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Intra-urban spatial inequalities: neighborhood change and residential mobility dynamics in Turin (1971-2011)

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Chapter 1

Introduction

Cities are places where population groups characterised by high level of diversity live. The non-random distribution of individuals within cities reflects, and to some extent reinforces, their social distance and stratification, creating a complex mosaic of distinctive residential areas.

The spatial configuration of the city environment has been a central issue in the urban sociology since the traditional studies of the Chicago school scholars in the 1920's. The study of "who gets what where" (Lobao et al. 2007) enhances the more general interest for social inequalities which is at the core of sociological investigation, by focusing on its spatial dimension. Research has indeed acknowledged the importance of geography and place, and there is now a widespread consensus in the literature about the statement that where you live matters in addition to who you are (cf. Van Ham et al. 2012).

In this regard, neighborhoods represent the scale at which the intra-urban structure of social inequalities arises. Over the last decades, a vast body of literature has been written on neighborhood effects. It claims, despite being not conclusive, that the amount of opportunities and resources which each neighborhood offers to its residents affects a variety of individual outcomes, additionally to individual characteristics (cf. for a review e.g. Ellen & Turner 1997, Van Ham et al. 2012). Compositional and contextual neighborhoods' attributes thus contribute to their stratification creating an urban "opportunity structure" (Galster & Killen 1995).

In the literature, however, the term "neighborhood" is used with very diverse connotations and there is not a widespread consensus on its definition (cf. Tosi 2001). I would nevertheless argue that the conceptualisation provided by Galster (2001), who defines the neighborhood as a "bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses", is particularly effective in order to investigate cities socio-spatial structure, because of its inclusiveness in recognising the multidimensional nature of neighborhoods. It indeed emphasises the importance of a variety of local features including demographic and socio-economic and housing characteristics of inhabitants.

The urban socio-spatial organization, however, is not static but may change over time.

From a macro level point of view, it evolves as a result of the transformation of neighborhood population composition driven by processes of selective residential mobility, in situ and demographic changes (Bailey 2012). From a micro level point of view, individuals and household may experience discontinuity in neighborhood characteristics not only because the area where they live changes over time, but also as a consequence of their residential movements in and out of different neighborhood types.

In the broader literature on residential sorting, these two dynamics producing neighborhood inequalities, namely neighborhood change and residential mobility, have been almost exclusively analysed separately by two different strains of investigation (Brazil & Clark 2018). The former date back to the traditional ecological approach proposed by sociologist belonging to the Chicago school and has developed mainly focusing on decline, while processes of ascent have been addressed only starting from the 1960's by studies interested in gentrification processes. However, the majority of empirical studies have focused either on exceptional and specific cases of neighborhood decline or ascent or, when accounting in a systematic way for neighborhood change dynamics, have considered one single attribute (e.g. income or poverty level, ethnicity, housing values) or transformations between two points in time (Delmelle 2015). Differently, in order to investigate the "bundle of spatially based attributes associated with clusters of residences" (Galster 2001) which constituting the neighborhood, there is need to account simultaneously for a variety of local features including notably demographic, socio-economic and housing characteristics of residents. In this respect, there is therefore still a lack of knowledge about long-term longitudinal neighborhood transformations considered from a multidimensional perspective.

The latter strain, referring to residential mobility, has generated a broad and comprehensive knowledge on the reasons why individuals and households move and more generally on residential behaviour. Nevertheless, scarce attention has been devoted to the consequences of residential movements in terms of location outcomes, i.e. concerning neighborhood destination (Clark et al. 2014). Studies which have tackled this issue have indeed mainly addressed residential movements in and out of deprived areas, neglecting the diversity of neighborhoods belonging to the catchall "non-poor" category (Brazil & Clark 2018).

It has to be acknowledged that mentioned literature gaps are also due to methodological difficulties as well as to the scarcity of complex long-term consistent georeferenced data required to answer these kinds of research questions (Zwiers et al. 2016). However, recently, some authors have started to look at processes of neighborhood change with a long-term perspective: starting from typologies accounting for multidimensional characteristics, they analyse neighborhood transitions and adopt the concept of "neighborhood trajectory" to explore a broader range of long-term pathways of change (Wei & Knox 2014, Delmelle 2015, 2016, 2017, Foote & Walter 2016, Ling & Delmelle 2017, Zwiers et al. 2016, 2018, Foote 2017). Similarly, also intra-urban residential movements across the entire neighborhood spectrum have begun to be investigated more extensively, with the aim to understand to what extent structural residential mobility flows act to link similar or rather dissimilar neighborhood types, thus contributing in different ways to the reproduction of spatial inequalities (Bailey & Livingston 2007, 2008, Sampson & Sharkey 2008).

This dissertation aims to bring together these two streams, and to contribute to the literature on neighborhood inequality by providing a descriptive and explorative analysis of neighborhood change and residential mobility in an Italian city, accounting for the entire spectrum of residential areas rather than considering only those at the bottom or at the top of the urban hierarchy. Moreover, the focus on long-term dynamics contributes to enhance the understanding of these processes which very rarely have been studied with a comparable temporal perspective. Finally, in this work a very small spatial scale of analysis has been used (census block, "sezione di censimento") which allows to investigate neighborhood inequality in a very detailed manner and to reveal how cities are socially and spatially patterned as well as to what extent this structure tends to persist or evolve over time.

In doing so I will rely on recent methodological advances and I will apply them to investigate the city of Turin, located the north-western region of Piedmont. There is indeed a complete lack of empirical evidence on these phenomena referring to the Italian context and this is, as mentioned, also due to the scarcity of suitable data necessary to conduct these empirical investigations. However, a notable exception in this regard is represented by the "Turin Longitudinal Study" (TLS – "Studio Longitudinale Torinese") which is a system of longitudinal records resulting from the combination, through record-linkage procedures, of municipal registry, census and several healthcare databases including data for the entire resident population of Turin.

I will first develop a neighborhood typology accounting for the demographic, socio-economic and housing attributes of individuals and households inhabiting them. I will then investigate to what extent and in which ways Turin neighborhoods have evolved over the forty years between 1971 and 2011, exploring their transitions and trajectories. Secondly, I will consider intra-urban residential movements to examine what are the individual and household characteristics which influence the propensity to move and neighborhood outcomes, i.e. the likelihood of moving "laterally" to neighborhood with similar profile to the one of departure, or rather "vertically" to areas characterised by more advantaged or disadvantaged neighborhood profile in terms of socio-economic compositional attributes. Specifically, the main research questions I will attempt to answer are:

Question 1a: What neighborhood types, according to a multidimensional perspective accounting for the demographic, socio-economic and housing characteristics of residents, can be identified in the city of Turin in the period between 1971 and 2011?

Question 1b: What is the spatial arrangement of the different neighborhood types?

Question 2a: To what extent and in which ways Turin neighborhoods have changed in terms of their demographic, socioeconomic, and housing characteristic from 1971 to 2011? More in detail, what have been the most common neighborhood transitions and trajectories?

Question 2b: What is the spatial arrangement of the most common neighborhood trajectories?

Question 3a: Which individual and household characteristics can be identified as predictors of intra-urban residential movements over time?

Questions 3b: Which individual and household characteristics can be identified as predictors of upward, downward or "lateral" movements in the urban neighborhood hierarchy over time?

Questions 3c: To what extent do residential mobility flows act to link different and/or similar neighborhood types?

1.1 Outline

This introduction is followed by Chapter 2 in which I discuss the theoretical and methodological frameworks that have guided this research. As mentioned, neighborhood change and residential mobility phenomena have been analysed by two distinct streams of literature, therefore I will first review contributions dealing with neighborhood change. In this regard, I will focus on the human ecological perspective and on studies on gentrification to scrutinize main theories of both neighborhood decline and ascent. I will then review studies which have developed and applied recent methodological advances to investigate neighborhood transitions and trajectories. Moreover, I will review theories about residential mobility, and particularly the life course perspective which has provided extensive knowledge of the determinants of residential relocations. I will succesively consider recent contributions on neighborhood outcomes of residential movements as well as on aggregate flows across the entire neighborhood hierarchy. Finally, I will review some Italian studies which, despite having a different methodological framework, have addressed the study of Turin city socio-spatial structure in order to give some preliminary insights on the case study on which this dissertation is based. To conclude I will illustrate the research questions which have guided this work.

Chapter 3 introduce the system of datasets used to conduct this research, the "Turin Longitudinal Study". For each of the two parts in which the empirical analysis is divided, the former accounting for processes of neighborhood change (Chapter 4) and the latter for individual residential mobility behaviours (Chapter 5), I will illustrate the unit of analysis, variables and methods used. Finally, I will briefly describe some relevant aspects of the

Turin city historical, economic, housing and demographic context which have influenced its socio-spatial structure, in order to provide a background for the analysis conducted in this dissertation.

Chapter 4 deals with the investigation of neighborhood change in Turin between 1971 and 2011. I will first develop the neighborhood typology which is at the base of this work, using a clustering analysis on 25 variables belonging to the three dimensions which in the literature have proven to have a role in the differentiation of residential areas: demographic, socio-economic and housing attributes of residents. I identified seven neighborhood types whose profile and spatial arrangement are successively described. I will then investigate how Turin neighborhoods have changed over time through the analysis of transitions and by adopting the concept of neighborhood trajectories through the use of sequence analysis techniques. Finally, results are mapped to allow the investigation of their spatial arrangement.

In Chapter 5, first, the occurrence of residential movements for Turin residents is considered, as well as their neighborhood survival rates, i.e. how large share of neighborhood inhabitants stays, thus “survive”, in the same neighborhood after a t amount of time. I will focus on the likelihood of moving with the purpose to identify what are the individual and household characteristics which mainly influence the propensity to relocate within the city boundaries. The next section will be devoted instead to the analysis of the determinants of “lateral” or “vertical” moves, i.e. to relocations between the same neighborhood type or rather to neighborhood with better or worse socio-economic attributes. Finally, I will account for the aggregate residential mobility flows considering the proportion of residents moving from a certain neighborhood to another, in order to assess to what extent relocations occur across the entire neighborhood hierarchy or mainly between similar neighborhood types.

To conclude, Chapter 6 discusses and summarizes the main findings in light of the theoretical and methodological framework presented in Chapter 2. Moreover, I will point out the substantial and methodological contributions of this research to the literature on residential sorting. Finally, I will outline some limitation of this work and propose some future research perspectives to further enhance the understanding of these phenomena.

Chapter 2

Theoretical and methodological issues

2.1 Neighborhood inequalities

By tackling the issue of "who gets what where" (Lobao et al. 2007), the study of spatial inequality enhances the more general interest for stratification which has been constantly at the core of sociological investigation. Research concerned with poverty, deprivation and disadvantage has acknowledged the importance of geography and place, and there is now a widespread consensus in the literature about the statement that where you live matters in addition to who you are (cf. Van Ham et al. 2012, 2013). Looking at cities, the heterogeneity of urban populations reflects in their socio-spatial stratification creating distinctive patterns of residential neighborhoods. The neighborhood represents indeed a scale at which urban social inequalities arise and may be reinforced.

There is not a univocal definition of neighborhood in the urban social sciences, most of them, however, involve two general components, i.e. the physical and the social (Schwirian 1983). Drawing on the literature of neighborhood change and residential mobility, and according to the aims of this research, I follow the conceptualisation provided by Galster (2001). He defines the neighborhood as a "bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses". This definition emphasises the importance of a variety of local features including demographic and socio-economic characteristics of inhabitants, physical attributes, environmental and infrastructural attributes, services, patterns of social interaction, institutions and also "sentimental characteristics", such as place identification (Galster 2001). It is indeed a definition particularly attractive because of its inclusiveness in recognising the multidimensional nature of neighborhoods.

These compositional and contextual features contribute to the stratification of neighborhoods by the amount of opportunities and resources, i.e. the "opportunity structure"(Galster & Killen 1995) that they offer to their residents and which may affect a variety of individual outcomes (cf. Van Ham et al. 2013). Over the last decades a vast body of studies dealing with neighborhood effects has reported consequences on outcomes such as educational achievement, deviant behaviour, health, social and occupational mobility (cf. for a review e.g. Ellen & Turner 1997, Van Ham et al. 2012). This concept has also been adopted by policy makers who have attempted to countering segregation and spatial concentration through area-based policies aimed at creating more diverse and mixed neighborhood populations (Van Kempen & Bolt 2012).

Literature about segregation and neighborhood effects has mainly focused on the social disadvantaged and, until recently, much less attention has been directed towards the corresponding geography of privilege and affluence (Toft 2018, Burrows et al. 2017, Cunningham & Savage 2015). However, in order to fully understand neighborhood inequalities, there is a need for investigation of the entire spectrum of residential patterns and of the ways in which they are stratified within cities originating a neighborhood hierarchy (Clark et al. 2014, Brazil & Clark 2018). Moreover, neighborhoods are not static and they evolve over time. They can change in terms of population composition as a result of: selective residential mobility flows namely when the characteristics of individuals and households moving in differ from those of residents moving out; in situ changes, i.e. modifications in the attributes of stable residents; by demographic or natural changes such as birth, death and aging processes (Bailey 2012).

In understanding neighborhood's role in the wider urban context and the resulting structure of neighborhood inequalities is indeed crucial considering how and to what extent they change over time and how residential mobility behavior of residents contribute to this processes. As already mentioned in the Introduction, the objective of this dissertation is to analyse these urban dynamics in the Italian city of Turin from the 70's to 2011, with the purpose to contribute to the empirical evidence on this topic by focusing on an Italian case and by adopting a longitudinal and long-term perspective. In this chapter, I discuss the theoretical and methodological framework that has guided this research and whose inspection should facilitate the understanding of the research work and especially of empirical analysis.

The broader literature on residential sorting has evolved through two distinct strains of investigation, the former deals with studies aggregated changes in neighborhoods, while the latter with residential mobility processes (Brazil & Clark 2018). Indeed, in Section 2.2 I review the main theoretical traditions in the study of neighborhood change, focusing on the main theories of both neighborhood decline and ascent (Section 2.2.1 and 2.2.2). Moreover, I review recent methodological advances and empirical contributions in this literature field which constitute the methodological framework of the first part of the analysis conducted in this dissertation (Section 2.2.3).

In Section 2.3 I instead consider the life course perspective which represents nowadays the main theoretical framework for the analysis of residential mobility phenomena. I focus particularly on individual and household characteristics which have proven to be the most relevant in influencing the propensity to move. In Section 2.3.1.2. I examine determinants of neighborhood outcomes referring to the likelihood of moving "laterally", between neighborhood characterized by similar status in terms of relative advantage or disadvantage with respect to the one of origin, or "vertically" i.e. moving upward or downward in the neighborhood hierarchy.

Finally, few recent studies dealing with the analysis of aggregate residential mobility flows across neighborhood types are considered, in order to show attempts to account for the macro-level consequences of micro-level residential choices (Section 2.3.1.3).

To conclude, I will present some empirical studies which have addressed the analysis of the socio-spatial structure on Turin city in the last decades and I will illustrate the research questions which this dissertation aims to answer, developed drawing from the literature on neighborhood sorting and on more recent methodological and empirical contributions.

2.2 Neighborhood change over time

As it has been previously clarified, in this dissertation neighborhood is defined as a "bundle of spatially based attributes" (Galster 2001). More specifically, for the purposes of this research, distinctive traits of residential areas are drawn from a few built environment attributes and mainly from characteristics of individual and household inhabiting them, referring, more in detail, to the demographic, socio-economic and housing dimensions. Consistently, neighborhood change processes represent the result of population composition transformations altering the multidimensional profile of residential areas.

The investigation of neighborhood change processes dates back to the early '20s with the contribution of the Chicago School scholars. In the following decades, research on this phenomenon has been carried out in many different academic fields and from different perspectives (cf. for a review Schwirian 1983, Temkin & Rohe 1996, Van Beckhoven et al. 2009). However, the literature dealing with neighborhood change dynamics intended as transformations in the population composition of residential areas has mainly developed in the context of the human ecology perspective[1]. Attention has been almost exclusively directed to neighborhood decline and authors belonging to this approach, despite proposing a diversity of theories and models, share assumptions on the role of structural forces and economic competition in the process of natural change (Temkin & Rohe 1996, Pitkin 2001).

[1]In addition to the human ecology perspective, two other major approaches can be distinguished in the literature on neighborhood change (Schwirian 1983, Temkin & Rohe 1996, Van Beckhoven et al. 2009, Pitkin 2001). Briefly, on the one hand, the subcultural approach, which has developed in the 30's mainly as a reaction to the ecological models. According to this perspective, neighborhood change does not represent an inevitable and natural process but can be prevented by the strength of social networks and residents' neighborhood attachment. On the other hand, the political economy approach which explains urban development and neighborhood change mainly referring to the impact of larger economic and social transformations and to the role played by actors both at the (super)national and local level such as governments (Institutional approach), housing associations, as well as by other players such as "managers" or gatekeepers" (Managerial approach).

2.2.1 Investigating neighborhood decline: the human ecology approach

Despite sharing common assumptions, human ecology scholars have elaborated a great variety of models that differ for the role acknowledged to specific trigger factors of neighborhood transformations.

The invasion-succession model developed by Burgess (1925), one of the principal researcher within the Chicago School, is considered the first example of neighborhood change theory. In his view, the development of neighborhoods is part of a natural process resulting from the competition for the urban space. Social groups differ in terms of residential preferences and tend indeed to reside in distinctive city areas, giving rise to a concentric rings structure. The "business core", in the city centre, represents the most valuable area because of its accessibility and centrality in term of economic, cultural and political life. It is encircled by an area "in transition", principally characterised by decay and, then, by a third ring inhabited by factory workers, who have escaped from the transition area but who still prefer to live not very far from their workplace. Beyond this zone, there is a "residential area" where, differently, residents from the upper class prefer to live because of its exclusiveness and the presence of single detached houses. The process of invasion-succession is indeed based on the tendency of each inner zone to extend its area by the invasion of the next outer one. This phase is then followed by the in-flow of lower-income residents moving into neighborhood previously inhabited by higher class residents, and contributing to their decline. Therefore, for Burgess, city growth and neighborhood change occur through the invasion-succession dynamic caused by the competition for space.

Differently, the filtering theory proposed by Hoyt (1939) emphasises the role of homeowners in activating urban transformation processes. In his view, the will of homeowners to invest in their properties affects their desirability as compared to that of newer residential buildings (Temkin & Rohe 1996). It is expected that this will decrease during the years, due to the aging of the housing stock and the rising of its maintenance cost, causing an additional reduction in dwellings qualities and values. As a result, these areas become less attractive than those characterised by a new building development in the suburbs. Wealthier household prefer indeed to move in the newer neighborhoods, creating vacancies and allowing the less affluent household to replace them in the city zones with older housing stocks.

Despite some similarities, the Hoyt filtering model differs from the one proposed by Burgess (1925), first because the former argues that processes of city growth and neighborhood change are caused by the attractiveness of recently-developed suburbs rather than the to the unattractiveness of the central city areas (Van Beckhoven et al. 2009). Secondly, Hoyt proposed a spatial arrangement of residential areas in the form of sectors rather than concentric rings. In his opinion, the most valuable city sections are not necessarily located in the centre but can be situated in one or more city "sectors". As a consequence, the process of neighborhood decline does not proceed linearly along a single way from the city core outwards but may originate in different sectors and proceeds in many directions.

Concerning the spatial patterns of change, Harris & Ullman (1945) argued that a third generalisation of the internal structure of cities has to be considered, since many cities are not organized around a single centre but around several discrete “nuclei”. These multiple nuclei may have existed from the very origin of the city foundation or may have developed over time as a consequence of city growth and specialization, infrastructure and urban (re)development and migration in-flows. In this model, the structure of the city and its transformation are considered to be the result of its physical attributes as well as of broader social and economic forces, emphasizing the role of the context-dependence in processes of neighborhood change. Indeed, they argued that whatever the precise reason for the origin of the multiple nuclei, once they have been established general growth forces tend to reinforce their pre-existing patterns.

An additional traditional model of neighborhood change, which incorporated many elements of the one previously described, is the life-cycle model developed by Hoover & Vernon (1959). Firstly, it describes neighborhood change through life course stages which can be seen as a sequence of invasion-succession dynamics, thus referring to the Burgess model. Secondly, considerable attention is given to the renovation of the building stock which is affected both by aging processes and the simultaneous development of new housing buildings, thus including the crucial arguments of the filtering model. With the purpose of accounting for the “whole processes of evolution of the metropolitan population pattern”, Hoover and Vernon identify five potential stages of neighborhood change: “development, transition, down-grading, thinning out, and renewal”. After a phase of new housing development, mainly marked by single-family houses, a second phase follows characterised instead by the construction of apartments and a resulting increase in population density in that area. The third one is a downgrading step in which the population continues to grow and old dwellings are adapted to accommodate larger households. In the fourth stage, density and dwelling occupancy gradually decline, because of decreasing households size and abandonment, vacancy and demolition of dwelling units. Finally, the last phase represents the real innovation of this model of neighborhood change. It considers the possibility of a renewal for downgraded neighborhoods, which is more likely to occur especially if driven by public interventions. This model represents indeed the first theoretical reference to the possibility of neighborhood upgrading pathways, challenging to some extent the inevitability of decline. Moreover, the authors point out that not every single neighborhood is necessarily expected to evolve through the five life-cycle stages and according to the stated order. Differently from other ecological models, the life-cycle provides a theoretical framework for understanding not only neighborhood decline but also potential pathways of ascent and renewal.

A final category of ecological models dealing with neighborhood change issues is the one focusing on residential location decisions and, particularly, on how changes to income, family structure and/or neighborhood characteristic affect household’s residential choices

(Temkin & Rohe 1996). These preferences, taken as a whole, may have an impact on urban residential patterns generating neighborhood transformations. Bid rent and tipping or border models are the most well-known in this group.

The former framework dates back to the 60's and 70's with the work of authors like Alonso (1964) and Muth (1969, ref. in Temkin Rohe 1996), but has continued to be further revised also lately (cf. e.g. Rosenthal 2008). According to the bid rent theory, neighborhood change is the results of households' decisions to move to other city areas resulting from modifications to their family or income characteristics (Temkin & Rohe 1996). Moreover, it is assumed that residential choices are driven by a trade-off between commuting costs and land values. Indeed, differently from firms which use the criteria of the highest profit to find the best location, households tend to maximize satisfaction; and, in trying to balance the costs of commuting against the advantages of cheaper land, at any given location, lower-income families can buy a smaller land portion than high-income ones. However, as for the former the decision is anyway about a limited quantity of land, the difference in price results less relevant than commuting costs (Alonso 1964). This system of preferences gives rise to an ordered structure where the wealthiest households, who can afford higher commuting costs, live in the outermost city areas and consume larger housing lots, while less wealthy household prefer to reside in smaller homes closer to the urban core (Temkin & Rohe 1996, Clapham et al. 2012, Delmelle et al. 2013). According to Alonso (1964), this gives insights about the "American cities paradox" about the dropping of property values and the corresponding rising of family incomes with distance from the city centre.

Finally, border or tipping models likewise focus on locational decisions of residents. However, they consider other explanatory factors than housing cost, namely social or ethnic characteristics of neighborhood inhabitants (cf. for a review Schwirian 1983, Temkin & Rohe 1996, Van Beckhoven et al. 2009). These models claim that out-migration to higher-income households to outer city areas is the result of the in-migration of lower-income households or families of different ethnic groups, therefore having an impact on the population composition of the neighborhood and causing its change. Moreover, this process may have further consequences such as a decline in housing values, which can produce a further in-flow of lower income families (Van Beckhoven et al. 2009). Schelling (1971) tipping model represents a seminal contribution in this regard. He formulated a simulation model based on the assumption that individuals would prefer to live in areas where the majority of individuals belongs to their own ethnic group. The model shows that once a "tipping point", i.e. a threshold percentage values, of Black residents is exceeded, the rate of out-mobility of White residents (the original group living in the neighborhood) will increase, until eventually only Black individuals are present in the area. In other words, it shows that even a small change in the area ethnic profile can lead to a neighborhood transformation and ultimately to a state of complete segregation.

Many critiques have been addressed to the ecological approach. Firstly, for being derived from a biological model rather than based on the role of cultural and social process (Van Kempen 2002). Secondly, these theories lack specificity regarding the main causes of neighborhood change, which is described as a natural and inevitable process, and assume the complete economic rationality of all the actors in the housing market (Van Beckhoven et al. 2009). Thirdly, in this approach the role of institutional and political factors, at any level, is absent. Especially for this last reason, ecological models have been criticized for being essentially American (Van Kempen 2002, Van Beckhoven et al. 2009). Indeed, they reflect circumstances of a specific time and of a specific system in which the role of the state was marginal with respect to the free market economy. Fourthly, this approach focuses almost exclusively on neighborhood decline and there is a lack of attention to the use of these models to guide empirical research.

Still, however, I would argue that this approach provides a useful framework for looking at the transformations of the socio-spatial structure of cities. In this regard, invasion-succession and filtering theories describe, although not fully explaining them, neighborhood change processes which may also be recognized in contemporary and Not-American cities.

2.2.2 Investigating neighborhood ascent: studies about gentrification

Starting from the 1960's, the conventional viewpoint about the inevitability of neighborhood decline over time has begun to be challenged by studies describing a renewal process occurring in previously deteriorated city central areas (Delmelle 2016).

Ruth Glass (1964) first coined the term "gentrification" to describe the process of neighborhood change by which, in London central neighborhoods, previous working class residents were replaced by higher income ones. After her analysis, this topic has received considerable attention and a massive amount of both theoretical and empirical contributions have been written on this subject.

Two main conflicting positions have been proposed in the literature on gentrification dynamics. Some authors argue for a primary role of the so-called "demand-side" elements in triggering gentrification, while others underline the essential role of the "supply-side" factors. Despite this, they share a common definition of gentrification as a multidimensional process involving both a change in the social composition of a neighborhood, characterised by the exit of working-class households and the entry of upper class ones, and a renovation of the deteriorated housing stock with consequent changes in condition, economic uses, tenure and values (cf. Lees et al. 2010). More debated is instead the issues concerning the mechanism of displacement or replacement of residents, referring to the voluntary or rather constrained out-mobility of lower-class residents a the core of the process (cf. e.g. Atkinson 2004, Freeman 2005, Lees et al. 2010).

The rent gap theory elaborated by Smith (1979) is at the heart of the literature stream commonly defined "supply-side". In this view, the "rent gap" is defined as the disparity between the potential and the actual ground rent of a certain city area. According to this framework, gentrification occurs when this disparity is sufficiently wide that developers recognise the potential of a neighborhood and trigger the dynamic of change. For this reason, it is a process considered to has higher chance to occur in central and declined areas which have been previously invested by processes of filtering (cf. Section 2.2.1), thus making the capitalization more profitable and the gentrification a “rational market response”. Several different actors in the land and housing market may initiate this dynamic, such as professional developers, owners who buy and redevelop properties deciding either to occupy or to rent them after completion, real estate agents and financial institutions. Smith (1979) defines this phenomenon as a back to the city movement “but of capital rather than people”, overturning the main argument of the “demand-side” perspective on gentrification.

To this second literature stream belong authors who argue that the gentrification cannot be explained without referring to the role of “gentrifiers". Indeed, there is need for some effective demand for inner city properties from potential gentrifiers in order that this kind of urban transformation may occur (cf. Lees et al. 2010). In this regard, it is argued that a leading role in shaping new residential preferences has been played by transformations in the labour market such as the growth of service class job opportunity downtown, the decline in number of blue-collar workers and the increase in number of women entering the labour force. These factors combined with demographic changes such as the growing number of unipersonal households and childless couples, contribute to the formation of a “new” middle class with a peculiar demographic composition, a cultural oriented consumption and specific life-styles who prefer to live in the inner city close to central city jobs and cultural facilities (Hamnett 1991). As a result, their needs and preferences lead to an increase in the demand for centrally located housing without which, authors belonging to this perspective claim, gentrification is unlikely to occur however large the rent gap is.

To conclude, in this literature filed attention has also been directed to the state involvement in gentrification processes. Hackworth & Smith (2001) distinguished in this regard three “waves” of gentrification. In the first wave (from the 50’s to the economic recession of 1973) instances of gentrification were highly localised and often significantly funded by the public sector. In the second wave (during the 70’s and 80’s) the role of state actors is defined as “laissez-faire” and there was an increasing connection between this dynamic and a wider range of economic and cultural processes at the global and national scales. The third wave (mid 90’s) is characterised by the emergence of a state-led gentrification where the role of public actors in adopting it as a policy tool for renovation has increased[2] (cf. Lees et al. 2010).

One of the main weaknesses of this theoretical perspective is that under a single label have been aggregated highly differentiated process, making “gentrification” a “chaotic concept” (Beauregard (1986) as cited in Lees et al. 2010). Authors belonging to this

[2]Lees and colleagues (2010) have identified a fourth wave of gentrification (2000-2006) which refer specifically to U.S. cities and to a period characterised by what the Economist defined the “biggest stock market bubble of the history” and “the consolidation of a powerful national political shift favoring the interest of the wealthiest household, combined with a bold effort to dismantle the last of the social welfare programs associated with the 1960’s.”.

approach have indeed repeatedly argued that gentrification is “not the same every-where” and that it occurs in various ways in different neighborhood in different cities and implying a variety of actors (Lees 2000). Moreover, nowadays a number of differentiated forms has been identified (e.g. super-gentrification, family gentrification, rural gentrification, cf. Lees et al. 2010) which further contribute to the chaotic nature of this concept.

On the other way round, research on neighborhood upgrading pathways has tended to focus, with few exceptions, only on the process of gentrification (Van Criekingen & Decroly 2003, Owens 2013). Therefore, there is need to enhance empirical investigations and develop a broader theory of neighborhood ascent in order to both clarify the concept of gentrification and account for a wider range of neighborhood upgrading dynamics (Owens 2013).

2.2.3 Methodological issues and recent empirical contributions

The literature review conducted in the previous sections has shown how the study of neighborhood change processes has constantly been of great importance for the urban studies and particularly for the urban sociology. This interest has given rise to a variety of approaches and to a significant volume of contributions.

However, while theories of neighborhood change date back to the early 20’s with the work of Chicago School scholars and very general models have been developed over decades, empirical research has differently been rather limited to the investigation of specific and exceptional cases of downgrading or upgrading, namely gentrifying, neighborhoods (Zwiers et al. 2016). As a result, the systematic analysis of neighborhood inequality structure within cities has received much less attention and has concerned mainly U.S. cities. Moreover, studies dealing with this issue have often considered neighborhood change processes focusing on one single dimension such as income or poverty levels, unemployment rate, ethnicity or housing values, thus failing to account for complex multidimensional nature (Galster 2001) of neighborhoods (Delmelle 2015). Additionally, in most of these works, the dynamic character of neighborhoods is ignored, reducing neighborhood change to the difference between two points in time rather than capturing longitudinal pathways over the long term considering multiple occasions (Delmelle 2016).

Only recently, some authors have started to look at processes of neighborhood change with a long-term longitudinal perspective and in general terms, thus without privileging either neighborhood decline or ascent. Starting from the creation of neighborhood typologies able to accounting for diverse neighborhood compositional characteristics, they have begun to study neighborhood transitions and to adopt the concept of “neighborhood trajectory” in order to explore a broader range of multidimensional long-term pathways of neighborhood change (Wei & Knox 2014, Delmelle 2015, 2016, 2017, Foote & Walter 2016, Ling & Delmelle 2017, Zwiers et al. 2016, 2018, Foote 2017).

These contributions delineate a new literature stream to which this dissertation aims to contribute. Thus, the following subsections are devoted to the illustration of methodological issues faced and solutions proposed by authors referring to it, as well as to the review of the empirical evidence they have provided. Moreover, the reading of this review may also facilitate the understanding of my research design and findings.

2.2.3.1 Multidimensional nature of neighborhood: classification

The non-random spatial distribution of individuals and households within cities involve different dimensions simultaneously, and in order to account for the "bundle of spatially based attributes" defining a neighborhood (Galster 2001), there is need to adopt a multidimensional perspective. Indeed, the analysis of differences among neighborhoods uniquely in terms of income, poverty or housing values shows an oversimplified representation as compared to that accounting, for instance, also for dissimilarities concerning the ethnic origin and demographic characteristics of residents.

In the urban studies literature, the first descriptions and exploratory analysis dealing with city differentiation in the characteristics of the residents population through the use of multivariate statistical techniques have been conducted in the context of the Factorial Ecology. This approach arose during the '60s and 70's, when a great number of articles dealing with this method appeared (cf., also for critiques, e.g. Johnston 1971, Berry 1971, Johnston 1976) and it was characterised by the application of the factorial analysis techniques to the issue of "areal differentiation" (Rees 1971).

Despite some conceptual similarities with cluster analysis procedure, this kind of data reduction approach does not truly represent a classification technique and does not address questions regarding neighborhood differentiation. The main computational difference between cluster and factorial analysis is that the former combines cases while the latter combines variables. Moreover, while cluster analysis creates typologies of observations directly, factor analysis can group observations only indirectly (Reibel 2011). Using this approach, a considerable variety of variables representing neighborhood characteristics are reduced via Principal Components Analysis (or similar techniques) to a manageable number of factors used to describe the broad categories of traits that may distinguish neighborhood types (Reibel 2011).

Conversely, the adoption of neighborhood classification approaches is primarily related with the rise of techniques such the aforementioned cluster analysis and it is, to a certain extent, also opposed to the use of segregation indexes which compare groups according to a single attribute (Reibel 2011). Moreover, differently from the use of composite indexes, multidimensional classification and, more specifically, of neighborhood typologies avoid flattening along a one- dimensional continuum information drawn from variables belonging to various dimensions.

Studies concerned with neighborhood classification which considered the entire spectrum of urban neighborhood types, thus without focusing exclusively on deprived or ethnic neighborhoods or, conversely, on affluent ones, have analysed almost exclusively U.S. cities (Morenoff & Tienda 1997, Mikelbank 2011, Wei & Knox 2014, Delmelle 2015, 2016, Foote

& Walter 2016, Foote 2017)[3]. These authors have proposed typology including between four and nine classes, which have been identified using variables referring to three main dimensions: demographic, socio-economic and housing characteristics of neighborhood inhabitants. These are the aspects which models of neighborhood change have defined essential both for the spatial distribution of social groups and for the activation of neighborhood transformations through selective residential mobility flows. Moreover, they have proven to have a fundamental role in differentiating residential areas in much empirical research (Wei & Knox 2014).

Despite referring to different U.S. cities, three types of neighborhood recur in nearly all the classifications. First, neighborhood characterised by a severe socio-economic disadvantaged in relation to the other city areas. “Struggling” is the label introduced by Mikelbank (2011) in his study on Cleveland to define those areas inhabited by individuals and families with the lowest socio-economic profile. The same label is employed by Delmelle (2015, 2016) to indicate neighborhoods with similar characteristics in Los Angeles, Chicago and other U.S. cities. The reference to zones at the bottom of the urban hierarchy often goes with an indication about the ethnic origins of residents: Mikelbank (2011) uses “struggling African American” which differs from the one just mentioned for the marked ethnic connotation and Morenoff & Tienda (1997) refer to “ghetto underclass”; Wei & Knox (2014) uses the label “black/poor” and “immigrant” to identify socio-economic disadvantaged areas characterised respectively by the presence of Black residents or rather by a mix of different origin immigrants; Foote & Walter (2016) and then Foote (2017) describe instead “minority-concentrated” and “immigrant starts” neighborhood in many metropolitan areas and cities hosting major universities. A second recurring neighborhood type is the one defined as “stable” by several cited authors to indicate areas standing out for an aging population, high homeownership rate, low poverty and unemployment rate and stable residents. Although, some differences exist mainly concerning the presence of new housing stock and recent in-mover residents, this type share many traits with the “white/aging” neighborhood identified by Wei & Knox (2014). Third, suburban neighborhoods, characterised by a specific spatial location, a high presence of families with children, recent housing stock, both high homeownership rate and housing values, are present in several of these classifications. Finally, despite being less common, other relevant types introduced in these studies are: on the one hand, “elite”, “middle class”, “blue-collar” defined on the basis of occupational stratification of residents; on the other hand, “new starts” and “young urban” referring to areas inhabited by the highest educated residents, with a prevalence of renters and non-family households, and with highest housing values.

[3] The studies by Morenoff & Tienda (1997) and Mikelbank (2011) concerned the development of a neighborhood typology and the study of neighborhood transitions. Despite they did not explore neighborhood trajectories, they are considered by authors who instead have used this concept as interesting and relevant contributions for their comprehensive view on neighborhood classifications. For this reason, I decided to include them in this review.

2.2.3.2 Neighborhood change: transitions and trajectories

In time-in-space analysis, meaning the study of changes over time in the attributes of spatially situated units (Andrienko et al. 2010), adopting a longitudinal long-term perspective allows to go beyond the investigation of changes between two points in time and to consider longer sequence of states through which neighborhoods pass over years (Delmelle 2016).

This perspective has been only recently used in the analysis of residential areas composition and this is, at least in part, due to methodological difficulties in considering variations across multiple attributes over time while looking at spatial units, but also to the need for complex long-term consistent georeferenced data (Ling & Delmelle 2017) which are quite rare (Zwiers et al. 2016).

In this regard, firstly, there is a growing body of literature arguing that neighborhood are "slothful" (Tunstall 2016) and that significant neighborhood change is rare and may take several decades (Hulchanski 2010, Meen et al. 2013) rather than being a widespread process quickly transforming the socio-spatial structure of the city (Van Ham et al. 2013). On the one hand, neighborhoods are relatively stable as result of a strong degree of path-dependence and a quite static housing stock (Meen et al. 2013), on the other hand, neighborhood can be potentially extremely dynamic in the compositional population characteristics due to residential mobility and/or in situ and demographic change (Bailey 2012, Van Ham et al. 2013). The majority of studies on neighborhood dynamics have focused on short-term analysis, for this reason data covering longer periods of time, with comparable information, are indeed necessary in order to verify these statements. Moreover, long-term studies are needed in order to understand to what extent decline and gentrification are exceptional case of neighborhood change and, furthermore, to gain insights about the frequency of change across all neighborhoods (Zwiers et al. 2016).

Secondly, data has to be georeferenced, covering the entire city territory at an adequately fine spatial scale to detect intra-urban residential patterns. In this regard, in the literature, the majority of authors have chosen to operationally defined neighborhoods using administrative boundaries, and in the U.S. literature this often coincides with the use of census tracks (cf. e. g. Mikelbank 2011, Wei & Knox 2014, Delmelle 2015, Foote & Walter 2016). Alternatively, when researcher can have access to microdata, it is possible to divide the city area using predetermined spatial grids, for instance 500 by 500 meters' grid, by imposing an artificial partitioning (e.g. Zwiers et al. 2016, 2018).

Studies that, relying on multidimensional classifications, have often looked at transitions between different neighborhood types to trace and describe neighborhood change dynamics (cf. e.g. Morenoff & Tienda 1997, Mikelbank 2011, Wei & Knox 2014, Delmelle 2015). A transition occurs when a neighborhood modifies its compositional characteristics passing from one type to another over time. The likelihood of this event is quantifiable, and moreover, information about single transitions can be aggregated thus generating a more detail representation of transformation occurred within cities. In this regard, transition matrices allow to discover whether and to what extent a certain type of neighborhood tends to transform into a different type. Neighborhood transitions represent thus a useful tool because allow to summarize data about each single variation, quantifying its likelihood to occur and providing a detailed representation of socio-spatial restructuring of urban groups through years.

