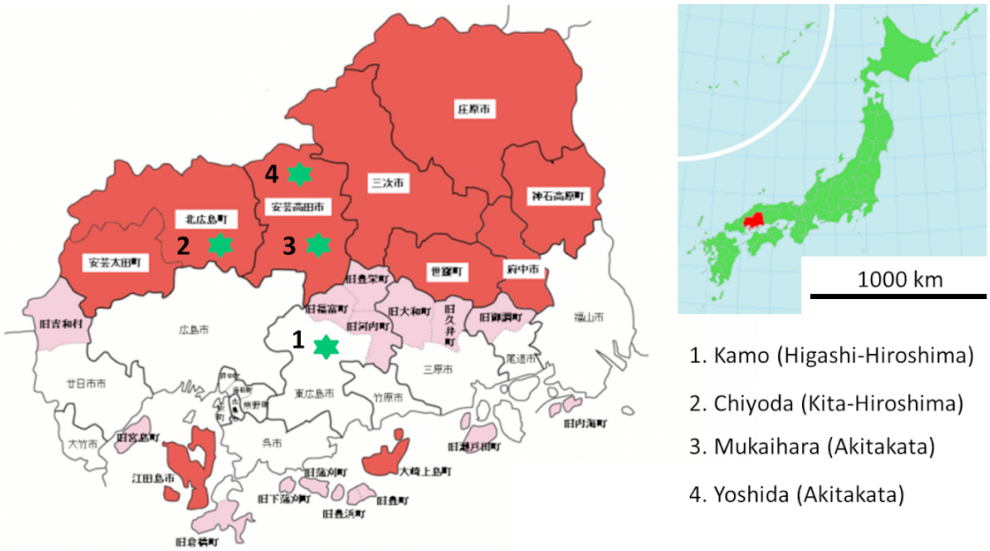

Figure 1. Locations of the survey in Hiroshima prefecture. Original images adapted from Hiroshima Prefectural Government.

Table 1. Socio-demographic information of the locations of study.

School	1. Kamo-Saijo	2. Chiyoda	3. Muhaikara	4. Yoshida
City/Municipality	Higashi-Hiroshima	Kita-Hiroshima	Akitakata	Akitakata
Population — 2011	178,827	20,136	31,565	31,565
Population — 2017	185,857	19,126	29,425	29,425
Density — 2017 (inhab./km^2)	291.85	30	59	59

transport disadvantage. If there are negative impacts on well-being that are, to any extent, attributable to a condition of transport-disadvantage, we may reasonably argue the existence of transport-based social exclusion, assuming that for an individual, higher levels of well-being are linked to lower levels of social exclusion and vice versa. De Vos, Schwanen, Van Acker and Witlox (2013) acknowledge that as travel options differ between different kinds of neighborhoods, this can result in different levels of subjective well-being. Considering this, in this section we explain how transport disadvantage and well-being are being characterized and measured (see Figure 2).

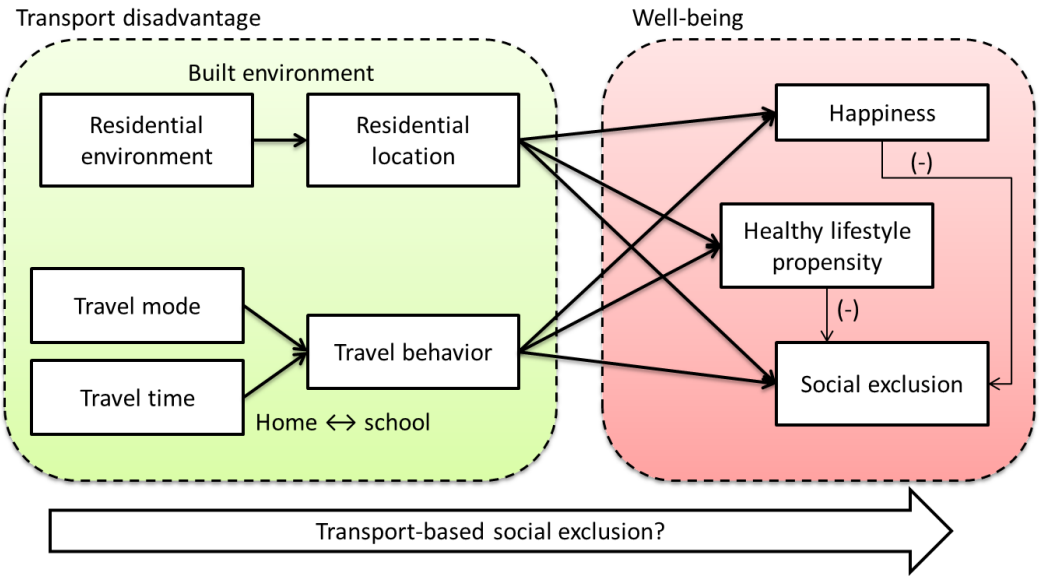

Figure 2. Conceptual framework of transport-based social exclusion.

3.2.1. Transport Disadvantage

Some conditions of transport disadvantage are already an inherent part of the targeted group (i.e., high school students), such as the inability to drive to school by themselves. Thus, they must rely on non-motorized modes (walking, bicycle), public transport (bus, train), or being driven, for their daily trip to school. Considering this, we include the effects of two main types of transport disadvantage: one related to residential location and the other to travel behavior (schooling).

- Residential location: geography and the environment have a much larger influence on well-being than previously thought (Brereton, Clinch, & Ferreira, 2008). For comparison purposes, two types of residential location will be considered: depopulating areas and non-depopulating areas respectively. We assume that residents in the former experience more disadvantages than residents in the latter, examining aspects such as the need to travel further distances to access most of the urban facilities and school itself, as well as a more reduced accessibility by public transport.
- Travel behavior: Students in the questionnaire survey were asked to describe how their daily—or most frequent—trip to school is by indicating the different travel modes they use and the duration for each of the stages in their schooling trip (see Figure 3).

