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Is Local Public Transport unsuitable for elderly? Exploring the cases of two Italian cities

Ilaria Mariotti [a,*], Claudia Burlando [b], Stefano Landi [c]

[a] DAStU-Politecnico di Milano, Italy
[b] Department of Economics and Business Studies, Università degli Studi Di Genova, Italy
[c] Università Cà Foscari di Venezia, Italy

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ABSTRACT

The issue of developing environments responsive to the ambitions and needs of older people has become a major concern for social and public policy. According to the activity theory, psychological well-being in old age is based upon the level of activity and social contacts which are kept (Havighurst, 1968). Several researchers (e.g., Mollenkopf, 1997; Banister & Bowling, 2004; Burnett & Lucas, 2010; Stanley, Vella-Brodrick, & Currie, 2010; Mifsuda et al., 2019; Van Hoven & Meijering, 2019) show that participation in activities is related to larger social networks and fewer feelings of loneliness, and that outdoor mobility contributes to old people's life satisfaction. As the activity space of old people shrinks with age, the conditions of the neighborhood where older adults live become increasingly important. Moreover, the integration and management of public transport with active travel (including equity and health implications) is a key subject for policy makers. Although Italy is the "oldest" country in the European Union (closely followed by Germany), the literature exploring elderly mobility is scant. The paper aims to fill this gap by investigating the motivations of a representative sample of older adults, in the cities of Milan and Genoa, not to take trips and activities because of the perceived inadequacy of Local Public Transport. The 411 old people, living in three peripheral neighborhoods in Milan - the Italian financial capital -, and in three peripheral neighborhoods in Genoa - the oldest Italian metropolitan area-, were interviewed face-to-face in 2019. Multivariate logistic regression models are adopted to explore whether giving up moving inside the city is related to: i) elderly's demographic variables, health conditions and modes of transport; ii) the perceived satisfaction of both Local Public Transport and the neighborhood ("ageing in place"); iii) the town of residence.

1. Introduction

According to UN World Population Prospects (2019), the number of senior citizens worldwide is rising at a faster rate than before and this undoubtedly creates a severe demographic imbalance that will have a profound impact on our societies. In 2018, for the first time in history, people aged 65 or above outnumbered children under five years of age globally. In 2018, nearly one fifth (19.7%, i.e., +0.3% respect to 2017 and + 2.6% compared with 10 years earlier) of the EU population was aged 65 and more and the percentage of old people is forecast to grow throughout Europe, reaching an average of 30% by 2060 (Eurostat, 2019). In this context, Italy and Germany are the European countries with the strongest tendency to ageing.

The effects of ageing will range from health provision to social services, including a change in the urban mobility scenario, its structure and consequently user needs. The rapid increase in the number of over 65's means also profound changes in personal needs and the services required to satisfy them (van Hoven, Brouwer, Meijering, & McCann, 2012). This necessarily means identifying new solutions at various levels. In Europe there has been growing awareness of the phenomenon of ageing along with a need for specific policies to be adopted.

As stressed by the "active" ageing theory (WHO, 2015), psychological well-being in old age is based upon the level of activity and social contacts. "*Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age*" (WHO, 2002, p.12). Participation in activities is related to larger social networks and fewer feelings of loneliness (Stanley, Vella-Brodrick, & Currie, 2010; van Hoven & Meijering, 2019). Mobility is linked to wellbeing (Banister & Bowling, 2004) and to physical health (Mollenkopf, Marcellini, Ruoppila, Szeman, & Tacken, 2005), indeed the possibility to move outdoor contributes to old people's life satisfaction (Burnett & Lucas, 2010; Mifsud, Attard, & Ison, 2019; Mollenkopf et al., 1997), and quality of life

* Corresponding author.
E-mail addresses: ilaria.mariotti@polimi.it (I. Mariotti), burlando@economia.unige.it (C. Burlando), stefano.landi@unive.it (S. Landi).

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perception (Banister & Bowling, 2004). The possibility to move independently and easily is certainly one of the fundamental strategies to keep old people involved in an active and healthy social life (Johnson, Shaw, Berding, Gather, & Rebstock, 2017; Mifsud et al., 2019; Nordbakke & Schwanen, 2014). As stated by Mašková (2014), there is a considerable variability in the definitions of 'active' ageing (see also Boudiny, 2012), however, despite this variability, they are built upon the assumption that there is a link between activity in old age and other ethically desirable values such as life satisfaction, enhanced health and quality of life (Avramov & Mašková, 2003). Ideas of successful or active ageing are based on the conception of individuals who influence their ageing through their active lifestyle and engagement in life (Cardona, 2008).

Cities are places where people can benefit from urbanization economies and transport plans. Longer life expectancy combined with improved health and economic conditions will allow senior citizens to enjoy more and for longer their urban environment if accessibility to places and services is guaranteed (Flores, Caballer, & Alarcòn, 2019). Urban mobility planning becomes a significant driver towards friendly and inclusive (for senior citizens and not only) urban environments (Martens, 2018). Older adults' social networks decline with increasing age and increasing age is marked by a withdrawal away from the public to the private sphere. This behaviour is reflected by a reduction in activities and a shrinking of the activity space of old people (Fobker & Grotz, 2006), who prefer the immediate residential environment (Mestheneos, 2011; Michael, Green, & Farquhar, 2006). In many countries old people are the backbone of the family, helping with the children, taking the children to and from school, preparing meals, doing the grocery shopping etc. Hence, much of the travel is of a local nature within the neighborhood, and some travel is to specified shops in the city centre. Therefore, it is important, though nevertheless difficult, to formulate guidelines for an age-appropriate residential environment.