At the same time, however, the analysis of neighborhood transitions allows only to account for change between two points in time, considering each transition as disconnected from those which may have interested the same area previously or later in time. In this respect, this is a tool which cannot account for the overall and continuous transformation path of urban residential areas (Galster et al. 2007, Delmelle 2016).

As mentioned, recently some authors have started to investigate neighborhood change using a fully longitudinal perspective and to introduce the concept of "neighborhood trajectory" (Wei & Knox 2014, Delmelle 2015, 2016, Foote & Walter 2016, Foote 2017, Ling & Delmelle 2017, Zwiers et al. 2016). The notion of "trajectory", strictly linked with those of "career" and "sequence", is nowadays extensively used in many discipline with the social sciences (Barban & Billari 2012) and particularly by authors adopting the life course theoretical perspective, even if it has been originally gathered from biological studies on DNA sequences (Abbott 1995).

The sequence analysis is a method allowing to investigate the evolution of phenomena over time, focusing on process continuity rather than on single states as were independents (Aisenbrey & Fasang 2010, Blanchard et al. 2014). It promotes an understanding of individual sequences by considering each sequence as a unit of analysis, thus allowing to detect temporal changes in event frequencies and fostering the description of social processes, and consequently to investigate what are the determinants of such patterns. This is an approach with a high descriptive power which, when applied to the study of urban transformations, allows not only to compare a neighborhood profile in different points in time but also to identify the series of profiles which have characterised it over time, their respective order and duration of each episode. Moreover, sequences can be used with the aim to understand if neighborhood with similar characteristics have experienced similar transformation (Zwiers et al. 2016).

Findings from empirical studies which have adopted this perspective largely depend on the neighborhood classification and on the time span considered. However, these studies have pointed out a high persistence in the socio-spatial structure of residential areas over time. Neighborhood stability, i.e. continuing to belong to the same neighborhood type over the years, often appears be the most likely outcomes (Wei & Knox 2014, Delmelle 2015, 2016, Foote & Walter 2016, Foote 2017, Ling & Delmelle 2017), underlying the role of path-dependency processes in neighborhood dynamics (Hulchanski 2010, Meen et al. 2013, Tunstall 2016).

The use of sequences as analytical tool has enabled to recognized pathways described by theories of neighborhood change, namely declining and upgrading trajectories. In respect to processes of neighborhood decline as portrayed by the traditional ecological models, supporting evidence was found particularly about dynamics of filtering, featuring by an aging housing stock and an inflow of lower-income residents, especially belonging to ethnic minority groups (Wei & Knox 2014, Delmelle 2016, 2017). However, also other trends of neighborhood decline have been identified. For instance, areas which skipped the stage of relative lower socio-economic status by passing directly to the later stages of the neighborhood life-cycle (Wei & Knox 2014), or densification of neighborhoods from detached to multifamily dwellings populated by either wealthy or younger, childless residents (Delmelle 2017). Concerning upward trajectories, besides gentrified neighborhoods, Delmelle (2017) uncovered White single-family housing neighborhoods, either with a blue-collar and aged population or with a higher socio-economic profile, upgrading to multi-family, highly educated, white and Asian group in the 50 largest metropolitan areas across the United States from 1980 to 2010.

These studies also uncovered the existence of other pathways which difficultly fill into this dichotomy because not involving a significant improvement or worsening of their socio-economic characteristics. For instance, the transformation from "black/poor" to "immigrant" neighborhood described by Wei & Knox (2014) refers to a change from a neighborhood inhabited mainly by Black residents to one inhabited by residents with diverse ethnic origins which do not implicate neither an upward or a downward transformation in socio-economic terms. Similarly, in the same study, the change from "white/lower" to "white/aging" underlines a transformation which refers primarily to the demographic attributes of residents concerning thus aging dynamics rather than socio-economic improvement or decline.

2.3 Residential mobility

Residential mobility can be defined as the process by which individuals and households match their housing needs to the dwellings available to them (Clark 2012). In the literature, there is a marked distinction concerning the definition of residential mobility behaviours according to which local moves within the same local housing market are mostly defined as "residential movements" or "residential moves"[4], while longer-distance moves between cities or even across national borders are defined "migration" (Clark 2012).

Residential movements are at the core of the second part of this dissertation (cf. Chapter 5). More specifically, since this work aims to study the socio-spatial structure of neighborhood inequality and its evolution over time, the focus is on intra-urban residential relocations, i.e. within the municipal boundaries.

The study of residential mobility has a long tradition and, not only sociologists but also

[4]It has to be noticed that the term "mobility" is commonly used to refer to recurrent movements, for instance, daily commuting practices between house and work place. For this reason it is thus necessary in this case to stress the adjective "residential".

demographers, geographers and economists have contributed extensively to the literature on residential dynamics and their relationship with changes in the urban socio-spatial structure (Dieleman 2001). In this regard, different theoretical approaches have been developed (cf. Lersch 2014). However, over the past few decades, research dealing with this phenomenon has been enriched by being embedded within the life course perspective, which is nowadays considered the most influential approach (Clark & Withers 2007). In this research I indeed refer to this theoretical perspective, whose main characteristics and pivotal issues are reviewed in Section 2.3.1.

2.3.1 The life course perspective

Understanding “Why Families Move” has been an issue in the literature since the early contribution of Rossi (1955) (cited in Van Ham 2012), where he claimed that residential movements have to be considered an ordinary part of the household life cycle rather than an urban pathology, inspiring a long tradition of studies about residential relocation motivations (Coulter & Scott 2015).

This work contributed to situate the debate in the context of the housing studies and to shift the focus from research on aggregate patterns to household behaviours (Dieleman 2001). In Rossi’s view, mobility is a function of changing family structure over time: a transition into a new stage in the household life cycle increases the potential for moving because of a mismatch between dwelling characteristic (e.g. number of rooms, tenure, location) and new needs and preferences (cf. e. g. Morrow-Jones & Wenning 2005, Coulter & Scott 2015). This explanation of mobility, often named as “life cycle approach”, links housing choices to the family life cycle, where processes of family formation and evolution are considered as a fixed sequence of stages, defined by the size of the family, the age of the household head and the presence of children (Van Ham 2012). In each subsequent stage, households expand or contract in size and composition leading to the need for more or less space.

The life cycle approach has been criticized for being normative (the set of stages is the same for all) and deterministic, and for strongly emphasizes upward moves, e.g. from small to bigger dwellings, from renting to owning, neglecting thus the existence of alternative pathways (Van Ham 2012).

However, it had dominated the literature for decades, until the 90’s when the introduction of the notion of family "life course" represented a turning point in the understanding of residential mobility (Clark 2012). The life course approach is by far more comprehensive and flexible, and therefore more powerful for examining residential behaviour (cf. Mulder & Hooimeijer 1999, Feijten 2005, Lersch 2014). It is nowadays the main theoretical framework adopted in the literature dealing with residential mobility, also because of its rich conceptualisation of the link between relocation choices and different life domains (e.g. partnership formation, parenting, employment, health) and interdependencies among family components (Clark 2012, Lersch 2014). It allows looking beyond the “lock-step approach of linear age" (Clark & Huang 2003) by emphasizing the dynamic nature of residential mobility processes. Although age is recognised as a relevant dimension, the focus is on the increasing variation in the sequence and timing of events in family trajectories (Morrow-Jones & Wenning 2005, Clark 2012). Following this perspective, i housing behaviour is not a function of age-specific time per se but of life course events (Clark & Withers 2007).

The life course approach stresses not only the importance of the occurrence of life events but also of additional characteristics such as timing, order and duration of the succession of states (Feijten 2005). Moreover, it allows accounting for a variety of factors influencing housing behaviours including historical and individual time (Van Ham 2012). At the macro level, time can be interpreted as calendar or historical time. The life course approach indeed points out that life events have to be understood in their specific historical and social context, in order to adequately account for constraints and opportunities to which individuals and households are subject (Feijten 2005). For instance, structural, cultural and technological transformations, as well as the resulting demographic changes in the last decades resulted in an increase of both the variety of living arrangement and the demand for bigger and higher quality dwellings. Likewise, at the micro level, time can be interpreted as individual time, and the timing of a life event can be expressed both as age or position within ordered events, e.g. childbirth comes first or after becoming a homeowner? (Feijten 2005).

In the explanation of residential mobility motivations, the life course approach thus starts at the micro level considering trigger events which lead to new housing preferences and needs for individuals and households. However, the existence of a trigger for moving is considered a necessary but not sufficient condition. The role of resources and restrictions which enable (e.g. financial and material resources) or limit (e.g. homeownership as a long-term investment, interdependence with other household members) residential choices has also to be taken into account (Mulder & Hooimeijer 1999). Moreover, at the macro level, economic, political and housing market conditions determine other opportunities and constraints that influence residential choices (e.g. available housing, location, discrimination in the housing market) (cf. Mulder & Hooimeijer 1999, Van Ham 2012).

It has to be noticed that the flexibility of the life course approach represents to some extents also a shortcoming. It does not offer a very rigorous theoretical framework which is difficult to falsify, and, finally, it is also empirically challenging because it calls for very comprehensive and complex life history data in order to account for all the aspects considered relevant in residential mobility behaviours (Lersch 2014).

Two main issues, among those tackled by the literature on residential mobility within the life course approach, are relevant for the purposes of this review and are going to be discussed in the following subsections. First, research on the determinants of residential moves, for which we have now an extended knowledge especially referring to the role of trigger life course events, tenure, age and education credentials. Second, research dealing with spatial outcomes of residential movements, for which we have considerable details referring to the neighborhood choice and processes of moving in and out of the most deprived urban areas, while less is known about mobility patterns across the entire neighborhood hierarchy (Clark et al. 2014).

2.3.1.1 Determinants of residential movements

To what extent the likelihood of moving is influenced by events and states in various life course domains, or in other words "who moves and under which circumstances", represents a central question in the literature of residential mobility within the life course theoretical framework (Mulder & Hooimeijer 1999).

A large body of empirical investigations has been conducted on this issue and past research has shown that, particularly, family career events are linked with residential moves. First, leaving the parental home, often due to partnership formation or marriage, the end of educational training and the entry into the labour market, are intrinsically associated with a residential movement (Lersch 2014, Wagner & Mulder 2015). Similarly, the formation and the dissolution of a partnership typically requires at least the relocation of one partner and in some cases of both (e.g Feijten & van Ham 2010, Coulter & van Ham 2013), alternatively, relocations may be undertaken in anticipation of these events (Clark & Huang 2003). Residential relocation as consequence of separation are often urgent, financially and spatially restricted (Feijten & van Ham 2010, Wagner & Mulder 2015) and Mulder & Wagner (2012) show that the likelihood of a move after divorce is significantly reduced if the parents live close by. Individuals tend to relocate also anticipating the birth of children. Indeed, the probability of residential moves increases after the first conception, as the birth of a child affects the demand for better and larger housing, while it decreases before the birth and is back to the normal after a child is born (e.g Wagner & Mulder 2015, Clark 2013, Lersch 2014). In the past few years, research attention has likewise concerned relocation for widowed, showing that becoming widowed triggered residential mobility especially in the first year and that disabled individuals, those with a high educational level or living in a single-family unit are more mobile and more likely to move closer to their relatives (cf. for a review Wagner & Mulder 2015).

Additionally, literature illustrates that changes in job status may cause relocations. However, these events have found to be less relevant than family changes in order to explain residential moves, especially short-distance ones (cf. Bailey & Livingston 2007) and its influence is stronger for renters and unipersonal households (Clark & Withers 1999). Moreover, concerning the employment status, unemployed residents have been discovered to be more mobile than employed one in several studies, while longer unemployment spell tends to reduce the likelihood of relocations (cf. e.g. Bailey & Livingston 2007, Lersch 2014).

Besides life course events, also individual and household characteristics represent determinants of residential moves. In this respect, age resulted to be an important predictive factor, although, as it has been previously argued, it is not age itself that has an effect on the likelihood of moving while age as proxy for life course stages and life course transitions (Morrow-Jones & Wenning 2005). Young adults (approximately 20-35 years old) are found to be the most mobile age group, whereas with the increase of age the likelihood to relocate decreases and, to some extent, it tends to increase again by the time of empty-nesting or when reaching retirement age (e.g. Bitter & Plane 2012, Bailey & Livingston 2007, Clark et al. 2014, Lersch 2014). In general, being in a partnership reduces the risk of residential moving while findings on the number and age of children are less clear (cf. e.g. Bailey & Livingston 2007, Lersch 2014). Concerning household resources, in his recent literature review about determinants of residential movements, Lersch (2014) reported that, while significant increases or decreases in income level raise the likelihood of moving, the overall income level has found to have not consistent effects. Differently, regarding education, having a higher degree tends to influence positively the probability to move (e.g Bailey & Livingston 2007, Clark & Withers 2007).

Finally, differences between natives and immigrants have been identified in the chance of moving. Their housing careers may differ both as result of different housing needs and preferences (e.g. immigrants are often on average younger than locals, tend to have a higher number of children, larger families and lower standards related to housing quality). Moreover, migrants tend to be less able to relocate according to their preferences (e.g. they have lower economic resources, lower knowledge of the housing market regulation and they are often victims of higher levels of discrimination). As a result, migrants often have higher mobility rates than locals (cf. e.g. Van Kempen & Bolt 2012, Bonvalet et al. 1995).

Many studies have shown the strong link between housing tenure and residential mobility. Indeed, owners are found to me by far less mobile than renters. This is at least partially due to the stronger financial burden for homeowners (e.g. financing costs such as mortgage, transaction costs, maintenance etc.), along with the fact that tenure is intertwined with age, resources and with other life course transition, such as marriage, which also influence the stability of residents (e.g. Feijten & Mulder 2002, Clark 2012, Lersch 2014, Wagner & Mulder 2015). Moreover, tenure choices and, particularly, entry into homeownership have been considered relevant issues in residential mobility behaviours (e.g. Van Ham 2012, Lersch 2014), and, in this regard, it has to be noticed that changing tenure is a possible trigger for residential moves (Coulton et al. 2012). The literature likewise shows that the dwelling size has a strong correlation with the propensity to relocate. Living in conditions of "room stress" (overcrowded dwelling) indeed positively influences the likelihood of moving (e.g Dieleman 2001, Clark & Ledwith 2006, Clark & Withers 2007, Lersch 2014).

In the literature on residential behaviours, besides individual and household traits, also the influencing role of neighborhood characteristics has been taken into account, even results are not univocal (cf. Clark & Coulter 2015, Lersch 2014). Indeed, some studies show that, after controlling for life course events and housing characteristics, both perceived and actual neighborhood quality influence moving decisions. Moreover, the probability of moving increases with neighborhood deprivation, particularly for couples (Rabe & Taylor

2010). Other studies, differently, found only a modest relationship between neighborhood satisfaction and residential mobility (e.g. cf. Clark & Ledwith 2006, Lersch 2014). Greater attention has been focused particularly on some specific neighborhood characteristics, such as the presence of residents belonging to ethnic minorities. Several studies support the existence of "white flight" phenomena, i.e. the higher propensity for locals to leave a neighborhood with high or increasing ethnic heterogeneity (cf. e.g. Nordvik & Turner 2015, Andersen 2017). In general, however, neighborhood quality, as well as changing neighborhood characteristics, seem to be a weak predictor of relocations (Lersch 2014).

To conclude, residential movements are also influenced by the overall context and especially by the institutional environment and conditions of the local housing market, and this is also illustrated by the diversity of cross-national findings (Dieleman 2001). Numerous factors influence indeed residential mobility behaviours such as turnover and vacancy rate, levels of new construction, housing prices and affordability, as well as more general characteristics of the local housing market like relationship between homeownership, private rented and social housing dwellings. Moreover, similarly, welfare system characteristics, housing policies, mortgage market accessibility and interests rate as well as tax relief on housing investment have a role in influencing household residential mobility (Dieleman 2001).

2.3.1.2 Determinants of neighborhood outcomes

As previously mentioned, literature dealing with spatial outcomes of residential movements has primarily focused on deprived urban areas. On the one hand, considerable attention has been given to turnover level. This is indeed believed to be an additional problematic aspect because of its potential consequences on social cohesion and lack of identification with the neighborhood (Andersson & Bråmå 2004), as well as for the implications on the likelihood of policy intervention successes in these areas (Robson et al. 2009)

On the other hand, when considering the outcome of residential movements, almost exclusively mobility into and out of deprived areas has been investigated (Bailey & Livingston 2008, Clark et al. 2014, Brazil & Clark 2018). In this regard, empirical research referring to different contexts (both European and U.S. ones) has stressed the persistence of neighborhood inequality after residential relocation, meaning the tendency of moving from and to similarly deprived areas (cf. Brazil & Clark 2018). This may be at least partially due to the fact that the majority of moves occurs within short distances and that close neighborhoods tend to be similar (Bailey & Livingston 2007). Moreover, findings show that even when households exit disadvantaged neighborhoods, they are very likely to re-enter successively (cf. Bailey & Livingston 2008, Brazil & Clark 2018).

Conversely, research on mobility patterns across the entire neighborhood hierarchy has received much less attention. The notion of "we move to improve" dominated the classical literature on residential mobility in the past, particularly within the life cycle approach, which consider moving upwards on housing ladder and neighborhood hierarchy as the obvious outcome of the family advance in the life cycle (cf. Clark et al. 2014). However, this issues has been scarcely empirically investigate. Findings, from the few studies which have address this topic, have shown how higher individual education credentials are positively associated with the likelihood of moving up in the neighborhood hierarchy, i.e. to a neighborhood with a more advantaged profile then the one of departure, showing the ability to overcome structural constraints of the housing market (Clark et al. 2014, Clark & Morrison 2012, Clark & Maas 2016). The same is valid for household income level. However, when controlling also for tenure, it results to be the most relevant predictor of upward neighborhood mobility, with becoming a social renter strongly leading to move to more disadvantaged neighborhoods (Clark et al. 2014, Rabe & Taylor 2010). Moreover, Clark & Maas (2016) in their study on spatial mobility in Australia, found that tenure tends to absorb almost completely the effect of income.

Interesting findings also concern age influence. Indeed, increasing age seems to increment the propensity to upward residential movements (Clark & Morrison 2012), despite during the transition to adulthood, with the beginning of an independent housing career, individuals may experience a great variety of change in neighborhood environments (Brazil & Clark 2017) often characterised by a worsening in terms of neighborhood quality (Rabe & Taylor 2010). Concerning the difference in the propensity to move upward or downward for native and migrant residents, some studies have found locals to be more likely to improve neighborhood quality than ethnic minorities (e.g Clark & Morrison 2012), while others have found no significant differences (Clark & Maas 2016). Rabe and Taylor (2010) have investigated the role of life course events showing that while these have no significant effects on the probability of downward or upward movements for singles. Differently, for members of a couple, becoming unemployed leads to a worsening of neighborhood conditions while the opposite is true for childbirth events. Finally, controlling for individual and housing characteristics, there is some evidence that living in a more deprived neighborhoods decreases the likelihood of improving neighborhood conditions (Clark & Morrison 2012).

2.3.1.3 Aggregate residential mobility flows across neighborhood types

As shown in the previous subsections, the broader literature on residential sorting has evolved into two distinct strains of investigation. On the one hand, studies on neighborhood change which focus on aggregate modifications in the population composition of residential areas, on the other hand, studies of residential mobility through the study of relocations' determinants and, to a lesser extent, outcomes.

In the former strain, the driving mechanisms of neighborhood change have been mostly ignored. It has been often taken for granted that selective residential mobility, i.e. when the characteristics of residents moving in and out of the neighborhood differ thus triggering a transformation of its compositional profile, is the driving force responsible for neighborhood change (Teernstra 2014), and very rarely this has been investigated empirically. Moreover, other potential drivers, as in situ social mobility or natural change, have instead mostly been ignored (Bailey 2012, Bailey et al. 2016). In the latter strain, likewise, the consequences of residential movements on spatial inequality outcomes have been even more rarely addressed.

The spatial structure of neighborhood inequalities and its evolution over time represent the aggregate result of individual residential choices to stay or to move across more advantaged or disadvantaged urban neighborhoods. However, although the link between neighborhood change dynamics and residential mobility behaviour is at the basis of the reproduction of place stratification, this is still an under-studied phenomenon.

Authors who addressed this issue relied on the analysis of the structural flows of exchange across neighborhoods, with the aim to understand to what extent they act to link rather similar or different neighborhood types and thus contributing to the reproduction of spatial inequalities (Bailey & Livingston 2007, 2008, Sampson & Sharkey 2008). Their findings illustrate the existence of a certain dynamism with considerable movements across all neighborhood types and to some extent the propensity of selective migration in reinforcing patterns of segregation (Bailey & Livingston 2008). More in detail, as has been recently summarized by Brazil & Clark (2018), three main findings have been documented in this regard. Firstly, a "stickiness" in residential mobility flows for which high proportions of movers tend not to change their advantaged/disadvantaged position in the neighborhood hierarchy thus moving from and to neighborhoods with the same level of deprivation, and this proportion is higher for the most deprived areas (cf Bailey & Livingston 2007, Clark & Morrison 2012, Sampson et al. 2017). Moreover, a relevant share of movements involves neighborhood with very similar deprivation profile, e.g. belonging to the adjacent decile (Clark et al. 2014). Secondly, when individuals change neighborhood profile, they tend to circulate across all neighborhood categories, and this diversity has been found to be particularly evident during the transition to adulthood (cf. Brazil & Clark 2017, 2018). Thirdly, there is an issue of "reciprocity", meaning that the probability of moving from neighborhood type a to b appears to be strongly related to the likelihood of moving from b to a.

The analysis of residential flows provides insights into the complexity of neighborhood change and residential mobility processes as well as into their interplay in the urban context. It allows to take into account how individual residential choices at the micro level combine to create spatial flows that define the socio-spatial structure at the macro level. It makes indeed, for instance, possible to investigate to what extent neighborhoods which are very stable at the macro level in their population composition over time, are indeed characterised by a high turnover level of individuals with similar characteristics making them very "unstable" from a micro level point of view.

2.4 Other empirical evidence on Turin socio-spatial structure

The literature review conducted in this chapter illustrates that we still have an inadequate understanding of long-term neighborhood change trajectories as well as of residential intra-urban movements across the entire neighborhood hierarchy. Moreover, it pointed out a substantial absence of empirical evidence, concerning both of these phenomena, for the Italian context.

To the author best knowledge, a research on neighborhood change dynamics carried out by using multidimensional, long-term longitudinal perspective has to date not been conducted referring to any Italian cities. Similarly, in the Italian literature, there is a lack of analyses of residential mobility intra-urban movements, particularly paying attention to neighborhood outcomes in terms of its advantage or disadvantaged position over the neighborhood inequality ladder. As already mentioned, this has been due also to the complexity of data necessary in order to conduct these analyses and, consequently, to the difficulties concerning data availability and access for Italian cities.

For this reason, the primary objective of the present dissertation is therefore to investigate dynamics of neighborhood change and residential mobility by applying concepts, theories and recent methodological innovations described in the previous sections to the analysis of the city of Turin (Italy). This has been made possible through the use of a unique system of databases existing for the city of Turin (TLS- Turin Longitudinal Study) which links, among others, census and municipal registry micro data thus allowing longitudinal analysis.

Nevertheless, despite having used different methodological framework and data sources often with a shorter term (or without) temporal perspective, in the last decades several authors have addressed the study of Turin city socio-spatial structure and, to a lesser extent also of intra-urban residential mobility dynamics. In this section, I will review these contributions which offer some preliminary insights on the case study on which this dissertation is based.

At the beginning of the 80's, two studies were conducted by a research group of the Architecture school of Turin using data from the 1971 census and by adopting a Factorial Ecological framework (Berardi et al. 1980, Mela et al. 1981, cited in) Davico et. al 1997). As mentioned (cf. Section 2.2.3.1), this approach, which was one of the most frequently adopted in those years also in the international context, does not allow to directly classify neighborhoods (Reibel 2011). Indeed, even if it is a technique of data reduction, it deals with the combination of variables rather than cases. Berardi and colleagues applied factorial analysis techniques to a set of 20 variables gathered from both the Population and the Industry and Services censuses. Their findings about the Turin municipal territory show that more than 40% of the total variance is explained by a factor related to the presence of factory workers, low educational level and dwelling overcrowding. The city spatial structure related to this factor is characterised by the contrast between two types of areas: on the one hand, neighborhoods with a high presence of factory workers located in the suburbs of both the north and south city areas (particularly, Lucento-Vallette, Regio Parco, Mirafiori sud); on the other hand, middle-class neighborhoods located in the central city areas (particularly Crocetta) as well as in the hilly eastern one. This spatial distinction was also consistent with the second extracted factor concerning the existence of an aging housing stock.

A second research cited in Davico et al. (1997), is the one carried out by Mela and colleagues (Mela et al. 1981) which added to the variables used by Bernardi and colleagues also data on accessibility, land use and transports as well as on socio-economic characteristics of the resident population, including income. It confirmed the conclusions of Berardi and colleagues, namely, the existence of a distinction between central areas, including the hilly ones, and the suburbs. However, the authors underlined the presence of a more problematic socio-economic profile characterising suburbs in the north part of the city with respect to those in the south. Moreover, they argued that the peculiar characteristics belonging to the central zones were undertaking a process of diffusion towards the south-east ones which differently did not involve the northern zones.

In 1985, Marra (1985) used municipal registry data combined with electoral data to conduct several analyses, including a cluster analysis in order to elaborate a neighborhood typology. He identified six neighborhood types: "urban working class", "new-urban working class", "traditional middle-class", "young middle-class", "elite" and a "transit area". The two working class neighborhoods share a high presence of resident from the Southern Italian regions and workers but differ in relation to the level of integration of internal migrants. Indeed, "urban working class" neighborhoods (Aurora, Madonna di Campagnia, Borgata Vittoria, Barriera di Milano and Regio Parco) are characterised by a higher level of integration with lifestyles and values more similar to those considered typical of Turin born residents. Differently, in the "new-urban" ones (Mirafiori sud, Vallette, Falchera) residents have behaviours more similar to those peculiar of the regions of origin in terms, for instance, of family and demographic structure. The middle-class neighborhoods represent nearly 50% of the total. While the "traditional" ones (San Salvario-Valentino, San Paolo, Cenisia-Cit Turin, Vanchiglia-Vanchiglietta, Millefonti-Nizza, Madonna del Pilone) are characterised by a higher presence of entrepreneurs, managers and professionals, the "young middle-class" neighborhoods (Lingotto, Santa Rita, Mirafiori Nord, Pozzo Strada, Parella) are mainly inhabited by non-manual employees and a younger population. "elite" neighborhoods (Crocetta, Cavoretto) are characterised by the presence of higher social class and college-educated population. Finally, the "transit area" is characterised by the presence of both a population with similar attributes of that inhabiting "elite" neighborhoods as well as of a migrant population recently arrived in Turin from the Southern Italian regions. Moreover, this area is also defined by a low presence of middle-class residents.

It has to be noticed that the three studies above mentioned are all based on the same spatial partitioning of Turin municipal territory in 23 very large zones which tend to oversimplify the socio-spatial structure of the city. Moreover, they considered the social geography of the city only looking at one point in time.

Differently, the work conducted by Ires Piemonte (1995) adopted a partitioning based on 87 census tracts ("zone di censimento") with an average population of 11,000 inhabitants. The aim of this research was to understand the spatial distribution of residents according to their socio-professional attributes by comparing census data of 1981 with those of 1991, mainly through the use of a dissimilarity index. Findings show a higher spatial separation of professional groups in 1991 than it was ten years before, and particularly a marked trend towards higher segregation for middle and low class residents. Coherently with empirical evidence from other studies, results show a higher presence of entrepreneurs, managers and professionals in the central areas and a higher concentration of working class residents in the suburbs, especially in the northern city areas.

A territory partitioning based on census blocks ("sezioni di censimento") was otherwise used in more recent work by Ires Piemonte (Conforti & Mela 2008) based on census data for 1991 and 2001. This report focused on some "critical factors" referring, for instance, to the presence of elderly, unemployed, immigrants or with low education level residents by using location quotients to map their overrepresentation in Turin neighborhoods and identifying the city areas where more factors tend to overlap. Findings show that, even if in that period Turin was facing a deep transformation towards a post-industrial city, its socio-spatial structure still consisted in a clear distinction between central areas characterised by more advantaged profiles than suburbs. Moreover, this difference appears, once again, more marked for the outer northern zones and especially for census blocks where public housing dwellings are located. Furthermore, between 1991 and 2001 the number of census blocks presenting one or more critical factors has reduced (from 53.9% to 39.1%) and neighborhoods which have faced an overall profile improvement resulted to be mainly located in the central areas (such as San Salvario, Vanchiglia, San Paolo).

This last contribution offers also some insights into aggregated flows of intra-urban residential mobility for the years between 2001 and 2005 based on municipal registry data and by distinguishing only ten very huge zones within the city ("circoscrizioni"). Results from this analysis show that more than half of the movements occur within the same zone and the majority of flows link very adjacent zones which are also similar from the point of view of the population composition. These findings are somehow coherent with those reported by Davico et al. (1997) for the 80's and 90's.

2.5 Research questions

As already said, the primary objective of this dissertation is to investigate dynamics of neighborhood change and residential mobility by applying concepts, theories and recent methodological innovations described in the previous sections to the analysis of the city of Turin (Italy).

As outlined above, the literature on this topic suggests that the non-random spatial distribution of urban groups is structured along different dimensions, and the most relevant have appeared to be those linked to demographic, socio-economic and housing characteristics of residents. Therefore, I would expect, starting from these compositional attributes, to be able to identify different neighborhood types which have existed in Turin, each of them offering a peculiar "opportunity structure" (Galster & Killen 1995) to residents inhabiting it and consequently giving rise to a neighborhood hierarchy. The first research question to address is then:

Question 1a: What neighborhood types, according to a multidimensional perspective accounting for the demographic, socio-economic and housing characteristics of residents, can be identified in the city of Turin in the period between 1971 and 2011?

I would also expect neighborhoods belonging to the same type to be spatially clustered and to originate a spatial structure where the most advantaged ones are located in the central city areas while the least advantages ones in the outer zones. This is because, despite some trend towards decentralisation and suburban development, differently from the U.S. context, in the European cities inner areas are still the most valuables ones and thus in most cases inhabited by the wealthiest households. The second research question is indeed:

Question 1b: What is the spatial arrangement of the different neighborhood types?

In the literature which has focused on long-term neighborhood change, there are two viewpoints, that I would argue, following Zwiers and colleagues (2016), are complementary rather than competing. The first underlines the very dynamic nature of neighborhoods as result of residential mobility and/or in situ and demographic change while the second claims that neighborhood transformations are rare and may take several decades to occur because of the significant role of path-dependency processes (cf. Section 2.2.3.2). Due to the limited evidence for the European context, and the complete absence for the Italian one, on these dynamics, it is difficult to formulate hypothesises in this regard for the city of Turin. The third exploratory research question would then read:

Question 2a: To what extent and in which ways Turin neighborhoods have changed in terms of their demographic, socioeconomic, and housing characteristic from 1971 to 2011? More in detail, what have been the most common neighborhood transitions and trajectories?

Moreover, to enhance the understanding of the evolution of spatial neighborhood inequalities, I am also interested in investigating the spatial arrangements of the most common neighborhood trajectories. For this reason, the fourth research question I am going to address is:

Question 2b: What is the spatial arrangement of the most common neighborhood trajectories?

In the second part of the analysis, I will focus the attention on intra-urban residential mobility. Drawing on the extensive literature on this topic, I would expect the propensity of moving being associated with individual and household characteristics and, potentially, after controlling for them, also with the neighborhood type of residence. Moreover, I would also expect that these characteristics play a role in the likelihood of "vertical" or "lateral" movements of Turin residents across the neighborhood hierarchy (cf. Section 2.3.1.2). Thus, the next research questions are:

Question 3a: Which individual and household characteristics can be identified as predictors of intra-urban residential movements over time?

Questions 3b: Which individual and household characteristics can be identified as predictors of upward, downward or "lateral" movements in the urban neighborhood hierarchy over time?

To conclude, few recent studies have enhanced the understanding of these issues by focusing on the link between the micro level of residential mobility behaviours and their consequences at the macro level on neighborhood's composition (cf. Section 2.3.1.3). In order to contribute to this literature by exploring to what extent the dynamism reported in other studies can also be found in the case of Turin, the last research question I am going to address is:

Questions 3c: To what extent do residential mobility flows act to link different and/or similar neighborhood types?

Chapter 3

Data, variables, methods

This chapter describes the data and methods used to carry out the research. I will first present the "Turin Longitudinal Study", the data source selected for this work, which is a system combining different databases with longitudinal records for the entire resident population of Turin. A detailed description of data characteristics is followed by a focus on the neighborhood operational definition used. Then, I will discuss the choices made in defining the unit of analysis and relevant variables for each part of the analysis presented in this dissertation: the first dedicated to the exploration of neighborhood change dynamics while the second to the study of individual residential movements. Finally, in each of these sections, methods employed to answer the research questions are outlined.

3.1 Data

In this study, I applied a quantitative research design based on the case study of the city of Turin (Italy) to be able to answer research questions concerning long-term spatial phenomena which would not be possible to analyse by using qualitative methods. Indeed, in order to observe processes of neighborhood compositional change and individual residential mobility behaviour both over time and space, georeferenced long-term longitudinal micro-level data are required.

In this regard, longitudinal data, in which the same individuals are interviewed in repeated occasions, can be considered the best possible format for empirical research about change (and persistence) of individual outcomes while accounting for heterogeneity among them (Frees 2004, Andress et al. 2013). Similarly, in order to investigate spatial dynamics related to processes of neighborhood change and residential mobility, data about the living location of individuals and households are essential. Moreover, the spatial scale at which data are collected is also particularly relevant. A final issue concerns the long-term perspective of this work: residential patterns are highly persistent and neighborhood change has proven to be rare and may take several decades (Hulchanski 2010, Meen et al. 2013, Tunstall 2016). To observe these dynamics then request consistent data over long periods of time.

Even if gaining increasing popularity in the social sciences, these complex data are still very rare and mainly gathered from national administrative registers or few longstanding panel surveys. In the Italian context, however, these types of databases have not been implemented at the national scale yet.

A notable exception is represented by the "Turin Longitudinal Study" (TLS – "Studio Longitudinale Torinese")[1] which is a system of longitudinal records resulting from the combination, through record-linkage procedures, of Municipal registry, census data and several healthcare databases including data for the entire resident population of Turin city, located in the north-western region of Piedmont.

The TLS has been designed primarily to conduct epidemiological studies, however, its peculiarities make it interesting also for other academic purposes concerning demographic and social investigations, like those tackled by this dissertation. Because of the uniqueness and richness of TLS in the Italian context, the city of Turin was selected as an interesting case for this study.

3.1.1 TLS- Turin Longitudinal Study

TLS data used in this research are anonymized full population microdata gathered from five decennial Italian censuses ("Censimento della popolazione e delle abitazioni" by ISTAT-Italian National Institute of Statistics.), starting from 1971 to the most recent one in 2011, the Municipal registry ("Anagrafe") and the residential movements database.

The Decennial Italian census includes quite a variety of information about socio-economic and demographic individual and household related characteristics as well as dwelling features. Differently from other international census databases, however, it does not include any data about income, poverty and housing values. Moreover, data have been collected inconsistently over years and, despite all the TLS researcher's efforts in facilitating temporal comparison, this aspect narrows the number of variables which can be used in order to study long-term phenomena. The Municipal registry is a database with very few but constantly updated information about Turin residents, namely about place and date of birth, civil status, citizenship, date of marriage and actual address. Finally, the residential movement database contains multiple-spell data with information about dates, origin and destination for each intra-urban residential spell of individuals registered for at least one day as residing in Turin starting from 1971. Origin and destination codes allow distinguishing between intra-urban movements and those from/to other Italian cities or foreign countries. For intra-urban spells, the neighborhoods of departure and arrival are both recorded.

TLS is then an extraordinary data source because accounts for forty years of Turin city history, enabling the study of long-term processes. As mentioned, data are complete in

[1] The Turin Longitudinal Study is conducted by the Epidemiologic unit ASL TO3 of the Piedmont Region (SEPI). I wish to thank the TLS research group for giving me the opportunity to have access to TLS data.

the sense that they cover the entire registered population of Turin city. This means that problems associated with non-random missing observations and sample attrition typical of survey-based panel data do not need to be considered. I excluded from the analysis individuals not living in private households (e.g. living in educational, health-care, penal, military, religious or other institutions) because their movements are either determined by others or based on a very limited choice. Moreover, these are often transient and have little or no interaction with the neighborhood population (Bailey & Livingston 2008).

After these exclusions, the observations number for each of the TSL archives used in this work is shown in Table 3.1.

Table 3.1: Observations in each of the linked archives from the TLS system used in this study

	Observations
Census 1971	1,021,965
Census 1981	1,080,362
Census 1991	921,983
Census 2001	829,353
Census 2011	841,297
Municipal civil registry (updated to 2014)	2,363,614
Residential movement histories	4,566,399
(multiple spell records, updated to 2014)	(2,392,042 single individuals)

Data linkage procedures allow to associate anonymised records originating from each of this databases, moreover, data are geocoded making possible to follow individuals and households over time and space and, as a result, to both describe small area characteristics and track changes in the population composition, which are both essential to analyse neighborhood changes.

The characteristics of TLS make it the best available data source to try to disentangle how and to what extent Turin neighborhoods have changed over time. This choice has, however, also some limitations. First, TLS contains information referring only to the municipal territory, which means that there is no data for residents living just beyond city boundaries. This characteristic does not permit to tackle relevant issues regarding suburbanisation, urban sprawl and other urban change dynamics. Second, until now, there are not comparable databases referring to other Italian cities which makes impossible both to compare Turin with other Italian cities and to generalize results from this analysis to the national context. Third, besides very precise data on location and timing of residential moments, the Italian census include only very general information about individuals and households (and about their dwellings) which have been, moreover, not always collected consistently over time.

3.1.2 Neighborhood definition

In the literature on neighborhood change, two main solutions have been adopted in order to operatively defined neighborhoods. On the one hand, the choice of using administrative boundaries, which in the U.S literature often coincide with the use of census tracks (cf. e.g. Mikelbank 2011, Wei & Knox 2014, Delmelle 2015, Foote & Walter 2016). On the other hand, the choice to divide the territory using predetermined spatial grids, for instance 500 by 500 meter grids, to impose an artificial partitioning (Zwiers et al. 2016, 2018). I defined neighborhoods using census blocks ("sezioni di censimento"), the smallest territorial unit for which census data are available in Italy. I preferred census blocks, rather than an artificial grid, because their partition accounts for streets, buildings, squares, green areas and other elements that are relevant with respect to residential behaviours and dynamics of neighborhood change.

One of the difficulties in dealing with administrative boundaries instead of grids is, however, that census block boundaries are not consistent over time. Differently from the U.S context (cf. Logan 2014, GeoLytics 2003), any official standardization of census spatial units exists in Italy yet. Therefore, before to conduct the analysis, I had to make their boundaries consistent over time, by aligning them to the most recent partitioning of 2011[2].