3.2.2. Well-Being

One aim of transportation policies should be to contribute to people's subjective well-being, albeit it has received limited attention in the transport research and planning communities (Ettema, Gärling, Olsson, & Friman, 2010). Although the question of how well-being should be defined still remains largely unanswered (Dodge, Daly, Huyton, & Sanders, 2012), we pay special attention to issues such as acceptable quality of life and good health regarding its physical, mental and social dimensions. As such, well-being is assessed in terms of three main aspects: happiness (with several life domains), healthy lifestyle propensity, and social exclusion. The question items for each aspect were selected based on careful literature review, and can be observed in greater detail in Table 2.

4. Results

4.1. Travel Behavior

Based on the individual descriptions of travel to school, for each trip the dominant mode is considered as the main travel mode to school. The modal share for each school can be observed in Figure 4. With exception of *Mukaihara High School* (where the predominant travel mode is train by a large proportion, due also to a mountainous topography and its proximity to Hiroshima City), the most common travel mode to school is by bicycle. Long-distance travels that require the combined use of two or more modes are relatively uncommon. It should be noted that only *Mukaihara* and *Kamo* high schools can be accessed by railway. In contrast, for the locations Chiyoda and Yoshida, which are in more isolated areas, a larger dependence on buses and cars can be noted.

In Table 3, the average travel time to school by main travel mode(s) can be observed. The main travel mode(s) is the one (or the combination of two or more) used to cover the longest portion of the trip to school. It should be noted that the shortest average travel times are for non-motorized modes, while all the average travel times exceed 40 minutes for public transport users. For example, according to the example in Figure 3, the corresponding main modes would be bus and train combined.

4.2. Residential Location and Built Environment

The built environment is characterized by the distance from home to the nearest urban facilities that are listed in Table 4. With exception of post office, hospitals, police station, kindergarten and game centers, there are significant statistical differences between the distance from home to facilities in depopulating (rural) areas and non-depopulating (sub-urban) areas.

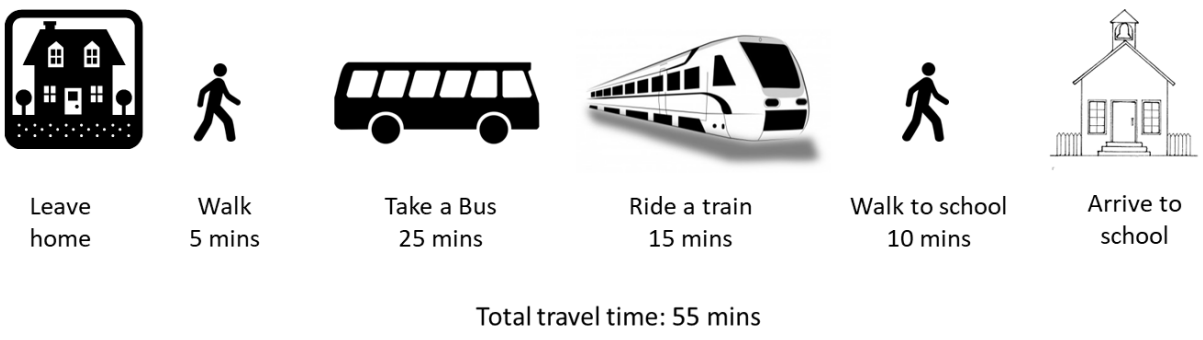

Figure 3. Example of a description of a daily travel to school.

Table 2. Measurements of well-being.

Well-being aspects	Related indicators
Happiness: "*How happy do you feel with your…?*"	Family finances, health, your family's health, relations with your neighbors, relations in other social networks, education, family life, leisure and social life, standard of living, what you are achieving in life, current safety, future safety, spirituality/religion, life as a whole.
Healthy lifestyle propensity: "*How important is it for you to…?*"	Eat breakfast every morning (LH1), Get enough sleep (LH2), Eat balanced and healthy food (LH3), Not smoke (LH4), Do physical activity (LH5); Living in a peaceful environment (LH6), Go to a park (LH7), Play sports (LH8), Participate in club activities (LH9), Do other social activities such as volunteering (LH10), Get to know your neighbors (LH11), attend cultural facilities regularly (museums, cinema, libraries) (LH12), Participate in out-of-home activities (LH13), Spend time with family (LH14), Spend time/go out with friends (LH15).
Social exclusion: "*How much do you agree with the following statements?*"	I feel safe with the traffic in my neighborhood (SE1), I feel safe during my daily travel (SE2), I feel I am in good physical health (SE3), I feel I am in good mental health (SE4), I feel in good bodily shape (SE5), I can participate in community activities (SE6), I can participate in community decision-Making processes (SE7), I am able to express myself as I wish (expression of identity) (SE8), I like volunteering for various activities (SE9), I can often access green spaces and the natural environment (SE10), I enjoy the places with a rich natural environment (SE11), I like the lifestyle in my current residential area (SE12), I want to have a very different lifestyle in the future (SE13), I can rely on public transport to go to the places I need (SE14), I live close enough to the places I like to go frequently (SE15), My daily travel to school is affordable to me and my family (SE16), I can get help from my close family when I need it (SE17), I can get help from my extended family when I need it (SE18), I can get help from my friends when I need it (SE19), I can get help from my neighbors when I need it (SE20), People in my community can get support from the local government for some of their daily life difficulties (SE21).

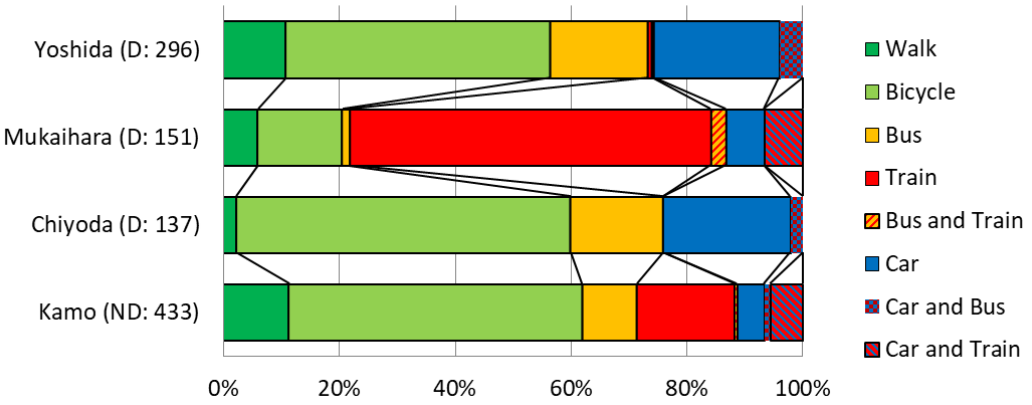

Figure 4. Main travel mode to school. Notes: (D): Depopulating area, (ND): Non-depopulating area. Numbers in parentheses indicate the number of valid sample answers collected in each school.