Given the complexity and dynamics of old age, different case studies need to be investigated to have a clearer picture of the local determinants and effects of mobility on ageing societies (Mifsud et al., 2019). Demographic change must therefore lead to changes in strategies for urban planners and urban transport planners (Buffel, Phillipson, & Scharf, 2012; van den Berg, Kemperman, de Kleijn, & Borgers, 2016) that will have to consider the effects of ageing on mobility needs and on transport systems (Alsnih & Hensher, 2003; Buehler & Nobis, 2010; Van den Berg et al., 2016). Within this context, the present paper studies travel behaviour in two Italian cities: Milan and Genoa in the north of the country. Specifically, it is explored why older adults were unable to take trips and activities because of the perceived inadequacy of the Local Public Transport (LPT) service. Milan and Genoa have been chosen because they differ according to: (i) the orography (Milan is flat, Genoa is hilly); (ii) the concentration of older adults (Genoa is the "oldest" Italian city, while Milan is the economic and financial center of Italy and attracts young and skilled labor): (iii) the accessibility levels to LPT (with Milan having the most capillary and efficient LPT). Specifically, the focus has been placed on three neighborhoods in each city, selected according to: (i) their peripheral location within the city; (ii) the concentration of old people; (iii) the socio-economic status characterised by medium-low income. The selection of peripheral medium-low income neighborhoods allows us to explore whether and how LPT is used and which might be the policies to be promoted to improve elderly mobility by LPT in these areas. The empirical analysis has been developed within the MOBILAGE[1] research project, founded by Fondazione Cariplo in 2018–19. A survey has been carried out through face-to-face interviews using a sample of "active" seniors (over 65) in the two cities.

Using multivariate logistic regression models, the aim is to assess whether the impossibility of taking trips and performing activities because of the perceived LPT inadequacy is related to: i) the elderly's demographic variables, health conditions and modes of transport; ii) the satisfaction for the LPT service and the neighborhood where respondents live ("ageing in place"); iii) the town of residence. The paper fills the gap in the literature about the Italian case, where only few empirical studies, at least to our knowledge, have been carried out about senior citizens mobility (ISFORT, 2016 and Crotti, Maggi, Pantelaki, & Rossi, 2020 for the case of Italy; Mariotti, Brouwer, & Gelormini, 2018 and Akhavan, Mariotti, & Pinto, 2020, for the case of Milan).

The paper is structured into five sections. The introduction is followed by a literature review on the role of mobility in active ageing. Data and methodology are described in section three. Descriptive statistics and the results of the econometric analysis are presented and discussed in section four. Conclusions are presented in the last section.

2. Background

The World Health Organization has established a path towards active ageing that is meant to highlight the necessary elements to maintain the quality of life of citizens as they age (WHO, 2015).

\In the past, seniority was synonymous with experience, knowledge, and wisdom. At present, the word 'elderly' has a negative meaning, often with connotations of handicap, dependence, and exclusion; this mistake exists even at the regulatory level. Although policy and regulation should specifically address the concept of seniority, even in 2020, this concept is often confused with that of disability (Pena Cepeda, Galilea, & Raveau, 2018). One element confirmed by some authors (Lamellet & Haustein, 2014) is that older people are frequently classed as "people with disabilities", but the reality of the baby boomers' generation is very different. They tend to be healthier, wealthier, and much more "mobile" than the previous generations, and all these aspects need to be considered when planning urban transport strategies that recognise the need for a multidisciplinary approach, interacting with other urban policies and projects on health, land use, infrastructure, technology.

The studies focusing on older adults' mobility mainly belong to health, economic and social sciences, and general sciences, with a prevalence of the first branch of discipline (Pantelaki, Maggi, & Crotti, 2020). Pantelaki et al. (2020) investigated how mobility can favour a healthy, independent, and socially connected living (three key dimensions of the EU Active Ageing Index), thus increasing older adults' well-being, through a multidisciplinary systematic review and found that well preserved mobility could improve ageing life satisfaction.

Mobility captures the ability of movement between different places (Morris, Dumble, & Wigan, 1979); it is a key ingredient in achieving goals associated with the WHO 'Global Age-Friendly Cities' project, such as social participation, social inclusion, (accessing) community support and health services, (making use of) outdoor spaces and buildings and (allocating) housing, aside from the obvious attention to transportation (van Hoven & Meijering, 2019). All these dimensions together are meant to enable older adults to 'age-in-place' (Cass, Shove, & Urry, 2005; Fitt, Curl, Dionisio, Ahuriri-Driscoll, & Pawson, 2019; Stanley et al., 2010; Stanley, Hensher, Stanley, & Vella-Broderick, 2011).

Denied mobility has an impact on access to key places and activities that represent participation. Increasingly, it is not just mobility, which is seen as an enabling factor, but the 'accessibility' of the locations, services, and facilities that people may need to reach to avoid exclusion (Akhavan & Vecchio, 2018; Shergold & Parkhurst, 2012). Accessibility can be defined as the ease with which people can reach destinations for different purposes (Metz, 2000) and, according to some authors, mobility is inextricably linked to the physical and emotional quality of life and general wellbeing (Metz, 2000; Nordbakke, 2013; Nordbakke & Schwanen, 2014; Preston & Rajé, 2007; Ryan, Wrestrand, & Schmidt,

[1] The project '*MOBILAGE: Mobility and Ageing: Daily Life and Welfare Supportive Networks at the Neighborhood Level*' is financed by Fondazione Cariplo (grant n.2017-0942, www.mobilage.unina.it). Three universities are involved: DAStU-Politecnico di Milano (Leader), University of Groningen (NL) and the Università Federico II di Napoli (IT). Claudia Burlando (Università degli Studi di Genova, IT) and Stefano Landi (Università Cà Foscari di Venezia, IT) have also collaborated on the project.