The partition resulting from this standardization consists of 3786 blocks covering the Turin municipal territory. They vary in size as well as in the number of inhabitants living in (on average 256.76, St. dev. 238.21) and are generally smaller than other spatial units used in analogous empirical research on neighborhood change and residential movements[3]. I nevertheless decided not to use the higher level unit (statistical zones, "zona statistica") because conversely it is relatively too large and internally too heterogeneous to be considered as a unit. Moreover, it is known from the literature on residential intra-urban mobility that households generally tend to move over short distances. For this reason, the use of bigger spatial unit of analysis would had hidden flows of residential relocations and their effects on changing household neighborhood quality over time(cf. e.g. Clark et al. 2014, Clark 2012, Baker et al. 2016). Finally, differently from statistical zones, census blocks are comparable at the national level and this could allow further comparisons at the national scale[4].

In this work, the terms "neighborhood" and "block" are indeed interchangeably used.

[2]I would like to thank professor Maurizio Pisati for helping me to address this issue by proposing a very effective solution. In the original census datasets, for each household in each census year, the block of residence is specified according to the administrative boundaries of that year. Starting from the set of coordinates representing each census block, we randomly selected a pair of coordinates for each household. Successively, we used the administrative partitioning of 2011 to assign each household coordinates to the corresponding 2011 census block. For the year 2011, the only one for which is possible verify the effectiveness of this procedure, only 0.16% of households have been improperly allocated in the adjacent block, which still represents a very good approximation.

[3]It has to be noticed that a block might not necessarily reflect what residents perceive as their neighborhood. In this analysis the neighborhood is defined as "bundle of spatially based attributes associated with cluster of residences" (Galster 2001) and the focus is on characteristics (referring to the demographic, socio-economic and housing dimensions) of the resident population rather than on their subjective perceptions of boundaries and attributes.

[4]However, on the other way around, it has to be said that results of statistical analyses change as geographic units of analysis change in size and shape. This issue is commonly defined in the literature as MAUP, Modifiable Areal Unit Problem and the choice to use a very fine scale helps to reduce problems arising from it (Clark et al. 2014).

3.2 Unit of analysis, variables and methods part I

The first part of the analysis, addressed in Chapter 4, is devoted to the development of a typology of neighborhoods and to the understanding of whether and to what extent neighborhoods in Turin have changed over the forty years considered, thus transitioning from a neighborhood type to another.

To the author best knowledge, this is the first attempt to group neighborhoods according to their residents' characteristics and to identify types using a long-term multidimensional perspective on an Italian city. In order to classify neighborhoods adequately representing their multidimensional nature (cf. Section 2.2.3.1), I decided to build a typology accounting for the characteristics of residents and housing stocks for each block. I preferred not to use a composite index which would flatten, along a one-dimensional continuum, indicators referring to very different dimensions.

The primary data sources for this first part of the analysis are the 1971, 1981, 1991, 2001 and 2011 census microdata, and the neighborhood represents the unit of analysis. Access to micro data[5] allowed to create 25 aggregate variables at block level referring to three dimensions which have proven to be, according to the international literature, the most relevant in differentiating neighborhood types and in identifying pathways of change: demographic, socio-economic and housing characteristics.

With respect to prior studies, on the one hand, I decided to include in the analysis two variables concerning the Italian regions of birth of residents. The aim is to account for the consequences, on socio-spatial residential patterns, of consistent domestic migration flows which interested Turin particularly in the 50's and 60's (cf. Section 3.4). I indeed distinguished between the proportion, in each neighborhood, of individuals born in the Southern Italian regions and in Piedmont, the Turin region. Moreover, differently from other studies, particularly those considering U.S. cities, I decided to consider separately the share of residents born in high-income foreign countries and those born in low-income ones[6]. In Turin, and more generally in the Italian context, migration flows from foreign countries began to be visible only in the 90's and have been very diverse in term of origins (cf. Section 3.4). For this reason, any other distinction referring to countries of origins would be ineffective in lack of specific hypothesis to be tested.

On the other hand, despite their acknowledged role in neighborhood differentiation and in theories about neighborhood change, some variables were omitted from this research.

[5]Access to anonymised micro data has been made possible thanks to a collaboration with the Epidemiologic unit ASL TO3 of the Piedmont Region (SEPI) in the context of the Turin Longitudinal Study.

[6]Countries have been classified using the "Country income classification" by the World Bank (World Bank Group 2007) which is one of the most commonly used in the Italian literature on migrations, especially in Epidemiology. Following the Italian literature on this issue, I simplify the classification distinguishing between individuals born in "high-income" countries and those born in all the other ones. This second group is commonly defined as "high-migration pressure countries" (PFPM, Paesi a forte pressione migratoria) underlying the fact that individuals from lower per capita income countries are presumably more likely to migrate towards richer countries. However, for the sake of simplicity, I preferred to label this category as "low-income countries".

Firstly, the Italian census does not include any information about income, poverty and housing values. Secondly, it was not possible to account for the residents' occupational status, due to the inconsistent way in which this has been collected over time[7]. These shortcomings certainly affect the comparison between empirical results from this analysis and the international literature of reference. However, it could be hypothesized that data on educational attainment, combined with information on housing tenure (Filandri 2012) may operate in this regard as a proxy for a more general socio-spatial stratification. Moreover, I also included variables accounting for the proportion of both no-earner households and those with income only from pension sources, thus contributing to a more accurate picture in this regard.

The selected 25 variables used to classify Turin neighborhoods are illustrated in Table 3.2. The first dimension considered deals with built environment attributes, housing tenure and quality. It refers, on the one hand, to population density (inhabitants/km^2) and dwelling construction period, distinguishing between the proportion of households living in buildings built before 1949 and the share of those living in very recent ones, built in the previous ten years of each specific census year. On the other hand, the proportion of home-owner and renter households are considered[8], as well as the share of households living in overcrowded dwellings[9]. Six variables belong to the socio-economic dimension: educational attainment, considering the spatial distribution of residents with college and high school degrees or with very low educational level (elementary or no degree), the unemployment rate and, finally, the share of no-earner households and those with income only from pension sources. Lastly, the third dimension refers to demographic characteristics such as age structure, place of birth and civil status together with information about household types (unipersonal households, couples with children under 18 years old, lone-parent with children under 18 years old, childless couples).

Following a method also used by previous studies(cf. e.g. Mikelbank 2011, Delmelle 2015, Foote & Walter 2016), in order to account for long-term historical trends and variables with different unit of measure, year-relative z-scores were calculated for every ecological variable for all the neighborhoods. This means that values for a particular neighborhood

[7] In this regard, limitations concern especially the most recent census. In fact, for the first time in 2011, the collection of some socio-economic data, including the occupational status, involved only a sample of households. For all the Italian municipalities with more than 20,000 inhabitants (including Turin), this was accomplished by the use of two questionnaires: a short form, completed by the full resident population, and a long form containing socio-economic questions addressed only to a population sample. (Borrelli et al. 2011). Due to the sampling features and to the characteristics of the research design of this study, it was not possible to use sample data from the 2011 census in the analysis.

[8] Unfortunately, it has not been possible to distinguish in a consistent way the share of social housing dwellings, despite the relevant role acknowledged in the literature of this type of tenure in the socio-spatial distribution of population groups within cities.

[9] In defining housing overcrowding, I used the operationalization proposed by the report "Povertà abitativa in Italia 1989-1993" by the Presidency of the Council of Ministers (Presidenza del Consiglio dei Ministri Commissione di indagine sulla poverta e sull'emarginazione 1997), which is one of the most cited indicators of housing deprivation in the Italian literature. According to this definition, housing overcrowding occurs when the size of the dwelling is lower than 30, 50, 65, 80, 110 and 125 square meters when household members are, respectively, one, two, three, from four to six, seven and eight and more.

Table 3.2: Aggregated variables used in the cluster analysis in order to classify Turin neighborhoods

Dimensions
Housing
population density
% residential buildings built before 1949
% residential buildings built in the previous 10 years
% homeowner households
% renter households
% overcrowded households
Socio-economic dimension
% individuals with college degree
% individuals with high school degree
% individuals with elementary or no degree
unemployment rate
% households with no income sources
% households with only pension income
Demographic dimension
% individuals <18 years
% individuals 18-35 years
% individuals >64 years
% individuals born in Piedmont region
% individuals born in Southern Italian regions
% individuals born in low-income countries
% individuals born in high-income countries
% unmarried individuals
% divorced individuals
% unipersonal households
% couples with children (< 18 years)
% lone parent with children (< 18 years)
% childless couples

on a particular variable have been compared to the average city value for that variable in each single census year. Consequently, for instance, the share of college-graduated residents in a neighborhood in 1971 is centred on 4.3% that is the average city value for that year, while the same variable for a neighborhood in 2011 is centred on 20.71% (city average of college-graduated in 2011). A neighborhood is considered to have an "above average presence of college-graduated residents" if this is higher of 4.3% in 1971 but only if it is higher than 20.71% in 2011. This strategy allows to account for long-term historical trends of the last decades, such as the general increase in educational attainment.

3.2.1 Clustering procedure

After having standardized their boundaries, 3786 census blocks cover the Turin municipality territory, and considering five time stamps (1971, 1981, 1991, 2001, 2011) this created an initial dataset of 18930 records. For each block, 25 aggregate variables have been calculated using year-relative z-scores and they resulted to be not excessively highly correlated[10]. To ensure reliable results, I have excluded from the analysis neighborhoods

[10] Correlation coefficients are reported in the Appendix (Table A.1). Coefficients higher than 0.7 refer only to the correlation between the share of residents born in Piedmont and in the South of Italy, between the proportion of couples with children and that of residents under the age of 18, and, finally, between the

with no or very few residents (less than 15 inhabitants) obtaining a dataset with 16,970 observations (Tab.3.3).

Table 3.3: Census blocks included in the cluster analysis for each year

Census year	Freq.	Percent
1971	3,517	20.72
1981	3,523	20.76
1991	3,468	20.44
2001	3,209	18.91
2011	3,253	19.17
Total	16,970	100.00

Several classification approaches exist for developing multidimensional typologies[11]. An overview of the existing methods that have been used in neighborhood research has been elaborated by Reibel (2011). In this regard, cluster analysis is one of the more frequently adopted techniques. It allows assessing whether or not records included in a dataset can be summarized meaningfully in a small number of groups minimizing the within-group distances between observations and maximizing the between-group distances (Everitt et al. 2011).

Many different cluster techniques are available. In this analysis, the Two-Step Cluster Analysis based on the BIRCH (Balanced Iterative Reducing and Clustering using Hierarchies) algorithm has been used (Zhang et al. 1996, Chiu et al. 2001)[12] . I choose this algorithm primarily because designed to effectively manage very large datasets and because, combining a pre-clustering phase with a hierarchical method, it results to be more powerful than traditional k-means algorithms (Chiu et al. 2001). Moreover, it is particularly useful when the number of desired cluster is unknown because, differently from partitioning clustering methods, it can suggest the proper number considering statistical criteria (SPSS INC 2011).

As the name suggests, the procedure is based on a two-stage approach. In the first stage, records are pre-clustered in small sub-clusters using a sequential clustering strategy implemented by constructing a "Clustering Feature tree": a record is inserted into the closest leaf, if after the insertion the diameter of the sub-cluster is not larger than a threshold value, otherwise a new sub-cluster is created[13]. In the second stage, starting from the CF tree structure, an agglomerative hierarchical clustering algorithm is run to

proportion of homeowner and renter households. I decided however to not exclude these variables from the analysis to be able to account for the respective residual categories which are: individuals from other Italian regions, other household type with children and other than housing accommodations (e.g. caravan and makeshift housing)

[11]With "multdimensional typology" I mean typology accounting for several neighborhood characteristics (such as demographic, socio-economic etc.) to distinguish them to typology developed starting from a single characteristic, such as neighborhood types which differ according to the percentage of low-income households or residents belonging to ethnic minorities.

[12]I used the algorithm implemented in the software IBM-SPSS v.24

[13]More in detail, at the core of BIRCH algorithm is the concept of "Clustering Feature" (CF). The CF

group leaf nodes in a desired number of clusters. When the number of clusters is not pre-specified, to determine the optimal one the algorithm calculates the BIC criterion (Bayes Information Criterion)[14] for each number of clusters within a specified range. This is used to find an initial cluster number estimate, successively this is refined by finding the greatest ratio change in distance at each hierarchical clustering stage (every time one more cluster is considered) between the two closest cluster solutions.

In the literature, multidimensional neighborhood classifications described a number between four and nine clusters (cf. Section 2.2.3.1). However, due to the lack of empirical evidence in the Italian context and of precise hypothesis, I used both the combination of BIC and AIC criteria and their ratio change to test the validity of the number of clusters. Both of them pointed out to a seven cluster solutions[15]. Taking into account the literature on neighborhood typologies, substantial interpretations of groups and statistical criteria, I decided for a seven-cluster classification, which appears to be a well-balanced solution between accuracy and parsimony.

To obtain a classification consistent over time, all year standardized variables are included at once in the clustering procedure. This choice allowed to create a typology in which blocks belonging to the same cluster have comparable characteristics in every census year considered.

Variables which demonstrated to have the highest discriminant power in differentiating neighborhood types[16] are those referring to the educational attainment (share of college-graduated R^2=0.63; elementary or no degree R^2=0.54), to the Italian region of birth (share of Piedmont born R^2=0.56; Southern regions born R^2=0.55) and to the presence of households in overcrowded dwellings (R^2=0.53). Conversely, in this regard, indicators which

is a triplet of numbers (N, LS, SS) which summarize information about each sub-cluster, where N is the number of data points in the sub-cluster, LS is the linear sum of the points and SS is the sum of squares of the points. A CF tree is thus a height-balanced tree consisting in non-leaf nodes (sub-subclusters made up of entries) and leaf-nodes which are nodes without children, representing final sub-clusters. The size of the CF tree is influenced by the branching factor (B) specifying the maximum number of children that a non-leaf node can have, and by the threshold (T) which specifies the maximum diameter of the sub-cluster at the leaf node (Zhang et al. 1996). I used the SPSS v.24 default values for the CF tree: a maximum of three levels of nodes and a maximum of eight entries per node. This combination may result in a maximum of 512 leaf entries, hence 512 sub-clusters (SPSS INC 2011). The chosen distance measure to quantify proximities is the log-likelihood distance. It is a probability based distance: the distance between two clusters is related to the decrease in log- likelihood as a result of merging them together (Chiu et al. 2001).

[14] Among the existing measures of goodness-of-fit regarding the more appropriate cluster number, the information criteria have been increasingly popular. They allow to rank competing models characterised by different number of clusters measuring the information lost when a particular model is used to approximate the (unknown) true model (Everitt et al. 2011). The two most adopted information criteria are the Bayesian information criterion (BIC) and the Akaike's information criterion (AIC). These are relative measures of goodness-of-fit and are used to compare different solutions: smaller values in BIC or AIC indicate a better fit.

[15] Information Criteria results for the clustering procedure are displayed in Table A.1 and Table A.2 in the Appendix.

[16] In order to identify indicators with higher discriminant power, I compared the R^2 of a simple linear regression model with each of them as dependent variable and the variable indicating block cluster membership as independent one. The complete table of R2, F and P-values is reported in Table A.3 in the Appendix.

resulted to be the least powerful are those related to the presence of lone-parent households (R^2=0.05), proportion of residents born in foreign countries (high income countries R^2=0.06; high-income countries R^2=0.10) and, finally, share of divorced individuals (R^2=0.10).

3.2.2 Multinomial logit model

Once the neighborhoods have been classified, I then considered to what extent transitions from one type to another have occurred over the forty years between 1971 and 2011. To be able to account for processes of urbanisation, depopulation and land use change, in this part of the analysis, I considered also blocks with none or few inhabitants, which had been previously excluded from the cluster analysis, naming this eighth category "uninhabited blocks".

In order to quantify the likelihood of change, firstly, I used a transition probabilities matrix to analyse transformations between consecutive census years and to describe the most relevant mobility channels for each neighborhood type.

Secondly, I estimated a multinomial logit regression model in order to study to what extent neighborhood types have differed in their probabilities of upgrading, downgrading or staying stable over years[17]. The main independent variables considered are: neighborhood type at the previous census year, historical time (i.e. census year) and the interaction between these two variables which allows period effects to vary for each neighborhood type. Moreover, the model control for the initial status of each neighborhood (i.e. neighborhood type in 1971). Since the observation period starting point (1971) does not coincide with the beginning of neighborhood trajectories and of processes generating socio-spatial inequalities, controlling for the initial profile of neighborhoods is an attempt to account also for their past history[18]. Moreover, the neighborhood typology used in this work drawn on resident's characteristics, for this reason the number of individuals living in a block is related to its propensity to change: the more residents inhabit a neighborhood, the greater the variation needed in order to make its profile change. Therefore, controlling for this aspect allows estimating more precisely the likelihood of change for each neighborhood type.

The multinomial logit regression model can be then formalized as follows:

[17]Neighborhood stability is the reference category for the model.

[18]More in detail, the initial conditions issue arises when the start of observation period does not coincide with the start of the stochastic process generating individual (i.e. neighborhood in this case) experiences (Poggi 2007). Models accounting for initial conditions originated from the econometric literature about poverty and unemployment dynamics at the individual level. Heckman (1981) proposed this model, which has been lately enriched by other authors, with the aim of understanding whether persistence in economic phenomena is due to genuine causal effect of past on future outcomes or to underlying differences in individual characteristics (Giarda & Moroni 2018). This kind of model is not very common in the literature on neighborhood change and more generally in the urban studies (cf. as exception Sampson & Morenoff 2006).

$$yi \in Y_i \sim \text{Multinom}(\pi_i^1, \pi_i^2, \pi_i^3) \tag{3.1}$$

$$\pi_i^k = \frac{\exp(\eta_i^k)}{1 + \exp(\eta^2 i) + \exp(\eta^3 i)} \qquad k = 1, \ldots, 3 \tag{3.2}$$

Results will be presented as predicted probabilities at representative values (Long & Freese 2006). The estimates will show whether and to what extent difference among neighborhood types in the probability of upgrading, downgrading or stay stable exist and whether they vary significantly across decades.

3.2.3 Sequence analysis

For the last section of the first part of the analysis concerning the identification of the most frequent neighborhood trajectories, I identified the state sequence for each neighborhood, meaning the sequence of neighborhood types it has belonged to over the forty years considered. Sequence analysis, originally gathered from biological studies on DNA, is now a method increasingly applied within social sciences to study life trajectories and careers. Instead of considering observations over time as they were independent single events, this analytical tool emphasizes the investigation of strings of states, accounting for specific durations and a specific order, and thus for the continuity of the process (Aisenbrey & Fasang 2010, Blanchard et al. 2014).

In this analysis I considered categorical sequences consisting of five ordered elements. The list of states defining the alphabet of the sequences is composed by the seven neighborhood types resulted from the cluster analysis, plus, as eighth state, the “uninhabited blocks”. This last category includes all the blocks with none or few inhabitants which had been previously excluded from the clustering procedure (cf. Section 3.2.1). This choice permits to account also for processes of urbanisation and depopulation or land use change. As a result, each block is characterized by a full sequence of states, one for each census years from 1971 to 2011.

Including sequential information in the analysis increases its complexity, especially because the number of possible sequences grows exponentially with the sequence length (Brzinsky-fay et al. 2006). For instance, with eight elements and a sequence length of five points in time, the number of producible sequences is 32,768.

Being interested more in the succession of different neighborhood profile than in the timing or in the duration of the states, I decided to focus on same-order sequences (or Distinct state sequences DSSs’) accounting for distinctive successive states, which consider “experienced states” and “sequencing”, namely looking at type and order of different states (neighborhood types) experienced by neighborhoods (Studer & Ritschard 2016). Therefore, I considered sequences which did not account for both the “timing” of changes (i.e. the year at which the transition from a neighborhood type to another occurred) and spell lengths ("duration": i.e. for how many census years the neighborhood has belonged to a certain type).

Some examples of sequences are shown in Figure 3.1 and 3.2.

Figure 3.1: Sequence index plot of sequences 1 to 10

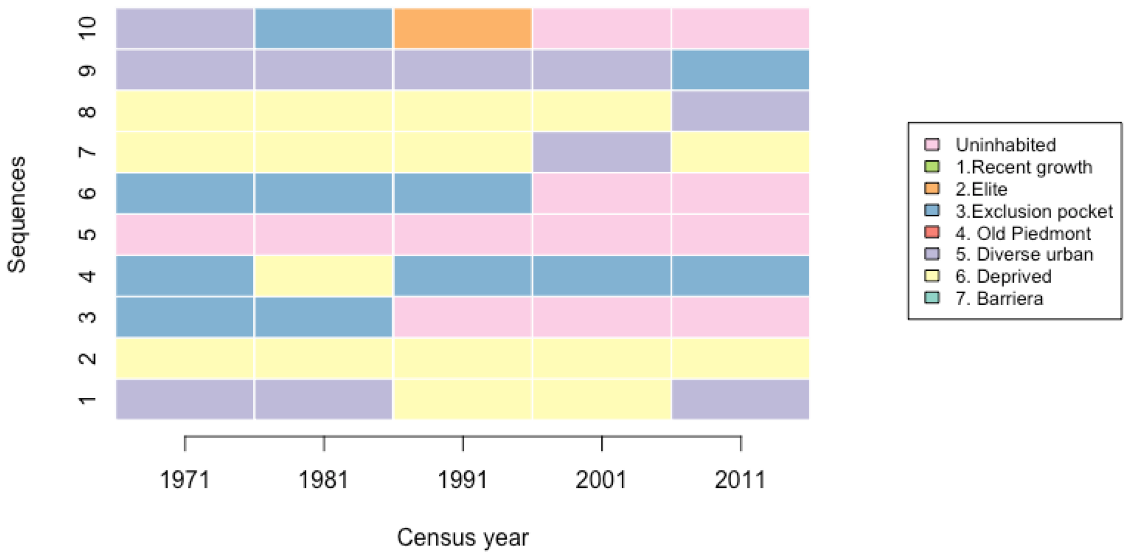


Figure 3.2: Sequence index plot of sequences 1 to 10 using the Dss's definition

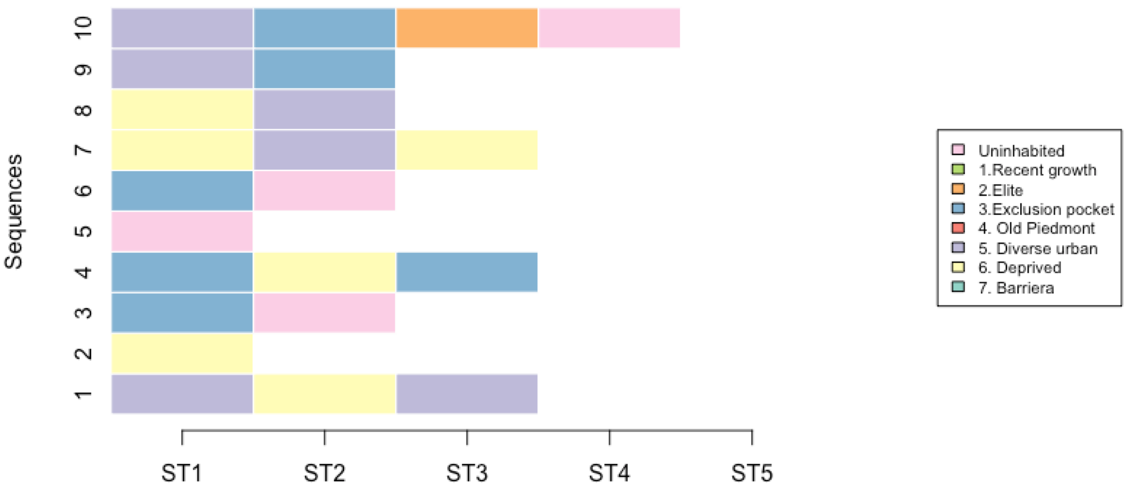


Figure 3.1 represents the state sequences for the first ten observations of the dataset. For instance, sequence n.1 is composed of three states and three episodes. More in detail, this block was Diverse urban (type 5) in 1971 and 1981, then Deprived (type 6) in 1991 and 2001, and finally again Diverse urban in 2011. Sequence n.2 is instead a stability sequence; this neighborhood has been Deprived for forty years. Figure 3.2 shows the same sequences of the previous figure, using however the DSS's sequence definition. In this case, the single states which have characterised each neighborhood are reported without any reference to

the years in which this happened. For instance, using this definition, sequence n.3 and n.6 are identical.

This way of constructing and representing sequences allows me to focus on my research question concerning the most common neighborhood trajectories, simplifying sequence complexity and encouraging to explore pathways by identifying neighborhoods which have experienced similar trajectories.

3.3 Unit of analysis, variables and methods part II

The second part of this research focuses on individual residential movements, with the ultimate aim to grasp to what extent residential behaviours create scope for neighborhood change. Indeed, aggregate flows, resulting from the individual choices of residential location and subsequent decisions to stay or leave, strongly affect both states and evolution dynamic of neighborhoods. The primary unit of analysis thus shifts from the neighborhood (Chapter 4) to the individual (e.g. Turin residents). In the first section of the analysis (5.1), I used the TLS residential movements dataset in order to explore occurrence and frequency of relocations and to estimate the neighborhood survival rate for Turin inhabitants. In considering complete residential histories of individuals who have resided in Turin for at least one day from January the 1st 1971 onwards, TLS also reports the spell start date for the first episode. The dataset I used for this work indeed includes residential spells going from the beginning of the twentieth century to 2014, year of the last update. Moreover, the access to daily dates data allowed to treat time and durations as continuous when considering neighborhood survival rate.

In the subsequent sections of Chapter 5, the focus is on determinants of moves with the purpose, firstly, to understand which individual and household characteristics influence the chance of moving rather than continuing to stay in a neighborhood. Secondly, to disentangle what are the predictors of upward, downward or lateral individual movements among different neighborhood types. As previously mentioned, the residential movements dataset includes too few variables to investigate determinants of residential movements. Therefore, for the analysis conducted in these last sections I used microdata from the five census years going from 1971 to 2011.

A second advantage of using censuses is the chance to include household and dwelling characteristics in the analysis, which have been previously found to be extremely relevant in residential behaviours (cf. Chapter 2). For this reason, in the literature on residential mobility, the choice of the unit of analysis varies between individual and household. On the one hand, moving is considered a family action. On the other, it has to be considered that the household is not a stable unit and its composition changes as a consequence of entries and exits of individual members. Further, these modifications are often associated with residential movements making challenging follow household relocations over time (Lersch 2014).

In trying to solve this issue, I followed other authors' (cf. Lersch 2014) choice to consider the individual as central unit of the analysis, including however also information about household traits to account for its role in residential behaviours.

3.3.1 Residential movements

Residential movements are at the core of the second part of this research. I used the term "residential movement" following the marked distinction which exists in the literature about the definition of residential mobility behaviours. According to this differentiation, local moves within the same local housing market are predominantly defined as "residential movements" or "residential moves" while longer-distance moves between cities or even across national borders are mainly identified as "migration" (Clark & Morrison 2012)[19]. Since the focus of this work is on neighborhood change and the role of residential mobility as driver of this phenomenon, I more specifically define residential movement as a change of individuals' registered address identified as main place of residence[20] which implies the exit from the original neighborhood, i.e. census block. I therefore did not considered relocations occurring within the same neighborhood[21].

In the dataset used for the survival analysis (residential movements TLS dataset) address changes are registered using daily dates, thus residential movements are stored as spells and time can be treated as continuous. Differently, for the analysis on determinants of moves and location outcomes (i.e. better, worse or similar neighborhood type referring to the previous one), data used are gathered from the decennial censuses. For this reason, residential movement is defined as living in a different neighborhood compared to the last census year, i.e. to ten years before[22].

More specific restrictions applied to the two different datasets are described in the respective method sections and empirical chapters.

3.3.2 Survival analysis

For the purpose of this work, I excluded from the original TLS residential movements dataset individuals not living in private households. The resulting dataset consists in 4,422,456 records for 2,310,785 subjects including residential spells going from the begin-

[19] Moreover, to avoid misunderstanding with the concept of "mobility", which commonly refers to current movements such as daily commuting practices between the house and the place of work, I always use the complete expression "residential mobility".

[20] Using administrative data, it should be acknowledged that some individuals may not be registered where they actually live, for instance, to circumvent regulations.

[21] Relocations occurring within the same neighborhood are on the whole very rare, and in Turin for the period considered in this analysis represent only 6% of the total moves. This figure is obviously conditioned by the definition of neighborhood as census block, which is very small spatial unit (cf. Section 3.1.2).

[22] The rationale for the choice of using census data rather than the residential movements dataset is due to the richness of data included, as argued before. One of the consequence of this choice is then that is not possible to trace potential movements occurred in the period between census years. However, as findings from the survival analysis show, the medial survival time in the same neighborhood is around 12 years making not so common observe more than one move in ten years.

ning of the twentieth century to 2014, year of the last update. In order to address the research question about how large share of neighborhood inhabitants continues to live in the same neighborhood over time, survival analysis techniques have been used because they permit to deal with duration and event while handling censoring issues. Survival analysis concerns analysing the time to the occurrence of a failure event, and an event can be defined as a qualitative change of the unit of analysis from a state j to a state k, that takes place at a given point in time (Cleves et al. 2010).

In this analysis, residential movement out of the original neighborhood has been defined as the event of interest and duration, the time interval that an individual spends on a specific state before the event occurrence, is express in days. Moreover, more than half of the Turin residents relocate two or more times, thus the dataset has been set to account for multiple-failure (episodes) per subject data. None of the observations include in the dataset is left-censored, namely, starting date is included for every spell. Differently, right-censored observations, i.e. observation ending before the spell completion, exist and refer on the one hand to all those episodes ending with the death of the individual or with a movement within the same neighborhood. On the other, being this dataset updated to 2014, all the spell still ongoing at this date are considered as right-censored.

At the hearth of the survival analysis there is the survivor function that represents the probability of survival past time t, or equivalently, the probability that there is no failure event prior to t (Blossfeld et al. 2002). In other words, in this analysis, it denotes the probability that a residential episode duration is at least t, i.e. that an individual has stayed in the same neighborhood until time t. To compute the survivor function, I used the Kaplan-Meier estimator.

Formally:

$$\widehat{S}(t) = \prod_{j|tj \leq t} \left(\frac{n_j - d_j}{nj} \right) \tag{3.3}$$

where nj is the number of individuals still in the neighborhood at time tj and dj is the number of individuals who moved at time tj. The product is overall observed failures times less than or equal to t.

Results will be presented using the Kaplan-Meier curve, where survival rate is plotted against survival time. This is a very effective and common way to report survival analysis results, and it is very useful especially in order to compare survivor function for different population groups.

3.3.3 Logit and multinomial logit models

After having examined to what extent individuals tend to stay in their neighborhood over time and to have verified that a difference exists in the survival rates over neighborhood types, I firstly estimated a logit regression model in order to investigate what are the individual and household factors that are associated with higher or lower propensity to relocate out of a neighborhood. Secondly, I estimated a multinomial logit regression model with the aim to examine what individual and household factors are associated with the propensity to undertake an upward movement, i.e. moving to a neighborhood type characterised by a higher socio-economic profile, a downward movement, i.e. moving to a neighborhood with a lower socio-economic profile, or rather moving laterally to a neighborhood with the same profile of that of departure.

As mentioned, for this last sections of the analysis, differently from the preceding ones, I used census micro-data for 1971, 1981, 1991, 2001 and 2011. Moreover, I excluded observations for individuals with less than 18 years old because their residential movements are mostly dependent on those of their parent. However, because in the literature the presence of children is acknowledged to have a relevant role in residential mobility dynamics, in order to account for it, I included in the model a variable indicating the presence or not of at least one child in the household, considering the age of the youngest (0-5, 6-11, 12-17). Finally, individuals that have been present in only one census year, i.e. with one observation, have also been excluded.

In the first model, the dependent variable measure whether or not an individual relocates between each census year and the consecutive one. All time-varying independent variables are measured in the census year before the potential movement and they include: sex, age, educational attainment, occupational status, place of birth, civil status, presence of children in the household, census year, tenure, overcrowded dwelling and neighborhood type of residence. Moreover, to account for variations over time, two interaction terms have been added: between educational attainment and time and between neighborhood type of residence and time.

The logit regression model can be then formalized as follows:

$$yi \in Y_i \sim Bernoulli(\pi_i) \tag{3.4}$$

$$\pi_i = \frac{\exp(\eta_i)}{1 + \exp(\eta_i)} \tag{3.5}$$

Resulted will be present using odds ratio and Average Marginal Effects (AME) which report the average of the marginal effects (in percentage points) of each covariate on the propensity of moving out of a neighborhood for all the observations (Long & Freese 2006)[23].

[23]This means that, for instance, the AME for men and women are computed considering for each observation the probability of the outcome of interest and the same probability treating the individual as were of the opposite sex, leaving all other independent values as they are. Then, the difference between these two probabilities is computed, and the AME represents the average of the marginal effects for all the observations (Williams 2012)

For this model, estimates will show whether and to what extent the propensity of moving to a different neighborhood is associate with individual and household factors and, moreover, whether holding constant individual characteristics the neighborhood type of residence influence the propensity to move.

The second model I estimated is a multinomial logit regression model in order to investigate what are the individual and household characteristics associate with the likelihood of improving or worsening neighborhood quality through residential movement rather than moving "laterally" to a neighborhood with the same profile as the one of departure (reference category). This model is indeed estimates only for movers, namely residents who have change address and census block with respect to the previous census year. The analysis is run on the same dataset of the previous described model and with the same independent variables (for more details and the model formalization cf. Section 3.2.2).

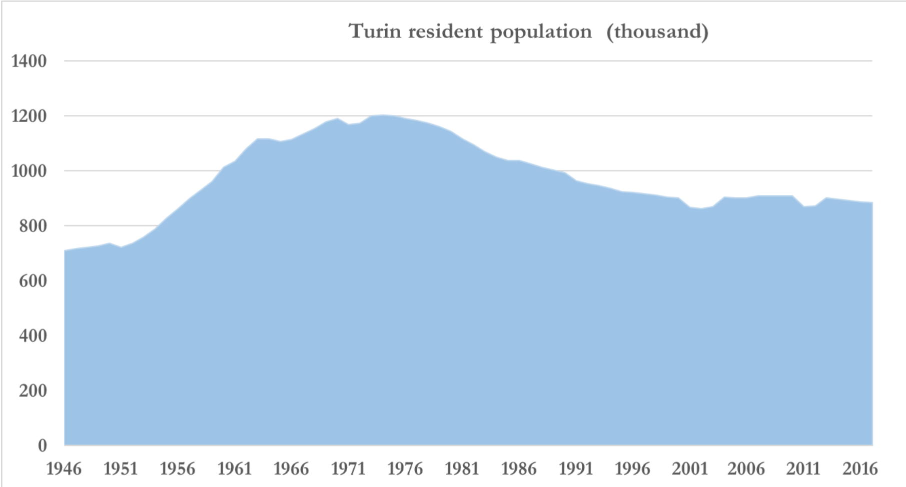
3.4 Study context

The role of the overall context in the socio-spatial distribution of the urban groups within cities has been widely acknowledged in the literature on both neighborhood change and residential mobility processes. The history as well as the physical, institutional and housing market conditions influence the spatial structure of neighborhood inequality and its evolution over time in complex ways, whose interplay is not easy to investigate empirically. The aim of this subsection is indeed to briefly describe some relevant aspects of the Turin city context which have influenced its socio-spatial structure, in order to provide a background for the analysis conducted in this dissertation.

Firstly, Turin has faced considerable economic transformations in the last decades. Its industrial development in the Twentieth Century, which made of Turin one of the most important Italian industrial city, was the result of a long and irregular process culminate in the Italian economic boom years. Driven by the expansion of the automotive industry and especially by the growth of the FIAT, in the 50's and 60's the identity of Turin is that of a one company town able to attract massive flows of internal migrants from other Italian regions: at first, especially from other Northern regions (particularly from Veneto), at later time especially from the Southern ones (mainly Puglia, Basilicata, Campania, Calabria, Sicilia).

The magnitude of these migration processes is one of the main factors which have influence the spatial distribution and stratification of the population within the city boundaries (cf. Mela 2015). From 1948 to 1951, on average, 20,500 new immigrants per year have been registered, in 1955 was registered an inflow of around 51,500 residents, in 1960 around 74,750 and in 1961 the highest inflow with 75,920 new residents. On the whole, from 1953 to 1961 it has been registered an inflow of 466,130 individuals moved in Turin (Caiazzo et al. 2017). As a result, the Turin population (cf. Figure 3.3) almost doubled between the early '40s and the 60's (Città di Torino 2016).

Figure 3.3: Turin resident population (Data source: Città di Torino 2016)



This rapid and consistent population growth resulted particularly unfavourable for migrant residents who, highly discriminated in the housing market, often inhabited overcrowded and inadequate dwellings located in the most degraded city areas (Barbagli & Pisati 2012). Partly due to the population growth as well as to the war damaged, in this period an extensive new housing development, both within the public and the private sector, allowed to expand the housing stock as well as to improve housing conditions (Bernardi & Poggio 2004). The city expansion was also driven by a national social housing plans (Ina-Casa, and successively by the Gescal Fund) through which have been developed entire new large housing estates (e.g. Falchera 1951-1954, Vallette 1954-1961, Mirafiori 1962-1971) (De Magistris 1999).

Between the 80's and the early 90's Turin faced clear signals of an industrial crisis and started its slow transformation towards a post-industrial city, looking for a new identity and new directions for economic growth. The consequences of this metamorphosis on the urban environment became recognisable in the 90's and, in this regard, the 1995 General Plan (PRG) had a relevant role in outlying two main development directions: on the one hand, the need to convert abandoned former industrial areas, thus opening the possibility for urban renewal; on the other hand, it launched the big project "Spina Centrale" which implies the bury of the old railroad line which crossed the city from north to south (Ires Piemonte 2012). In this context, the projects related to the 2006 Winter Olympic Games updated and enriched the guidelines defined by the Plan and boosted several urban regeneration projects in deprived city areas (Belligni & Ravazzi 2012, Ires Piemonte 2016).

Simultaneously, relevant transformations have involved also the housing market. Starting from the 1960's, the homeownership rate began to grow and this expansion has also been accompanied by an overall improvement in housing conditions, including construction standards, building equipments and dwelling overcrowding levels (Poggio 2009). While in 1961 in Turin the proportion of homeowners was nearly 46%, ten years after it was 51%, 59% in 1981, 68% in 1991 and reached 71% in 2001 and nearly 73% in 2011 (census data reported by Filandri & Zengarini 2017). Several factors encouraged the expansion of homeownership in Italy, including: public policies, the crucial role of the family in the production, financing and transfer of homeownership, and the lack of suitable alternatives offered by the rental market (Baldini & Poggio 2014).