Table 3. Average travel time to school by main travel mode(s).

Main travel mode	Walk	Bicycle	Bus	Train	Bus and Train	Car	Car and Bus	Car and Train
Travel time	13.1	19.1	45.6	48.8	52.9	21.0	42.4	38.6
(Std. Dev.)	(6.9)	(10.9)	(18.9)	(22.0)	(23.7)	(11.1)	(13.3)	(10.7)
N	93	455	115	169	7	124	20	34

Notes: N corresponds to number of respondents by travel mode; unit of travel time: minutes.

4.3. Well-Being Measurements

In this section, the distribution of the well-being measurements detailed in Table 2 can be observed in Figure 5, Figure 6, and Figure 7. For comparison effects, and considering the distribution of the responses, the following categories will be considered: for social exclusion (see Figure 5) we consider the less satisfied group (respondents who answered *not at all* or *few times* for the agreement level) and the more satisfied group (respondents who answered *several times* and *totally agree*); for healthy propensity lifestyle, we consider the portion

Table 4. Distance from home to different urban facilities.

	Depopulating area (584)		Non-depopulating area (433)		ANOVA Test		
	Dist.	(SD)	Dist.	(SD)	F-value	p-value	
School	9.6	(8.8)	7.0	(7.5)	25.1	<0.001	***
Bank/post office	3.3	(7.2)	4.0	(9.7)	2.0	0.160	
Convenience store	3.1	(6.4)	1.5	(4.5)	19.5	<0.001	***
Supermarket	4.4	(7.9)	2.3	(5.0)	24.6	<0.001	***
Drugstore	8.0	(11.5)	4.6	(10.2)	24.0	<0.001	***
Train station	12.9	(14.4)	5.0	(8.3)	105.3	<0.001	***
Bus stop	2.8	(7.9)	3.7	(10.6)	2.9	0.091	*
Sports facilities	8.9	(12.6)	10.4	(14.4)	3.2	0.074	*
Park	9.0	(14.6)	4.0	(10.4)	37.5	<0.001	***
Community center	6.5	(12.3)	4.2	(10.2)	10.3	0.001	***
Hospital/health center	5.3	(9.2)	4.9	(10.2)	0.5	0.497	
Swimming pool	10.7	(13.4)	17.5	(18.0)	47.4	<0.001	***
Game center	12.8	(14.0)	11.4	(14.7)	2.5	0.111	
Bowling center	25.0	(13.9)	13.7	(14.2)	110.6	<0.001	***
Baseball center (bating)	23.6	(14.7)	18.3	(16.3)	20.4	<0.001	***
Shopping center	21.7	(17.4)	14.9	(17.7)	25.8	<0.001	***
Clothing shop	10.2	(13.4)	8.4	(13.4)	4.1	0.042	**
Bookstore	10.1	(12.7)	6.2	(11.3)	25.0	<0.001	***
Cram school	12.8	(16.4)	5.8	(11.6)	56.0	<0.001	***
City hall	7.4	(11.3)	9.0	(12.2)	4.5	0.034	**
Police station	5.2	(9.3)	5.7	(10.3)	0.8	0.369	
Kindergarten	4.4	(9.1)	3.5	(8.7)	2.5	0.118	

Notes: Significant at * 90%, ** 95%, *** 99% level. Average distances in kilometers.

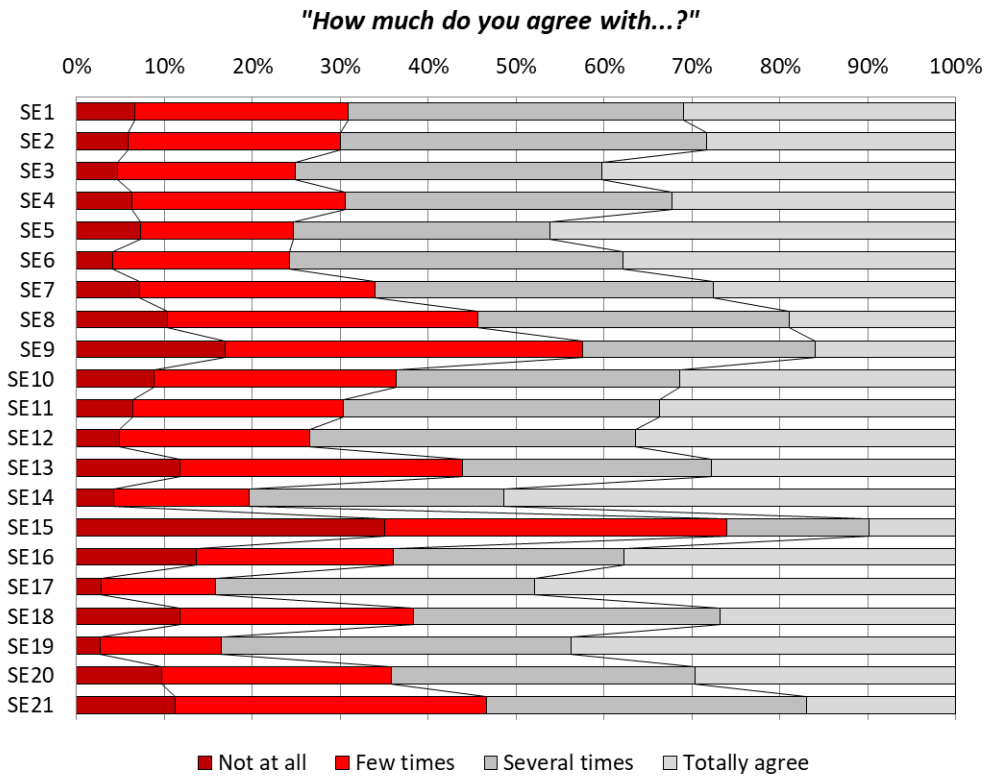

Figure 5. Measurement of social exclusion.