2015). In addition, higher levels of mobility mean participation in social and physical activities and are normally associated with greater life satisfaction (Banister & Bowling, 2004), and healthy ageing (McPhee, Downey, & Stough, 2019). Accessibility is defined as the amount of potential opportunities for interaction (Hansen, 1959) and focuses on the importance of reaching desired destinations, such as shopping, school, or work. Accessibility is frequently used in recent years as a social indicator to establish how different social groups can or not gain access to opportunities (Arellana, Oviedo, Guzman, & Alvarez, 2020; Foth, Manaugh, & El-Geneidy, 2013).

Poor accessibility and mobility may cause social exclusion, that is a process in which a person or group cannot participate effectively in mainstream society. The process of social exclusion restricts socioeconomic participation, which ultimately affects the health, life quality, cohesion, and equity of the ageing society (Al-Rashid et al., 2021). According to Lucas (2012), the concept of social exclusion emphasises the interactions between a series of factors. First, age, disability, gender, and race; secondly, factors which lie with the structure of the local area, such as a lack of available or inadequate LPT services and lastly, factors that lie with the national and/or global economy. The improvement of the public transport system is a key element of any strategy to tackle transport based social exclusion (Church, Frost, & Sullivan, 2000). Aguiar and Macario (2017) claim that people who experience a less satisfactory ageing process are those disconnected to society. Thus, the need for social interaction continues in later life and is a pre-requisite for active ageing (Alidoust, Bosman, & Holden, 2019; Alsnih & Hensher, 2003) that needs to be taken into consideration while providing urban mobility options for the elderly.

Although driving for old people means maintaining independence (Mariotti et al., 2018; Rosenbloom, 2009), the richness in urban mobility options reduces the dependency on the car in a phase of life when physical or emotional problems (sight, hearing, perceptions of safety, security, and comfort) are likely to make car use complicated, especially in some areas/times (congestion) and in some conditions (darkness, rain, etc.) (Burlando & Cusano, 2018; Orru, Poom, & Nordlund, 2019). The existence of practical alternatives to car use for old people must necessarily show that what may be viable for a younger person, e.g., rapid but uncomfortable LPT or complex technology, may not be appropriate for older citizens (Mifsud, Attard, & Ison, 2017). Physical changes and psychological conditions will affect the driving skills of old people and, according to Aguiar and Macario (2017), in countries where mobility is strongly related to vehicle ownership there is a prejudicial effect of ageing and mobility (Wasfi, Levinson, & El-Geneidy, 2012).

Van Hoven and Meijering (2019) explore how older adults, living in a suburban neighborhood in the Northern Netherlands, experience their 'mundane mobilities', and find that it is inextricably linked to the physical, social, and affective context of the neighborhood. Older adults can remain strongly attached, self-sufficient and confident because of their interaction with the neighborhood through routine and everyday mobilities, thus experiencing "ageing in place". In the 1970s, Rowles (1978, 1983) demonstrated how meanings of place result from the routine practices older adults conduct in everyday life. "These routines have physical, social and autobiographical dimensions, which provide people with a sense of 'insideness' in a place" (Van Hoven & Meijering, 2019, p. 2). Ageing in place is a policy goal focused on supporting people to live in their own home or community for as long as possible as an alternative to institutional care (Fitt et al., 2019). In the Netherlands ageing in place has been embraced by the Integrated Service Area (ISA) urban policy, which promotes the location of many facilities (shops, healthcare, recreational facilities) within a 500 m radius (Jansen, Pijpers, & De Kam, 2018).

Scant is the empirical literature about the mobility of older adults in Italy. At least to our knowledge, two analyses has been carried out at country level (Crotti et al., 2020; ISFORT, 2016), and two about Milan (Akhavan, Mariotti, & Pinto, 2020; Mariotti et al., 2018).

The Istituto Superiore di Formazione e Ricerca per i Trasporti (ISFORT) (2016) in its annual report AUDIMOB (Osservatorio su stili e comportamenti di mobilità degli Italiani) developed a study on old people mobility in Italy in 2015 by age classes (60–69 and 70–80 years) and travel behaviour. This study has shown: a decreased mobility by senior citizens over the total population, an increase of the use of private car since 2007, a reduction of the use of Local Public Transport (LPT), bike and foot. Furthermore, they found a greater willingness to change the modal choice for people aged 60–69 than for those aged 70–80. Crotti et al. (2020), using the "Italian citizens' daily life" survey by the National Institute of Statistics (ISTAT), explored the relationship between health dimensions of the sub-sample of people aged over 60 years in Italy and their use of LPT, considered as a more active and sustainable means with respect to car use. Considering the overall trips of Italians, the share of trips undertaken by old people is 24.1% for cycling, 20.6% for walking, 16.5% by car, 14.5% by LPT and 10.9% by motorcycle. By applying a recursive mixed-process approach, they found that taking LPT or driving cars more frequently is associated with higher levels of psychological and self-perceived health. Moreover, the use of LPT at least once a week is linked to better physical health especially for people over 65 years old.