While homeownership is the dominant tenure and widespread among all social strata, which is one of the peculiarities of the Italian housing market, nowadays in Italy 16% of households live in private marked rented dwellings and 5% in the public sector rented market, which includes social housing sector (4% approximately) mainly constituted by traditional public housing (Poggio & Boreiko 2017). Indeed, as a result of the progressive liberalization of the rental sector, the consequent increase in rental prices and a lack of social protection, the rental stock results to be mainly occupied by the most disadvantaged urban groups (Filandri & Autigna 2015) and low-income households are more concentrated in the rental sector than in the past (Baldini & Poggio 2014).

As known, tenure plays a significant role in the spatial distribution of individuals within cities, and this is especially true for households living in public housing which are often located in the outer city areas. Unfortunately, data on characteristics and location of Italian public housing are highly fragmentary and not very common. For what concerns the city of Turin, any map of the spatial distribution of these dwellings is available to date. However, we know that in 2011 in Turin, public housing dwellings represented about 3,6% of the total (18,109 out of 499,617 dwellings), of which about 7 out 10 were built before the 1981 (Città di Torino - Divisione Edilizia Residenziale Pubblica 2011).

To conclude with, considering also the relevance of this topic in the literature, a significant increase in the share of residents born in foreign countries has become visible in Turin only starting from the 90's and it has been very diversified in terms of origins. The proportion of foreign-born represented about 3% of the population until 1991, it was nearly 5% in 2001 and reached 13% in 2011. In the 1971, the first five foreign countries of birth of Turin residents were Former Yugoslavia (22.8% of foreign-born residents, census data), France (16.8%), Tunisia (15.0%), Libya (6.2%) and Argentine (5.5%) , while in 2011 they were Romania (33.9%), Morocco (12.5%), Peru (7.0%), Albania (4.1) and Moldovia (3.6%). Similarly to internal migrants in the 50's and 60's, they often inhabit more disadvantages city areas than residents born in Turin or in Piedmont region, as consequences of their differences in terms of demographic and socio-economic characteristics, such as their average, younger age, larger families, lower economic recourses, as well as because of difficulties which they have to face in the housing market (cf. e.g. Ponzo 2009).

Chapter 4

Results part I: multidimensional neighborhood change over the long-run

In this chapter, I will present results from the analysis conducted to answer to research questions concerning processes of multidimensional neighborhood change in the city of Turin in the period from 1971 to 2011. I will start by presenting the typology I developed which classify neighborhoods in seven groups according to the characteristics of their residents with regards to housing, socio-economic and demographics attributes. Then, I will describe their spatial arrangements and evolution over time. In the second section, I will analyse neighborhood change dynamics by referring to neighborhood transitions and to the most common longitudinal trajectories, distinguishing between "downgrading", "upgrading", and "other" trajectories, and I will conclude by mapping them in order to show their spatial distribution.

4.1 Neighborhood typology

In this section, I present results from the analysis conducted to answer to my first research question, which concerns the identification of several neighborhood types that differ according to the demographic, socio-economic and housing characteristics of individuals and households living there.

As stated in Chapter 3, in order to adequately represent the multidimensional nature of neighborhoods, I decided to develop a typology rather than use a composite index which would flatten, along a one-dimensional continuum, indicators referring to very different dimensions. For this purpose, after having standardized neighborhood boundaries, I run a cluster analysis to summarize and simplify information derived from a complex set of 25 variables in a synthetic and meaningful classification, where neighborhoods have been divided into groups characterized by the highest possible within-group homogeneity and between-groups heterogeneity[1].

I identified seven clusters that can be considered as distinct types of urban neighborhoods. Since the final objective is to use it to account for processes of neighborhood change, I created a typology that, on the one hand, is consistent over time, namely, census blocks belonging to each cluster share the same profile regardless for the year in which they are considered. In other words, the cluster structure refers to the overall period between 1971 and 2011 and it is not year-dependent. On the other hand, thanks to the inclusion of year-relative standardized variables, the typology likewise accounts for long-term historical trends. Consequently, for instance, neighborhoods belonging to the Elite neighborhood type (Cluster 2) in 1971 are characterized by an "above average presence of college-graduated residents" of the same magnitude (on average +1.59 St. dev from the average-city value) of those neighborhoods belonging to the same cluster in 2011; however, the average-city value of college-graduated with which is compared is 4.3% in 1971 and 20.71% in 2011[2], thus taking into account the general increase in educational attainment occurred in the last decades.

As expected all the selected dimensions play a relevant role in the differentiation of neighborhood types, which is consistent with previous findings from the international literature on neighborhood classification and, more generally, on spatial inequalities and place stratification (Wei & Knox 2014). More in detail, however, it has to be noticed that some variables have a higher discriminating power than others[3] Clusters differ the most (2 St.dev) in terms of Italian region of births and educational attainment (especially for the share of college graduated and those with elementary or no degree) of residents and for what concerns the share of overcrowded dwellings. The smallest differences are those related to the presence of residents born in high-income foreign countries (from-0.11 to 0.33 St. dev), to the proportion of separated and divorced individuals (from -0.29 to 0.38 St. dev) and, finally, to that of lone-parent households (from -0.16 to 0.51 St dev).

4.1.1 Neighborhood types: profile analysis

Table 4.1 shows the distribution of census blocks across the seven neighborhood types. It is worth to highlight that groups, while having an adequate proportion of cases neither particularly narrow nor wide, differ in size. In this regard, the only exception is Cluster 3 which is the smallest one with about 5% of cases. However, despite its dimension, I decided not to exclude it nor to combine it with another cluster due to its peculiar profile and to the fact that, even considering different solutions (i.e. higher or lower number of clusters), it continued to remain separate from the others.

[1] For further details on methods see Chapter 3

[2] See Table A.4 in the Appendix for descriptive statistics of ecological variables

[3] In order to identify indicators with higher discriminant power, I compared the R-squared of a simple linear regression model with each of them as dependent variable and the variable indicating block cluster membership as independent one. The complete table (A.3) of R-squared with F and P-values is reported in the Appendix.

Considering the whole period from 1971 to 2011 the group quantitatively more relevant is Cluster 7 followed by Cluster 4, including respectively 28% and 20% of city blocks, while the others have sizes ranging from 14% to 9%.

Table 4.1: Percentage of blocks belonging to each neighborhood type over time (cluster size)

	Census year					
Neighborhood type	1971	1981	1991	2001	2011	Total
1. Recent growth	21.13	14.19	10.06	6.89	6.70	11.97
2. Elite	14.16	14.50	15.97	13.34	13.65	14.35
3. Exclusion Pocket	6.99	5.56	5.54	2.80	3.44	4.93
4. Old Piedmont	14.93	17.49	19.72	23.50	22.97	19.60
5. Diverse Urban	8.96	8.29	8.02	10.63	11.65	9.46
6. Deprived	11.43	13.03	12.34	10.00	11.50	11.69
7. Barriera	22.41	26.94	28.34	32.85	30.07	28.00
Total	100	100	100	100	100	100

In order to identify the peculiarities of each group, it is appropriate to look at the averages of standardized variables within each cluster (Table 4.2): values close to zero indicate that a cluster reflects, for that variable, city-average characteristics; the higher the absolute value (ignoring the sign), the greater the variable's contribution in explaining neighborhood differentiation. For instance, with respect to population density, while Cluster 5 is characterized by an average city number of residents per km^2, Cluster 3 has the lowest (-0.92 St. dev. from city average) and Cluster 7 the highest one (0.57).

According to their profile and trying, whenever possible, to provide continuity with literature on neighborhood typology, I labelled the seven clusters as: Recent growth (1), Elite (2), Exclusion pocket (3), Old Piedmont[4] (4), Diverse urban (5), Deprived (6), Barriera (7)[5]. The following are brief descriptions of each neighborhood type based on its most relevant characteristics.

1. Recent growth. This neighborhood type is characterized by the most considerable amount of recent buildings, the lowest of old ones, a low population density and the highest share of homeowners. Couples with children and youth are over-represented as opposed to the relative absence of elderly and unmarried residents and unipersonal households. From the point of view of origins, in these neighborhoods exists a balanced mix: there is a slight prevalence of Piedmont born and an around average of residents born in Southern Italy; similarly, the foreign-born population from low and high-income countries is around the

[4] I would like to thank Professor Serena Vicari for suggesting me this label that I consider very effective.

[5] The label "Barriera" (barrier, door) refers to the concept of "barriera", namely to areas with a high concentration of factory working class residents which grew just outside the Turin city door at the end of the 19th century. In that period, households from the lower classes decided to move just outside the city doors in order to not pay duties on goods, giving rise to neighborhoods characterised by a very high population density which were diffused in many city zones. I decided to use this label due to some of the characteristics of the Turin "barriere" and not because of a spatial overlapping between neighborhoods belonging to this cluster and the precise location of the old "barriere".

Table 4.2: Profile analysis: average value of the standardized variables within each cluster

	Neighborhood type						
Dimensions	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Housing							
population density	-0.33	-0.51	-0.92	0.21	0.04	0.44	0.57
% residential buildings built before 1949	-0.95	0.46	0.00	-0.42	1.02	0.67	-0.22
% residential buildings built in the previous 10 years	1.25	-0.20	0.38	-0.13	-0.31	-0.31	-0.18
% homeowner households	0.55	0.22	-0.63	0.51	-0.36	-0.71	0.07
% renter households	-0.39	-0.33	0.39	-0.37	0.37	0.90	0.14
% overcrowded households	-0.04	-1.03	0.31	-0.47	-0.32	0.97	0.53
Socio-economic							
% individuals with college degree	-0.27	1.59	-0.36	0.03	0.48	-0.62	-0.54
% individuals with high school degree	0.14	0.96	-0.42	0.32	0.20	-0.85	-0.37
% individuals with elementary or no degree	0.18	-1.12	0.76	-0.37	-0.40	0.90	0.39
unemployment rate	-0.25	-0.51	0.7	-0.29	0.00	0.97	0.09
% households with no income sources	-0.57	0.25	0.25	-0.13	0.39	0.46	-0.08
% households with only pension income	-0.62	-0.11	-0.48	0.57	-0.18	-0.03	0.22
Demographic							
% individuals <18 years	0.68	-0.26	0.78	-0.39	-0.37	0.43	0.03
% individuals 18-35 years	0.25	-0.44	0.17	-0.31	0.18	0.36	0.14
% individuals >64 years	-0.76	0.42	-0.56	0.48	0.06	-0.21	-0.01
% individuals born in Piedmont region	0.15	1.04	-0.72	0.54	-0.10	-1.11	-0.29
% individuals born in Southern Italian regions	-0.07	-1.11	0.49	-0.47	-0.04	1.11	0.35
% individuals born in low income countries (LIC)	-0.09	-0.19	0.73	-0.22	0.10	0.36	-0.03
% individuals born in high income countries (HIC)	-0.13	0.33	0.25	-0.08	0.20	-0.11	-0.11
% unmarried individuals	-0.46	0.10	0.33	-0.29	0.83	0.37	-0.21
% divorced individuals	-0.29	0.14	0.01	-0.14	0.38	0.13	-0.08
% unipersonal households	-0.5	-0.01	0.08	-0.25	1.02	0.26	-0.11
% couples with children	0.94	-0.30	0.37	-0.28	-0.58	0.03	0.04
% lone parent with children	-0.06	0.07	0.51	-0.16	0.09	0.18	-0.07
% childless couples	-0.04	-0.01	-0.52	0.45	-0.45	-0.42	0.19

city-average level. Finally, the share of households with no income or only from pension income sources is the lowest across the neighborhood types which, combined with the lower than average unemployment rate, suggests a high labour market participation. All these features seem to be related to process of urban expansion and housing development that also explain the higher number of blocks belonging to this cluster at the beginning of the study in the 70's and its progressive shrinkage over time.

2. Elite. Neighborhoods belonging to this cluster represent the wealthiest areas where the highest proportion of college and high-school graduated and the lowest of residents with only elementary, or even none, degree live. This relative well-being manifests itself also through the lowest unemployment rate and proportion of household living in overcrowded dwellings, combined with a lower than average presence of renter-occupied housing. Moreover, also built environment characteristics as low population density and above average proportion of buildings constructed before 1949 suggest the existence of single detached houses, in line with the relative status of residents. These are the blocks where internal migrants from the South of Italy are on average less present while being characterized

by the highest presence of Piedmont-born and foreign-born from high-income countries, strengthening the exclusiveness of these city areas. Finally, from a demographic point of view, although being inhabited by a variety of household types, there is the lowest presence of young residents while elderly are over-represented. The "elite" label has been previously used by Wei and Knox (2014) and later by Foote (2017) to name a neighborhood type which has some similarities with the one identified in this analysis. I chose it, however, mainly to underline the relatively privileged status of these city areas with respect to other clusters than to argue that they share entirely comparable attributes.

3. Exclusion pocket. This cluster has as main features the lowest population density and the highest prevalence of children and lone-parent households, while the share of couples with children, although above city average, is comparatively not as high. Piedmont-born residents are by far underrepresented, whereas a mix of different origin residents consisting of the highest proportion of foreign-born from low-income countries and an above average presence of both from high-level countries and internal migrants from Southern Italy is present. Neighborhoods belonging to this class are also inhabited by under average proportion of elderly and households with only income sources from pensions. Concerning housing tenure, the unbalanced rates between homeownership and rented occupied dwellings suggest the presence of "other type than housing" accommodations (e.g. caravans, makeshift housing). These peculiarities combined with the very low general educational attainment and a high unemployment rate underline a profile of relative socio-economic disadvantage.

4. Old Piedmont. The peculiarity of this cluster is in its unbalanced age structure and its aging profile. It has, on the one hand, the most significant proportion of elderly and households with income only from pension sources and couples without children and, on the other, the lowest presence of minors and lone-parent families. Inhabitants born in the Turin region are overrepresented while the presence of internal migrants and especially foreign-born from low-income countries is below the city average. The high rate of owner occupancy, the low share of both overcrowded and rented dwellings and the around mean level of highly educated residents underline the relative well-being of this area which, albeit experiencing it with less intensity, share several attributes with the Elite cluster. Lastly, for what concerns the housing dimension, the building stock is neither old nor very recent probably being the result of previous decades' waves of urban expansion.

5. Diverse urban. This cluster defines areas with an aging housing stock with reverse characteristics than Recent growth neighborhoods. Also, renter-occupied dwellings prevail, while the share of owner-occupied and overcrowded are under the average city level. It is inhabited by the highest proportion of living-alone, unmarried and divorced individuals and the lowest of families with children. This rather young neighborhood, inhabited by highly educated residents, by a balanced mix of both Italian and foreign-born, with a slightly above average proportion of individuals from high-income countries, has some of

the characteristics often attributed to gentrified neighborhoods in central urban areas. Other socio-economic indicators, such as a higher than average presence of households with no income sources and below average of only pensions income considered together with only an on average unemployment rate and the demographic and household related characteristics previously underlined, may suggest the existence of a non-elderly inactive population, reasonably still in education or training.The label "Diverse urban" has been previously used by Owens (2013) to refer to a neighborhood type sharing some of the attributes with the cluster identified in this analysis.

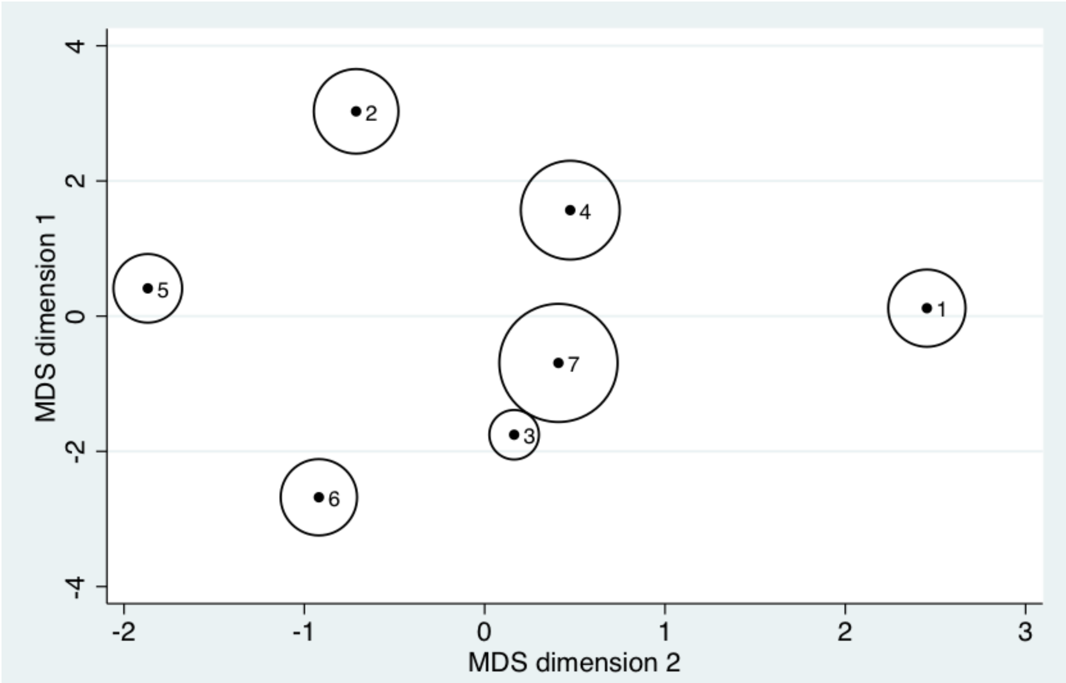
6. Deprived. This neighborhood type defines areas characterized by an aging housing stock, a high population density and, particularly, by the lowest socio-economic profile compared to the others. This aspect is also evident when looking at the combination of general educational attainment, tenure composition and presence of households with no income sources. From a demographic point of view, this is the neighborhood type with the highest proportion of youth, internal migrants from the South of Italy and with the smallest share of residents born in the Turin region. Moreover, also the percentage of children, migrants from low-income countries, unmarried, divorced residents and unipersonal households exceeds the city average while the proportion of couple without children is under this threshold. This neighborhood type is probably one of the most studied in literature even if different labels have been used to name it. For this reason, I choose the "deprived" label with the aim to make it easily recognizable and to encourage comparisons.

7. Barriera. Neighborhoods included in this group represent approximately a fourth of census blocks considered over the entire period, making it the biggest cluster. It is defined by the highest population density, a lower than city average educational attainment, a high presence of overcrowded dwellings and above-average residents with Southern Italian origins. These characteristics underline a potential vulnerability and, even if to a lesser degree, this profile has some similarities with that of Deprived neighborhoods. Differently, this cluster has around city-average characteristics with concerning household type mix, demographic aspects as age structure and country of birth of foreign-born population, housing stock and household income sources.

To further clarify and facilitate the interpretation of the results, clusters can be projected into a two-dimensional space by using a spatial representation technique known as multidimensional scaling (Everitt et al. 2011). This method allows to address information resulting from cluster analysis and to interpret them by reflecting the structure behind data on a graph (Kruskal & Wish 1978). The general aim of using multidimensional scaling is to visualize clusters and uncover the dimensions (axis) on which neighborhood types tend to diverge or converge.

Figure 4.1 shows the results of the projection, where the circle size is proportional to the cluster size (number of census tracts belonging to the cluster) and Euclidean distances express dissimilarities among clusters. The first dimension (1) is the most relevant one in

Figure 4.1: Projection of the seven clusters on the Eucledian space



differetiating neighborhood types. Distances along this dimension may be interpreted as dissimilarities in terms of relative socio-economic advantage: neighborhood types which are in the upper part of the graph are those with more favourable profile than those in the lower part. It is probably now more evident how "Elite" and "Deprived" neighborhoods are at the opposite pole of this dimension. On the other hand, clusters maximally far along the second dimensions (2) are indeed Diverse urban and Recent growth. This dimension seems to point out differences concerning housing stock, especially regarding building construction age, as well as difference civil status an household types of neighborhoods' residents.

This representation also allows to show how the seven clusters cover the plane in a somewhat balanced way and this contributes to validate the cluster solution proposed.

4.1.2 Neighborhood types in a spatial perspective

In order to develop this typology, I did not include information about the spatial arrangements of neighborhoods, for instance, about their proximity or distance to the city centre, which has been instead one of the crucial aspect studied in the literature on neighborhood studies since its foundation (cf. Section 2.2). This choice allowed me to group neighborhoods with similar characteristics regardless of their location within the city boundaries[6].

[6] It could be argued that differences in population density are somehow related to different city zones, where a lower level of inhabitants per km^2 is more frequent in the suburbs while it is higher downtown. However, this relation is not unequivocally straightforward: high-density residential housing estates are present often in peripheral areas, as well as less densely populated zones in the city core. For this reason, it cannot be considered an indicator of specific locations within the municipal boundaries.

For this reason, it is now interesting to examine, a posteriori, their distribution from a spatial perspective and at how it has changed over time. The aim here is to assess whether these types, which have been identified starting from the demographic, socio-economic and housing characteristics of their residents, are also clustered from a geographical point of view. This aspect is relevant, not only as an additional element contributing to validate the classification but mainly because it allows extending the semantic express by this typology including also spatial attributes as well as to verify to what extent these configurations are somehow consistent with the models existing in the literature.

As shown in Figures from 4.2 to 4.6, some clusters have a more precise definition in terms of spatial location than others, and, moreover, some of them have a more compact shape, given by contiguous tracts belonging to the same neighborhood type, while others are more fragmented.

Clusters having more defined outlines are Elite and Diverse urban. Three compact separated segments compose the former: the area on the east-side, which represent a green and hilly city area (Collina[7]) geographically distinct from the rest of the city not only because of its orography but also due to the presence of one of the city river (Po); secondly, the area crossing the historical centre (Crocetta), famous for its single detached houses in Art Nouveau Style; thirdly, a smaller area (Campidoglio, San Donato, Cit Turin) which share the same elegant residential architecture of the previous mentioned, being however traversed by one of the main city roads. Except for the last segment mentioned, which decreases in dimension over time, the spatial distribution of this neighborhood type is almost stable, and this could be the result of a particularly high path-dependency due to its historical architecture and orographic peculiarity. These are, moreover, the residential areas recognized as the most prestigious and exclusive in the city.

Similarly, also the spatial arrangement of Urban diverse neighborhoods is quite compact (even if less than Elite cluster) and, with few exceptions, almost stable over time. Blocks belonging to this cluster are situated at the city core and in its very closed areas both on its East (Vanchiglia, San Salvario, Porta Nuova) and further West (Campidoglio, Boringhieri, San Paolo), and along the northern Po riverfront (Madonna del Pilone). Considered in a temporal perspective, spatial concentration of Diverse urban neighborhoods while increasing in number have tended to expand especially southwards, however, it can be still considered a neighborhood type located in the very central urban area.

By contrast, Exclusion pocket and Deprived clusters consist of more spatially fragmented neighborhoods scattered throughout the city, and they preserve this pattern for the entire period from 1971 to 2011. Blocks belonging to the first one are principally located in isolated zones along the four rivers flowing within the municipality territory, having congruous characteristics with the presence of "other than housing" accomodation described in the previous paragraph[8]. Deprived neighborhoods are, differently, primarily

[7]See Figure A.2 in the Appendix for more details on administrative areas and their names.

[8]Looking at its spatial configuration in the most recent census years, in several of these areas are

Figure 4.2: Neighborhood types in Turin (1971)

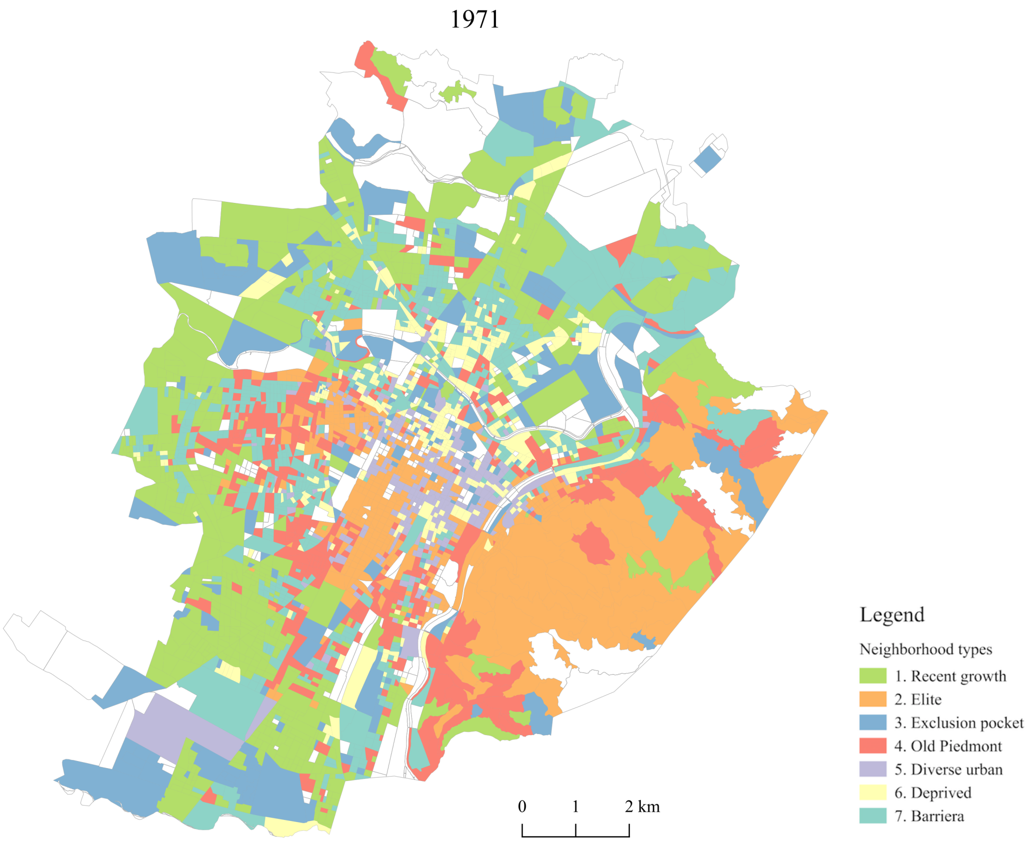


Figure 4.3: Neighborhood types in Turin (1981)

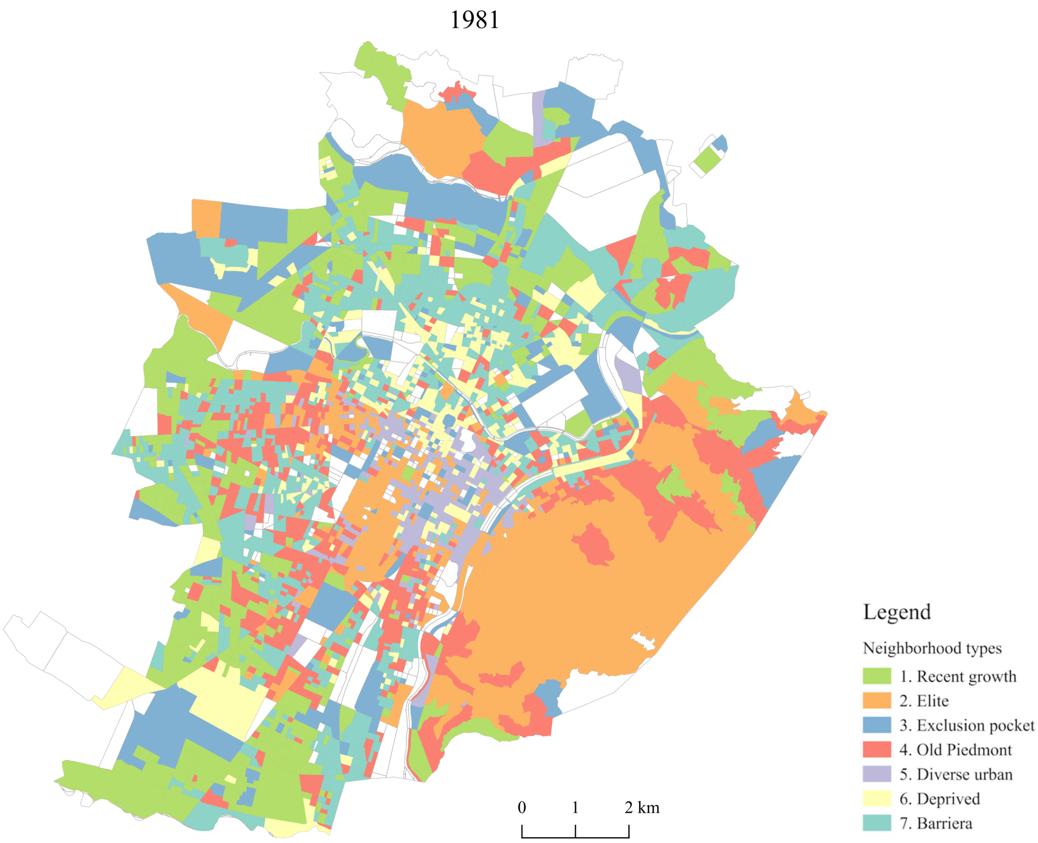


Figure 4.4: Neighborhood types in Turin (1991)

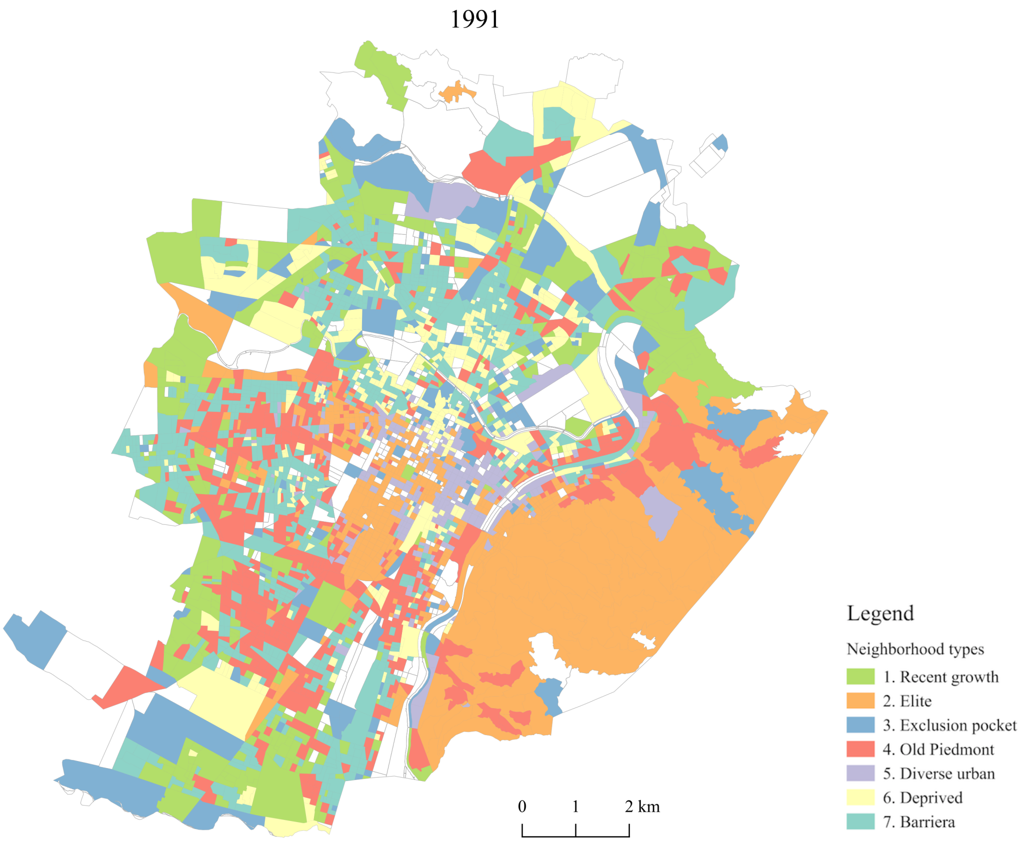


Figure 4.5: Neighborhood types in Turin (2001)

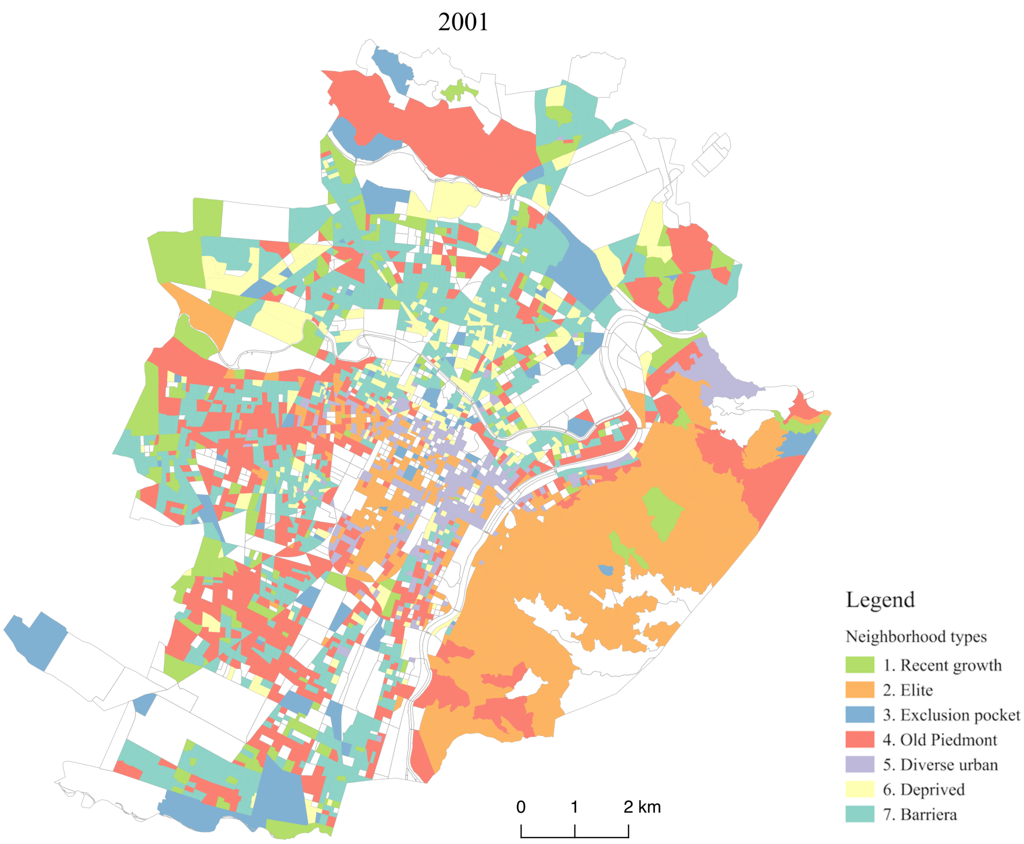
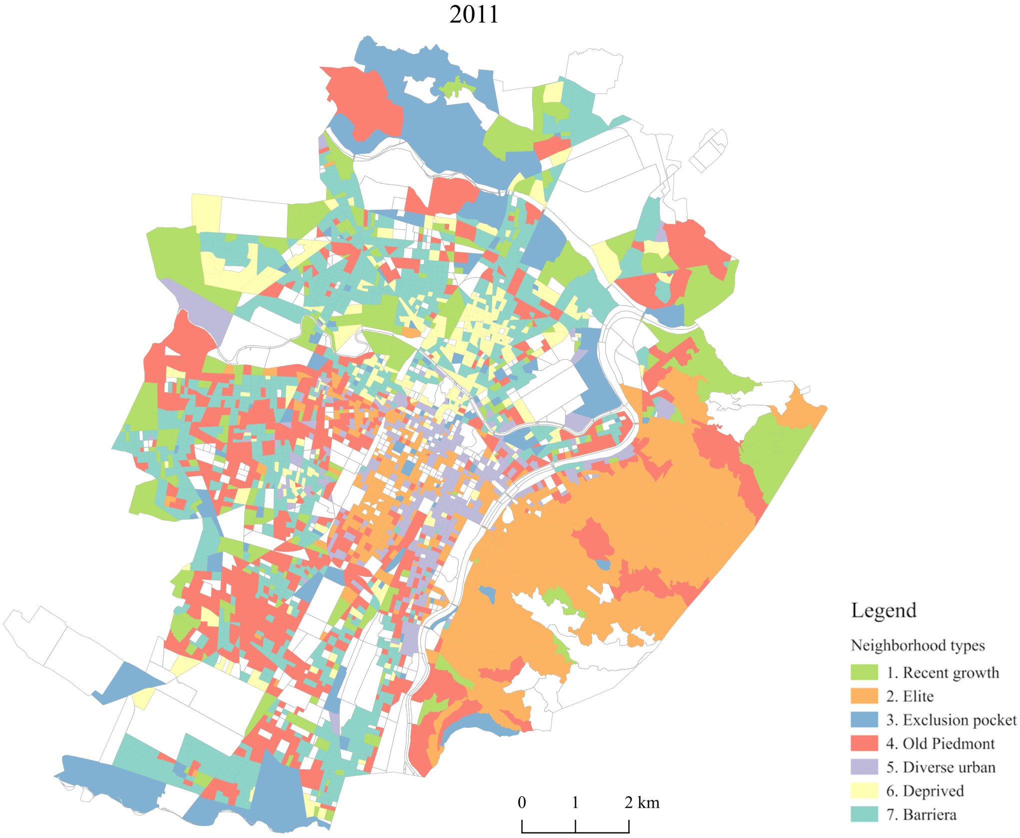


Figure 4.6: Neighborhood types in Turin (2011)



located in the northern part of Turin, involving both peripheral and semi-central areas. Despite being more spatially concentrated than Exclusion pocket blocks, they do not have a compact shape but tend to be surrounded by a mosaic of various neighborhood types. The spatial spread distribution of blocks belonging to these two neighborhood types appears to be consistent for several of the involved areas. The only clear trend of change is a slight movement of Deprived blocks away from the city core, toward the north.

Finally, blocks belonging to the remaining clusters have instead a less clear spatial arrangement and, moreover, it has changed more noticeable over the last forty years. These neighborhoods are located in the semi-peripheral and peripheral area of the city, with the exclusion of the hilly east part. In the 1971 Recent growth neighborhoods involved the outer blocks, which were more compact and concentrated, being surrounded by Old Piedmont (especially in the south-west areas) mixed to Barriera blocks (especially in the north). This pattern could be considered the effect of a vast urbanisation and growth of new residential housing stock occurred in the ‘60s. In the following decades, the number of Recent growth neighborhoods decreased, and many of them became Old Piedmont or

located the authorized (by the Municipality) “nomad campsites” inhabited by Roma and Sinti families, thus supporting empirical evidence for the isolation and severe multidimensional deprivation of residents.

Barriera neighborhoods, which conversely increased in size.

4.1.3 Summary and concluding remarks

Results from this first part of the analysis clearly show the non-random spatial distribution of social groups within city boundaries and how they tend to differentially allocate themselves creating recognizable patterns according to demographic, socio-economic and housing characteristics. The seven-class typology has shown to be meaningful and effective in differentiating neighborhood types, despite the absence of variables which have been previously found to be very relevant in the urban socio-spatial structuring and thus widely used in the literature on neighborhood classification such as income, occupational status and housing values.

Analysing the spatial configuration of the seven neighborhood types, moreover, has contributed to validate this solution showing a reasonable pattern regarding both location and spatial contiguity of blocks belonging to the same type. Furthermore, this seems to support the choice to use blocks, the smallest geographic census unit, to operationalise neighborhoods: indeed, adopting a larger unit would have hidden the fragmentary nature at least of some of the clusters, flattening their peculiarities. This classification is to some extent consistent with other existing in the literature. Multidimensional typologies accounting for the entire spectre of neighborhoods have been primarily based on empirical evidence from American cities, and for this reason, they are not easily comparable with this one, which I developed for a single Italian city. Despite this, some authors (Mikelbank 2011; Wei Knox 2014; Delmelle 2015; Delmelle 2016; Foote Walter 2016; Foote 2017) have proposed typologies consisting in between five and nine classes which have some points in common with that resulting from this research.