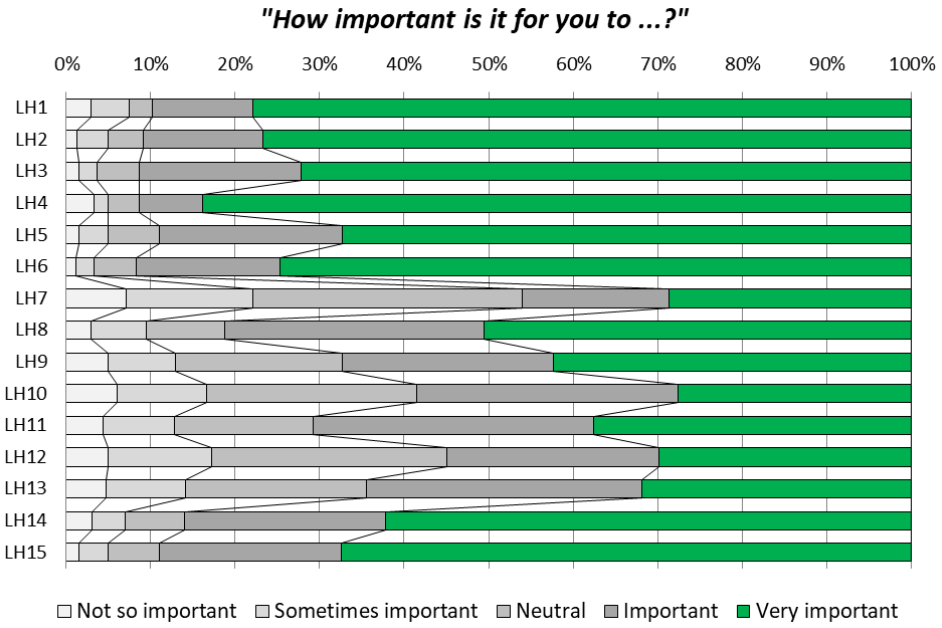

Figure 6. Importance of health habits.

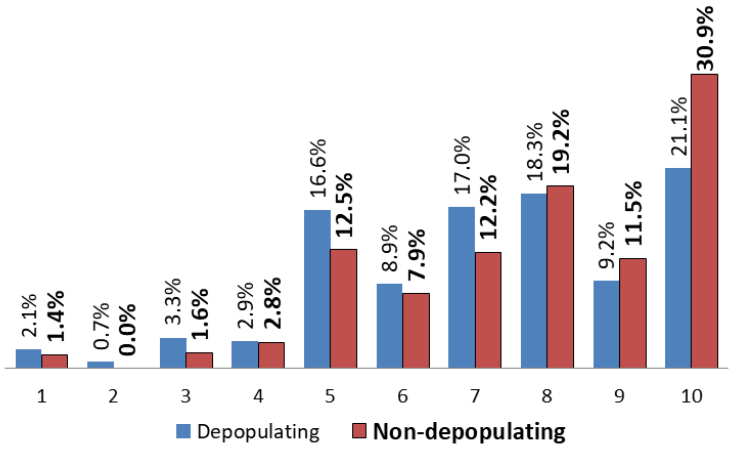

Figure 7. Distribution of happiness scores according to the type of area. Note: 1 is the most unhappy condition, 10 is the happiest condition.

of respondents who consider the practice if each of the mentioned habits very important (see Figure 6). Based on the distribution of happiness scores, we can consider three levels: low (scores from 1–4), medium (5–7) and high (8–10). In Figure 7 the difference of score distributions between depopulating and non-depopulating areas can be observed.

5. Analysis of Transport-Based Social Exclusion Issues

5.1. Influence of Depopulating Area on WB

Firstly, the variations of the different well-being indicators are compared between depopulating and non-depopulating areas.

Based on the responses for the questions related to social exclusion (SE1—SE21), we can distinguish two main groups: the first group reflects a big (or total) agreement whereas the second group reflects little (or no) agreement. Then, the percentage of individuals that agree within each type of zone (depopulating and non-depopulating) is compared, and the Pearson Chi-Squared test is employed for testing which differences are statistically significant. The results can be observed in Figure 8 and Table 5.

Regarding happiness with all the aforementioned life domains, as well as for all the aspects of healthy lifestyle propensity that were assessed, higher scores were found for non-depopulating areas in comparison with depopulating areas. However, some mixed results can be observed regarding social exclusion (see Figure 9). Additionally, we found that the social exclusion items can be grouped into seven bigger categories: *safety*, *health*, *participation*, *nature*, *lifestyle*, *accessibility*, *and social support*. This was