A focus on Milan was developed by Mariotti et al. (2018), who carried out in 2017 in depth interviews using a sample of 129 active older adults to see how they perceived their neighborhood in terms of mobility. The authors found that respondents move at least twice a day outside and prefer walking (35.4%), mainly for daily duties, visiting friends and relatives living nearby, LPT (30.8%), private car (22.8%) and bike (11%). Most respondents prefer to age in place and feel happy in their current environment. Among the LPT, they declared to prefer buses than the underground because the stops are closer to each other, and the underground elevators do not always operate.

Akhavan, Mariotti, and Pinto (2020) explored the old people's mobility needs and how they perceived "ageing in place" through a survey to a representative sample in 2019 in Milan. They find that 'walking' is their preferred mode and older adults are overall satisfied to live in their neighborhood, thus underlying the importance of "ageing in place". About 72% declared to interact with relatives, friends or people living in their neighborhood, on average, more than once a day. Furthermore, the respondents state that they mainly meet at home and in community spaces (associations, library, clubs, etc.), open public spaces, bars or through online interactions. This study underlines the key role of intergenerational interactions, which in Italy are higher than in other European countries (Akhavan, Mariotti, & Rossi, 2020): about 20% of people aged 30–49 co-habit with a parent, and grandparents represent a precious resource for families, especially with two full-time working parents, in managing their school-age children (Mossong, Hens, Jit, et al., 2008). Moreover, while Germans record the lowest number of daily contacts (average value: 7.95), Italians represent the largest (average value: 19.77) (Mossong et al., 2008).

3. Research methodology

3.1. Sample

Italy[2] is the "oldest" country in the European Union (closely followed by Germany) and Genoa is Italy's "oldest" metropolitan area (583,601 inhabitants), densely populated (2395.7 inhabitants/square Km) and located in the north west of the country. Genoa is characterised by one of the most critical trends in Europe: 27.6% of the population is over 65, an age dependency ratio that exceeds 250% and an average age of over 48 years (ISTAT, 2019). The case of Genoa has been compared to the case of Milan (Table 1), which is a large metropolitan city (1,352,000 inhabitants), economic and financial centre of the country, located in the north west, and densely populated (2063 inhabitants/square Km) (Fig. A1 in Appendix). In Milan, the share of older people is about 23%; unlike Genoa, which is hilly, Milan is flat, and it is characterised by a

[2] Italy has an average life of around 85 years for women and 81 years for men (Istat, 2019).

more efficient LPT. The density (km/square km) of the metro lines in Milan in 2015 is 39.9, in Genoa is 3; Milan records 74 metro wagons per 100,000 inhabitants, while Genoa only 3 (ISTAT data).

A survey has been carried out through face-to-face interviews using a representative sample of older adults (207 for Milan and 204 for Genoa), which was selected based on gender and age groups (65–69 years, 70–74 and 75+). The survey focused on three specific neighborhoods for each city, which were selected according to their peripheral location, within the cities, age concentration and socio-economic status (lower income). Specifically, these neighborhoods showed a higher concentration of senior residents than the city's average[3] (Location Quotient >1),[4] and a medium-low income (Landi, Ivaldi, & Testi, 2018 for Genoa, and Mariotti et al., 2018 and Akhavan, Mariotti, & Pinto, 2020 for Milan). The neighborhoods are the following: Niguarda, Gratosoglio, and Gallaratese in Milan, and III, V and VII districts (Ponente, Val Polcevera and Val Bisagno) in Genoa.

The interviews, which were carried out both indoors (clubs for seniors, commercial centres, sports centres, etc.) and outdoors (parks, LPT stops, etc.), were addressed to "active" seniors, i.e., those who, alone or accompanied by others, can go outside, even with the help of mobility aids such as wheelchairs or walking sticks.[5]

3.2. Model description

To investigate the motivations explaining why old people did not take trips and perform activities because of the perceived LPT inadequacy, multivariate logistic regression models were run. They include the effects of individual factors as, for example, age, gender, health status, education, the satisfaction about the neighborhood they live in ("ageing in place") and the judgement about LPT services. For the empirical test, the following model is proposed:

$$\text{Logit}(\text{ActivityRenounce}LPT_i) = \beta_0 + \vec{\beta}_1 \text{DEM}_i + \vec{\beta}_2 \text{Health}_i + \vec{\beta}_3 \text{MOB}_i + \vec{\beta}_4 \text{LptSAT}_i + \vec{\beta}_5 \text{NeighSAT}_i + \delta \text{CITY}_i + \varepsilon_{it} \quad (1)$$

Where *ActivityRenounceLPT*$_{ij}$ is the dependent binary variable indicating the share of individuals that were unable to take trips and activities because of perceived inadequacy of the LPT service (question: "*Did you not perform an important activity -leisure activities, family or work – because of LPT inadequacy in the last 12 months?*").

The explanatory variables are: (i) *DEM* is a vector of demographic variable (Age, Gender, Education); (ii) *Health* is a vector of health conditions (perceived health status, living alone, assisted for travel); (iii) MOB is a vector of control factors proxying the individuals' mobility; (iv) LptSAT indicates the perceived satisfaction for the LPT services; (v) NeighSAT is a vector of variables measuring various domains referring to the satisfaction for different characteristics of the neighborhood they live in; (vi) CITY is the dummy variable that identifies the town of residence; and Ɛ is an error term.