Firstly, variants of "Deprived" neighborhood category are present in almost all classifications. Probably the most commonly adopted label is that of "struggling" neighborhood. Mikelbank (2011) used it in his study about Cleveland making a distinction with "struggling African American" neighborhoods according to ethnic characteristics of residents. The same label has also been used by Delmelle (2015, 2016) to refer to very similar deprived areas in Los Angeles, Chicago and other U.S cities. Wei and Knox (2014) used instead the label "black/poor" and "immigrant" to emphasize the presence of ethnic concentrations respectively of black and mixed immigrant population. Similarly, Foote & Walter (2016) and Foote (2017) pointed out the presence of comparable "minority-concentrated" and "immigrant starts" areas in several fast-growing metropolitan areas and cities with major research universities. Although authors accentuated the role of ethnic origins differently, all these neighborhood types refer to the most socially and economically disadvantage city areas with very similar features to those identified by the "Deprived" cluster in this work. I preferred however to name this cluster "Deprived" rather than "Struggling" which, in my opinion, allows for a more immediate understanding of its peculiarity.

Secondly, the type I defined "Old Piedmont" has some similarities with the "Stable" neighborhood identified by Mikelbank (2011), Delmelle (2015, 2016), Foote & Walter (2016), Foote (2017). They broadly refer to areas with an aging population, high homeownership rate, low poverty and unemployment rate and stable residents. Despite some differences related to the newer housing stock and a high share of recent in-movers, this neighborhood largely corresponds to the "white/aging" identified by Wei & Knox (2014). Despite these similarities, however, I preferred to use a different label to prevent misunderstanding since I did not consider the inhabitant's residential stability.

Thirdly, I borrowed the label "elite" from the work of Wei and Knox, used successively also by Foote (2017). Authors used this name to stress the relative advantage of this neighborhood type over the others, referring to areas inhabited by "very wealthy households of highly-educated professionals distinguished by their exceptionally high household incomes, homeownership rates, median rents, and home values. They also have above-average shares of foreign-born populations, seniors, and old housing stocks" (Wei & Knox 2014). Even if in my work was not possible to account for household incomes and home values, however, the "Elite" cluster is characterised by the highest socio-economic profile, as described before, and share many traits with the one previously studied in literature. Moreover, I found this name effective in describing its peculiarity clearly.

Lastly, the "Diverse urban" neighborhood share some features with the "Young urban" identified by Delmelle (2016), especially regarding the presence of highly educated residents, living in multi-unit dwellings, with very few children. I did not control for many other characteristics identified by Delmelle and for this reason I decided to use a different label.

With respect to the spatial distribution of neighborhood types as emerged from the literature referring to the U.S. cities, it has to be noticed a fundamental difference in the characterisation of suburbs. Indeed, in the U.S. context, outer city areas are generally the most valuable areas, marked by the presence of a newer housing stock composed by single-detached houses and with high levels of homeownership, inhabited by an above average college-educated population. Differently, in the Italian context, these areas are generally defined by relatively disadvantaged profiles. The concept of "periphery" in the Italian, as well as in the European literature, commonly refers to a spatial as well as to social isolation and often to social deprivation and decay (cf. e.g. Fregolent 2008). Results from this analysis show however a more complex socio-spatial structure which somehow questioned the idea of a monocentric city, also thanks to the use of a very small spatial scale such as the census block, as well as the idea of suburbs defined by homogeneous profiles. Peripheral Turin neighborhoods have been characterised by different level of relative socio-economic disadvantaged which include not only the belonging to Deprived (especially in the northern zones) and Barriera clusters, but also to Old Piedmont and Recent growth ones.

All this considered, the neighborhood typology I developed appears to be coherent also with findings from other Italian authors who have used different theoretical frameworks and data sources (cf. Section 2.4). Particularly relevant is the fact that, despite the lack of data on occupational status and income, in this analysis is still possible to recognize the distinctions in the socio-spatial city structure underlined in those research, namely: on the one hand, central areas and the eastern hilly zones characterised by a more advantaged profile; on the other neighborhoods in the suburbs belonging to the most disadvantaged neighborhood types (Berardi et al. 1980, Mela et al. 1981, Marra 1985, Conforti & Mela 2008). However, the finer spatial scale used in this work consents to discover a more articulate mosaic of different neighborhood types, for instance in the city core where more advantaged neighborhoods are located close to very disadvantaged ones.

In describing the spatial arrangements of the different neighborhood types and especially its evolution over time, some initial considerations about how the spatial sorting of individuals and households have changed over the forty years under study have been made. Looking at maps and considering to what extent clusters have modified their size, meaning the number of census blocks belonging to each of them over time, and their spatial location contributed obtaining the first insights on dynamics of neighborhood change that have taken place in Turin from the 70's to 2011. Next paragraphs are dedicated to explore this topic more deeply, starting from the study of neighborhood transitions and concluding with the analysis of neighborhood trajectories.

4.2 Multidimensional neighborhood change

Consistently with the second research question (Question 2a) , in this section, I will address the issue of how Turin neighborhoods have changed over time between 1971 and 2011. Dynamics of neighborhood change have proven to be slow (Hulchanski 2010, Meen et al. 2013, Tunstall 2016) and to be able to capture them there is need for long-term consistent georeferenced data, which are very rare (Zwiers et al. 2016). As mentioned in Chapter 3, the Italian census, even if not extremely rich of information, is probably the only data source allowing for the study of a fine-grained spatial articulation of social groups over the long-term, for Italian cities.

In this work, the focus is on multidimensional neighborhood transformations, and neighborhood change is defined as a shift for a neighborhood from one type to another between census years, i.e. from a cluster to another. The analyses which I will tackle in the next pages are thus grounded on the typology I illustrated earlier.

In order to understand temporal changes occurring in Turin territory neighborhoods, I will firstly consider how clusters have changed in size over time, secondly, how neighborhoods have passed through different types considering pairs of consecutive censuses, and, finally, what are the most common neighborhood trajectories accounting for the entire sequence of states experienced by each census block from 1971 to 2011.

4.2.1 Neighborhood types in a temporal perspective

As mentioned, the study of neighborhood transitions and trajectories is based on the way neighborhood types have been classified. For this reason, firstly, I will focus on the temporal distribution of blocks across clusters, i.e. the number of blocks assigned to each neighborhood type, which is not constant over the five census years considered (cf. Table 4.1).

At the beginning of the study period, in 1971, Barriera and Recent growth neighborhoods outnumbered other clusters, while Exclusion pocket accounted for the smallest number of blocks. As time passed, it can be noticed a marked decline in the number of blocks belonging to Recent growth: from about 21% of neighborhoods to 7%. This decline seems to reflect the gradual drop from the 70's in the number of city areas with low population density and recently interested by significant residential real-estate development, combined with a somehow exclusive presence of families with children.

While being constantly the smallest cluster, also Exclusion pocket has reduced its size over time, even if with a very tiny increase in the last decade considered. This could reflect, as for Recent growth neighborhoods, processes of urbanization which tend to affect low densely populated city areas. In this case, the high presence of children and foreign-born residents from low-income countries, peculiar features of this neighborhood type, could explain the (very small) increase in number in the last decade due to an overall increase of foreign-born residents, primarily from low-income countries and their on average higher fertility rates.

Differently, Barriera and Old Piedmont clusters have linearly moderately increased in size from 1971 to 2001 with a small reduction from 2001 to 2011. This transformation can be the result of aging processes which have interested previously Recent Growth neighborhoods both referring to the age of residents, which is reflected in their household composition, and to the housing stock. In Turin, the number of Urban Diverse neighborhoods remained stable with a slight increase in the two last decades. Similarly, neighborhood types at the top and the bottom of the socio-economic inequality ladder, Deprived and Elite clusters, accounted for about 12% and 14% and remain substantially stable over time, with small fluctuations. These stability trends do not support any statements about increasing socio-spatial inequalities in the last decades, nor that neighborhoods have become more polarized.

4.2.2 Neighborhood transitions: on the likelihood of change

Until this moment, the analysis has been conducted in a cross-sectional perspective, taking somehow pictures of the state of neighborhood types in different years. This approach, however, does not allow to uncover what are the mechanisms behind temporal changes. For instance, the almost unvaried size of both Elite and Deprived ones: is this temporal stability in number the result of blocks having the same profile over the forty years considered?

Alternatively, do exist different blocks which have passed through a deprivation status in this period interchangeably?

In this subsection, I will account for processes of change using a longitudinal perspective instead. This viewpoint allows considering the more precise issue of neighborhood transitions. A transition occurs when a census block changes profile passing from one neighborhood type to another in the subsequent census (i.e. every ten years), and the likelihood of this event can be quantified. Moreover, information about single transitions can be aggregate thus generating a more detailed representation of the transformations occurred in the spatial organization of urban groups over time.

Before classifying blocks into neighborhood types, I had excluded those with very few or no inhabitants. In this part of the analysis, however, I decided to reintroduce this kind of blocks, defining them as "uninhabited blocks", to be able to account also for processes of urbanisation and depopulation. This choice has resulted in a balanced dataset (Table 4.3): each block has five observations, corresponding to census years from 1971 to 2011, on the "neighborhood type" variable which now consists of 8 categories (7 neighborhood types plus the 8th "uninhabited" neighborhood).

Table 4.3: Percentage of blocks belonging to each neighborhood type, including "uninhabited" blocks

	Census year					
Neighborhood type	1971	1981	1991	2001	2011	Total
0. Uninhabited	7.11	6.95	8.40	15.24	14.10	10.36
1. Recent growth	19.62	13.21	9.22	5.84	5.76	10.73
2. Elite	13.15	13.50	14.63	11.30	11.73	12.86
3. Exclusion Pocket	6.50	5.18	5.07	2.38	2.96	4.42
4. Old Piedmont	13.87	16.27	18.07	19.92	19.73	17.57
5. Diverse Urban	8.32	7.71	7.34	9.01	10.01	8.48
6. Deprived	10.62	12.12	11.30	8.48	9.88	10.48
7. Barriera	20.81	25.07	25.96	27.84	25.83	25.10
Total	100	100	100	100	100	100
(N)	3786	3786	3786	3786	3786	3786

To quantify which type of neighborhood are more prone to undergo to transformation and which, conversely, are more likely to stay stable without experiencing change, I calculated transition probabilities considering occasions of all the five waves (3786 blocks, for a total of 18930 observation). The unconditional transition probability table (Table 4.4) reports probabilities of transition to a specific state (neighborhood type) at time $t{+}1$ based on the neighborhood profile at t.

The order in which I entered the name of clusters in Table 4.4 is different from the one I used before. It follows the results of the multidimensional scaling analysis for the first dimension (1), the one accounting for the degree of relative advantage disadvantage of a type with respect to the others. Neighborhood types are then ordered from the least advantaged one (Deprived) to the most (Elite)[9]. Uninhabited blocks category, for which no other information is given except for the (almost) total absence of residents living in these areas, is list as first to keep it separate from the ordered list of the others.

Table 4.4: Transition probability matrix

	Neighborhood type (t+1)							
Neighborhood type (t)	0.Uninhabited	6.Deprived	3.Exclusion Pocket	7.Barriera	1.Recent growth	5.Diverse Urban	4.Old Piedmont	2.Elite
0. Uninhabited	83.60	0.70	6.24	0.63	4.70	0.70	0.98	2.45
6. Deprived	2.24	64.53	5.34	16.58	1.80	8.82	0.68	0.00
3. Exclusion Pocket	25.28	14.23	29.28	7.46	11.46	4.28	3.18	4.83
7. Barriera	1.09	8.16	1.03	73.82	5.35	3.95	6.47	0.13
1. Recent growth	3.86	2.21	4.41	22.78	41.42	0.83	21.13	3.36
5. Diverse Urban	3.02	5.06	2.69	8.16	0.65	56.77	9.54	14.11
4. Old Piedmont	2.06	0.62	1.01	12.87	4.42	4.69	69.06	5.27
2. Elite	3.97	0.20	1.26	0.15	1.71	6.33	11.45	74.94
Total	11.17	10.45	3.9	26.18	8.51	8.52	18.5	12.79

Ordering neighborhood types in this manner allows to more clearly show similarities between them in terms of inequalities and, moreover, to easier identify transitions as upgrading or downgrading transformations. A neighborhood passing from Deprived to Barriera type can thus be considered as improving its profile while changing from Recent growth to Barriera can be seen as a decline.

Results indicate that a high proportion of neighborhood with a given profile at time textitt remained in the same type at time *t+1*. On the diagonal line are reported the so-called "stability rates", i.e. the likelihood that a neighborhood with a specific profile is going to maintain the same profile also in the consecutive census year, thus after ten years. The average stability rate for all time periods is 65,70. This means that, in general, about two out of three blocks preserve unvaried their characteristics in consecutive census years.

Results also show that for all neighborhood types the likelihood to stay stable is higher than experiencing a transformation. The highest stability rate is that of uninhabited neighborhoods: more than 8 out of 10 continue to remain inhabited also after ten years, and when they change profile, becoming residential neighborhoods, are more likely to become Exclusion pocket areas (6.24%), Recent growth (4,70%), or in a very tiny proportion Elite (2.45%) neighborhoods. Many of these were and still are in 2011 industrial areas where plants are located, only almost one block out of ten has been involved in the expansion of new residential building construction.

Elite and Barriera neighborhoods resulted having very high stability rate, followed by Old Piedmont and Deprived ones. Differently, stability is less likely than change between

[9]As already mentioned, this is not stricto sensu an ordered classification. Indeed, it has been developed accounting for the multidimensional nature of neighborhoods. However, as shown in the multidimensional scaling analysis in Chapter 3, the dimension along which neighborhood types differ the most refer to socio-economic attributes. Moreover, this dimension is also very relevant in terms of substantive meaning in order to distinguish among relatively advantaged and disadvantaged neighborhood types. For these reasons, the classification proposed in this part of the analysis has to be considered ordered in a broader sense and thus it does not allow to use, for instance, regression models for ordered variables.

two censuses for Recent growth (41,42%) and, particularly, Exclusion pocket neighborhoods for which almost one block out of three change profile with a likelihood that is very close to that of becoming "uninhabited" blocks, thus losing (almost) all its residents. This depopulation trend is instead very unlike for all the other neighborhood types. Among processes of change, the most common transformations are those between similar types: it is more likely to see mobility path between neighborhood types that are not very far in terms of deprivation. It is indeed more likely for a neighborhood to change from Exclusion pocket (14.23%) or Barriera (8.16%) to Deprived than from areas with a profile more oriented towards multidimensional well-being (Elite 0.20%, Old Piedmont 0.62%).

Among downgrading transitions, the most common are those from Recent growth to Barriera (22.78%), from Old Piedmont to Barriera (12.87%) and from Barriera to Deprived which are consistent with traditional theories on neighborhood change according to filtering theories and for which empirical evidence has been found in the literature about US cities (Mikelbank 2011, Delmelle 2015, 2016). This model describes a general downgrading progression for areas where the aging of relatively new housing stock encourages residents with economic capacity to relocate: the depreciation of dwelling units, caused by the decline of its quality, facilitate their replacement by lower-income residents, especially of belonging to minority groups. In these transitions, both the aging housing stock and the replacement of residents with a lower profile are present as well as the inflow of residents from low-income countries and the Southern Italian regions.

Other transitions, concerning a relevant proportion of neighborhoods, underlying a worsening of multidimensional conditions, are those: from Exclusion pocket to Deprived (14.23%), from Diverse Urban to Barriera (8.16%) and, despite remaining in the area of relative advantage, from Elite to Old Piedmont neighborhoods. It has to be noticed how unlike is for a block having a whatever profile to become an Exclusion pocket neighborhood (3.9% of total transitions). This figure contributes to affirm once more the peculiarity of this cluster which appears to be entirely apart from the others.

Transitions accounting for an upgrade of socio-economic characteristics are those from Recent growth to Old Piedmont cluster (21.23%), from Deprived to Barriera (16.58%), from Diverse Urban to both Elite (14.11%) and Old Piedmont (9.54%) and, finally, from Exclusion pocket to Recent growth (11.46%). As known, the literature on neighborhood upgrading has been devoted mainly to study processes of gentrification, and there are almost no theories about other variants of neighborhood ascent (cf. Chapter 2). In this analysis, some evidence about some of the traits acknowledged as typical of gentrification processes can be found in the transition rate of passing from being a Deprived neighborhood to a Diverse Urban one. This socio-economic ascent is driven by a sharper improvement in educational attainment, decreasing population density, increasing presence of foreign-born residents from high-income countries and couples with children being replaced by unmarried residents and unipersonal households.

The descriptive analysis provided so far suggests the existence of a strong path dependence (or state dependence) in neighborhood change dynamics. For blocks belonging to majority of neighborhood types, the probability to face profile modifications is by far lower than that to maintain their own profile over consecutive census years. Moreover, the highest viscosity can be found in the most advantaged neighborhoods. These findings are consistent with the growing body of research suggesting that residential patterns are highly persistent and neighborhood changes rare (Meen et al. 2013, Tunstall 2016).

In this last part of the analysis, I used a multinomial logistic model in order to estimate the probabilities to improve, worsen or not change profile for blocks belonging to each of the neighborhood types. The model controls for: census year (historical time), to investigate whether probabilities of neighborhood improvement, worsening or stability have been different over decades and, moreover, whether this period effect varies across neighborhood types (interaction between neighborhood type and census year); initial status, meaning the type each neighborhood belonged to in 1971, since the observation starting point (1971) does not coincide with the beginning of neighborhood trajectories and of processes generating socio-spatial inequalities; number of inhabitants living in the neighborhood, because the neighborhood classification used in this work is based on resident's characteristics, and for this reason the number of individuals living in a block is related to its propensity to change: the more residents inhabit a neighborhood, the greater the variation needed in order to make its profile change. Therefore, controlling for this aspect allow to estimate more precisely the likelihood of change for each neighborhood type.

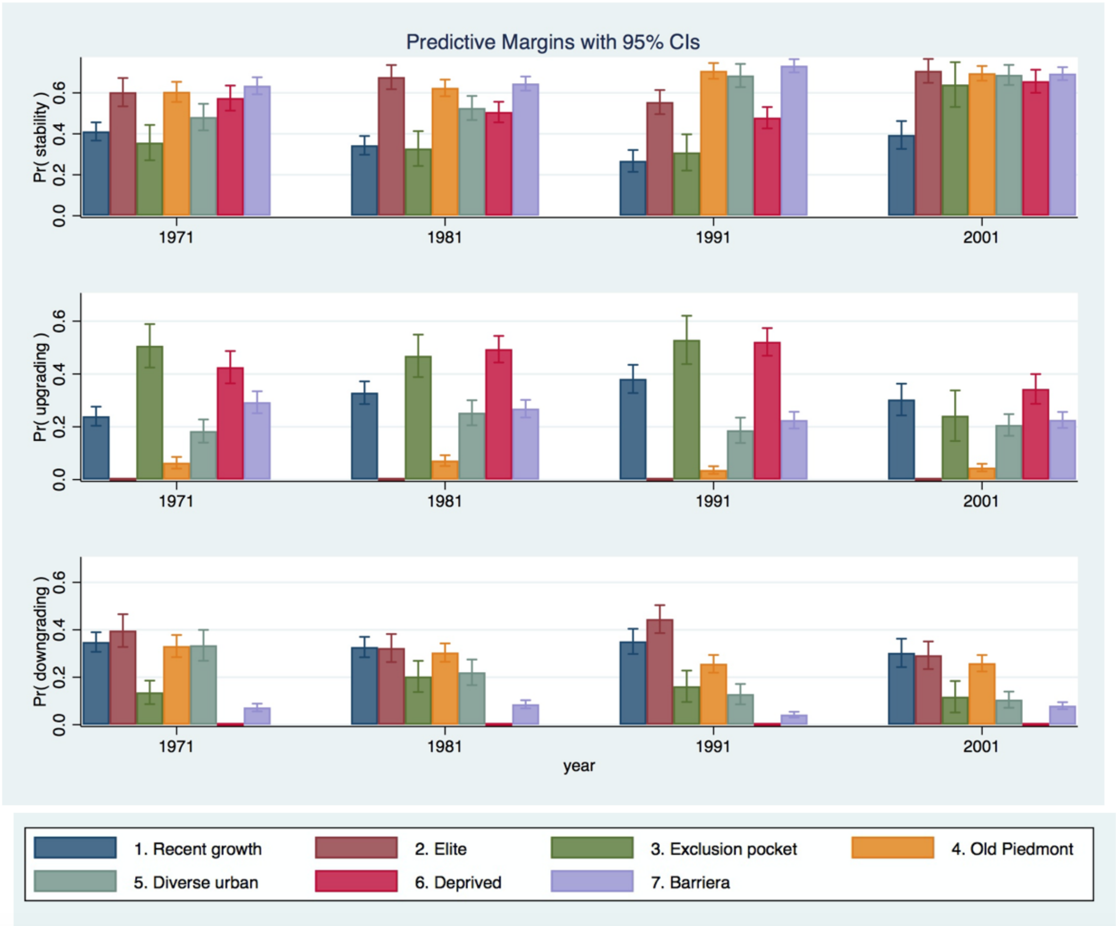
Figure 4.7 shows difference across neighborhood types in estimated probabilities for being stable, upgrading and downgrading over time[10].

Among the most relevant findings, the graphs illustrate how, even after controlling for previously mentioned variables, stability is still generally the most likely outcome, even if this status persistence varies both over time and across neighborhood types. Looking at temporal dynamics, starting from the 2000's, especially for the most disadvantaged (Deprived and Exclusion pocket, but also Recent growth) and advantaged (Elite) neighborhoods, stability has become more likely, reversing the trend of the previous years. Moreover, this is also true for Diverse urban neighborhoods whose increase in stability rate started earlier in the 90's. Smaller variations over time have conversely concerned Old Piedmont and Barriera blocks. Despite this general trend, however, Recent growth and Exclusion pocket neighborhoods appear to be those more prone to change, having indeed the lowest stability rates.

Upgrading and downgrading probabilities represent, obviously, the other side of the coin of stability dynamics: the less a neighborhood is stable the more it is prone to change, by definition. Estimated probabilities, however, allow to uncover that there is less variation among clusters regarding the occurrence of worsening of socio-economic conditions than improvements. The former has been around 30-40% for all neighborhood types with exception, on the one hand, of Barriera and Exclusion pocket blocks, for which it has been

[10]The model estimates can be found in Table A.5, and A.6 in the Appendix.

Figure 4.7: Predicted neighborhood probabilities (95% Confidence Interval) for being stable, upgrading or downgrading



closed to 10% over the whole period; and on the other, of Diverse Urban ones for which the probability to undertake a downward pathway was 30 percentage points higher than in the 70's, but decreased over time until reaching 10% in the 2000's as result of their stabilisation[11].

The 90's has been the most favourable moment for disadvantaged neighborhoods (Deprived and Exclusion pocket), to improve their profile, with a likelihood of upgrading closed to 50%, which has then declined in the last decade considered. Moreover, despite their relative advantage position, Recent growth neighborhoods have had a higher propensity to upgrade than Barriera neighborhoods which have been very stable over the forty years from 1971 to 2011.

[11] It has to be noticed that probability to upgrade is close to zero for neighborhoods belonging to the Elite group, as well as probability to downgrade are zero for the Deprived one. This is a statistical artefact due to the fact that Elite and Deprived types are the most advantaged and disadvantaged ones. As a results, there is no higher type towards which upgrade for the former as well there is not lower type towards which downgrade for the latter. This is known in literature also as "ceiling/floor effect".

4.2.3 Neighborhood trajectories

In the literature, interest for neighborhood change with a long-standing longitudinal perspective is fairly recent and notably linked to the introduction of the concept of "neighborhood trajectories" (Wei & Knox 2014, Delmelle 2015, 2016, Foote & Walter 2016, Foote 2017, Ling & Delmelle 2017, Zwiers et al. 2016). Instead of considering observations over time as they were independent single events, this analytical tool emphasizes the investigation of strings of states, accounting for specific durations and a specific order, and thus for the continuity of the process (Aisenbrey & Fasang 2010, Blanchard et al. 2014). In this regard, looking at neighborhood trajectories can enhance the perspective and the understanding of neighborhood change dynamics, going beyond the study of differences between two points in time (Zwiers et al. 2016).

In addition to investigate the transitions rates between neighborhood classes, as I did in the previous subsection, keeping a longitudinal perspective, it is possible to examine the sequence of neighborhood types experienced by each block for the entire 40 years study period. The focus is indeed no more on single transitions between clusters, but on pathways of long-term change. In this last subsection, I will analyse neighborhood trajectories using sequence analysis in order to answer to the research question about what are the most common trajectories of change for Turin neighborhoods in the period from 1971 to 2011.

Table 4.5 illustrates a cross-tabulation between the number of different states and the number of spells for all the Turin neighborhood trajectories. More than half of the blocks assists only to one or two spells, meaning that a single profile or two have characterised them on the entire analysis period. On the other extreme, there are very few neighborhoods (less than 4%) which have assist to five spells, one for each census year considered. This table also shows that not all blocks with three or more episodes went through likewise number of different states: indeed, one of the existent change trends is to return to a status already experienced before recursively.

Table 4.5: Cross tabluation of the number of states and spells for neighborhood trajectories (% of the total)

	Number of spells					
Different states	1	2	3	4	5	Total
1	1001 (26.44%)	0	0	0	0	1001 (26.44%)
2	0	1201 (31.72%)	428 (11.30%)	143 (3.78%)	15 (0.40%)	1787 (47.20%)
3	0	0	462 (12.20%)	295 (7.79%)	61 (1.61%)	818 (21.61%)
4	0	0	0	125 (3.30%)	46 (1.22%)	171 4.52%)
5	0	0	0	0	9 (0.24%)	9 0.24%)
Total	1001 (26.44%)	1201 (31.72%)	890 (23.51%)	563 (14.87%)	131 (3.46%)	3786 (100)%

I considered categorical sequences consisting of five ordered elements each of them representing one out of the eighth neighborhood types (seven cluster plus uninhabited blocks) for a specific year. Examining trajectories of the 3786 neighborhoods existing in Turin, sequence analysis pointed out 1085 different trajectories (of 32768 producible ones).

Being interested more in the succession of different neighborhood profile than in the timing of change or in the duration of the states, I decided, however, to focus on same-order sequences accounting for distinctive successive states, which consider “experienced states” and “sequencing” of neighborhoods, namely looking at type and order of different states (neighborhood types) experienced (Studer & Ritschard 2016). Therefore, I considered sequences which did not account for both the “timing” of changes (i.e. when the transition from a neighborhood type to another occurred) and spell lengths (“duration”: i.e. for how many census years the neighborhood has belonged to that types).

Using this definition, the number of same-order sequences fell to 667 and the 30 most common, shown in Table 4.6, accounts for 59.75% of the total. For instance, the most common same-order sequence is “7” indicating all those neighborhoods (8.77 %) that have been exclusively Barriera (7) for the all period from 1971 to 2011, experiencing then a stability trajectory of non-change. Similarly, sequence “17” indicates those blocks that, no matters when, have been firstly Recent growth and then Barriera neighborhoods.This empirical evidence suggests that there is some variability in the longitudinal trajectories of change. It is, however, difficult to compare this result to those obtained by other authors, not only because of the different context and for the use of same-order sequences but mainly because this variability is a function of both the number of groups and of the number of time points considered[12].

The analysis, however, confirms findings from other studies (Hulchanski 2010, Meen et al. 2013, Tunstall 2016) regarding the prevalence of long-term neighborhood stability over change: over the forty-years considered around one neighborhood out of four (26.44 %) has keep unchanged its profile. Moreover, stability trajectories of six neighborhood types (out of the eight considered) are in the top twelve most frequent ones. More in detail, the most frequent sequences are Barriera (7) and Elite (2) stability; far less stable are instead Recent growth and Exclusion pocket neighborhoods (60th and 204th).

The most common change pathways are mainly characterized by two spells, underlying once again the slowness of these process and the need to look at very long-term periods of time in order to study them. Moreover, many of them can be classified following the traditional distinction into downgrading or upgrading according to the direction of transformations related to the socio-economic dimension. However, from this descriptive

[12]For instance: Wei and Knox (2014) found that the top 39 sequences accounted for more than 90% of the total using seven neighborhood classes observed, however, for only three time stamps; Delmelle (2015) using 5 neighborhood classes for 5 waves found that the top 10 sequences described almost 50% of the total number; Foote (2017) with seven clusters and four time points found that the top 24 sequences accounted for almost 65% of the total.

Table 4.6: Top 30 most frequent neighborhood trajectories

Sequence	Number of block	Percentage of blocks	Cumulative percentage of blocks
7	332	8.77	8.77
2	215	5.68	14.45
14	196	5.18	19.62
17	165	4.36	23.98
4	149	3.94	27.92
0	137	3.62	31.54
6	93	2.46	33.99
47	90	2.38	36.37
24	88	2.32	38.70
76	86	2.27	40.97
65	67	1.77	42.74
5	64	1.69	44.43
67	55	1.45	45.88
52	51	1.35	47.23
30	50	1.32	48.55
676	39	1.03	49.58
747	39	1.03	50.61
147	34	0.90	51.51
30	33	0.87	52.38
174	32	0.85	53.22
717	31	0.82	54.04
252	28	0.74	54.78
7676	27	0.71	55.49
75	24	0.63	56.13
10	23	0.61	56.74
171	23	0.61	57.34
20	23	0.61	57.95
42	23	0.61	58.56
74	23	0.61	59.17
36	22	0.58	59.75

analysis, a number of "other" pathways emerge which difficulty fit into this dichotomy[13]. The following are brief descriptions of their salient characteristics.

4.2.3.1 Downgrading

This category includes trajectories defined by the worsening of socio-economic conditions. The pathway from Recent growth to Barriera shows an aging process involving both the housing stock and demographic characteristics of residents, a rising population density as well as an increase in the proportion of renters and overcrowded dwellings. The declining

[13] I firstly have tried to conduct a cluster analysis to group trajectories in meaningful groups, as other authors did (cf. e.g. Delmelle 2016, 2017). However, the prevalence of stability trajectories made this analytical choice not very effective. Indeed, trajectories tend to cluster around those representing stability pathways.

presence of families with children and of Piedmont born inhabitants coupled with the rising share of unmarried, divorced and unipersonal households.

Another trajectory results in Barriera neighborhood. Its starting point is this time Old Piedmont neighborhood and, differently from the previous one, the socio-economic decline is here accompanied by an increase in the share of youth and families with children, combined with an influx of individuals from in low-income countries.

Albeit less intense, also the change from Elite to Old Piedmont refers to a decline, especially with respect to a worsening in educational attainment, dwelling crowding and unemployment rate, which is partially soften by the increase in the share of homeowners and decline in the presence of family with no income sources. The aging residential stock and population growth coupled here with a loss of residents born in foreign high-income countries and gain in those coming from Southern Italian regions.

The last two downgrading trajectories deal with a shift to Deprived neighborhood: the former follows a pathway from Barriera neighborhood that has some elements of filtering processes, where the aging housing stock come together with loss of population, especially of Piedmont born residents, an influx of those from low-income countries and rising share of inhabitants born in Southern Italian regions. Couples with no children seem to be replaced by younger and unmarried inhabitants living alone as well as by lone parents. The latter, from Exclusion pocket to Deprived areas, features, conversely, a decrease in foreign-born residents and families with children accompanied by a rise in the presence of both youth and elderly suggesting an "aging in place" dynamic (Wei & Knox 2014). Population growth and a sharp decline in new buildings stress the significant transformation related to the housing dimension.

4.2.3.2 Upgrading

Pathways showing a socio-economic ascent result less common than the downward one in the top 30 frequent sequences. However, the most frequent trajectory of change is the upgrading transition from Recent growth to Old Piedmont neighborhoods. It refers to both an aging residential stock and population. While the general educational attainment improves and the share of over-crowded dwellings decrease, there is no amelioration regarding unemployment and home-ownership rate; moreover the presence of family without or only with pension income declines.

Three among upgrading trajectories represent the opposite transition of pathways above mentioned about downgrading trajectories, affirming the relevance and the recurrence of transitions between these particular neighborhood types: firstly, the trajectory from Deprived to Barriera neighborhood, where the recent residential stock drives a rise in population density, presence of Piedmont born and elderly resulting in a more heterogeneous social environment.

Secondly, the trajectory from Old Piedmont to Elite, which as previously mentioned, deals with a soft socio-economic improvement driven by educational attainment, a decline in overcrowded dwellings and the unemployment rate. Its more relevant characteristics are however the increasing share of Piedmont and influx of high-income countries foreign-born residents combined with a decreased population density.

Thirdly, the pathway from Barriera to Old Piedmont, which is mainly characterized by a substatial improvement in socio-economic conditions, a shrinking and aging population where the loss of families with children, residents from the South of Italy and, to a lesser-extent, born in low-income foreign countries are combined with the growing presence of childless couples and elderly.

Other two upgrading trajectories found in the top thirty sequences refer to transition from Deprived to Diverse urban and from Barriera to Diverse urban. They share many common traits such as decreasing population density, high-income countries foreign-born presence and couples with children replaced by unmarried, divorced individuals and unipersonal households. Moreover, their socio-economic ascent is driven by a sharper improvement in educational attainment. It has to be noticed that some of these characteristics belong to those distinctive of gentrification. Despite these similarities, the former is characterized by a rising percentage of Piedmont born and elderly combined with a loss of residents from low-income countries that result in a more mixed neighborhood, while the latter, mainly by an increase in the rate of household with no income sources and renters, which moderate its socio-economic upward trajectory.

Finally, the change from Diverse urban to Elite neighborhood is defined by an improvement referring to all the socio-economic variables which underlines a shrinking population and a recent renewal of the housing stock. The influx of residents from high-income countries seems to be counterbalanced by the exodus of those born in low-income ones. Moreover, the proportion of families with and without children increases while the presence of youth, unmarried and unipersonal households sharply decrease.

4.2.3.3 Other trajectories

Among the most frequent neighborhood trajectories uncovered looking at the city of Turin, there are pathways which can be defined neither downgrading nor upgrading. First, trajectories resulting in "inhabited" blocks such as "30", "10" and "20" sharing a common pathway towards a (almost) total population loss for which the upward/downward dichotomy is not meaningful. Moreover, without a further examination is difficult to define these processes in a more meaningful manner. Despite the evident depopulation trend, with available information, it is not possible to distinguish whether this is the result for instance of change in land uses or which other dynamics have occurred in these areas.

Another trajectory reaffirming the need to go beyond this dichotomy includes all the sequence characterized by a recurring transition between different states such as "676", "030", "717", "252", "7676", "171". These sequences should be carefully analysed, also focusing on their spell lengths and trying to understand if it could be more appropriate to interpret them as "quasi-stability" pathways in which there is a predominant status with a short episode of change; or rather if these blocks are somehow unable to definitively undertake a transformation remaining "trapped" into this recurring transition.

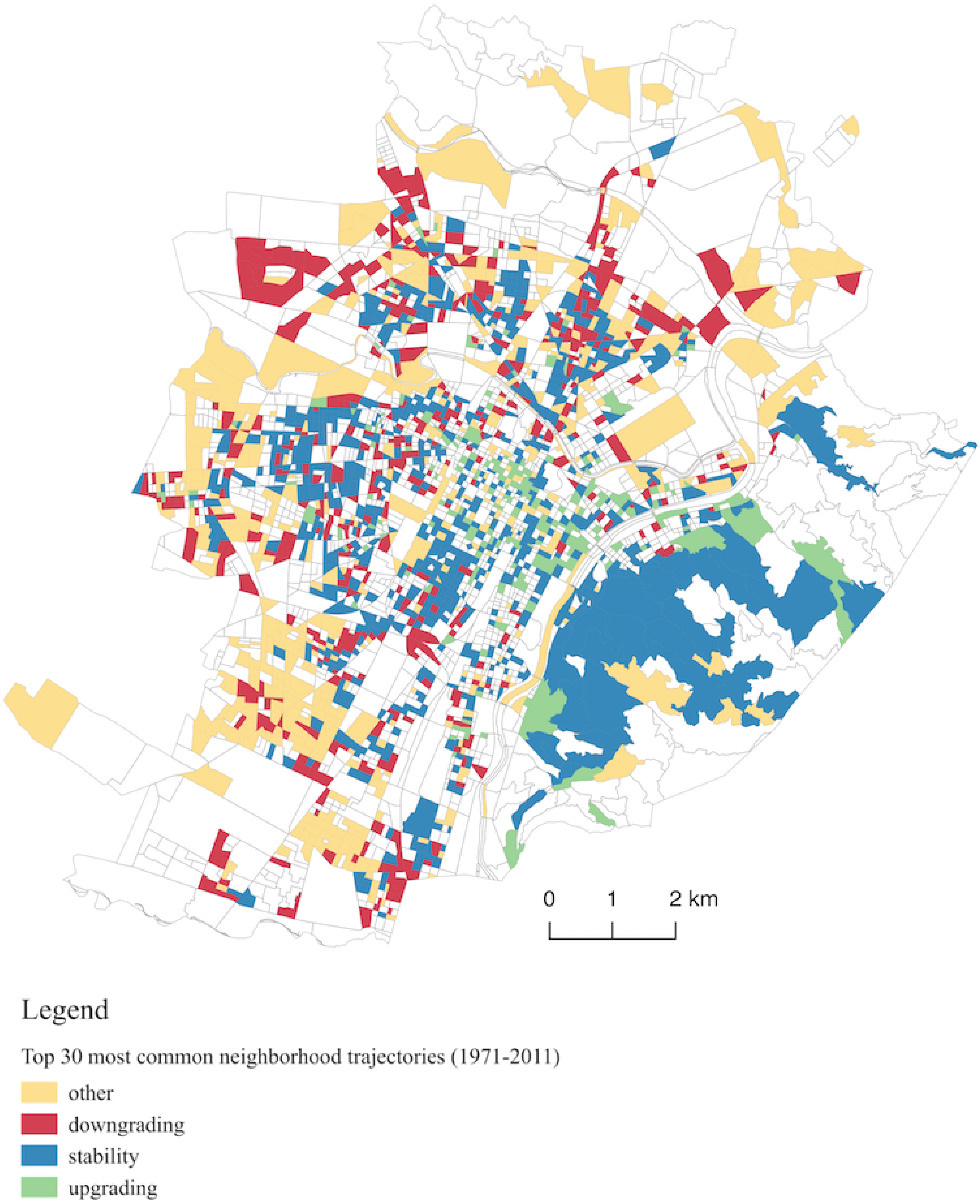
The last "other" trajectory group is defined by the two only sequences including three different states, among the most commonly observed in Turin in the period from 1971 to 2011. The "147" sequences describe an overall linear downgrading regarding aging residential buildings, increasing population density and rising share of unipersonal households, unmarried and divorced residents. Other characteristics, however, do not evolve as linearly over the whole period: on the one hand, the stability of socio-economic condition of the first phase is combined with a worsening during the second transition; on the other, there is a shift from a demographic point of view which firstly results in an older and mainly Piedmont born population and successively in a younger, family-based and more mixed social environment. The "174" trajectory is instead characterized by a downgrading followed by an upgrading phase, the process of population aging is on the contrary almost linear: these areas pass from relative young social environment with the prevalence of families to an neighborhood with older residents. These last two more complex pathways are a combination of previously described transitions, however, looking at the complete sequences allows to enhance the understanding of this transformation and to detect their not linearity. Moreover, in this case, it could be useful to look also at spell lengths and timing to further examine what causes and drivers of these transformations are.