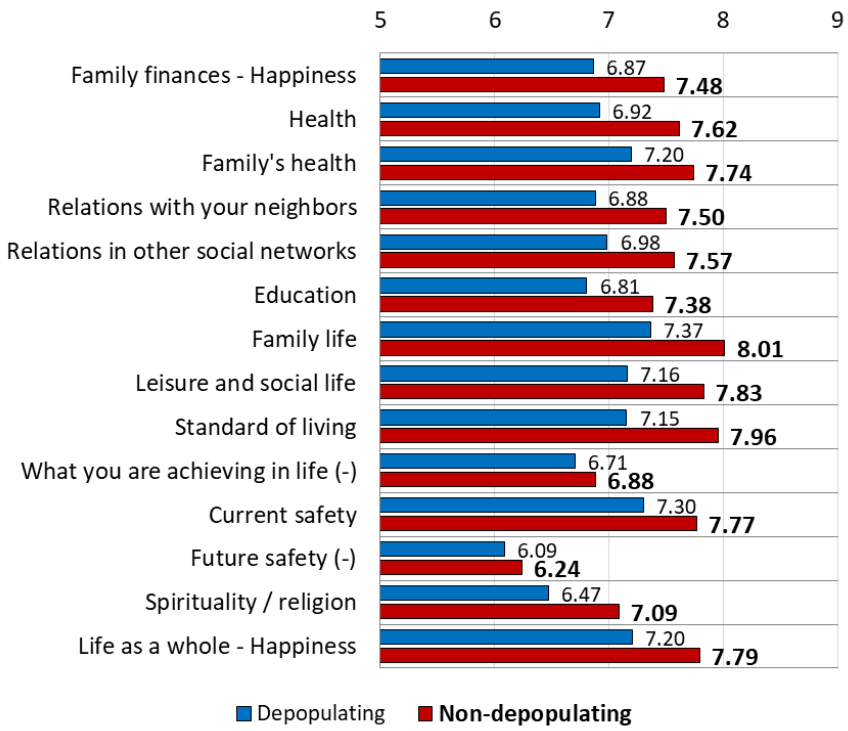

Figure 8. Average happiness scores regarding different life domains for depopulating and non-depopulating areas.

Table 5. Propensity to a healthy lifestyle: variation between types of area.

	Type of area [a]		Pearson-χ^2 [b]
Lifestyle and health habits	D (433)	ND (584)	(df = 1)
Eat breakfast every morning (LH1)	72.4	85.2	23.60***
Get enough sleep (LH2)	71.1	84.3	24.36***
Eat balanced and healthy food (LH3)	64.7	82.2	37.87***
Not smoke (LH4)	81.0	87.8	8.42***
Do physical activity (LH5)	63.2	72.7	10.32***
Living in a peaceful environment (LH6)	70.9	79.7	10.13***
Go to a park (LH7)	26.5	31.4	2.88*
Play sports (LH8)	46.2	56.4	10.18***
Participate in club activities (LH9)	39.6	46.2	4.48**
Other social activities (LH10)	26.5	28.9	0.68
Get to know your neighbors (LH11)	34.6	41.6	5.17**
Regular access to cultural facilities (LH12)	29.8	30.0	0.01
Participation is various activities (LH13)	27.4	37.9	12.57***
Spend time with family (LH14)	56.8	69.3	16.34***
Spend time/going out with friends (LH15)	62.8	73.7	13.28***

Notes: [a] Values represent the percentage of respondents within each type of area who consider the practice of each one of the listed lifestyle and health habits as *very important*. D: Depopulating area; ND: Non-depopulating area; [b] Pearson Chi-square values significant at * 90%, ** 95%, *** 99% level.

confirmed by the results of factor analysis (Varimax rotation, *KMO* = 0.864, 67.8% of variance explained).

For depopulating areas, higher satisfaction with a few aspects of social exclusion was found: volunteering (SE9, $\chi^2 = 6.56$, $p = 0.010$), enjoyment of the natural environment (SE11, $\chi^2 = 5.12$, $p = 0.024$) and change of lifestyle (SE13, $\chi^2 = 5.7$, $p = 0.017$). It reflects that features associated to low density environments can contribute positively to well-being. Dolan, Peasgood and White (2008) remark that more research is needed to understand the effects of social capital and contact with local community on well-being, whereas Schwanen and Wang (2014) mention that out-of-home activities tend to be more undertaken in lower density areas.

For non-depopulating areas, students show higher satisfaction regarding physical health (SE3, $\chi^2 = 13.4$,

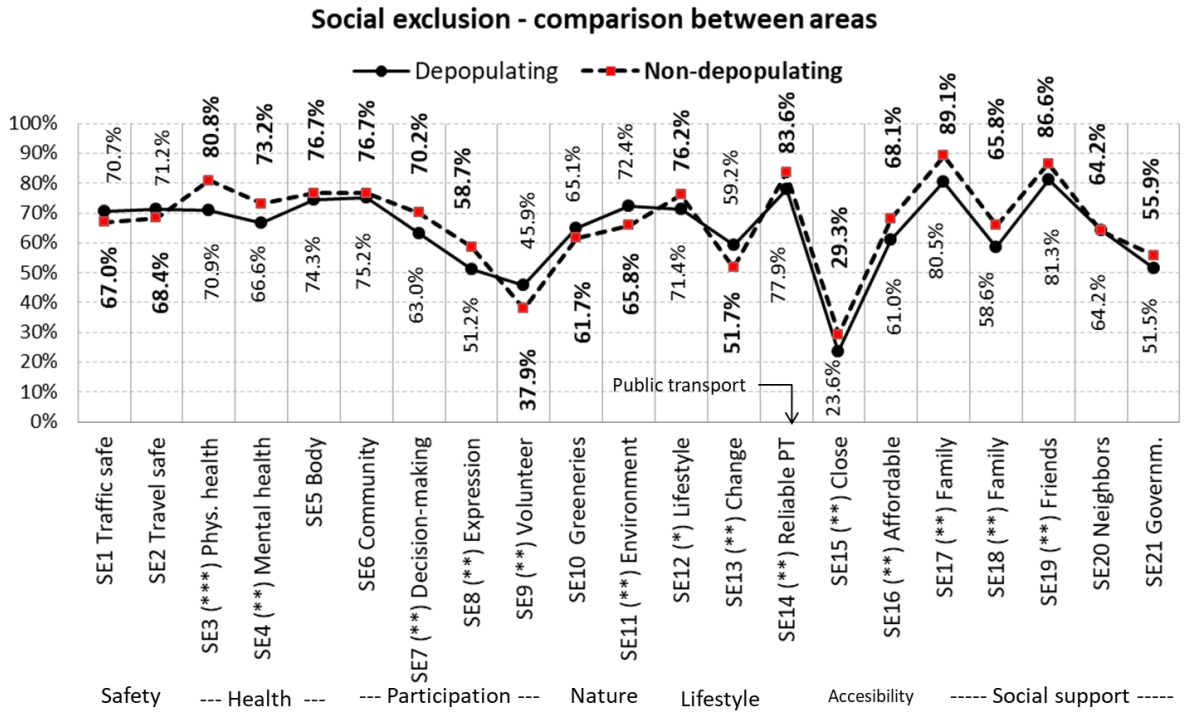

Figure 9. Comparison of social exclusion between areas.