Specifically, education was measured as a dummy variable with a score equal to 1 for individuals with at least a high school diploma or more (*HighEducation)* and 0 for lower education level. Health characteristics were represented by three variables: perceived health status, living alone, assisted for travel, where the first is evaluated as a 4-point scale (from 1, bad, to 4, very good). The other two were measured as the presence / absence of the condition (0–1). The controls for mobility habits were the presence/absence of a driving license or LPT season ticket. The first helps to avoid bias for people that did not perform their activity because they can use their own car, thus bypassing the problem of LPT inadequacy. The second, LPT season ticket, controls whether season ticket holders are prepared not to use public transport. LptSAT, satisfaction for LPT services, is depicted as the sum of the following six domains related to LPT perceptions: (i) comfort inside the vehicles; (ii) information at the stop and inside the vehicle; (iii) waiting time; (iv) LPT ticket cost; (v) security at the stop and inside the vehicle; (vi) punctuality. The reliability test was satisfactory for LptSAT scale with Cronbach's alpha values above 0.82 (composite reliability = 0.83 and average variance extracted = 0.46). After running the model as described (1), we tested the same model with all the six domains composing LptSAT, investigating which dimensions most influence giving up the activity. Then, NeighSAT, which refers to the perceived satisfaction for five domains of the neighborhood, and can proxy "ageing in place", was added to the model. The 5 domains were (i) social aggregation centres; (ii) green areas; (iii) commercial activities; (iv) LPT proximity; (v) perceived neighborhood security.[6]

4. Results

Descriptive statistics are presented in Table 2, together with the univariate analysis of each explanatory variable with the depended variable (ActivityRenounceLPT). Univariate analysis provides some interesting insights on the sample's characteristics. Several variables, as expected from the literature, are associated with people answering about being able or unable to take trips and activities. For example, respondents with poorer health status showed positive association with giving up their activities ($p < 0.001$) as well as individuals assisted for movements ($p < 0.001$) (Table 2). On the other hand, univariate analysis did not show any relationship among gender, age, living alone and being unable to take trips and perform activities. More people without a driving license stop taking trips or carrying out activities than those with one, probably because the latter have the possibility to carry out the activities using their car ($p < 0.05$). In addition, LPT season ticket holders are less likely to stop social activities also here probably being more frequent users, they had made a default choice for mobility (Schlag & Teubel, 1997) and are thus more accustomed to LPT inefficiency ($p < 0.001$). Moreover, individuals not giving up their activities are more satisfied of LPT service and their neighborhood. Interviewees that do not give up trips and activities do not complain about LPT ticket cost (Burlando, Ivaldi, & Musso, 2016) and security issues, while punctuality and waiting times remain equally important for both groups.

As concerns the sub-domains of neighborhood satisfaction, social aggregation centres, and green areas, these are evaluated positively by people not giving up making trips or carrying out activities. Similarly, LPT proximity is positively associated with not giving up, whilst the presence of commercial activities and perceived security are not significant.

Table 3 shows the descriptive statistics of the two cities to identify differences and similarities. The two samples emerge as statistically similar for all demographic variables (age, gender, education), for old people living alone, and presence/absence of a driving license. On the other hand, Genoa's interviewees stated to have poorer health, and show a higher propensity to be assisted for movements, probably also because of the city's orography which makes walking difficult in some cases (i.e., steep hill). As concerns neighborhood satisfaction, Milan's interviewees are slightly more satisfied. In both cities the perception of safety is poor, mainly due to the poor maintenance of pedestrian crossings, traffic light synchronization that does not take into account the time the elderly need to cross, scarce public lighting, and pavements with differences in

[3] An exception for the city of Genoa is given by the Val Polcevera neighborhood, which was selected as third peripheral case study. Other neighborhoods with a LQ >1 are high-income, thus were not selected.

[4] Location Quotient = (n. over 65_neighborhood/tot. Population neighborhood)/(n. over 65_Milan (or Genoa)/n. tot. Population_Milan (or Genoa)).

[5] The "active" category includes "active individuals" and "assisted individuals", while it does not include "not motivated individuals", and "immobile individuals" (Akhavan, Mariotti, & Pinto, 2020).

[6] All domains were measured on 4-point scale from 1 "not at all satisfied" to 4 "very satisfied".

Table 1
Main features of the cities of Milan and Genoa and selected neighborhoods.

Municipality	Milan			Genoa		
Neighborhoods	Gratosoglio	Gallaratese	Niguarda	Ponente	Val Polcevera	Val Bisagno
Population	18,728	32,133	36,561	58,826	60,504	73,980
Density (pop/Km2)	5653	8251	8600	763	1833	9364
Over 65 (%)	30%	35%	28%	28%	25%	29%
LQ	1.32	1.52	1.21	1.03	0.94	1.05
Bus,tram, metro stops /Km2	12.1	24.4	29.8	9.22	19.2	20.9

Source: authors' elaboration of ISTAT data (2019).

Table 2
Descriptive statistics and univariate analysis.