Figure 4.8 shows the spatial distribution of most common neighborhood trajectories classified as "downgrading", "upgrading" or "other" pathways.

In order to answer to understand which is the spatial arrangement of neighborhood trajectories, the first result is its widespread geographical distribution within the city which is higher than those of distinct neighborhood types. This aspect underlines how dynamics of neighborhood changes manifest themselves at block level, particularly those related to a worsening of socio-economic conditions, thus with very different outcomes also between very closed neighborhoods.

Long-term downgrading trajectories concerned neighborhoods which are dispersed in many areas, with the exception of the very urban core and the wealthier hilly area on the east which appear to be very stable over time with some tracts also improving their profile. Consistently with the literature on neighborhood change and findings from other authors regarding neighborhood trajectories, Figure 4.8 show how neighborhoods which have undergone an upward transformation are in areas closed to the city core. Considering these trend, it can be hypothesized that those tracts which are both still belonging to the Deprived type in 2011 and closed to those which have differently undertaken an upgrading pathway in the last decades are those with a higher potential of improvement of their profile in the next years. This is also supported by previous findings on renewal trend and gentrification phenomena which has been described as spatially contagious patterns, even if temporally uneven (Delmelle 2016, Guerrieri et al. 2013). Despite their variegate pathways, "other" trajectories are instead mainly visible in the outer west "half ring" and

Figure 4.8: Spatial arrangement of Turin neighborhood trajectories



both declining and very stable blocks surround them.

Finally, Figure 4.9 shows the spatial distribution of neighborhoods which have followed stability pathways over the forty years considered, distinguishing them according to neighborhood types. Results illustrate, on the one hand, that among stability trajectories there are many neighborhoods characterized by the most advantaged profile, especially belonging to the Elite type which result rather spatially clustered. On the other hand, neighborhoods with the more disadvantaged profiles, belonging mainly to the Barriera cluster and, to a less extent, to the Deprived one, are instead spatially scattered in the west and north-west semi-peripheral city areas.

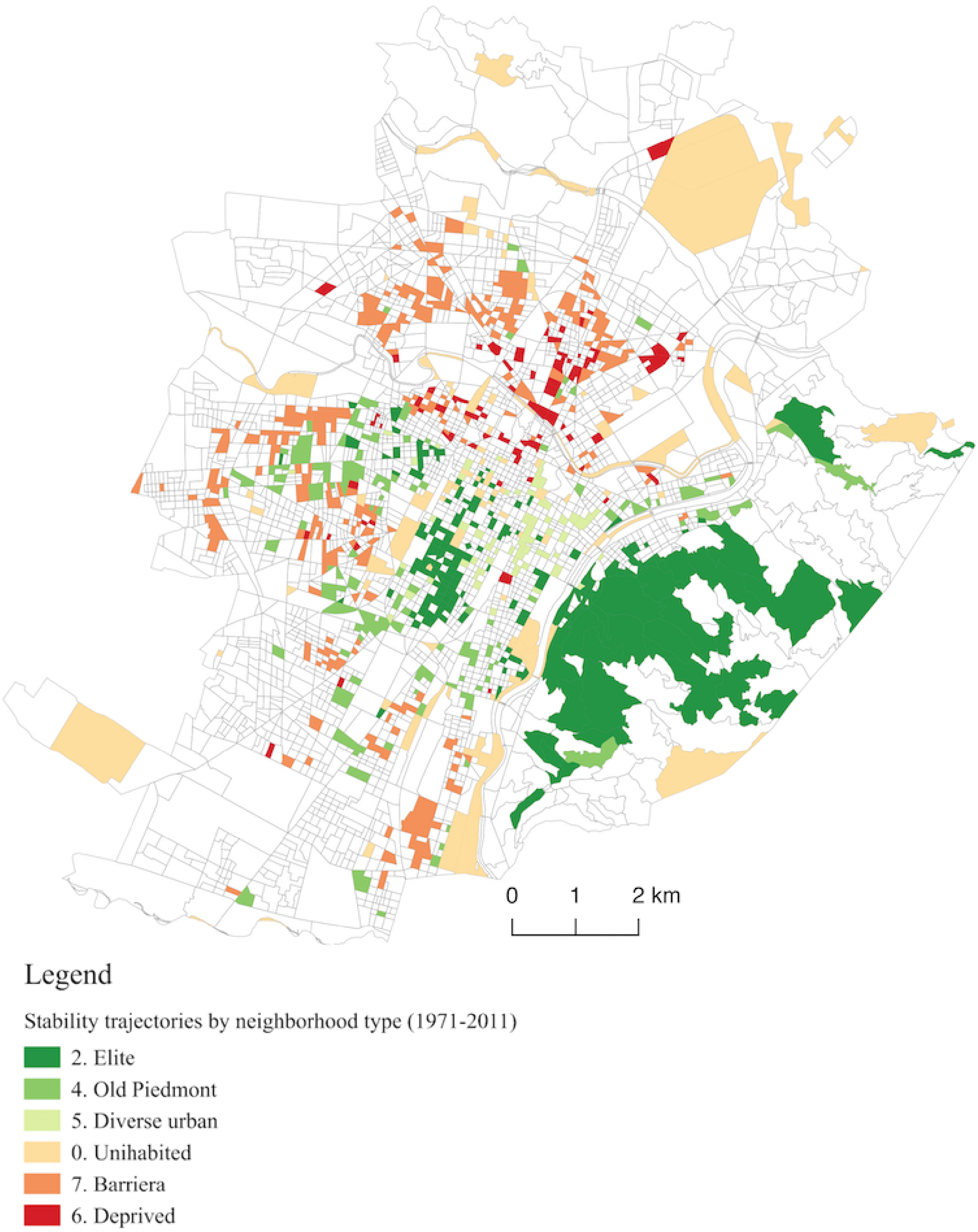
4.2.4 Summary and concluding remarks

Neighborhood types have changed their size over time and this can be considered the first result concerning the temporal evolution of neighborhood dynamics from a cross-sectional perspective. Differences across decades appeared to be related mainly to transformation on the housing dimension and referring to the aging of the residential building stocks. This phenomenon could account, indeed, for the marked decline in the number of blocks with a Recent growth profile occurred starting from the 80's, and the simultaneous rise of Barriera and Old Piedmont neighborhoods. This trend could be, however, also related to the progressive reduction of areas characterized by a much higher than average almost exclusive presence of families with young children in comparison with other household types. This tendency does not reflect the decreasing fertility rate per families in the last decades, because long-term historical modifications like this one have been accounted in the typology; it would seem rather accounting for a general more mixed social environment both from the point of view of age group and household variety in the last decades considered than in the 70's.

Differently, neighborhood types with the most relatively advantaged and disadvantaged profile, Deprived and Elite, have maintained substantially unchanged size over the study period forty years, with small fluctuations. These stability trends do not support for the city of Turin from 1971 to 2011 any statements about increasing socio-spatial inequalities, nor about neighborhoods becoming more polarized.

Results from the analysis of transitions between neighborhood categories have shown that neighborhoods are more likely not to change even when looking at long-term period, thus illustrating how stable they are when multidimensional characteristics are taken into account: on average about two out of three blocks preserve unvaried their characteristics in consecutive census years, thus after ten years. Elite and Barriera neighborhoods have the highest stability rates, followed by Old Piedmont and Deprived ones; differently, stability is less likely than change for Recent growth and Exclusion pocket blocks. Finally, it has to be noticed that Barriera cluster include the largest number of neighborhoods and it also has many traits corresponding to average city characteristics. It is also for these reasons that transitions for and to this neighborhood types are more likely than other.

Figure 4.9: Spatial arrangement of Turin neighborhood stability trajectories



The last part of the analysis dealt with the most common long-term neighborhood trajectories accounting for the complete sequence of profile experienced by blocks. One of the main findings of this section is that one single transition mainly characterises most frequent sequencing, i.e. neighborhoods have belonged only to two different clusters over the forty years. As a result, trends described about transitions, which focus on consecutive census years, and those illustrated referring to trajectories are similar from the point of pathways: they both accounted for change from a neighborhood type to another, and cluster involved in these transformations are in most cases the same. However, these findings do not tell the same story: the overlapping of the most common trajectories with single transitions is a further important demonstration of the slowness and rareness of dynamics of neighborhood change.

A variety of neighborhood trajectories resulted from this analysis. Some of them are consistent with models and theories of neighborhood change from the international empirical evidence for more recent studies: particularly, filtering and gentrification dynamics as well as a predominant absence of change for many blocks over the entire period of study. Nevertheless, to enhance the understanding of the complexity of pathways, especially of those belonging to the "other" neighborhood trajectories, other methods appeared to be necessary. The choice to look at same-order sequences has proven to be sufficiently effective in order to summarize the complexity of patterns, but did not allow to deepen analysis timing and spell durations which in this case demonstrated to be essential. Moreover, other techniques would also permit to go further the descriptive analysis conducted in this work.

The spatial distribution of neighborhood dynamics underlines a low geographical contiguity, only upgrading areas appeared to be concentrated in the urban core. This variety at block level could be related to the tight link between building environment and neighborhood change: despite being very closed two blocks can have very different housing stock and these could have a role in also differentiating their trajectories over time; moreover, construction, renovation or demolition activities, which can be considered the most important source of residential buildings transformation, often affected tiny portion of urban territory. These hypotheses should be further investigated and this could be easier narrowing the study period to the last decades, for which more data sources are available.

Chapter 5

Results part II: intra-urban residential mobility

In this chapter, I will present results of the analyses conducted to answer my second set of research questions concerning residential mobility and its role as a potential driver of neighborhood change. Differently from the previous chapter, here the unit of analysis is represented by the individual residents and the focus is on their residential movements across Turin city neighborhoods. I will first describe frequencies and characteristics of moves to provide an overview of the phenomenon and I will then integrate this information by illustrating how the probability of remaining ("surviving") in the same neighborhood after a time t varies for distinct social groups and across individuals living in different neighborhood types. Furthermore, I will investigate what are the individual and household characteristics associated with higher risk of residential movements using a logistic regression model. In addition, I will also consider what are the determinant of upward, downward or lateral movements between neighborhoods with different position in the scale of relative advantaged/disadvantage. To conclude, I will explore how individual residential choices can be aggregated to show connection flows between distinct neighborhood types.

5.1 Residential movements in Turin: occurence and survival rates

Findings from the previous chapter pointed out the existence of a non-random socio-spatial structure in Turin, and, moreover, they showed to what extent this has slowly changed, over the forty years considered, as a consequence of neighborhood's ascent and decline in terms of their relative socio-economic position. Results describe a diversity of neighborhood trajectories, which goes beyond the dichotomy of upgrading/downgrading and includes stability, i.e. status persistence, as one of the most common pathways.

As stated in Chapter 2, little is known about the drivers of neighborhood change. Selective residential mobility is one of the potential mechanism behind these transformation processes (Bailey 2012), and taking it into account can enhance the understanding of its contribution to the reproduction of socio-spatial inequalities at the municipal level.

This second part of the analysis will indeed focus on residential movements with the ultimate aim to grasp to what extent they create scope for neighborhood change. More in detail, in this section, I will analyse frequencies and characteristics of Turin residential movements, in order to provide an overview of the phenomenon and to contribute to contextualise findings for the subsequent sections.

In considering complete residential histories of individuals who have resided in Turin for at least one day from January the 1st 1971 onwards, TLS also reports the spell start date for the first episode[1]. The dataset I used for this work indeed includes residential spells going from the beginning of the twentieth century to 2014, year of the last update.

All this considered, starting from when they were born or moved to the city, to their exit from the municipal registry, due to moving out of the city or death, in Turin only about one out of five individuals (22.68%) have resided only at one single address, thus without experiencing intra-urban residential movements. Residential relocations appear thus a very common experience and this is not surprising if we think that at least one relocation out of the parental nest is something concerning almost all individuals (Lersch 2014). Indeed, 44.55% of residents relocated one time, 19.75% two times, 6.94% three times. Finally, around 5% of residents relocate four or more times.

To understand to what extent outmigration from a neighborhood creates scope for change, the first question to answer is how large share of the initial pool of neighborhood inhabitants stays, thus "survives", in the same neighborhood after a t amount of time. Secondly, does this survival rate differ across neighborhood types? In this regard, in the literature, it has been questioned whether, after controlling for individual characteristics, the probability of moving differ across neighborhood types, and particularly whether is higher for residents living in deprived areas. In other words, are Turin residents living in a particular neighborhood type less or more likely to move than those living in others?

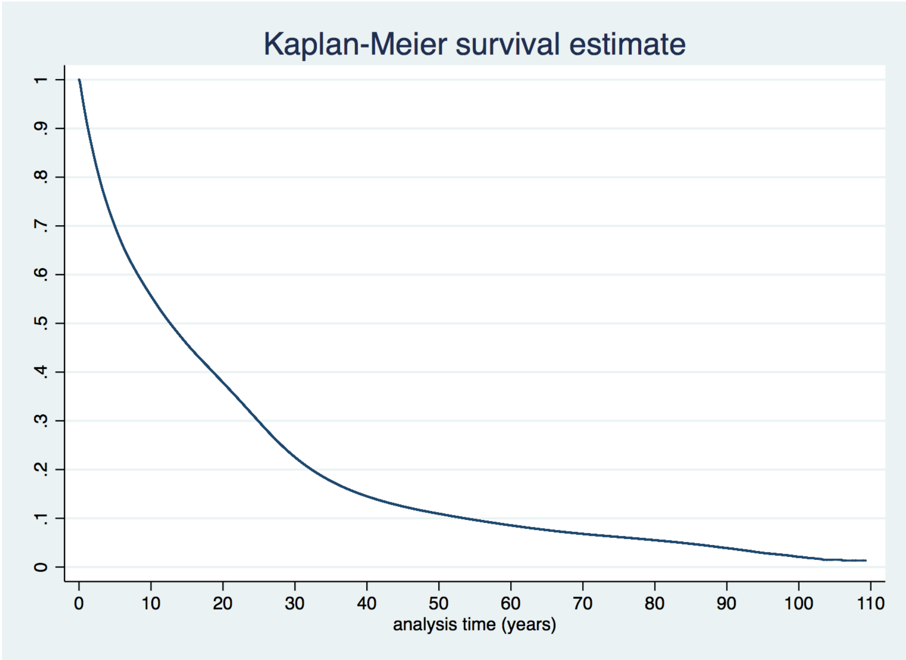
Relocations occurring within the same neighborhood are on the whole very rare and represent only 6% of the total moves. Since the focus of this analysis is on the likelihood of moving out from the neighborhood, from here onwards I will consider as "move" only relocation out of the original census block. Using this definition of move (only residential moves out of the original census block): 24.66% of residents never moved, 45.44% relocate one time, 18.52% two times, 6.29% three times, 5.08% four or more times.

Considering the whole Turin population, Figure 5.1 reports the Kaplan-Meier estimate survivor function for changing neighborhood. The survival curve is a useful tool to examine mobility over time and between groups. It shows how large proportion of the population, has not yet moved from their neighborhood, after a time t (years) (Cleves et al. 2010). In other words, the graph illustrates what is the probability of "survive", i.e. continuing to

[1]This means that for individuals residing in Turin on January the 1st1971 we know since when they are living at that address. As a consequence, the oldest episodes included in the dataset started in the early decades of 1900 (for individuals who have resided for seventy years at the same address). However, less than 6% represent spells started before 1940 (cf. Chapter 3).

live in the neighborhood, after having lived in it for a number of years[2].

Figure 5.1: Neighborhood survival curve



The curve is rather steep for the first five years of the residents' mobility episodes and then the survival rate decreases more gradually. After five years, the probability of still staying in the same neighborhood is about 70%, in other words, we can expect around three residents out of ten to relocate to a different block after having lived in the same block for five years. After ten years, more than half of the inhabitants are still in their neighborhood and, more precisely, this proportion reaches 50% after 12 years (median survival time). After having lived more than 30 years in the same neighborhood, the survival chances decrease very slowly.

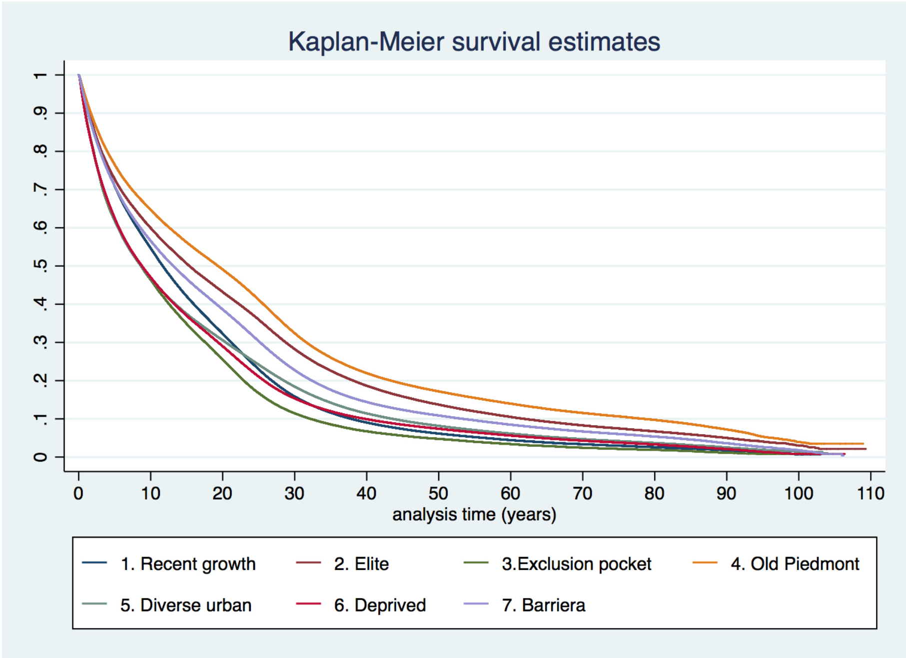
In order to test whether the survival rate differs across neighborhoods, I compared the Kaplan-Meier survival estimates for individuals living in different neighborhood types, using the typology developed in the first part of the analysis (cf. Chapter 4). The log-rank test confuted the null hypothesis that there was no difference between neighborhood types of residence in the probability of moving out of the original neighborhood, and Figure 5.2 reports survival curves for each of them[3].

Differences among neighborhood types regarding survival rate nearly do not exist for the first five years, thus the probability of staying is similar also for very dissimilar residential areas and, moreover, the same occurs, to a lesser extent, also for the very long episodes.

[2]Confidence intervals are so small that are not visible in the graph. The corresponding table (Table A.7) for the survivor function (with confidence intervals) is reported in the Appendix.

[3]Similarly, to Figure 5.1, also in Figure 5.2 confidence intervals are too small to be visible in the graph. Tables with survivor functions (Table A.8) and log-rank test for equality of survivor functions (Table A.9) are reported in the Appendix.

Figure 5.2: Neighborhood survival curve by neighborhood types



The maximum variation concerns, instead, chances of surviving after having resided in the same neighborhood for a period of 15-30 years: while the chance of remaining is 49% for Old Piedmont block residents (t=20), this is only around 25% for those living in Exclusion pocket ones, who generally have the lowest survival rate. Indeed, survival rates are higher for residents living in the most advantaged city areas, while it is lower for the least advantaged ones.

A different way to look at diversity among neighborhood types is to consider the 0.5 probability line (median line): residents of Exclusion pocket, Deprived and Diverse urban neighborhoods reach this level, i.e. 50% of out-mobility, after about 9 years, whereas residents from Recent growth, Barriera and Elite about 15 years and, finally, those living in Old Piedmont neighborhoods only after 20 years. The firsts are thus, on average, significantly less stable neighborhoods than the last ones in terms of the proportion of turnover of residents over time.

On the whole, survival is the highest for residents living in Old Piedmont and Elite neighborhoods which are the most advantaged city areas. Conversely, the probability of continuing to live in a Deprived or Exclusion pocket neighborhood are very similar up to 10 years, after when the survival rate from the former begins to decreases more slowly. Residents having lived in Deprived neighborhoods for more than 30 years are also less likely to move than individuals having lived for the same time in Recent growth neighborhoods.

Considering dissimilarities in the probability of (not) moving out of neighborhoods with different profiles implies accounting for their demographic, socio-economic and housing characteristics. It is known from the literature on residential mobility that individuals and households have different residential behaviours. For instance, younger residents tend to be more mobile than the elderly as well as migrants tend to be more mobile than natives. Similarly, also tenure and other housing features are predictors of out-mobility, indeed, being renter is a predictor of higher mobility rates than being homeowner. Moreover, in the literature, evidence has be found showing how different types of neighborhood may play a different role in the life course of individuals and households (cf. Section 2.3.1).

For these reasons, in order to draw conclusions about whether dissimilarities in neighborhood survival for distinct neighborhood types are expression of their more or less mobile population or rather whether dissimilarities exist also after controlling for individual characteristics, there is need to rely on multivariate analysis.

5.2 Determinants of residential moves: who moves and who stays

Residential relocation decisions are often the result of trigger events originating in other life course trajectories, mainly job and family ones. These combine with household needs and preferences and a choice set determined by their resources and restrictions as well as by housing market opportunities and constraints (Lersch 2014, Van Ham 2012).

In the literature, a number of factors have been acknowledged that might be associated with higher or lower propensity to move (cf. Section 2.3.1.1), however, as described in Chapter 3, the TLS residential movements database includes only information about sex, date and place of birth and date of marriage for Turin residents, which represent too few variables to investigate of residential movements. Therefore, for the analysis conducted in the following sections I used microdata from the five census years going from 1971 to 2011. Table 5.1 reports the descriptive statistics for mover and stayer residents[4].

Differences between the proportion of movers and stayers exist particularly regarding age groups: while half of the young adult (18-34 years old) population experience residential mobility, this concerns only nearly 13% of residents over 64 years old. Moreover, while over decades younger residents tend to become more mobile, the stability rate of the elder ones increases. Similarly, as expected, also differences, albeit less intense, exist concerning place of birth: in the 70's and 80's individuals born in the Italian Southern regions were the most mobile group, however over time they have become more stable, even more than Piedmont born residents. Conversely, residents born in low-income countries have become more mobile over decades. However, it has to be taken into account the different average age of these population groups which greatly influence their residential mobility behavior. Concerning educational attainment, residents with a high-school degree appear to be the most mobile while those with very low degree are conversely the most stable. Unemployed and unmarried individuals resulted to be more inclined to move than those employed,

[4]Time-varying covariates are measured in the census year before the potential residential movement

Table 5.1: Determinants of moving: descriptive statistics

	1971		1981		1991		2001	
	stayers	movers	stayers	movers	stayers	movers	stayers	movers
female	66.85	33.15	68.11	31.89	70.64	29.36	73.65	26.35
male	62.43	37.57	64.51	35.49	67.20	32.80	70.43	29.57
age								
18-34	47.26	52.74	45.40	54.60	44.61	55.39	45.81	54.19
35-49	70.57	29.43	72.20	27.80	71.20	28.80	69.84	30.16
50-64	78.23	21.77	79.59	20.41	84.27	15.73	84.59	15.41
>64	83.15	16.85	82.74	17.26	88.55	11.45	90.38	9.62
place of birth								
Piedmont	67.97	32.03	67.90	32.10	66.54	33.46	68.79	31.21
South Italian region	57.72	42.28	62.18	37.82	70.64	29.36	78.02	21.98
Other Italian region	67.87	32.13	71.65	28.35	77.15	22.85	81.92	18.08
High-income country	71.16	28.84	68.29	31.71	64.92	35.08	69.04	30.96
Low-income country	66.74	33.26	68.89	31.11	63.91	36.09	51.65	48.35
educational attainment								
college	64.76	35.24	62.68	37.32	65.03	34.97	67.22	32.78
high school	55.77	44.23	57.11	42.89	60.00	40.00	64.98	35.02
secondary school	61.49	38.51	63.50	36.50	65.34	34.66	71.27	28.73
not secondary school	67.94	32.06	72.74	27.26	80.74	19.26	84.73	15.27
occupational status								
employed	60.18	39.82	62.37	37.63	63.10	36.90	64.48	35.52
unemployed	33.79	66.21	46.72	53.28	49.33	50.67	57.70	42.30
inactive	68.41	31.59	71.23	28.77	73.51	26.49	75.76	24.24
retired	80.80	19.20	82.09	17.91	87.20	12.80	89.30	10.70
civil status								
married	69.25	30.75	71.69	28.31	75.84	24.16	78.61	21.39
unmarried	45.82	54.18	47.02	52.98	50.20	49.80	54.68	45.32
widowed	77.23	22.77	78.35	21.65	84.16	15.84	86.95	13.05
divorced	62.54	37.46	56.88	43.12	59.96	40.04	65.45	34.55
household with children								
no children	66.74	33.26	67.80	32.20	71.05	28.95	74.34	25.66
0-5 years old	59.19	40.81	57.38	42.62	55.55	44.45	58.20	41.80
6-11 years old	66.14	33.86	67.52	32.48	66.15	33.85	68.64	31.36
12-17 years old	65.11	34.89	68.64	31.36	70.26	29.74	71.83	28.17
not ownership	60.66	39.34	58.40	41.60	55.61	44.39	57.78	42.22
ownership	75.91	24.09	78.33	21.67	78.82	21.18	78.84	21.16
not overcrowded dwelling	69.45	30.55	70.92	29.08	72.60	27.40	74.98	25.02
overcrowed dwelling	60.61	39.39	60.18	39.82	60.08	39.92	62.54	37.46
Neighborhood type								
1. Recent growth	62.45	37.55	69.93	30.07	72.06	27.94	74.61	25.39
2. Elite	67.08	32.92	65.99	34.01	67.37	32.63	71.28	28.72
3. Esclusion pocket	69.45	30.55	71.51	28.49	68.78	31.22	67.76	32.24
4. Old Piedmont	69.36	30.64	70.00	30.00	72.36	27.64	75.50	24.50
5. Diverse urban	62.20	37.80	59.07	40.93	60.52	39.48	65.29	34.71
6. Deprived	58.01	41.99	59.61	40.39	66.40	33.60	68.91	31.09
7. Barriera	65.70	34.30	65.34	34.66	68.15	31.85	71.35	28.65
N: 714,602								

inactive or retired, and those married, widowed or divorced. Less pronounced are instead differences according to the presence of children in the household and neighborhood types of residence.

However, in order to disentangle the relative contribution of the factors which influence the propensity of moving, I estimated a logit regression model. The dependent variable measures whether an individual relocated or not between each census year and the consecutive one, i.e. after ten years. Independent variables included in the model refer to some of the traits considered to have a role in residential behaviour by the reference literature: sex, age, place of birth (Piedmont, Southern Italian regions, other Italian regions, low-income foreign country and high-income foreign country), education (college degree, high school degree, secondary school degree, no secondary school degree), occupational status (employed, unemployed, inactive, retired), civil status (married, single, widowed and divorced), the presence of children in the household according to the age of the youngest (no children, 0-5, 6-11, 12-17 years old), tenure (ownership or not), overcrowded dwelling[5] and neighborhood type of residence[6]. To account for the variation over time of the associations between the main independent variables and the outcome, three interaction terms have also been included: between period (census year) and age, education and neighborhood types. All time-varying independent variables are measured in the census year before the potential movement.

Table 5.2 reports the estimation results (odds ratio) of observing a positive outcome, i.e. have changed neighborhood with respect to ten years before, rather than a negative outcome i.e. still living in the same neighborhood than ten years before. Odds ratio are not easily interpretable in substantial terms: values greater than 1 indicate covariates that increase the chance of moving, whereas values between 0 and 1 indicate covariates that reduce the chances of moving and 1 indicates no effects. To better understand the magnitude of these influences, it is instead more suitable to rely on Average Marginal Effects (AME) which report the average of the marginal effects (in percentage points) of each covariate on the propensity of moving out of a neighborhood for all the observations (Long & Freese 2006, cf. also Chapter 3).

Results show that there are not significant differences in the odd for changing neighborhood for men and women, while age has a negative effect. In accordance with findings of other studies (cf. e.g Bailey & Livingston 2007, Clark et al. 2014, Lersch 2014), youth between 18 and 34 years old are those more mobile and the risk of moving decreases with the increasing of age. As it has been argued (Morrow-Jones & Wenning 2005), it is not only age itself that has a relationship with the likelihood of relocations, but age has to be considered also as proxy for life course stages and transitions. Thus transitions in both family and job careers make young adults the most mobile age group Lersch (2014).

[5]For the definition of overcrowded dwelling cf. Chapter 3.

[6]Despite their acknowledged role in the literature on residential mobility, because of the lack of precise temporal data, it was not possible to include in the model variables referring to life course events, e.g. childbirth, employment related events, union dissolutions.

Table 5.2: Model estimates (Odds ratio)

	Odds ratio	Robust st. err.	Conf.inter
sex	1.000	0.00367	[0.993,1.008]
35-49	0.480***	(0.00350)	[0.473,0.487]
50-64	0.366***	(0.00347)	[0.360,0.373]
>=65	0.284***	(0.00441)	[0.275,0.293]
1981	0.937**	(0.0216)	[0.896,0.980]
1991	1.037	(0.0242)	[0.990,1.085]
2001	1.049	(0.0259)	[0.999,1.101]
age#year			
35-49# 81	0.891***	(0.00918)	[0.873,0.909]
35-49# 91	0.801***	(0.00868)	[0.784,0.818]
35-49#101	0.853***	(0.00956)	[0.834,0.872]
50-64# 81	0.936***	(0.0117)	[0.913,0.959]
50-64# 91	0.623***	(0.00816)	[0.607,0.639]
50-64#101	0.613***	(0.00849)	[0.597,0.630]
>=65# 81	1.053**	(0.0203)	[1.014,1.094]
>=65# 91	0.596***	(0.0120)	[0.573,0.620]
>=65#101	0.540***	(0.0109)	[0.519,0.562]
place of birth			
Southern Italian region	1.149***	(0.00479)	[1.139,1.158]
Other Italian region	1.023***	(0.00549)	[1.013,1.034]
High-income country	1.058***	(0.0171)	[1.025,1.092]
Low-income country	1.291***	(0.0132)	[1.265,1.317]
educational attainment			
high school	1.050**	(0.0191)	[1.013,1.088]
secondary school	0.793***	(0.0139)	[0.767,0.821]
not secondary school	0.682***	(0.0118)	[0.660,0.706]
education# year			
high school 1981	0.881***	(0.0202)	[0.842,0.921]
high school 1991	0.836***	(0.0184)	[0.801,0.873]
high school 2001	0.834***	(0.0177)	[0.800,0.869]
secondary school 1981	0.949*	(0.0210)	[0.909,0.991]
secondary school 1991	0.971	(0.0207)	[0.931,1.012]
secondary school2001	0.957*	(0.0198)	[0.919,0.996]
not secondary school 1981	0.991	(0.0217)	[0.950,1.035]
not secondary school 1991	1.029	(0.0222)	[0.986,1.073]
not secondary school 2001	1.092***	(0.0240)	[1.046,1.140]
occupational status			
unemployed	0.948***	(0.00710)	[0.934,0.962]
inactive	0.831***	(0.00357)	[0.824,0.838]
retired	0.770***	(0.00531)	[0.760,0.781]
civil status			
unmarried	1.665***	(0.00772)	[1.650,1.680]
widowed	1.312***	(0.0107)	[1.291,1.333]
divorced	1.763***	(0.0144)	[1.735,1.792]
household with children			

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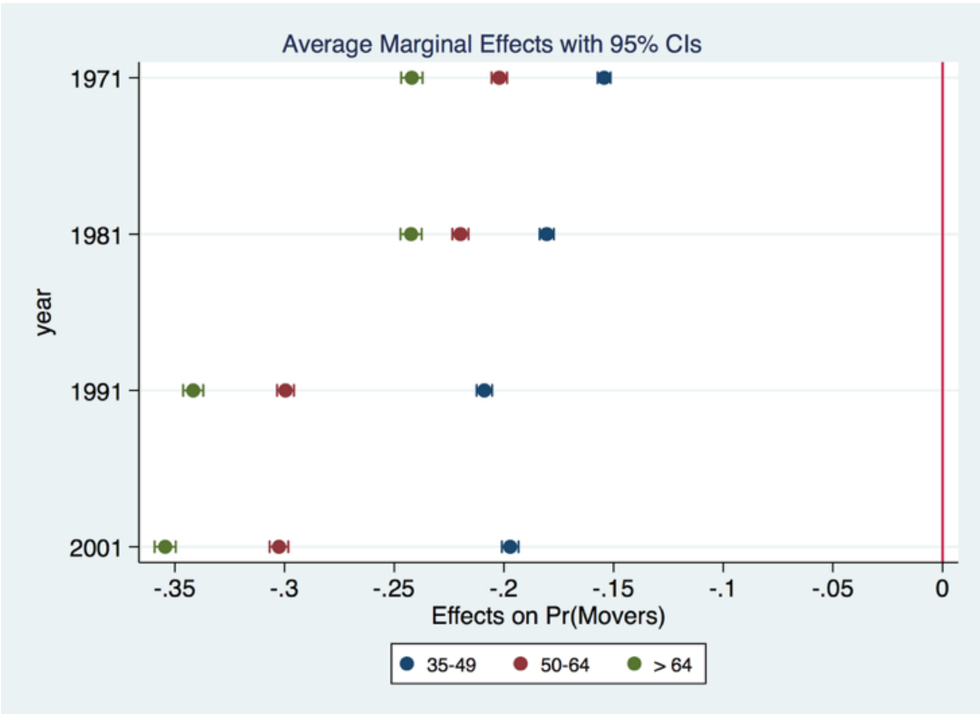
Table 5.2 Continued from previous page

	Odds ratio	Robust st. err.	Conf.inter
0-5 years old	1.004	(0.00547)	[0.993,1.015]
6-11 years old	0.979***	(0.00549)	[0.968,0.989]
12-17 years old	0.985**	(0.00511)	[0.975,0.995]
ownership	0.424***	(0.00155)	[0.421,0.427]
overcrowed dwelling	1.327***	(0.00506)	[1.317,1.337]
Neighborhood type			
2.Elite	0.859***	(0.0111)	[0.837,0.881]
3. Exclusion pocket	0.613***	(0.0102)	[0.594,0.634]
4. Old Piedmont	0.757***	(0.00740)	[0.743,0.772]
5. Diverse urban	0.874***	(0.0117)	[0.851,0.897]
6. Deprived	0.931***	(0.0104)	[0.911,0.951]
7. Barriera	0.776***	(0.00666)	[0.763,0.789]
Neighborhood type#year			
2 1981	1.364***	(0.0251)	[1.316,1.414]
2 1991	1.558***	(0.0305)	[1.500,1.619]
2 2001	1.364***	(0.0321)	[1.303,1.428]
3 1981	1.012	(0.0243)	[0.965,1.061]
3 1991	1.391***	(0.0435)	[1.308,1.478]
3 2001	1.460***	(0.0685)	[1.331,1.600]
4 1981	1.294***	(0.0181)	[1.259,1.330]
4 1991	1.463***	(0.0220)	[1.421,1.507]
4 2001	1.428***	(0.0258)	[1.378,1.479]
5 1981	1.448***	(0.0291)	[1.392,1.506]
5 1991	1.714***	(0.0372)	[1.643,1.789]
5 2001	1.436***	(0.0332)	[1.372,1.502]
6 1981	1.150***	(0.0183)	[1.115,1.187]
6 1991	1.019	(0.0176)	[0.985,1.054]
6 2001	1,017	(0.0216)	[0.975,1.060]
7 1981	1.317***	(0.0164)	[1.285,1.349]
7 1991	1.484***	(0.0205)	[1.445,1.525]
7 2001	1.463***	(0.0250)	[1.415,1.513]

Exponentiated coefficients; * p<0.05, ** p<0.01, *** p<0.001

Figure 5.3 reports the AME accounting for the interaction between age and year, showing how being 35-49 years old decreases the probability of moving out of the neighborhood by 15 percentage points in 1971 while being 50-64 by 20 p.p. and finally being over 64 around 25 p.p. However, differences across age groups appear to get larger over time, especially for residents older than 49 years old. Starting from 1991, indeed, individuals who are more than 64 years old have chance to relocate nearly 35 percentage points lower than youth between 18 and 34 years old and this disparity remains stable also in the following decade. Residents older than 50 years old have then far less probability to move in 1991 and 2001 than it was in 1971 and 1981, while the gap between the class of 35-49 years old and the younger one (18-34) remains almost the same over the whole period considered. The growing diverge in the propensity to move between young and adult Turin residents over time can be interpret, on the one hand, as the result of differences in the timing of first access to the housing market. Individuals aged 50-64 in 1991 entered the housing market in the '60 and 70's, a period in which, in Italy, and especially in the major urban areas like Turin, the number of available accommodations have exceeded the number of households and the quality of housing has considerably improved (Bernardi & Poggio 2004, Poggio 2009, Filandri & Zengarini 2017). On the other hand, their higher stability, compared to the same age group in previous decades, is also linked to the expansion of the home-ownership in Turin, in line with the Italian trend, passing from nearly 32% (the same for over 64 age group) in 1971 to 70% (76% for residents over 64 years old)[7].

Figure 5.3: Average Marginal Effects for the interaction between age and year



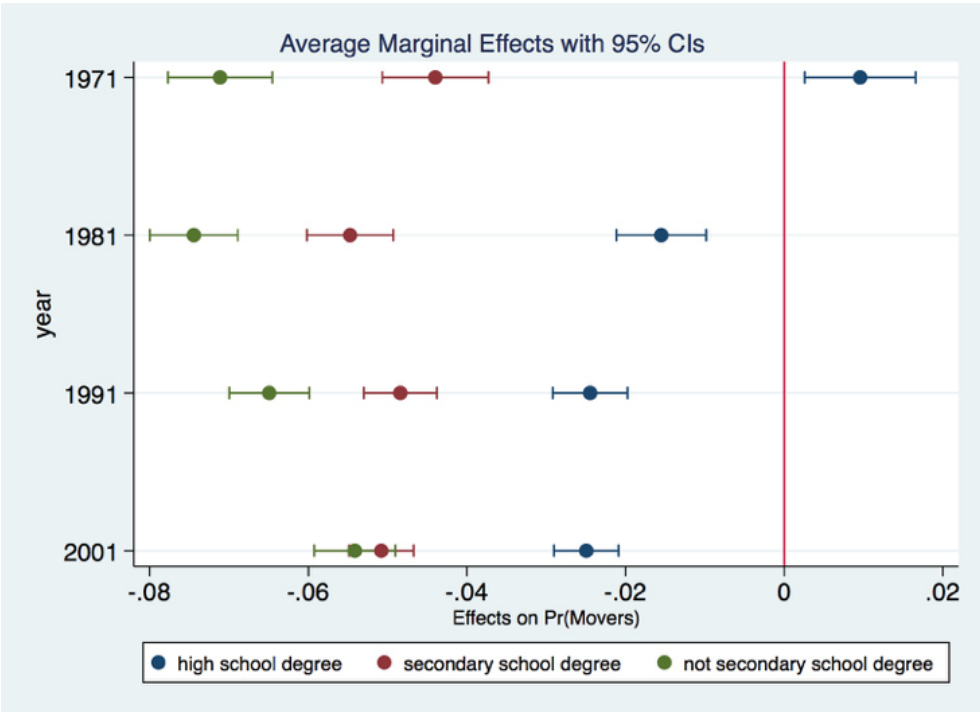
The second independent variable of interest is educational attainment that, in absence of variables referring to income and occupational class, can be considered as an indicator of social stratification. The magnitude of the AME for educational attainment on the propensity to relocate over time is shown in Figure 5.4.