$p < 0.001$), mental health (SE4, $\chi^2 = 5.14$, $p = 0.023$), participation in community decision-making (SE7, $\chi^2 = 5.78$, $p = 0.016$), self-expression (SE8, $\chi^2 = 5.59$, $p = 0.018$), lifestyle (SE12, $\chi^2 = 2.97$, $p = 0.085$), public transport reliability (SE14, $\chi^2 = 5.17$, $p = 0.023$), accessibility (SE15, $\chi^2 = 4.17$, $p = 0.041$; SE16, $\chi^2 = 5.58$, $p = 0.018$), and social support from family and friends (SE17, $\chi^2 = 14.5$, $p < 0.001$; SE18, $\chi^2 = 5.57$, $p = 0.018$; SE19, $\chi^2 = 5.12$, $p = 0.024$).

For other aspects of social exclusion related issues, such as safety (SE1, SE2), obesity (SE5), participation in community activities (SE6), access to green areas and social support from neighbors and community (SE20, SE21), no significant differences were found between depopulating and non-depopulating areas.

5.2. Influence of Travel Behavior on Well-Being

The average happiness by travel mode and the correlation values between travel time in minutes (total and by mode) and the happiness values can be observed in Table 6. Although, in general, happiness increases as travel time decreases (Morris & Guerra, 2015a; Stutzer & Frey, 2008), this is applicable to walkers and train users, whose well-being appears to be sensitive to the effects of long trips.

Regarding social exclusion, the difference for travel times between the most satisfied and the least satisfied individuals can be observed in Figure 10 . Statistically significant differences were found in *safety* (SE1, $p = 0.098$; SE2, $p = 0.092$), *health* (SE3, $p = 0.014$, SE4, $p = 0.017$; SE5, $p = 0.055$), *accessibility* (SE16, $p < 0.000$), and *social support* (SE20, $p = 0.048$, SE21, $p = 0.018$).

For lifestyle health habits, in Figure 11, the difference of average travel times between students who consider them *very important* and *"not very" important* can be observed. Significant results were found for breakfast, sleep, eating balanced food and not smoking (LH1, $p = 0.001$; LH2, $p = 0.005$; LH3, $p = 0.001$; LH4, $p = 0.046$).

Table 6. Happiness by employed travel modes.

	Travel time	**Walk**	**Bicycle**	**Train**	**Bus**	**Car**
Average Happiness score		7.49	7.66	7.22	7.30	7.33
(SD)		(2.06)	(2.08)	(2.29)	(2.18)	(2.23)
Pearson Correlation						
Time by mode (in mins.)	**−0.103*** **	**−0.113*** **	0.020	**−0.086*** **	−0.020	−0.018
p-value	**0.001**	**0.000**	.529	**0.006**	.529	.577

Note: *** Significant at 99% level.

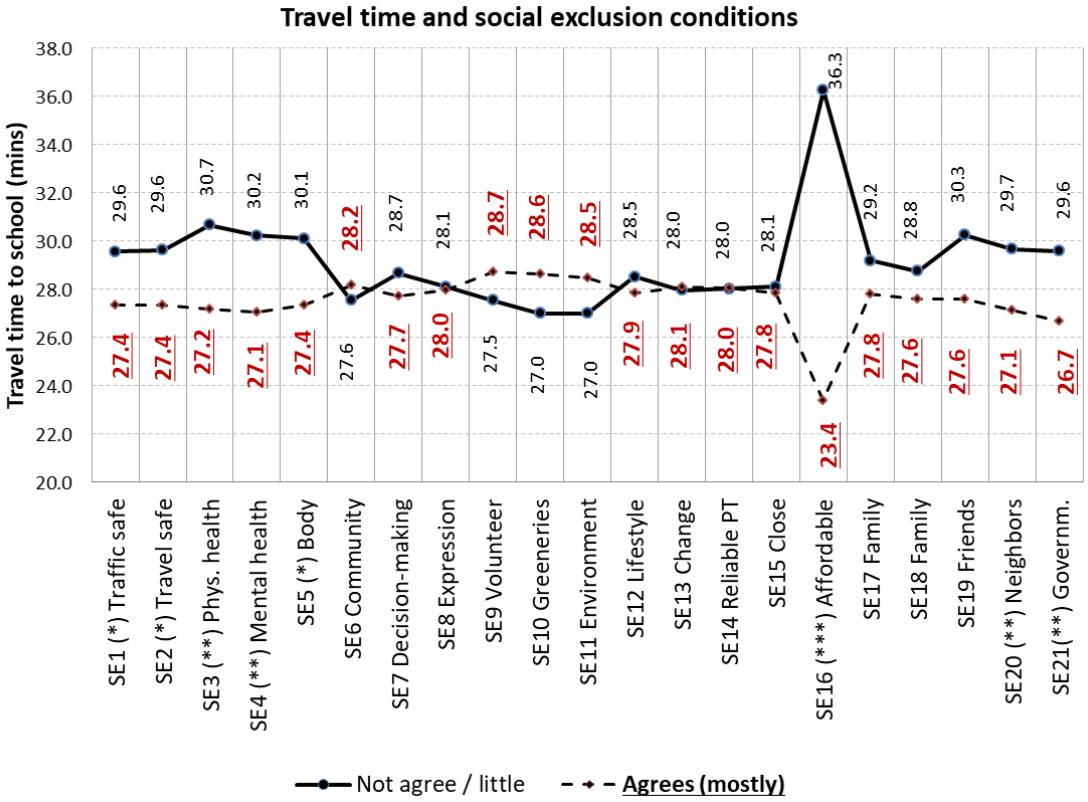

Figure 10. Comparison of travel time between different social exclusion conditions.