Variable		Mean (SD)/Quota	Min - Max	Association with Activity Renounce			
				% of cases LPT renounce	Yes	No	Chi squared and F-test
ActivityRenounceLPT	Yes	0.43		1			
	No	0.57		0			
Gender	Male	0.37		0.44			0.262
	Female	0.63		0.41			
Age		76.6 (6.5)	65–97		75.7	76.3	0.885
City	Milan	0.49		0.21			130.6***
	Genoa	0.51		0.75			
Assisted for movements	Yes	0.19		0.823			62.2***
	No	0.81		0.334			
Living Alone	Yes	0.37		0.444			0.234
	No	0.63		0.419			
Health Status		2.83 (0.83)	1–4		2.63	2.98	12.6***
Education	High	0.39		0.412			0.686
	Low	0.61		0.453			
Satisfaction of Neighborhood characteristics							
Social Aggregation Centers		2.99 (0.87)	1–4		2.73	3.18	27.91***
Green areas presence		3.03 (0.88)	1–4		2.78	3.37	49.18***
Commercial activities presence		3.1 (0.84)	1–4		3.15	3.06	1.09
LPT proximity		3.43 (0.74)	1–4		3.29	3.53	10.455***
Neighbour safety		2.7 (0.82)	1–4		2.70	2.86	2.771
Driving license	Yes	0.54		0.372			6.5*
	No	0.46		0.495			
LPT season ticket	Yes	0.39		0.321			12.5***
	No	0.61		0.498			
Opinions on LPT service		15.5 (3.77)	9–24		14.45	16.28	11.6***
	Comfort	2.24 (0.70)	1–4		2.13	2.33	8.76**
	Information	2.55 (0.82)	1–4		2.42	2.65	7.90**
	Waiting times	2.31 (0.83)	1–4		2.24	2.37	2.36
	Cost	2.51 (0.89)	1–4		2.32	2.62	10.96***
	Safety	2.37 (0.91)	1–4		2.30	2.58	9.60**
	Punctuality	2.42 (0.86	1–4		2.38	2.45	0.59

* $p < 0.05$;
** $p < 0.01$;
*** $p < 0.001$.

height or occupied by cars parked irregularly (Akhavan, Mariotti, & Pinto, 2020; Mariotti et al., 2018).

The analysis of the peripheral neighborhoods underlines differences in the two cities: Genoa hosts a higher number of commercial activities, mainly neighborhood shops, than Milan, and here older people stated to be more satisfied about the presence of these activities. Furthermore, respondents in Genoa show a higher level of satisfaction with LPT proximity than those in Milan, who, conversely, are more satisfied about social aggregation centers and green areas.

The zero-order correlation matrix of the variables is presented in Table A1 in Appendix, which shows that there is no significant correlation between the main explanatory variables. On the other hand, a significant correlation concerns, as expected, the dependent variable with LPT satisfactions.

The results of multivariate logistic regression models are presented in Table 4. All models show statistically wide differences between the two cities, with people living in Milan being less likely of giving up trips and activities, probably because of the higher capillarity of mobility services and orography compared to Genoa, which is hilly and has a less efficient LPT. The results indicate, as expected, that individuals with better health conditions are more willing to take trips and activities, while those assisted for movements show a higher probability of giving up socially related activities (Pena Cepeda et al., 2018; Rosso, Taylor, Tabb, & Michael, 2013). Interestingly, in all three regressions, age does not

Table 3
Descriptive statistics and univariate analysis by city.

Variable		Mean (SD)/Quota	Min - Max	Genoa	Milan	Chi squared and F-test
Gender	Male	0.37		0.42	0.33	2.627
	Female	0.63		0.58	0.67	
Age		76.6 (6.5)	65–97	75.9 (7.0)	76.9 (5.9)	0.138
City	Milan	0.49				
	Genoa	0.51				
Assisted for movements	Yes	0.17		0.32	0.07	43.3***
	No	0.83		0.68	0.93	
Living Alone	Yes	0.37		0.33	0.40	2.09
	No	0.63		0.67	0.60	
Health Status		2.83 (0.83)	1–4	2.7 (0.87)	2.9 (0.76)	11.1**
Education		2.24 (0.93)	1–4	2.24 (1.01)	2.24(0.83)	0.01
Satisfaction of Neighborhood characteristics						
Social Aggregation Centers		2.99 (0.87)	1–4	2.75 (0.88)	3.23 (0.80)	33.71***
Green areas presence		3.03 (0.88)	1–4	2.73 (0.70)	2.87 (0.91)	96.50***
Commercial activities presence		3.1 (0.84)	1–4	3.32 (0.82)	2.87 (0.91)	32.04***
LPT proximity		3.43 (0.74)	1–4	3.27 (0.82)	3.58 (0.63)	18.82***
Neighbour safety		2.7 (0.82)	1–4	2.95 (0.86)	2.63 (0.94)	12.60***
Driving license	Yes	0.54		0.53	0.56	0.43
	No	0.46		0.47	0.44	
LPT season ticket	Yes	0.39		0.19	0.60	73.91***
	No	0.61		0.82	0.40	
Opinions on LPT service		15.5 (3.77)	9–24	15.1 (5.03)	15.9 (5.8)	1.87
	Comfort	2.24 (0.70)	1–4	2.19 (0.67)	2.29 (0.72)	2.05
	Information	2.55 (0.82)	1–4	2.46 (0.73)	2.64 (0.92)	4.71*
	Waiting times	2.31 (0.83)	1–4	2.26 (0.78)	2.37 (0.91)	1.85
	Cost	2.51 (0.89)	1–4	2.40 (0.78)	2.57 (0.95)	3.55*
	Safety	2.37 (0.91)	1–4	2.52 (0.87)	2.40 (0.94)	1.65
	Punctuality	2.42 (0.86)	1–4	2.46 (0.84)	2.37 (0.89)	1.15

*p > 0.05;**p > 0.01;***p > 0.001.

significantly influence the dependent variable. This could mean that age is less important than health status. Living alone is not significant, showing that it may not be a proxy of the level of activity/mobility or health status of an individual. Unlike univariate analysis, where a driving license or an LPT season ticket showed a negative association with giving up activity, in the regression analysis they are not statistically significant.

Conditionally on age, gender, education, health status and other control variables, people having a positive perception about LPT service show lower possibilities of giving up their activities. Conversely, other control variables such as living alone, education, driving license and the LPT season ticket are not statistically significant.