With the exception of 1971, college educated have constantly a higher propensity to relocate than other residents, which is coherent with findings from other international studies, suggesting that education and/or resources represent in this regard enabling factors (cf. Bailey & Livingston 2007, Lersch 2014). On the whole, the difference between individuals

[7]The predicted probability of moving for the 18-34 years old for an average individual is nearly 43% in 1971, 45% in 1981 and 50% in 1991 and 2001.

with college degree and high school degree is small, nearly 2 percentage points, while having at most a secondary school degree decreases the propensity to move by around 4 percentage points. Moreover, over time, these dissimilarities have tended to soften, and indeed in 2001 there is no more difference in the likelihood of moving for those who have a secondary degree or a lower one. This trend reflects the progressive extension of the mandatory school age and the process of educational credential inflation over the last decades. As mentioned, educational attainment can be considered a proxy of income and thus the association just described may reflect not only distinctive social group residential preferences but also their greater or lesser resource availability in order to deal with housing market constrains.

Figure 5.4: Average Marginal Effects for the interaction between educational attainment and year

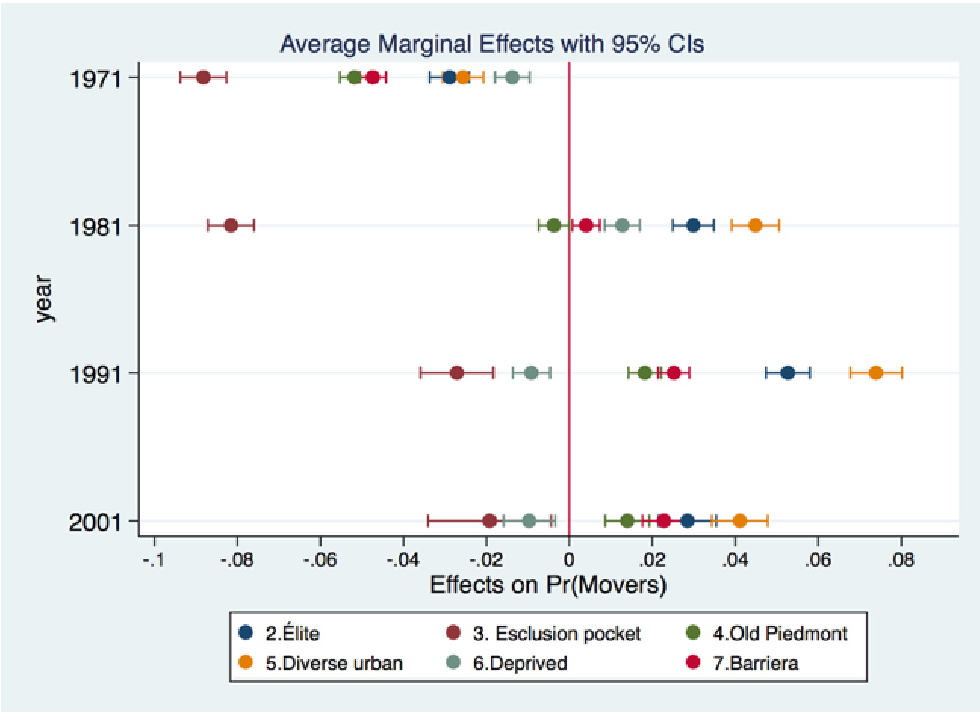


Finally, Figure 5.5 shows the AME for the interaction between neighborhood type of residence and census year.

Even after controlling for individual, household and housing characteristics, the neighborhood type of residence seems to have still a role as determinant of the propensity to move of its residents. In Figure 5.5 the red line refers to Recent growth neighborhoods, the type positioned in the midpoint of the urban hierarchy (cf. Chapter 4). In 1971 residents of Recent growth neighborhoods have the highest chance to move while in the following decades are Diverse urban and Elite neighborhoods those characterised by inhabitants with a higher propensity to relocate. Conversely, for the whole considered period, moving out of Exclusion pocket neighborhoods is less likely than moving out other neighborhood types.

Even if the gap with Recent growth neighborhood has decreased over time, passing from nearly -8 percentage points in 1971 to nearly -2 p.p. in 2001, residents living into Exclusion pocket neighborhoods have reached in the following years the same chance to relocate than resident of Deprived neighborhood resident which are still lower (around -8 p.p. in 1991 and -4 p.p. in 2001 from Diverse urban) than that of individuals living in other urban areas. The association between neighborhood type and out-mobility likelihood then does not show a clear relation between level of neighborhood advantage/disadvantage and propensity to relocate.

Figure 5.5: Average Marginal Effects for the interaction between neighborhood type of residence and year



As expected (Van Kempen & Bolt 2012, Bonvalet et al. 1995), place of birth has a relation with propensity to move. Differences between natives and immigrants' mobility rates might be the result of distinct housing needs and preferences, but also of the generally lower ability to realise their preferences. Findings show how residents born in the Turin region (Piedmont) are more stable than both individuals born in other Italian regions or in foreign countries. The effect of place birth, holding constant all the other variables, is on the whole very small[8], and residents born in other Italian region than Piedmont or the Southern ones as well as residents born in high income countries have almost the same probability to move (around +1 p.p.) than those born in Piedmont. However, there is a

[8]The complete table with Average Marginal Effects for all the independent variables can be found in Table A:11 in the Appendix.

higher likelihood of moving of 2.5 p.p. for individuals born in the South of Italy and of around 5 p.p. for those born in low-income countries than for Piedmont born.

Being married is associated with a lower propensity to move than being unmarried, divorced or widowed, and similarly being unemployed, inactive or retired rather than being employed.

However, while the effect of occupational status is very tiny[9], being divorced increases the likelihood of moving of 10 percentage points and being unmarried by 9 p.p. with respect to married residents. Differently, holding constant all the other variables, the presence of children in the household appear to have no relationship with the likelihood of moving. Consistently with past research, housing tenure has a strong relation with the hazard to relocate. Home-owners result to have a propensity to move 15 percentage points higher than renters, while the association with living in an overcrowded dwelling is positive but less strong (+5 p.p.).

5.3 Neighborhood location outcomes: what characteristics influence the likelihood of moving downward, upward or laterally?

Housing and neighborhood are inseparable. Dwellings are indeed located in specific neighborhoods constituting an essential characteristic of the residential location (Galster 2012, Lersch 2014). However, despite the growing literature on neighborhood effects suggesting that neighborhood represents an important factor in influencing relevant individual outcomes, little is known about the effect that residential movements have on neighborhood quality adjustment, namely about moving into neighborhoods that are in a higher or lower position in the urban hierarchy. Attention has mainly been directed towards the examination of the moves into or out of deprived areas while only few authors have provided empirical evidence about the changes in neighborhood quality over the life course across the full spectrum of neighborhood types (cf. Chapter 2).

With the aim to contribute to this literature stream and in order to explore what are the factors potentially driving the resorting of individuals across the neighborhood hierarchy, I estimated a multinomial logit model accounting for the neighborhood quality adjustment of movers. The dependent variable groups movers into three possible outcomes: "lateral movement" between neighborhood belonging to the same neighborhood type (reference category), "upgrading movement" which implies an improvement in the urban hierarchy, and "downgrading movement" which conversely identifies a worsening of neighborhood quality. Drawn from prior studies, the main independent variables of interest are: age, educational attainment (college degree, high school degree, secondary school degree, not

[9]This could be partially due to the fact that independent variables are measured up to ten years before the potential movement. This time-lapse is particularly not very effective for labour market related status which may evolve more rapidly, even if we can expect those statuses to be correlate over time.

secondary school degree), which can also be considered an indicator of a more general social stratification, and neighborhood type of residence. To account for the variation of education and neighborhood type effects over time, I also included interactions between these three variables and time (census year). Control variables refer to sex, origin (born in Piedmont, Southern Italian regions, Other Italian regions, foreign low-income countries, foreign high-income countries), occupational status, civil status, the presence of children in the households according to the age of the youngest and two dummies referring to home-ownership and overcrowded dwelling. All the time-varying independent variables are measured in the census year before the movement.

Table 5.3 shows regression coefficients as relative risk ratio (RRR) which indicate the ratio of the probability to move respectively to a better or a worse neighborhood over the probability to move laterally in a neighborhood belonging to the same type as the one of origin[10].

However, as mentioned for the previous model, I will rely on AME's in order to describe the magnitude of the association between outcomes and covariates. Figures 5.6, 5.7 and 5.8 show how age is associated respectively with the ability to worsen neighborhood quality with residential moves, to not experience any change (thus moving "laterally") or to improve neighborhood quality and how this association has changed over decades. The red reference line refers to the age class 18-34 years old. All the other age groups have lower probabilities than youth between age18 and 34 to move down the neighborhood hierarchy. Particularly, resident over 64 years old appear those less at risk to downgrading and this difference has increased over time. Moving out of the family of origin and beginning the adult trajectory may lead to important changes in neighborhood environment, often indeed this is combined with other significant life course event including partnership, college enrolment and/or first employment (Brazil & Clark 2018) and could imply a transitioning into cheaper rented accommodation resulting from the interplay of preferences and available resources (Clark & Morrison 2012).

Age has instead a smaller influence on the chance of moving laterally to a neighborhood with the same profile than that of departure. Conversely, while in 1971 and 1981 there is not a great difference in the chance to improve neighborhood quality for younger or older residents, starting from 1991 residents older than 64 years had a propensity to move to a better neighborhood nearly 6 percentage points higher than those between 18 and 34 years old. These findings underline that, coherently with other studies, although age is strongly linked with the probability of moving, it is less a determinant for the probability to move up or down in the urban neighborhood hierarchy, as shown by the moderate differences across age (Clark et al. 2014).

[10] Descriptive statistics for covariates are shown in Table A.10 in the Appendix.

Table 5.3: Model estimates (RRR)

	upgrading vs lateral		downgrading vs lateral	
	RRR	**[95% Conf.Int.]**	**RRR**	**[95% Conf.Int.]**
sex	0.953***	[0.940,0.966]	1.070***	[1.055,1.085]
age				
35-49	0.951***	[0.924,0.979]	0.936***	[0.909,0.964]
50-64	0.954*	[0.916,0.994]	0.875***	[0.840,0.912]
>=65	1,017	[0.946,1.094]	0.806***	[0.750,0.866]
year				
1981	2.304***	[2.094,2.534]	2.136***	[1.952,2.338]
1991	2.951***	[2.676,3.255]	3.622***	[3.304,3.971]
2001	2.000***	[1.801,2.221]	4.688***	[4.249,5.172]
age#year				
35-49# 81	1,002	[0.962,1.043]	0.815***	[0.781,0.850]
35-49# 91	1.207***	[1.156,1.259]	0.888***	[0.850,0.929]
35-49#101	1.189***	[1.139,1.241]	0.908***	[0.869,0.950]
50-64# 81	0.890***	[0.843,0.939]	0.810***	[0.767,0.855]
50-64# 91	1.222***	[1.153,1.295]	0.952	[0.898,1.009]
50-64#101	1.218***	[1.147,1.292]	0.804***	[0.757,0.853]
>=65# 81	0.936	[0.857,1.023]	0.788***	[0.721,0.862]
>=65# 91	1.282***	[1.165,1.411]	0.908*	[0.826,0.999]
>=65#101	1.206***	[1.098,1.325]	0.791***	[0.721,0.868]
place of birth				
Southern Italian region	0.762***	[0.750,0.774]	1.390***	[1.367,1.414]
Other Italian region	0.942***	[0.922,0.963]	1,014	[0.992,1.036]
Low-income country	0.924*	[0.868,0.984]	1,054	[0.988,1.124]
High-income country	0.647***	[0.621,0.673]	1.670***	[1.604,1.739]
educational attainment				
high school	0.723***	[0.670,0.781]	1.476***	[1.376,1.582]
secondary school	0.538***	[0.499,0.579]	1.823***	[1.703,1.952]
not secondary school	0.375***	[0.348,0.404]	2.394***	[2.237,2.561]
education#year				
high school 1981	0.828***	[0.752,0.912]	1,035	[0.947,1.132]
high school 1991	0.831***	[0.757,0.913]	0.945	[0.868,1.029]
high school 2001	0.916	[0.838,1.001]	0.908*	[0.837,0.985]
secondary school 1981	0.812***	[0.739,0.892]	1,048	[0.960,1.144]
secondary school 1991	0.721***	[0.658,0.790]	1,067	[0.981,1.160]
secondary school2001	0.849***	[0.778,0.927]	1,018	[0.939,1.105]
not secondary school 1981	0.866**	[0.788,0.952]	1,059	[0.970,1.156]
not secondary school 1991	0.751***	[0.683,0.826]	1,034	[0.946,1.130]
not secondary school 2001	0.895*	[0.812,0.985]	1,011	[0.922,1.108]
occupational status				
unemployed	0.829***	[0.809,0.851]	1.254***	[1.220,1.289]
inactive	1,008	[0.991,1.025]	0.976**	[0.960,0.993]
retired	0.931***	[0.902,0.961]	1,028	[0.996,1.062]
civil status				
unmarried	0.996	[0.978,1.014]	1.298***	[1.274,1.323]

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Table 5.3 Continued from previous page

	upgrading vs lateral		downgrading vs lateral	
	RRR	**[95% Conf.Int.]**	**RRR**	**[95% Conf.Int.]**
widowed	0.926***	[0.893,0.961]	1.145***	[1.103,1.189]
divorced	0.982	[0.951,1.013]	1.384***	[1.340,1.430]
household with children				
0-5 years old	0.964***	[0.945,0.984]	1.026*	[1.005,1.048]
6-11 years old	0.989	[0.967,1.010]	0.980	[0.958,1.003]
12-17 years old	0.999	[0.978,1.019]	0.977*	[0.956,0.998]
ownership	1.075***	[1.060,1.090]	0.736***	[0.725,0.747]
overcrowed dwelling	0.807***	[0.795,0.819]	1.270***	[1.251,1.290]
Neighborhood type				
2. Elite	1.46e-10***	[1.4e-10,1.5e-10]	3.327***	[3.188,3.471]
3. Esclusion pocket	14.12***	[13.06,15.27]	0.748***	[0.674,0.831]
4. Old Piedmont	0.496***	[0.474,0.520]	2.526***	[2.442,2.613]
5. Diverse urban	4.695***	[4.412,4.995]	4.500***	[4.246,4.770]
6. Deprived	10.63***	[10.19,11.09]	1.50e-10***	[1.4e-10,1.5e-10]
7. Barriera	2.867***	[2.781,2.956]	0.322***	[0.311,0.334]
Neighborhood type#year				
2 1981	0.456***	[0.429,0.484]	0.507***	[0.476,0.539]
2 1991	0.293***	[0.273,0.314]	0.415***	[0.387,0.445]
2 2001	0.364***	[0.333,0.397]	0.349***	[0.320,0.381]
3 1981	1.204*	[1.032,1.405]	3.117***	[2.613,3.718]
3 1991	2.394***	[1.781,3.217]	3.179***	[2.315,4.366]
3 2001	1,336	[0.920,1.942]	2.713***	[1.834,4.012]
4 1981	0.327***	[0.305,0.349]	0.386***	[0.368,0.406]
4 1991	0.165***	[0.154,0.178]	0.260***	[0.245,0.275]
4 2001	0.157***	[0.143,0.171]	0.235***	[0.219,0.252]
5 1981	0.356***	[0.326,0.389]	0.375***	[0.345,0.407]
5 1991	0.232***	[0.210,0.255]	0.226***	[0.207,0.247]
5 2001	0.203***	[0.183,0.225]	0.155***	[0.141,0.171]
6 1981	0.319***	[0.301,0.339]	0.440***	[0.417,0.464]
6 1991	0.312***	[0.292,0.335]	0.339***	[0.318,0.361]
6 2001	0.250***	[0.229,0.272]	0.251***	[0.232,0.272]
7 1981	0.273***	[0.261,0.286]	0.390***	[0.371,0.411]
7 1991	0.186***	[0.176,0.196]	0.187***	[0.176,0.199]
7 2001	0.212***	[0.197,0.228]	0.230***	[0.214,0.247]

Exponentiated coefficients; * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Education, which can be considered a proxy for resources availability but also for differences in preferences, appears strongly associated with neighborhood outcomes of moves (Fig. 5.9, 5.10, 5.11), especially concerning "vertical" adjustments. College degree results to be protective against experiencing an increase in neighborhood deprivation. As education attainment increases, the propensity of individuals to move to a less advantaged area decreases relatively to individual with college degree. Residents with only a secondary school degree have indeed a change nearly 12 percentage points higher to move to a more

Figure 5.6: Average Marginal Effects for age on the proability of downward movements

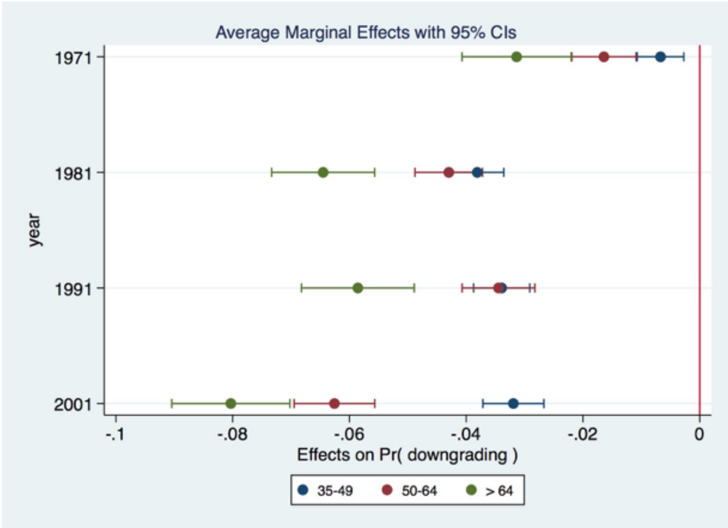


Figure 5.7: Average Marginal Effects for age on the proability of lateral movements

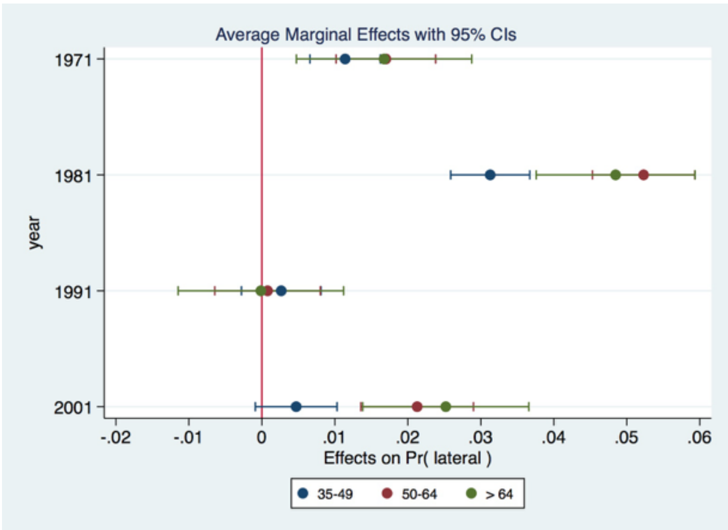
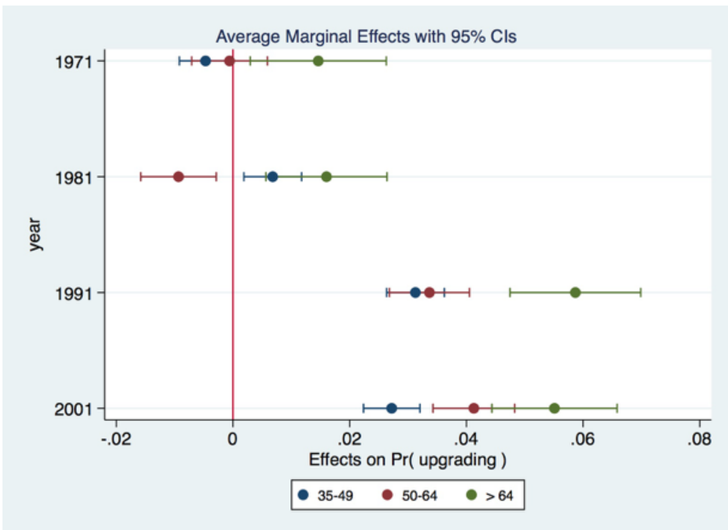


Figure 5.8: Average Marginal Effects for age on the proability of upwards movements



disadvantaged neighborhood that the one of departure, while those having a lower degree up to 20 p.p. Moreover, this relation has remained rather unchanged over decades. High level of education appears to be important in affecting upward socio-spatial mobility and this effect result to be even stronger than the one in containing the probability to downward moves. Individuals who did not get the secondary school degree have a probability to move to better neighborhood up to 26 p.p. lower than those with a college degree. Finally, difference in educational attainment makes a less difference concerning lateral movements. These findings are in line with those of other studies in the literature and, moreover, some authors found that, when controlling for education and tenure, income has no more a significant effect on the propensity to move to a more advantaged neighborhood (Clark et al. 2014, Clark & Morrison 2012).

Finally, holding constant individual characteristics, I considered the association with the neighborhood type of residence (Fig. 5.12, 5.13, 5.14). The red reference line in Figure 5.12, 5.13, 5.14 denotes Recent growth areas, the neighborhood type which represent the midpoint of the urban hierarchy (cf. Chapter 4). Results show that after controlling for individual characteristics, those movers who begin in better neighborhoods tend to move down by moving to less advantaged city areas. On the whole period, this association has changed in magnitude indeed, for instance, the likelihood to downgrade for movers leaving Elite blocks was 40 percentage points higher than for residents leaving Recent growth neighborhoods in 1971 while this was only 20 p.p. higher in 2001. Moreover, in 2001 individuals moving from Diverse urban areas were less likely to move to a more disadvantaged neighborhood than Recent growth residents. A similar effect exists when it comes to upward mobility: individuals moving from the most disadvantaged neighborhood have higher probabilities to improve their neighborhood quality than those leaving the least disadvantaged ones. However, it has to be noticed how the chance to upgrading from Barriera neighborhoods was much greater in 1971 than it was starting from the 80's. However, in this regard, it has to be considered the existence of what have been called floor and ceiling effects (Bolt et al. 2009, Brazil & Clark 2017, Huang et al. 2017): a person living in either the most or least disadvantaged neighborhood type can only move either up (from the most disadvantage) or down (from the least disadvantage). In this sense, indeed, their chance to upgrading or downgrading are limited by the definition of neighborhood categories. Moreover, the fact that clusters of neighborhood type have different sizes (number of census blocks included) makes more likely for movers to arrive in the larger clusters.

Moving laterally, in a neighborhood similar to the one of origin, is more likely in 1971 for residents living in Recent growth neighborhoods, while in 2001 residents from all neighborhood type rather than Exclusion pocket have a higher propensity. Individuals inhabiting Barriera neighborhoods have, starting from 1981, the largest chances to move to another Barriera area, followed by Old Piedmont and Elite residents. Despite their different position in the neighborhood quality ladder, residents leaving in Urban Diverse and

Figure 5.9: Average Marginal Effects for education attainment on the probability of downward movements

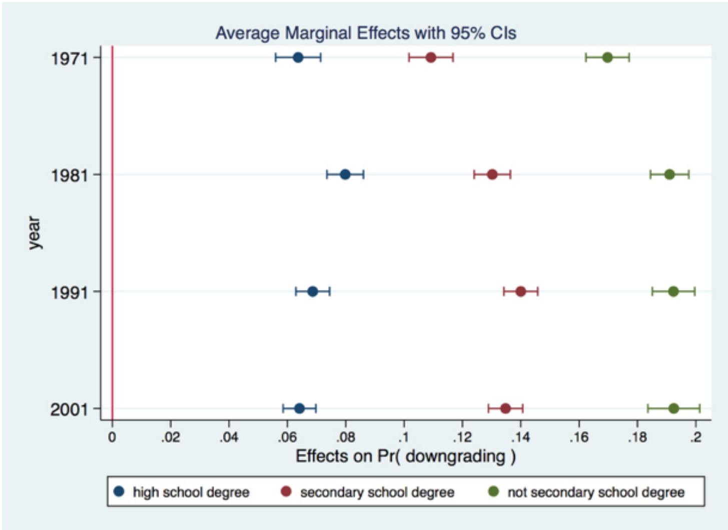


Figure 5.10: Average Marginal Effects for education attainment on the probability of lateral movements

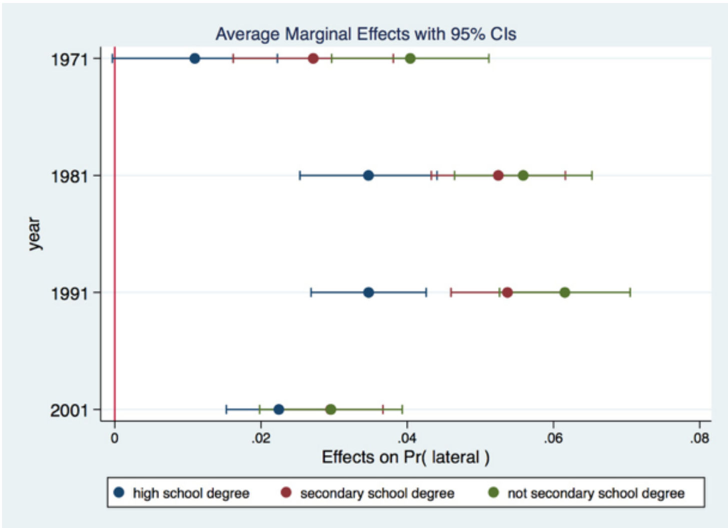
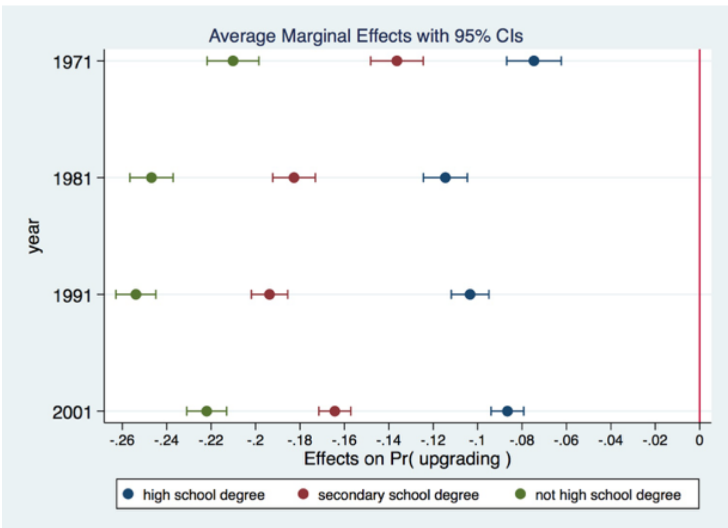


Figure 5.11: Average Marginal Effects for education attainment on the probability of upward movements



Deprived neighborhoods have a similar likelihood to move laterally, and this gets closer to those of Elite neighborhoods over time. To sum up, after controlling for individual characteristics and tenure, the likelihood to move up and down a the neighborhood relative advantage/disadvantaged ladder is highly conditioned by the initial neighborhood conditions, also because of floor and ceiling effects.

To conclude, coherently with the literature, residents born in Southern Italian regions or low-income foreign countries share the higher probability (respectively +6 p.p. and +10 p.p.) to move to a more disadvantaged neighborhood than residents born in Piedmont, other Italian regions or high-income countries. Home-ownership, holding constant other individual attribute but also neighborhood type of residence, is also associated with higher propensity to improve neighborhood quality and it is also protective regarding worsening conditions (nearly -5 p.p.).

5.4 Aggregate residential mobility flows: area connection

In the previous sections individual residential movements have been analysed in order to understand their occurrence and, moreover, the role of individual, household and neighborhood characteristics in influencing, firstly, the general likelihood to move or staying and, secondly, location outcomes. This last section pushes the analysis one step further by exploring how individual decisions combine to create spatial flows that define, and transform, the ecological structure of neighborhood inequality (Sampson & Sharkey 2008).

The aim of this section is then to understand to what extent residential mobility flows act to link more and less disadvantaged city areas, that means whether they tend to connect same type or similar neighborhoods, therefore running "laterally", or rather mainly different types of residential areas by running "vertically". This dynamic has been named by Bailey & Livingston (2007) "area connection" and taking it into account allows to examine to what extent distinct neighborhood types, and especially the most disadvantaged, are isolated from the wider housing system.

To figure out how aggregate flows connect neighborhoods thereby producing a linked network of stratification (Sampson & Sharkey 2008), firstly, it has to be noticed that neighborhood types differ according to the proportion of residents who stays or moves between consecutive census years. Old Piedmont and Exclusion pocket neighborhoods have indeed the higher rate of stable resident (respectively 72.17 and 70.03%), thus representing residential areas from which a lower share of residents moves. Conversely, Deprived and Diverse urban areas have the lower share of stable residents (respectively 62.95 and 61.9 %). After the multivariate analysis conduct in the previous Section, now we know that this difference in mobility rate is partially due to the different propensity to move of social groups inhabiting distinct neighborhood type, but also that, holding constant individual characteristics, to relocate appears less likely for residents of certain neighborhood type.

Secondly, to gain insights in the dynamics of area connection between neighborhood

Figure 5.12: Average Marginal Effects for neighborhood type on the probability of downward movements

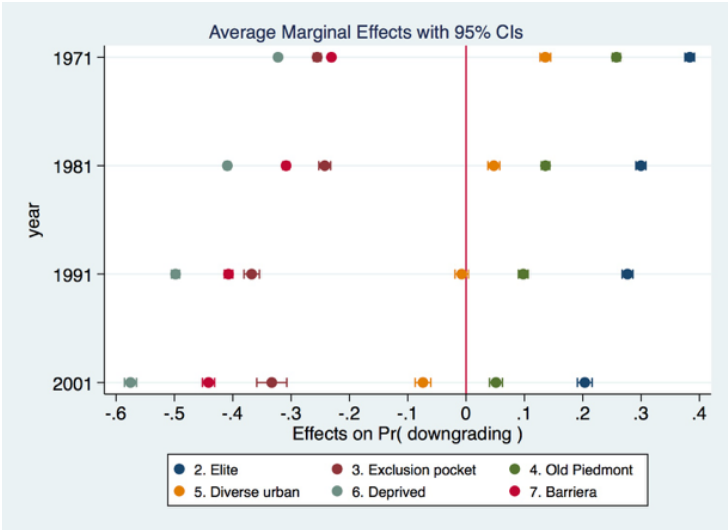


Figure 5.13: Average Marginal Effects for neighborhood type on the probability of lateral movements

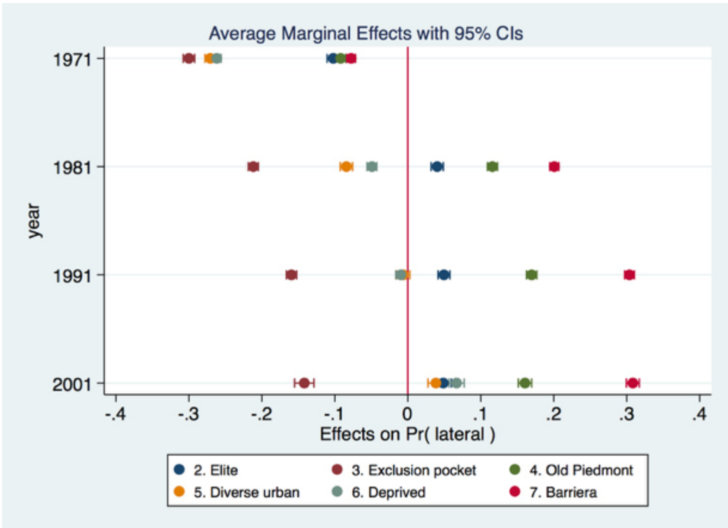
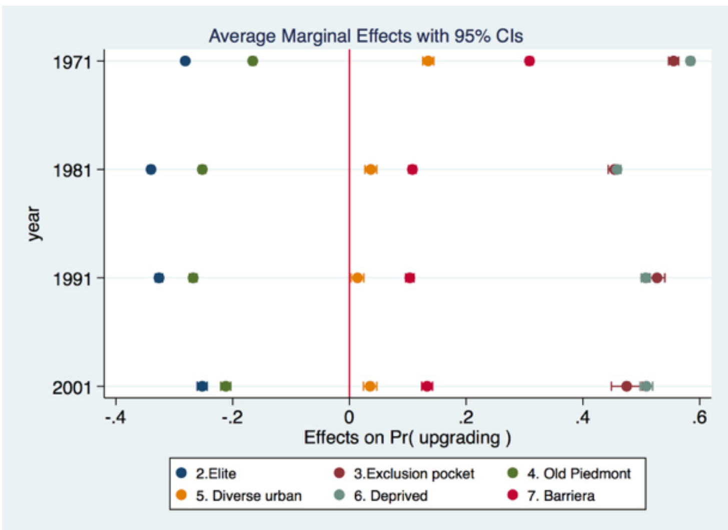


Figure 5.14: Average Marginal Effects for neighborhood type on the probability of upward movements



types it is possible to investigate the pattern of movement by origin and destination neighborhood type for all move events through a transition matrix (Tab 5.4).

Table 5.4 reports, for movers, the probabilities of transition to a specific neighborhood type at time *t+1* based on where they resided at time *t* . Neighborhood types are ordered starting from the most disadvantaged one (Deprived) to the least (Elite), as a result, the flows over the main diagonal represent moves to areas with a higher relative status in terms of advantaged, while flows under the diagonal represent moves to less advantaged areas. The diagonal reports stability rates, i.e. the proportion of residents that although has changed neighborhood, flowed into a block belonging to the same neighborhood type than the one of origin.

Results show that about one third of movements are lateral movements and these are more frequent between Barriera (44.98%), Old Piedmont (37.07%) and Elite (32.31%) neighborhoods. Conversely, lateral movements between Exclusion pocket neighborhoods are very rare (6.78%) as well as between Diverse urban areas (16.16%). Moreover, overall 54% of all moves are either within the neighborhood type of origin or to a neighborhood within the adjacent types. Therefore, moving a step further over findings from the previous Sections, it is possible to state that when residents undergo an upward or downward movement large changes in neighborhood quality are less common than minor changes. Nonetheless, there is considerable movement also in the off diagonal cells. Table 5.4 in this regard illustrates a systematic relationship between origin and destination neighborhood types, thus underlying, once again, the non-random distribution of residents over the municipal territory.

Figure 5.15 further illustrates the connection between each pair of neighborhood types, showing residential flows involving more than 10% of residents of the origin neighborhood.

On the whole, the proportion of upward movement is higher (35.75 %) than that of downward movement (30.08 %), supporting to a certain extent the "move to improve" statement (cf. Section 5.3). The figure efficiently accounts for the connection between neighborhood types through both upward and downward residential mobility flows and show how these dynamics can potentially act as drivers of neighborhood change dynamics. The flows concerning a higher proportion of residents link, among the downward ones Resident growth to Deprived and both Old Piedmont and Diverse urban to Barriera, while among the upward ones Deprived and Exclusion pockets to Barriera.

Table 5.4: Aggregate residential mobility flows across neighborhood types

Origin	Destination neighborhood type (t+1)							
neighborhood type (t)	6.Deprived	3.Exclusion pocket	7. Barriera	1. Recent growth	5. Diverse urban	4.Old Piedmont	2.Elite	Total
6. Deprived	21.25	4.01	40.7	11.16	5.13	14.93	2.82	100
3. Exclusion pocket	16.48	6.78	33.82	20.76	3.96	14.76	3.45	100
7. Barriera	9.12	1.95	44.98	14.83	3.64	22.28	3.19	100
1. Recent growth	5.77	2.48	31.17	30.19	2.9	22.51	4.98	100
5. Diverse urban	10.66	1.9	26.00	8.45	16.16	23.52	13.3	100
4. Old Piedmont	4.79	0.98	28.45	13.73	6.36	37.07	8.62	100
2. Elite	3.64	0.77	14.81	7.81	13.38	27.27	32.31	100
Total	9.08	2.11	34.93	15.68	5.9	24.75	7.54	100

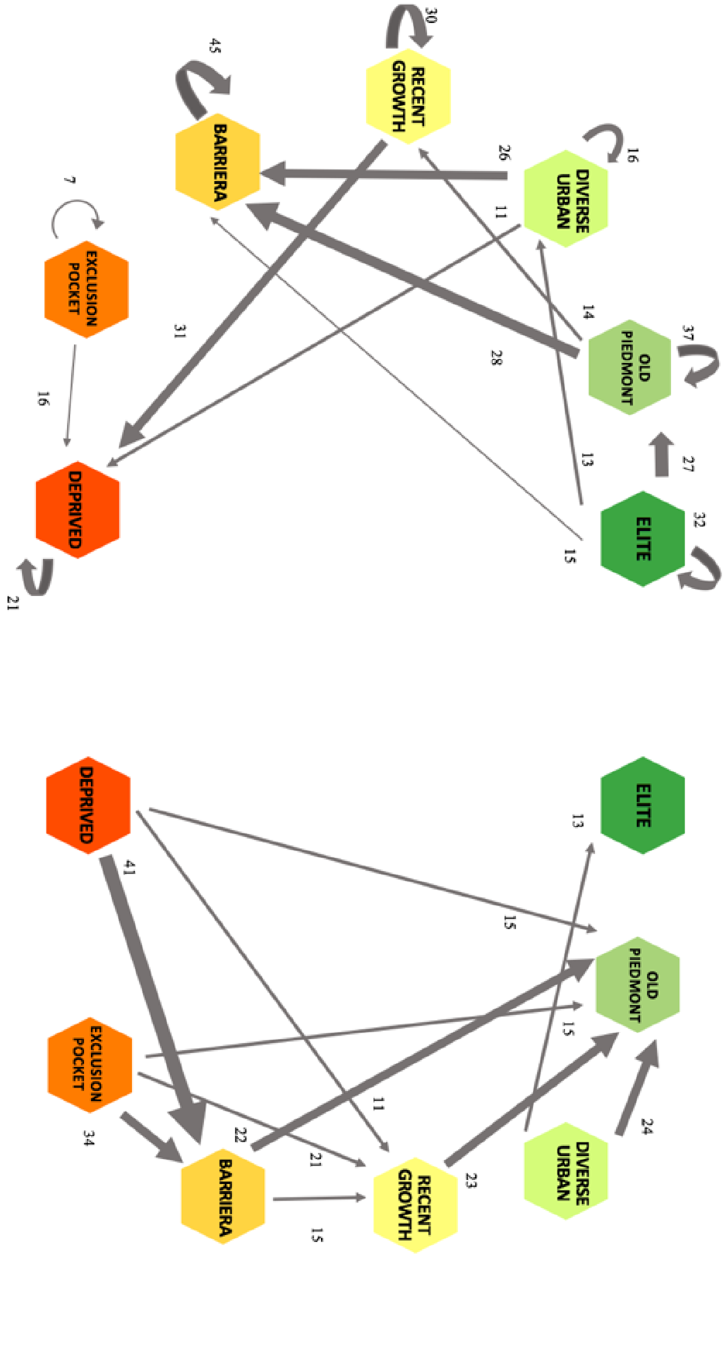


Figure 5.15: Aggregate residential mobility flows across neighborhood types, graphical representation

5.5 Summary and concluding remarks

Residential movements within the Turin municipality boundaries resulted to be rather frequent. The median survival time in the same neighborhood is indeed 12 years, which to some extent demonstrates the interplay between life course events and housing dynamics. Moreover, differences exist in terms of survival rates for residents inhabiting different neighborhood types. In this regard, individuals living in the most advantaged neighborhood types, namely Elite and Old Piedmont neighborhoods, tend to have a higher survival rate. Conversely, survival rates are lower for residents living in the most disadvantaged neighborhood such as Deprived and Exclusion pockets ones.