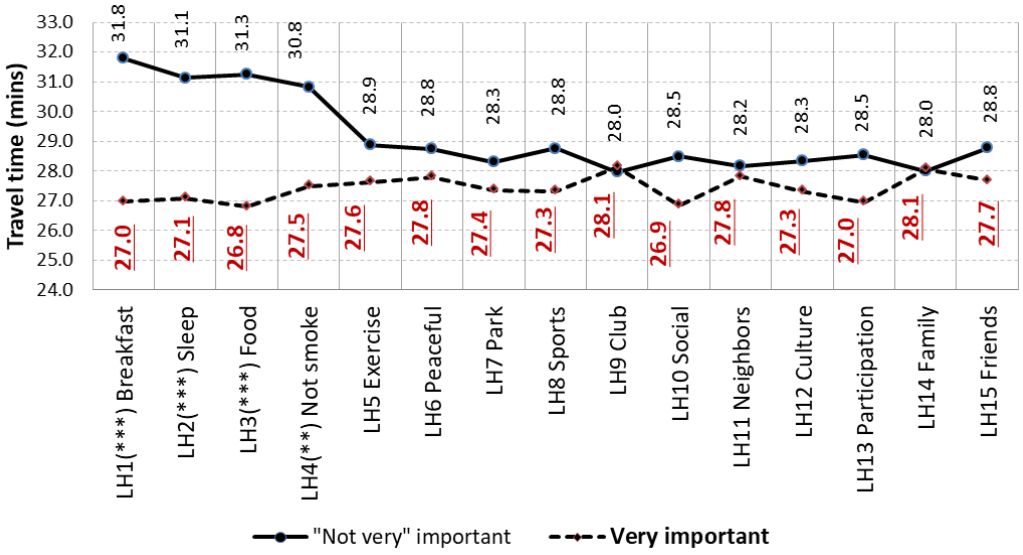

Figure 11. Comparison of travel time between healthy lifestyle propensity groups.

In Figure 12 the variation of average travel time among different levels of happiness can be observed as a complement for the information provided in Table 6. The ANOVA test results confirm that the difference in travel time among levels of happiness is significant ($F = 4.19$, $p = 0.015$), and one can observe how higher levels of happiness are clearly associated with shorter travel times to school. Commonly, people who spend more time commuting suffer lower well-being (Stutzer & Frey, 2008) and may have a poorer emotional condition (Morris & Guerra, 2015a; Olsson, Gärling, Ettema, Friman, & Fujii, 2013).

Finally, the percentage of individuals with the most favorable well-being condition ("*mostly agree/agree*" for SE variables and "*very important*" for LH variables) between users and non-users of the different travel modes is compared. Thus, the percentage of respondents who have the most favorable well-being condition within

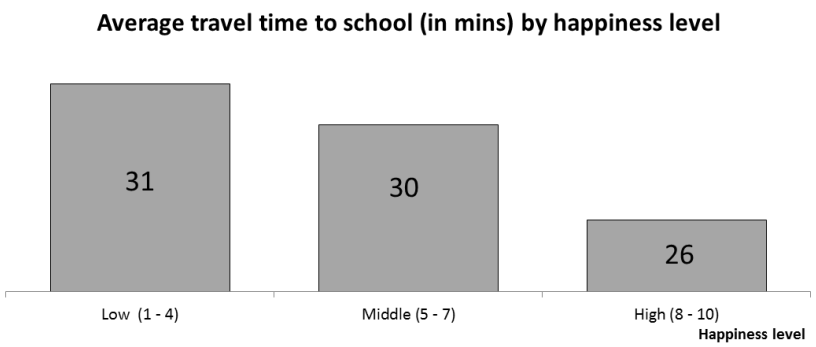

Figure 12. Happiness level and average travel time to school (in mins.) (lowest category score—highest category scoreumber of respondents in the category).

users of each travel mode (a), the percentage of respondents who have the most favorable well-being condition within non-users of each travel mode (b), *F*-value (c) and *p*-value (d) respectively are shown within parentheses in Table 7. For example, 71.8% of bus users often access green spaces and natural environment (SE10) whereas 62.3% of bus non-users do (see Table 6). If value a) is greater than b) for a well-being indicator, we place the indicator in the column "favorable effects"; otherwise, we place the indicator in the "unfavorable effects" column. In addition, well-being indicators without statistically significant differences were intentionally omitted in Table 7.

The favorable effects of cycling for students' well-being can be easily noted in Table 7. On the other hand, students who depend on the use of cars or buses for schooling tend to experience less satisfaction regarding well-being issues. However, the well-being of walkers and train users is more sensitive to the effects of trip duration, which cannot be observed for trips by bicycle, train, and bus. Other studies also find that people who walk and cycle tend to be more content than other commuters, such as train riders (Japan Guide, 2000). Other studies have also mentioned the positive effects of cycling on well-being (Morris & Guerra, 2015b; St-Louis, Manaugh, van Lierop, & El-Geneidy, 2014) as well as how car and bus users are less satisfied in comparison (St-Louis et al., 2014).

6. Discussion and Conclusions

According to our results, it was possible to confirm links between transport disadvantage conditions and well-being. More specifically, living in a depopulating area, having long home-school trips, and depending on public transport (more specifically bus) are conditions of transport disadvantage that have negative implications to high school students' well-being. The longest travel times to school correspond to public transport users (bus and train) whereas the shortest travel times correspond to non-motorized modes (walk and bicycle).

The negative influence of living in a depopulating area on well-being has been evidenced for the case of Hiroshima prefecture through our results. Therefore, living in a rural depopulating area can be considered as a situation of transport disadvantage. In general terms, high-school students in rural areas tend to have slightly lower happiness scores as well as a lower propensity to keep good lifestyle habits than students in sub-urban areas. As for social exclusion related issues, aspects such as health, participation, accessibility, and social support negatively affect students in depopulating areas more than in non-depopulating areas. Volunteering and enjoyment of natural lifestyle are things that tend to be more valued among high school students in rural areas though. De Vos et al. (2013) argue that there is a direct relation between subjectively experienced well-being and residential location which may offset many of the travel related well-being benefits of high-density locations; this study contributes to support that statement. However, living in a particular area involves a range of other factors that need to be considered in order to observe the net effect of commuting on well-being (Dolan et al., 2008).