Model 2 tests which LPT's features played a major role in giving up making journeys and carrying out activities. The perception of a low safety level negatively affects travel via LPT (odds ratio = 0.563***), and this is common to all the neighborhoods in the two cities. No other sub-domains appear to influence the probability of giving trips and activities, nor LPT ticket cost, nor waiting time or punctuality.

In Model 3, the role of several characteristics related to the perceived satisfaction of the neighborhood are tested (Table 4). Three dimensions are statistically significant: perceived neighborhood safety, LPT proximity and the presence of commercial activities. Individuals perceiving LPT proximity, higher safety and exploiting the commercial activities situated in their neighborhood show lower odds to state they have given up their activities. This model has the best goodness of fit (R-quadrato di Nagelkerke = 0.548). In model 3, the opinions on LPT service are still significant negatively related to giving up trips and activities, but with lower odds (0.899 vs 0.911) and lower p values ($p < 0.004$ vs $p < 0.018$). These results may indicate the importance that old people assign to the neighborhood's characteristics, which allow them to spend time and move within the neighborhood. According to model 3, satisfaction for the presence of determinate characteristics in the neighborhood plays a key role in not giving up activities, underlining, even more, the importance of "ageing in place". Moreover, the importance of perceived safety both for LPT and neighborhood is corroborated by the econometric analysis.

5. Discussion and conclusions

Quality of life and wellbeing in older age are related to mobility (Metz, 2000; Banister & Bowling, 2004; Mollenkopf et al., 2005; Nordbakke & Schwanen, 2014), and mobility is fundamental to active ageing and is closely linked to health status and quality of life as it is related to the ability to exercise, remain socially connected, be autonomous and independent (Webber, Porter, & Menec, 2010).

The results of the survey in Milan and Genoa underlined that several determinants explain why older adults give up moving and carrying out activities because of the perceived inadequacy of LPT systems. Conditional on age and gender, and other control factors, the main significant variables are those related to health status, neighborhood and LPT satisfaction. Moreover, the perceived quality of LPT service affects the probability of giving up making trips and carrying out activities: the higher the satisfaction, the lower the probability of giving up. Interestingly, even when including all the control factors, also a higher satisfaction for the neighborhoods where the interviewees live reduce the likelihood of giving up taking trips and performing activities.

These results confirm the importance that the perception about high quality LPT service and high quality of life, experienced in the neighborhood, plays in reducing the probability of old people giving up their usual activities, and consequently improving their life satisfaction. Our

Table 4
Logistic regression results.

	OR [95% CI]		
	Model 1	Model 2	Model 3
Age	0.964 [0.925–1.004]	0.975 [0.935–1.017]	0.981 [0.939–1.025]
Male	1.348 [0.745–2.441]	1.486 [0.804–2.749]	1.413 [0.753–2.653]
Health Status	0.691 [0.497–0.960]*	0.691 [0.493–0.969]**	0.695 [0.494–0.977]*
Assisted for movements	2.781 [1.4315–5.882]**	2.430 [1.108–5.329]**	2.624 [1.184–5.813]*
Living Alone	1.435 [0.808–2.549]	1.491 [0.832–2.671]	1.476 [0.814–2.676]
Education	1.075 [0.801–1.444]	1.139 [0.650–1.998]	1.193 [0.870–1.638]
Social Aggregation Centers			0.857 [0.591–1.244]
Green areas presence			0.804 [0.566–1.141]
Commercial activities presence			0.589 [0.394–0.882]**
LPT proximity			1.657 [1.093–2.511]*
Neighbour security			0.484 [0.336–0.698]***
Driving license	1.338 [0.715–2.502]	1.421 [0.740–2.726]	1.405 [0.718–2.751]
LPT season ticket	1.733 [0.918–3.274]	1.797 [0.929–3.476]	1.688 [0.861–3.309]
MILANO	0.078 [0.041–0.166]***	0.051 [0.025–0.102]***	0.056 [0.027–0.113]***
Opinions on LPT service	0.899 [0.837–0.966]**		0.911 [0.877–0.976]**
Comfort		1.045 [0.621–1.758]	
Information		1.044 [0.687–1.588]	
Waiting times		1.375 [0.823–2.285]	
Cost		0.757 [0.542–1.057]	
Safety		0.563 [0.400–0.806]**	
Punctuality		0.812 [0.508–1.298]	
R-quadrato di Nagelkerke	0.473	0.501	0.528

* $p < 0.05$;
** $p < 0.01$;
*** $p < 0.001$.

findings, therefore, support and extend the hypothesis of the increasing importance for senior citizens of ageing in place (Fitt et al., 2019; Golant, 1984; Schwanen, Dieleman, & Dijst, 2001). Indeed, regardless of the real LPT suitability, living in a neighborhood with commercial and social activities, well-maintained sidewalks, good quality of public spaces, and where the perception of security is good, reduces the need to travel and enables older adults to remain independent for as long as possible. The neighborhood also represents an important "place" where older adults can meet friends and relatives.

A neighborhood with these characteristics has been proposed by the Dutch "Integrated Service Area (ISA)" policy (Jansen et al., 2018), and many cities are trying to pursue policy directions along these lines, under headings such as New Urbanism, Smart Cities, 20-min neighborhoods, etc. This represents a desirable direction for integrated land use transport planning, which also offers a feasible solution to face the Covid-19 pandemic, where older adults have been forced to change their way of life, and will have to further adapt their habits, reducing physical interactions. During the Covid-19 pandemic, the active lifestyle described in Section 2 has been no longer practicable (Banister, 2014): old people's mobility and sociality need to be redesigned, on one side, guaranteeing more social distancing, whilst on the other, preventing social isolation and loneliness (Brooks et al., 2020; De Vos, 2020). As a result, walking and cycling, recreational or utilitarian, can be important ways to maintain satisfactory levels of health and well-being. Policy-makers and planners should consequently try to encourage active travel, while public transport operators should focus on creating ways to safely use public transport (De Vos, 2020). Within this framework, cities in Europe (e.g., Berlin, Vienna. Milan), North America (e.g., Philadelphia, Vancouver), and Latin America (e.g., Bogota, Mexico City) have already decided to temporarily turn car lanes into sidewalks and bike lanes (Laker, 2020). Additionally, restricting cars from certain local streets, placing additional (pop-up) cycling parking, and reducing waiting time for pedestrians to crossroads might be easy, cheap, and fast ways to stimulate active travel (De Vos, 2020). Similarly, the municipality of Milan has proposed in its "*Milano 2020 Strategia di adattamento*" (Milan 2020 adaptation strategy[7]) that the local, basic services be located within a 15-min walking distance, to reduce travelling by car. In fact, since public vehicles cannot overcome 25–30% of their capacity to guarantee social distancing, people might increasingly opt to use the private car, especially older adults that feel more fragile. This trend needs to be tackled to avoid a step back from the sustainable mobility policies developed up to now, and to cope with social exclusion (i.e., older age and lower income), which will be intensified by private mobility. Social distancing could also be guaranteed at the bus stop, specific controls could ensure the use of the prevention apparatus, along with real time communication of saturation levels inside the vehicles as well as at the LPT stop.

The paper presents some limitations mainly related to the sample of analysis which concerns six neighborhoods in the cities of Milan and Genoa, selected according to the peripheral location within the city, the high concentration of old people and the medium -low income. A broader study might emphasize similarities and differences among the neighborhoods differing from location, socio-economic conditions, and share of old people. Moreover, further empirical research might explore whether and how well-preserved mobility might improve ageing life satisfaction through three key dimensions of the EU Active Ageing Index: health conditions, independence, and social connectedness (see Pantelaki et al., 2020).

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[7] https://www.comune.milano.it/documents/20126/95930101/Milano+2020.++Strategia+di+adattamento.pdf/c96c1297-f8ad-5482-859c-90de1d2b76cb?t=1587723749501

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Appendix A. Appendix

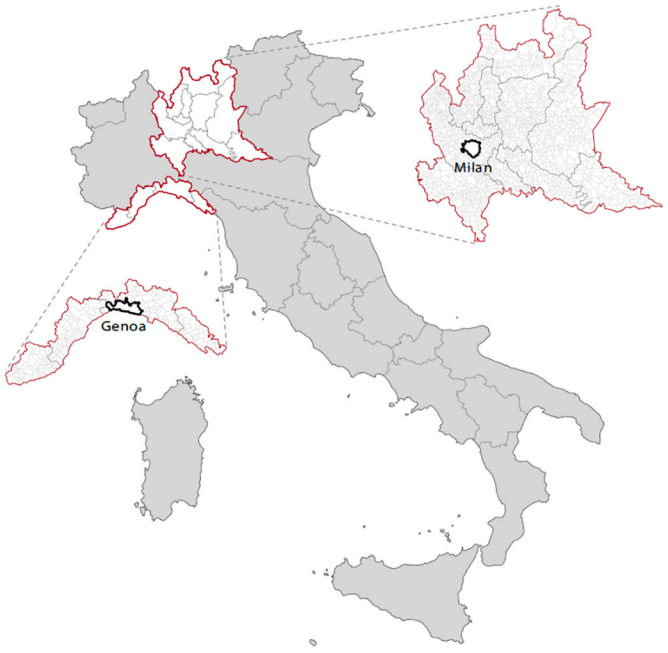

Fig. A1. The location of Milan and Genoa.

Table A1
Zero-order correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Age	1														
Health Status	−0.14**	1													
Education	−0.25**	0.06	1												
Opinions on LPT service	0.09	−0.04	−0.02	1											
Social Aggregation Centers	0.04	0.11*	−0.12*	0.02	1										
Green areas presence	0.05	0.01	−0.01	0.13*	0.29**	1									
Commercial activities presence	−0.02	0.36	−0.12*	0.03	0.18**	−0.17*	1								
LPT proximity	0.02	0.09	0.11	0.08	0.31**	0.20	0.19	1							
Perceived neighbour security	0.05	−0.09	0.15*	0.06	0.04	0.14*	0.17**	0.18**	1						
Comfort	0.04	0.03	−0.06	0.85**	0.06	0.13*	−0.09	0.03	0.02	1					
Information	−0.05	−0.02	0.02	0.81**	0.15**	0.15*	0.09	0.05	−0.02	0.57	1				
Waiting times	0.07	−0.09	−0.06	0.75**	0.02	0.06	0.07	−0.02	0.02	0.50**	0.53**	1			
Cost	0.06	−0.08	0.04	0.54**	0.03	0.05	0.04	0.15*	0.11*	0.37**	0.28**	0.31**	1		
Security	0.13*	0.01	0.03	0.67**	−0.39	0.05	−0.06	0.12*	0.18*	0.47**	0.48**	0.37**	0.35**	1	
Punctuality	0.15*	−0.12*	−0.05	0.71**	−0.04	0.18*	−0.11*	0.05	0.06	0.45**	0.50**	0.76**	0.27**	0.40**	1

1Pearson correlation coefficient. t-statistics in parentheses based on robust standard errors.
* $p < 0.05$;
** $p < 0.01$;

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