The negative effects of long trips on well-being are reflected specially in aspects such as safety, health, social support from neighbors and community, and personal indoor life habits (breakfast, sleep, balanced nutrition, not smoking). A better understanding of this phenomenon is necessary to help commuters increase their individual well-being (Olsson et al., 2013; Stutzer & Frey, 2008). Also, we considered travel time to school and living in a depopulating area separately for analysis effects, but actually the built environment only has indirect effects through influencing commuting characteristics (Ye & Titheridge, 2017). Our results confirm these influencing effects. For instance, the use of bus and car for schooling negatively affect students' well-being, but it cannot be considered negative *per se*. The increased dependence on car and bus associated to living in a depopulating area contribute to better explain these results.

It could be argued that bicycle users have more autonomy and flexibility for their trips, apart from shorter travel times, something that cannot be said of bus users. There would be restrictions for doing other out-of-school activities, which are an important part of building social capital and thus an important contribution to well-being. For our case study, we can confirm the depen-

Table 7. Effects on well-being by use of different travel modes.

	Favorable effects	**Unfavorable effects**
Walk	SE16 Affordable (**91.4%**, *61.3%*, 34.38, <0.001)	SE6 Community (**68.8%**, *76.5%*, 2.73, 0.099), SE11 Environment (**54.8%**, *71.1%*, 10.65, 0.001)
Cycling	SE3 Phys health (**79.1%**, *71.9%*, 7.07, 0.008), SE5 Body (**79.6%**, *71.9%*, 8.01, 0.005), SE6 Community (**78.7%**, *73.5%*, 3.71, 0.055), SE16 Affordable (**74.9%**, *55.2%*, 44.51, 0.000), SE17 Family (**86.6%**, *82.2%*, 3.64, 0.057), SE18 Family (**67.5%**, *56.9%*, 11.91, 0.001), SE19 Friends (**86.8%**, *81.0%*, 6.30, 0.012), SE20 Neighbors (**69.7%**, *59.8%*, 10.78, 0.001), SE21 Governm (**59.1%**, *48.8%*, 10.95, 0.001); LH1 Breakfast (**81.8%**, *74.7%*, 7.24, 0.007), LH3 Food (**75.2%**, *69.8%*, 3.67, 0.055), LH4 Not smoke (**87.3%**, *81.1%*, 6.98, 0.008), LH5 Exercise (**87.3%**, *81.1%*, 6.98, 0.008), LH7 Park (**31.6%**, *26.2%*, 3.72, 0.054), LH8 Sports (**56.9%**, *45.4%*, 13.57, <0.000), LH9 Club (**47.3%**, *38.4%*, 8.05, 0.005), LH10 Social (**31.6%**, *24.2%*, 7.03, 0.008), LH13 Participation (**35.8%**, *28.6%*, 5.98, 0.015).	
Train	SE14 Reliable PT (**86.7%**, *78.7%*, 6.75, 0.010), SE15 Close (**32.9%**, *24.3%*, 6.38, 0.012)	SE4 Mental health (**63.8%**, *70.9%*, 3.93, 0.048), SE16 Affordable (**54.3%**, *66.5%*, 10.96, 0.001), LH1 Breakfast (**73.3%**, *79.1%*, 3.17, 0.075), LH2 Sleep (**71.9%**, *77.9%*, 3.40, 0.065)
Bus	SE10 Greeneries (**71.8%**, *62.3%*, 4.82, 0.028)	SE5 Body (**65.5%**, *76.9%*, 8.63, 0.003), SE15 Close (**19.0%**, *27.2%*, 4.26, 0.039), SE16 Affordable (**44.4%**, *67.2%*, 28.37, <0.000), SE18 Family (**48.6%**, *63.8%*, 12.03, 0.001), LH4 Not smoke (**77.5%**, *84.9%*, 5.03, 0.025), LH7 Park (**19.7%**, *30.1%*, 6.42, 0.011), LH8 Sports (**43.0%**, *51.8%*, 3.80, 0.051), LH9 Club (**31.0%**, *44.2%*, 8.833, 0.003), LH10 Social (**19.0%**, *28.9%*, 6.026, 0.014)
Car		SE3 Phys. health (**70.2%**, *76.2%*, 2.77, 0.096), SE16 Affordable (**41.0%**, *68.9%*, 51.98, 0.000), SE17 Family (**78.1%**, *85.5%*, 6.01, 0.014), SE18 Family (**50.0%**, *64.1%*, 12.52, 0.000), SE20 Neighbors (**53.9%**, *66.4%*, 9.99, 0.002), SE21 Government (**46.1%**, *54.9%*, 4.66, 0.031), LH8 Sports (**44.4%**, *51.8%*, 3.28, 0.071)

dence on bus as another situation of transport disadvantage. In this regard, Morris and Guerra (2015a) argue that long trips significantly degrade the mood of bus riders. Therefore, special attention should be paid to the flexibility, accessibility, and affordability of public transport services for high school students, aspects that have been proven very sensitive and influential for a better well-being condition.

For future studies, based on more detailed geographical analysis by using post-code and more detailed land-related attributes, the effects of urban landscape features on well-being could be further clarified. Similarly important, it is necessary to understand the manner in which young people interact with others and the built environment. In other words, clarifying which of the distinctive features of urban and rural environments affect the well-being of young people based on necessities and expectations at both individual and group levels. Further research should also consider the interdependence of mode use, travel-related attitudes, and travel satisfaction (De Vos, Mokhtarian, Schwanen, Van Acker, & Witlox, 2016), as well as their joint contribution to well-being. These aspects, related to the daily travel experience, were not directly measured in this study, but it is

undoubtedly an important aspect of modern life (Stutzer & Frey, 2008) that affects people's well-being anywhere; although differently according to the residential location.

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Conflict of Interests

The authors declare no conflict of interests.

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