Results from the multivariate analysis about the individual and household characteristics influencing the likelihood of moving rather than continuing to live in the same neighborhood between two consecutive census years (10 years) are consistent with the international literature. Particularly, the probability to undertake a residential movement decreases with age which can be considered as a proxy of life course events. Moreover, having a higher education degree is associated with a higher probability to move, even if dissimilarities according to educational credential have tended to soften over time. Differently, there is no evidence for a clear relationship between the level of neighborhood socio-economic advantaged and the propensity to relocate, holding constant individual and household attributes. A higher likelihood of moving is associated especially with living in Diverse urban and Elite neighborhoods starting from the 80's, while in 1971 residents of Recent growth neighborhoods have the highest chance to move. Conversely, experiencing residential mobility is less likely for individuals residing in Exclusion pocket blocks.

However, the use of a 10's years time-span and the lack of variables concerning specifically life course events (such as childbirth or union formation and dissolution etc.) have proven to be relevant limits in this analysis. In this regard, these can be considered among the first explorative attempts to look at Turin intra-urban residential dynamic at the micro level with a longitudinal perspective.

Similarly, the analysis of neighborhood quality outcomes of residential intra-urban mobility behaviour represents a topic very scarcely investigated. Also in this case, I looked at the individual and household characteristics associated with the likelihood of improving or worsening neighborhood quality through residential mobility, rather than moving "laterally". In this regard, younger residents from 18 to 34 years old resulted to be the group with a higher probability to move down the neighborhood hierarchy, while residents over 64 years old are those less at risk. Moreover, differences among age classes have increased over time. A second individual attribute strongly associated with neighborhood outcomes, especially concerning "vertical" adjustment is education, which can be considered a proxy for resources availability. Having a college degree results to be protective against experiencing an increase in neighborhood deprivation, and moreover, the propensity to move to a less advantaged area decreases with the increase of educational attainment.

Finally, holding constant individual characteristics, I considered the association with the neighborhood type of residence. Findings related to this last point are however strongly affected both by floor and ceiling effects and by the different size of cluster representing neighborhood types. However, differences in the association between neighborhood type of departure and propensity to vertical or lateral moves seem to indicate the potential role of Deprived and Diverse urban areas as transition neighborhood in the housing career of Turin residents. Moreover, it has to be taken into account that, as known from the literature, the majority of moves occurs within a short distance and thus also the more or less spatial fragmentation of neighborhood types (cf. e.g. Elite vs Exclusion pockets) may have an impact on these findings.

The last part of the empirical investigation conducted in this dissertation deals with aggregated residential mobility flows across the entire neighborhood hierarchy. One-third of the movements link neighborhoods belonging to the same type and in this respect, lateral moves from Barriera, Old Piedmont and Elite neighborhoods are those more frequent. Conversely, those between two Exclusion pocket or two Diverse urban neighborhoods are very rare. Moreover, coherently with the literature and with results from other empirical research on Turin, the majority of all moves are either within the neighborhood type of origin or to a neighborhood within the adjacent types. Nonetheless, there is considerable movement also in the off-diagonal cells which illustrate a systematic relationship between origin and destination neighborhoods, thus underlying, once again, the non-random spatial distribution of residents over the municipal territory. To conclude, on the whole, the proportion of upward movement appears to be higher than that of downward movement, supporting to a certain extent the "move to improve" statement.

Chapter 6

Conclusions

The aim of this dissertation was to offer an extensive in-depth description of the long-term dynamic neighborhood sorting processes, in order to contribute to the empirical evidence on intra-urban neighborhood inequalities by focusing on the Italian case study of the city of Turin. I applied recent methodological advances in order to enhance the understanding of these urban phenomena by using a long-term longitudinal approach and considering, from a multidimensional perspective, the entire spectrum of neighborhood types.

Neighborhoods constitute an essential characteristics of the residential location and the direct spatial environment for households, providing important resources and opportunities for their resident (Galster 2001, Lersch 2014), moreover, they represent also the scale at which the intra-urban structure of social inequalities manifests itself. The literature on neighborhood is vast and transcends disciplinary boundaries and methodological approaches and very diverse definition of neighborhood have been formulated. In this dissertation, I followed the one proposed by Galster (2001) who defined the neighborhood as a "bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses", which I consider particularly effective in order to account for the multidimensional nature of neighborhoods. More in detail, to empirically investigate the city socio-spatial structure, I choose to focus, among the attributes cited by Galster, on the demographic, socio-economic and housing characteristics of neighborhood residents. These dimensions, indeed, have proven to be the most relevant in differentiate urban residential areas (Wei & Knox 2014).

Despite the long-standing tradition of the literature on residential sorting, there is still a lack of empirical evidence, both referring to neighborhood change and residential mobility dynamics, about long-term longitudinal processes accounting for the entire spectrum of neighborhood types. Moreover, these phenomena have been studied mainly referring to U.S. or North-European cities and there is almost no knowledge in this regard about Italian cities.

This dissertation aims to enhance this understanding by providing empirical evidence for the city of Turin over the forty years between 1971 and 2011, thanks to the possibility to rely on longitudinal data from the Turin Longitudinal Study. I addressed neighborhood sorting from two different perspectives. On the one hand, I analysed neighborhood change dynamics to uncover to what extent the spatial arrangement of Turin urban groups has evolved over the long-run and to explore the most common neighborhood trajectories. On the other hand, I investigated residential intra-urban moves to verify what individual and household characteristics are associated with the propensity of moving and, especially, which of them have a relationship with the likelihood of improving, worsening or not changing neighborhood quality by changing neighborhood. In this regard, the interest was also to address how individual residential behaviours combine to create residential mobility flows at the macro level able to connect similar or dissimilar neighborhood types.

Neighborhood typology

More in detail, the first research question (Question 1a) deals with the differentiation of neighborhood types in Turin. Starting from 25 variables referring to demographic, socio-economic and housing characteristics of residents, I developed a seven-class typology which, in my opinion, represents a balanced solution between parsimony and accuracy. Despite it is not strictu senso an ordered classification, neighborhood types can be arranged according to their attributes on the socio-economic dimension in order to express their relative advantaged or disadvantaged. In this regard, Elite neighborhoods are those at the top of the urban hierarchy while Deprived are those at the bottom, in between there are Old Piedmont, Diverse urban, Recent growth, Barriera and Exclusion pocket neighborhoods.

From the point of view of their spatial arrangement (Question 1b), Elite and Diverse urban neighborhoods appear those more spatially clustered in the central city areas and their spatialization is remained largely unchanged over time, while Old Piedmont, Recent growth and Barriera neighborhoods are located in the semi-peripheral and peripheral areas whit different arrangements over time. Exclusion pocket and Deprived neighborhoods have instead a more fragmented geography. Nevertheless, it is possible to recognize in these findings the socio-spatial structure outlined by Italian authors in the last decades: in the north part of the city is visible a higher concentration and more cluster of Deprived neighborhoods, while in the southern zones there is a more fragmented distribution which often corresponds to that of the public housing dwellings.

This classification is to some extent consistent with other in the literature referring to U.S. cities, even if greater dissimilarities exist for what concern the neighborhood spatial arrangement. Indeed, a prominent feature of contemporary cities in the United States has been the tendency for suburban areas to have very advantaged profile characterised by high income level and housing values. Conversely, in the European context, outer-city neighborhoods have often more disadvantaged profile, to the point that in the literature on “peripheries” the terms refer to the interplay of a spatial location fa from the city centre and a social dimension of deprivation and decline (cf. Fregolent 2008), while higher-income households tend often to locate in central city areas (Zwiers et al. 2016). U.S. cities are by far younger than European ones, and partly for this reason, they are rarely characterised by the historical downtowns instead typical of European cities which contribute to their attractiveness for wealthiest population groups, especially when object of urban renewal projects (cf. Rosenthal & Ross 2015).

As mentioned, most of the literature on neighborhood classification and change has been written referring to U.S. cities, for this reason, a second relevant difference emerged in this research regarding the role of ethnic differences in neighborhood stratification. The issue of ethnic spatial division within cities has been one of the main interest for studies concerning neighborhood composition and change in the U.S. cities. This is due to the higher level of segregation and separation of ethnic minorities as well as to the rise of this issues several decades earlier compared to European cities (van Kempen & Murie 2009, Rosenthal & Ross 2015). Empirical findings from this work, on the one hand, confirm the role of birth origins in the spatial arrangements of groups within the city, even if it proved to have a minor role than socio-economic attributes of residents in the differentiation of neighborhood types. On the other hand, as expected from the knowledge of the Turin historical and economic context, this dissertation provides evidence also concerning the role of internal migration flows from other Italian regions on the socio-spatial structure of the city. Internal and international migration flows have interested Turin in two different historical moments and, despite being not comparable in size, have resulted in concentration of not-native in, at least partly, the same city areas.

Results about the spatial distribution of urban population groups within the city boundaries are comparable also with those of others Italian authors who have addressed the study of Turin city social geography (Berardi et al. 1980, Mela et al. 1981, Marra 1985, Ires Piemonte 1995, Conforti & Mela 2008). This, despite they used, on the one hand, different methodological frameworks and reacher data sources, including for instance information on residents' occupational status. It is indeed possible to conclude that, in this dissertation, the lack of information on residents' occupational status, income and housing values is somehow balanced by the the set of variables included in the analysis, and particularly by the educational attainment and tenure. On the other hand, the choice of a finer spatial unit of analysis and of adopting a long-term temporal perspective demonstrated to be very effective in order to explore and describe the mosaic of neighborhood diversities and its evolution over time.

Neighborhood change

Findings about neighborhood change dynamics (Question 2a) show the prevalence of neighborhood stability. On average, about two out of three blocks preserve unvaried their characteristics in consecutive census years, thus after ten years. This is especially true for Elite and Barriera neighborhoods which have the highest stability rates, followed by Old Piedmont and Deprived ones. The descriptive analysis suggests the existence of a strong path dependence, moreover, the highest viscosity refers to the most advantaged neighborhood type. These finding are consistent with the growing body of literature arguing that neighborhood are “slothful” (Tunstall 2016) and that significant neighborhood change is rare and may take several decades (Hulchansky 2010, Meen et al. 2013) rather than being a widespread process quickly transforming the socio-spatial structure of the city.

Looking at temporal dynamics, starting from the 2000’s, especially for the most disadvantaged (Deprived and Exclusion pocket, but also Recent growth) and advantaged (Elite) neighborhoods, stability has become more likely, reversing the previous trend, while for Diverse urban neighborhoods the increase in stability rate started earlier in the 90’s. Despite this general trend, however, Recent growth and Exclusion pocket neighborhoods appear to be those more prone to change. Estimated probability of worsening of socio-economic conditions have been around 30-40% for all neighborhood types with exception, on the one hand, of Barriera and Exclusion pocket blocks, for which it has been closed to 10% over the whole period; and on the other, of Diverse Urban ones for which the probability to undertake a downward pathway was nearly 33% in 1971, but decreased over time until reaching 10% in the 2000’s as result of their higher stability. The 90’s has been the most favourable moment for disadvantaged neighborhoods (Deprived and Exclusion pocket), to improve their profile, with a likelihood of upgrading closed to 50%, which has then declined in the last decade considered. As mentioned, these were the years in which many large renewal and regeneration projects have been implemented in Turin (e.g. "The gate" and the huge “Spina Centrale” project). Moreover, despite their relative advantage position, Recent growth neighborhoods have had a higher propensity to upgrade than Barriera neighborhoods which have been very stable over the forty years from 1971 to 2011.

The use of the analytic tool of “neighborhood trajectories” allowed to consider urban transformations using a properly longitudinal perspective, thus dealing with the complete sequence of neighborhood profiles experienced between 1971 and 2011 and resulted to be effective in enhance the understanding of the evolution of the city socio-spatial structure over time. In this regard, one of the main findings is that the most frequent trajectories are characterised by a single transition, meaning that neighborhoods have belonged to only two different types over the forty years considered. Secondly, a variety of trajectories resulted from this analysis. Some of them are consistent with models and theories of neighborhood change and with international empirical evidence from recent research: particularly, filtering and gentrification dynamics as well as a predominant absence of change for many blocks over the entire period of study.

However, while upgrading trajectories have proven to be spatially clustered especially in the central city areas, coherently with the literature on gentrification and evidence from U.S. cities, neighborhoods which have declined over time resulted to be spatially scattered in several semi-peripheral and peripheral areas rather than in the urban core as often verified for American cities (Question 2b). Particularly, to the first group belong clearly the central area of Quadrilatero Romano (Municipio) and many blocks of the real city core (Piazza S. Carlo, Piazza Vittorio, Borgo Nuovo) and other close to the Porta Nuova railway station, San Salvario and Vanchiglia. More in detail, the Quadrilatero Romano and Sal

Salvario areas have been interested, in different years, by large renewal and regeneration projects and have been defined as example of gentrified neighborhoods by Semi (2015). Differently, as result of this explorative analysis, the areas interested by the Spina project do not seem to be interested, at least to date, in a systematic way by upgrading trajectories.

Moreover, this analysis showed the existence of "other" neighborhood trajectories which do not fit in the dichotomy of upgrading/downgrading and for which is necessary a more in-depth investigation. Indeed, the choice of use Dss's (same-order) sequence definition, which has proven to be effective in order to summarize the complexity of pathways, resulted to be a weaker tool in order to understand the peculiarities of the "other" trajectories which have interested the outer city zones.

Residential intra-urban mobility

From the analysis of residential intra-urban movements within Turin municipality emerges how moving is a rather common practice. As known from the literature, Italian households are less mobile compared to residents in other European or U.S. countries. This is mainly due to the extension of the owner-occupied sector, the role of the family in the access and provision of housing, both through material support to home acquisition and inheritance (Allen et al. 2004). When considering the survival rate, namely the probability of still staying in the same neighborhood after a t amount of time, in Turin we can expect around three residents out of ten who relocate to a different block after having lived in the same block for five years. After ten years, more than half of the residents still live in their neighborhood and this proportion reaches 50% after 12 years, which represents the median city survival time. This timing demonstrates to some extent the interplay between life course events and housing dynamics. Moreover, differences exist in terms of survival rates for residents inhabiting different neighborhood types. In this regard, individuals living in the most advantaged neighborhood types, namely Elite and Old Piedmont neighborhoods, tend to have a higher survival rate. Conversely, survival rates are lower for residents living in the most disadvantaged neighborhood such as Deprived and Exclusion pockets ones.

Results from the multivariate analysis about the individual and household characteristics associated with the likelihood of moving rather than continuing to live in the same neighborhood between two consecutive census years (10 years) are consistent with the international literature (Question 3a). Particularly, the probability to undertake a residential movement decreases with age which can be considered as a proxy of life course events. Moreover, having a higher education degree is associated with a higher probability to move, even if dissimilarities according to educational credential have tended to soften over time. Differently, there is no evidence for a clear relationship between the level of neighborhood socio-economic advantaged and the propensity to relocate, holding constant individual and household attributes. A higher likelihood of moving is associated especially with living in Diverse urban and Elite neighborhoods starting from the 80's, while in 1971 residents of Recent growth neighborhoods have the highest chance to move. Conversely, experiencing residential mobility is less likely for individuals residing in Exclusion pocket blocks.

When looking at neighborhood outcomes of residential mobility processes, interesting results concern the role of age and education (Question 3b). Young residents (18-34) result to be those with a higher probability to move down the neighborhood hierarchy, while residents over 64 years old are those less at risk, even if in Turin differences among age classes have increased over time. These findings confirm what is known from the literature about moving out of the family of origin and beginning the adult trajectory which may lead to important changes in the neighborhood environment. This life course event, moreover, occurs often in combination with other significant ones including partnership, college enrolment and/or first employment (Brazil Clark 2018) and could imply a transitioning into cheaper rented accommodation resulting from the interplay of preferences and available resources (Clark Morrison 2012). A second individual attribute strongly associated with neighborhood outcomes, especially concerning "vertical" adjustment is education, which can be considered a proxy for resources availability. Having a college degree results to be protective particularly against experiencing an increase in neighborhood deprivation, indeed the propensity to move to a less advantaged area decreases with the increase of educational attainment.

Differently, it has been more complex verify the independent role of neighborhood type of origin in the likelihood of experiencing an upward, downward or lateral move. Indeed, in this regard, the different dimensions of clusters (i.e. the number of census block included) represented to some extent a limitation. Indeed, it is more likely to move towards a bigger cluster (e.g. Barriera and Old Piedmont) than to a smaller one. However, differences in the association between neighborhood type of departure and propensity to vertical or horizontal moves seem to indicate the potential role of Deprived and Diverse urban areas as transition neighborhood in the housing career of Turin residents. Moreover, it has to be noticed that the existence of floor and ceiling effects contribute to complicating this picture

The empirical investigation dealing with aggregated residential mobility flows across the entire neighborhood hierarchy shows that one-third of the movements link neighborhoods belonging to the same type (Question 3c). Particularly, lateral moves from Barriera, Old Piedmont and Elite neighborhoods are those more frequent. Conversely, those between two Exclusion pocket or two Diverse urban neighborhoods are very rare. Moreover, coherently with the literature, the majority of all moves are either within the neighborhood type of origin or to a neighborhood within the adjacent types. Nonetheless, there is considerable movement also in the off-diagonal cells which illustrate a systematic relationship between origin and destination neighborhoods, thus underlying, once again, the non-random spatial distribution of residents over the municipal territory. On the whole, the proportion of upward movement appears to be higher than that of downward movement, supporting to a certain extent the “move to improve” statement. As stated by Brazil and Clark

(2018) this kind of analysis illustrates the intra-urban dynamism of residential movements which is normally underestimated. To conclude, the analysis illustrates how the results of individual and household location choices as well as the stay-or-leave decisions strongly affects both the profiles and the dynamic evolution of neighborhood. It is possibile to states that residential relocations most certainly represent a potential source of compositional neighborhood change and in order to fully understand how neighborhoods evolve evolve over time, it is necessary to look at how the different components of population dynamics work.

To conclude, this dissertation aimed to contribute to the literature on neighborhood long-term trajectories and residential mobility dynamics by applying a recent theoretical framework to an Italian cities, thus addressing by a different perspective issues which have been the heart of the urban sociology since its foundation.

Limitations of the present study

This study has several limitations which need to be addressed. While some of the methodological choices resulted to be very effective, namely the use of census blocks and the adoption of a long-term perspective, others such as the differences in size of neighborhood type clusters have limited the investigative power of the present study. This may suggest the possibility, in future research, to rely on a composite index (i.e. a continuous variable) and to differentiate neighborhood types according to the distribution deciles.

Although on the whole, this analysis is, in my opinion, powerful in its descriptive and explorative results, the choice of considered an Italian case study has been for several reasons a challenge and it caused a limitation in the data available. Nonetheless, this dissertation has allowed conducting a first exploration of neighborhood change and residential mobility phenomena which, albeit not perfect and conclusive, has enhanced the understanding of these issues. Furthermore, the choice to focus only on a particular city has obviously several limitations, especially with respect to the generalisability of findings. This choice has been due to the difficulties in having access to census micro data for other Italian cities and to the lack of longitudinal long-term dataset concerning residential mobility. However, things are changing and other cities are setting up longitudinal dataset and data on residential moves and, moreover, the Italian census is become "permanent" and this may represent an interesting innovation for further studies at the national scale.

In this work, neighborhood change is analysed only in relative terms, i.e. as relative improving or worsening with respect to other neighborhood types and thus average city characteristics. As a result, we don't know to what extent neighborhoods have improved or worsen in absolute term. However, very recently Modai-snir (2018) has proposed a new approach in order to decompose neighborhood change which may be very interesting for the further development of this research.

Similarly, it was not possible to account for the presence of public social housing when considering dwelling tenure. As known, tenure plays a significant role in the spatial distribution of individuals within cities, and this is especially true for households living in public housing which are often located in the outer and less valuable city areas. Moreover, the residential mobility behaviour linked to this kind of public housing dwelling by far restricts the choices of residents. Unfortunately, data on characteristics and location of Italian public housing are highly fragmentary and not very common and it was not possible to include them in the analysis.

Finally, the choice to look at same-order sequences when looking at neighborhood trajectories, on the one hand resulted to be very effective in order to enhance the understanding neighborhood long-term pathways by summarizing their complexity, however, on the other hand, it did not allow to deepen the analysis of timing and spell durations. This aspect resulted to be particularly relevant for the "other" trajectories which did not fit in the dichotomy of upgrading or downgrading ones. Moreover, the use of other analysis techniques would also permit to go further the descriptive analysis conducted in this work.

Further research

Starting from these limitations, I think that there is room for much further research on this topic. Firstly, considering the possibility to further investigate neighborhood change by decomposing the role of residential mobility flows. In doing this it would be possible considering whether they represent selective mobility flows or whether they contribute, through the turnover of individuals and households with the same characteristics to neighborhoods' stability. In order to do this, however, there is need to rely on a continuous variable (e.g. index) to define neighborhood types, in order to be able to analyse the role difference of in-movers and out-movers individual characteristics in neighborhood change processes. This kind of investigation is going to contribute to linking the results of the micro level of this analysis with those for the neighborhood macro level. In this respect, it would be really interesting applying to the Turin case the new approach very recently proposed by Modai-snir (2018).

Secondly, it would be very intriguing comparing neighborhood trajectories of areas object of large renewal andregeneration projects which have interested Turin in the last years with others characterised by spontaneous processes of change.

This research has a bird-eye perspective on spatial sorting dynamics which have proven to be effective in accounting for long-term transformations and to provide a first explorative analysis of these phenomena. However, focusing on more recent decades would allow to rely on more detailed data and thus to formulate a more detailed hypothesis and research questions. Particularly, this dissertation has created interest for inter-generational neighborhood inequalities. It would be really interesting analysing the inter-generational transmission of neighborhood inequalities and to study the role of tenure and education in this dynamic.

To conclude, recent research has shown that neighborhood matters and the amount of opportunities and resources which each neighborhood offers to its residents affects a variety of individual outcomes. The investigation of neighborhood change and residential mobility dynamics is relevant for a variety of literature streams in urban studies, and more generally for all those authors interested in the study of social inequalities. Moreover, findings regarding these phenomena have also some relevant policy implications. A proper understanding of these dynamics may be relevant, for instance, in order to implemented area-based policies which may result to be an ineffective tool because of (selective) residential mobility, as well as in the context of policies aiming to reduce or prevent neighborhood deprivation and decline by creating more diverse and mixed neighborhood population through social mixing.

Appendix A

Additional tables and figures

Table A.1: Authomatic clustering (BIC criterion)

Number of clusters	Schwarz Bayesian Information Criterion (BIC)	BIC change (a)	Ratio of BIC changes (b)	Ratio of distance measures (c)
1	104934.849			
2	74522.142	-30412.71	1	1.742
3	57271.18	-17250.96	0.567	1.426
4	45322.132	-11949.05	0.393	1.452
5	37242.682	-8079.45	0.266	1.277
6	31021.369	-6221.313	0.205	1.117
7	25501.881	-5519.488	0.181	1.622
8	22286.623	-3215.258	0.106	1.041
9	19218.185	-3068.438	0.101	1.021
10	16223.667	-2994.518	0.098	1.073
11	13467.039	-2756.628	0.091	1.158
12	11152.028	-2315.011	0.076	1.285
13	9458.105	-1693.924	0.056	1.106
14	7973.384	-1484.721	0.049	1.129
15	6714.671	-1258.713	0.041	1.037

(a) The changes are from the previous number of clusters in the table.
(b) The ratios of changes are relative to the change for the two cluster solution.
(c) The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Figure A.1: Correlation matrix

	population density	% residential buildings built before 1949	% residential buildings built in the previous 10 years	% homeowner households	% renter households	% overcrowded households	% individuals with college degree	% individuals with high school degree	% individuals with elementary or no degree	unemployment rate	% households with no income sources	% households with only pension income	% individuals <18 years	% individuals 18-35 years	% individuals >64 years	% individuals born in Piedmont region	% individuals born in Southern Italian regions	% individuals born in low-income countries	% individuals born in high-income countries	% unmarried individuals	% divorced individuals	% unipersonal households	% couples with children	% lone parent with children	% childless couples
population density	1																								
% residential buildings built before 1949	-0,02	1																							
% residential buildings built in the previous 10 years	-0,13	-0,32	1																						
% homeowner households	0,01	-0,30	0,18	1																					
% renter households	0,10	0,23	-0,14	-0,91	1																				
% overcrowded households	0,20	0,02	-0,08	-0,26	0,33	1																			
% individuals with college degree	-0,20	0,24	-0,04	0,12	-0,22	-0,64	1																		
% individuals with high school degree	-0,12	-0,05	0,08	0,25	-0,32	-0,64	0,58	1																	
% individuals with elementary or no degree	0,11	-0,05	0,05	-0,20	0,25	0,68	-0,71	-0,76	1																
unemployment rate	0,08	0,10	-0,04	-0,27	0,30	0,36	-0,34	-0,38	0,39	1															
% households with no income sources	0,01	0,32	-0,17	-0,21	0,17	-0,02	0,08	-0,05	0,04	0,28	1														
% households with only pension income	0,14	0,04	-0,26	0,07	0,00	-0,03	-0,15	-0,13	0,01	0,06	-0,07	1													
% individuals <18 years	-0,04	-0,11	0,27	-0,07	0,05	0,31	-0,17	-0,22	0,53	0,13	-0,11	-0,41	1												
% individuals 18-35 years	0,08	-0,04	0,10	-0,13	0,15	0,36	-0,27	-0,15	0,19	0,20	-0,02	-0,34	0,02	1											
% individuals >64 years	0,05	0,21	-0,30	0,04	-0,03	-0,29	0,19	0,09	-0,27	-0,09	0,24	0,69	-0,58	-0,47	1										
% individuals born in Piedmont region	-0,23	-0,10	0,05	0,34	-0,38	-0,59	0,54	0,56	-0,59	-0,45	-0,08	0,08	-0,21	-0,38	0,26	1									
% individuals born in Southern Italian regions	0,24	0,06	-0,02	-0,27	0,34	0,58	-0,59	-0,59	0,63	0,45	0,00	-0,01	0,23	0,34	-0,23	-0,86	1								
% individuals born in low-income countries	0,04	0,04	-0,01	-0,10	0,11	0,20	-0,11	-0,12	0,14	0,21	0,16	-0,13	0,08	0,17	-0,14	-0,34	0,02	1							
% individuals born in high-income countries	-0,06	0,11	-0,03	-0,04	0,01	-0,12	0,21	0,09	-0,13	-0,07	0,05	-0,06	-0,02	-0,05	0,03	0,02	-0,15	0,02	1						
% unmarried individuals	-0,01	0,41	-0,15	-0,25	0,17	-0,04	0,17	0,05	-0,14	0,27	0,28	-0,15	-0,15	0,21	-0,04	-0,19	0,14	0,16	0,07	1					
% divorced individuals	0,03	0,27	-0,09	-0,22	0,21	-0,03	0,13	0,02	-0,08	0,05	0,20	0,01	-0,09	-0,05	0,10	-0,01	-0,01	0,02	0,06	0,15	1				
% unipersonal households	0,06	0,45	-0,15	-0,24	0,16	0,00	0,13	-0,01	-0,06	0,04	0,33	-0,12	-0,17	0,15	-0,02	-0,15	0,07	0,13	0,10	0,47	0,37	1			
% couples with children	-0,06	-0,34	0,34	0,08	-0,07	0,25	-0,18	-0,09	0,33	0,00	-0,33	-0,43	0,77	0,10	-0,62	-0,10	0,13	0,02	-0,06	-0,31	-0,28	-0,39	1		
% lone parent with children	-0,03	0,09	0,01	-0,12	0,10	0,05	0,02	-0,04	0,08	0,08	0,12	-0,11	0,25	-0,02	-0,10	-0,03	0,03	0,03	0,01	0,14	0,21	0,00	-0,03	1	
% childless couples	0,03	-0,26	-0,02	0,24	-0,18	-0,09	-0,06	0,05	-0,12	-0,18	-0,19	0,37	-0,33	-0,15	0,30	0,19	-0,16	-0,11	-0,05	-0,49	-0,18	-0,33	-0,17	-0,15	1

Table A.2: Authomatic clustering (AIC criterion)

Number of clusters	Akaike Bayesian Information Criterion (AIC)	AIC change (a)	Ratio of AIC changes (b)	Ratio of distance measures (c)
1	104547.89			
2	73748.228	-30799.664	1	1.742
3	56110.308	-17637.92	0.573	1.426
4	43774.303	-12336.005	0.401	1.452
5	35307.897	-8466.407	0.275	1.277
6	28699.626	-6608.27	0.215	1.117
7	22793.181	-5906.445	0.192	1.622
8	19190.966	-3602.215	0.117	1.041
9	15735.57	-3455.395	0.112	1.021
10	12354.095	-3381.476	0.11	1.073
11	9210.51	-3143.585	0.102	1.158
12	6508.542	-2701.968	0.088	1.285
13	4427.662	-2080.881	0.068	1.106
14	2555.984	-1871.678	0.061	1.129
15	910.313	-1645.671	0.053	1.037

(a) The changes are from the previous number of clusters in the table.
(b) The ratios of changes are relative to the change for the two cluster solution.
(c) The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Table A.11: Average marginal effects all covariates for the probability of moving vs staying stable for Turin residents

	dy/dx	**P>z**	**[95% Conf. Int]**	
females	0.000	0.922	-0.001	0.001
age				
34-49 years old				
1971	-0.154	0.000	-0.157	-0.151
1981	-0.180	0.000	-0.184	-0.177
1991	-0.209	0.000	-0.212	-0.205
2001	-0.197	0.000	-0.201	-0.193
50-64 years old				
1971	-0.202	0.000	-0.206	-0.199
1981	-0.220	0.000	-0.223	-0.216
1991	-0.300	0.000	-0.303	-0.296
2001	-0.303	0.000	-0.307	-0.298
>64 years old				
1971	-0.242	0.000	-0.247	-0.237
1981	-0.242	0.000	-0.247	-0.237
1991	-0.342	0.000	-0.346	-0.337
2001	-0.354	0.000	-0.359	-0.350
place of birth				
southern Italian region	0.025	0.000	0.024	0.027
other Italian region	0.004	0.000	0.002	0.006
low-income country	0.010	0.000	0.004	0.016

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Table A.11 Continued from previous page

	dy/dx	P>z	[95% Conf. Int]	
high-income country	0.047	0.000	0.043	0.051
civil status				
unmarried	0.097	0.000	0.095	0.099
widowed	0.050	0.000	0.047	0.053
divorced	0.109	0.000	0.105	0.112
occupational status				
unemployed	-0.010	0.000	-0.013	-0.007
inactive	-0.034	0.000	-0.036	-0.032
retired	-0.047	0.000	-0.050	-0.045
household with children				
0-5 years old	0.001	0.480	-0.001	0.003
6-11 years old	-0.004	0.000	-0.006	-0.002
12-17 years old	-0.003	0.004	-0.005	-0.001
ownership	-0.156	0.000	-0.157	-0.155
overcrowed dwelling	0.051	0.000	0.050	0.053
educational attainment				
high school				
1971	0.010	0.007	0.003	0.017
1981	-0.015	0.000	-0.021	-0.010
1991	-0.024	0.000	-0.029	-0.020
2001	-0.025	0.000	-0.029	-0.021
secondary school				
1971	-0.044	0.000	-0.051	-0.037
1981	-0.055	0.000	-0.060	-0.049
1991	-0.048	0.000	-0.053	-0.044
2001	-0.051	0.000	-0.055	-0.047
not secondary school				
1971	-0.071	0.000	-0.078	-0.065
1981	-0.074	0.000	-0.080	-0.069
1991	-0.065	0.000	-0.070	-0.060
2001	-0.054	0.000	-0.059	-0.049
Neighborhood type of residence				
2.Elite				
1971	-0.029	0.000	-0.034	-0.024
1981	0.030	0.000	0.025	0.035
1991	0.053	0.000	0.047	0.058
2001	0.028	0.000	0.022	0.035
3. Esclusion pocket				
1971	-0.088	0.000	-0.094	-0.083
1981	-0.082	0.000	-0.087	-0.076

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Table A.11 Continued from previous page

	dy/dx	**P>z**	**[95% Conf.**	**Int]**
1991	-0.027	0.000	-0.036	-0.018
2001	-0.019	0.011	-0.034	-0.004
4. Old Piedmont				
1971	-0.052	0.000	-0.055	-0.048
1981	-0.004	0.045	-0.007	0.000
1991	0.018	0.000	0.014	0.022
2001	0.014	0.000	0.009	0.019
5. Diverse urban				
1971	-0.026	0.000	-0.031	-0.021
1981	0.045	0.000	0.039	0.051
1991	0.074	0.000	0.068	0.080
2001	0.041	0.000	0.034	0.048
6. Deprived				
1971	-0.014	0.000	-0.018	-0.010
1981	0.013	0.000	0.009	0.017
1991	-0.009	0.000	-0.014	-0.005
2001	-0.010	0.002	-0.016	-0.003
7. Barriera				
1971	-0.047	0.000	-0.051	-0.044
1981	0.004	0.017	0.001	0.007
1991	0.025	0.000	0.021	0.029
2001	0.023	0.000	0.018	0.028

Table A.3: Discriminant power of the variables included in the clustering procedure

	F	Prob >F	R-squared	Adj R-squared	Root MSE
population density	788.81	0.000	0.2182	0.2179	0.8561
% residential buildings built before 1949	1530.41	0.000	0.3512	0.351	0.79118
% residential buildings built in the previous 10 years	948.33	0.000	0.2512	0.2509	0.83471
% homeowner households	858.59	0.000	0.233	0.2327	0.77121
% renter households	802.62	0.000	0.2211	0.2209	0.79668
% overcrowded households	3168.68	0.000	0.5285	0.5283	0.5963
% individuals with college degree	4774.12	0.000	0.6281	0.6279	0.55736
% individuals with high school degree	2075.81	0.000	0.4234	0.4232	0.62865
% individuals with elementary or no degree	3301.35	0.000	0.5387	0.5385	0.57714
unemployment rate	1121.91	0.000	0.2841	0.2839	0.71421
% households with no income sources	502.48	0.000	0.1509	0.1506	0.73249
% households with only pension income	880.38	0.000	0.2375	0.2372	0.66768
% individuals <18 years	1014.93	0.000	0.2642	0.2639	0.66523
% individuals 18-35 years	555.7	0.000	0.1643	0.164	0.63896
% individuals >64 years	1205.08	0.000	0.2989	0.2986	0.61404
% individuals born in Piedmont region	3583.1	0.000	0.559	0.5588	0.56772
% individuals born in Southern Italian regions	3421.39	0.000	0.5476	0.5474	0.58223
% individuals born in low-income countries	301.15	0.000	0.0963	0.096	0.73989
% individuals born in high-income countries	188.71	0.000	0.0626	0.0622	0.68004
% unmarried individuals	1124.76	0.000	0.2846	0.2844	0.59761
% divorced individuals	326.67	0.000	0.1036	0.1033	0.54548
% unipersonal households	1045.72	0.000	0.27	0.2698	0.6408
% couples with childre	1380.96	0.000	0.3282	0.3279	0.59429
% lone parent with children	140.35	0.000	0.0473	0.047	0.70903
% childless couples	768.39	0.000	0.2137	0.2134	0.61313

Table A.4: Descriptive statistics for the aggregated variables used in the clustering procedure

Dimensions	1971		1981		Census year 1991		2001		2011	
	Mean	*St.dev*	*Mean*	*St.dev*	*Mean*	*St.dev*	*Mean*	*St.dev*	*Mean*	*St.dev*
Housing										
population density (inh/km2)	21838.57	17069.43	21982.90	16555.36	18646.93	14356.83	17517.52	13028.51	17962.47	12680.89
% residential buildings built before 1949	49.16	37.31	46.53	37.02	45.98	37.50	44.52	41.26	39.72	38.96
% residential buildings built in the previous 10 years	28.27	30.51	5.38	15.61	2.00	8.97	2.78	11.34	2.22	10.63
% homeowner households	23.93	16.46	33.76	18.03	49.58	19.86	57.92	23.14	61.03	21.58
% renter households	68.94	19.01	57.19	19.16	41.56	19.94	31.87	21.31	28.07	18.65
% overcrowded households	43.98	20.36	32.23	17.97	20.67	14.61	17.11	14.34	12.70	10.82
Socio-economic										
% individuals with college degree	4.30	6.85	6.27	8.84	9.41	10.70	15.19	15.10	20.74	15.52
% individuals with high school degree	12.04	9.23	17.22	9.89	22.55	11.19	25.77	11.87	28.02	10.11
% individuals with elementary or no degree	60.02	17.01	44.46	15.69	32.54	14.61	23.41	13.65	16.53	10.11
unemployment rate	2.97	3.27	10.28	6.57	13.31	9.00	11.53	10.17	9.17	7.48
% households with no income sources	7.19	5.66	11.35	7.45	14.00	9.47	11.54	9.04	9.41	7.28
% households with only pension income	16.66	10.34	19.89	10.10	24.03	10.81	26.11	12.44	28.53	12.20
Demographic										
% individuals <18 years	23.77	7.44	21.73	7.13	15.32	6.21	13.49	6.70	14.48	6.18
% individuals 18-35 years	25.19	7.58	23.95	7.16	24.95	7.56	21.84	8.64	17.51	7.51
% individuals >64 years	11.20	7.76	14.17	8.49	17.17	9.14	20.95	10.62	23.25	10.59
% individuals born in Piedmont region	56.25	14.11	57.29	13.33	59.27	12.81	59.93	14.29	58.35	15.09
% individuals born in Southern Italian regions	25.31	15.02	27.23	14.77	26.21	13.60	25.14	13.94	20.73	12.41
% individuals born in low income countries	1.61	3.36	1.55	3.00	2.31	4.23	4.59	6.59	12.24	11.42
% individuals born in high income countries	1.23	2.35	1.14	1.55	1.20	1.93	1.14	1.76	1.18	1.86
% unmarried individuals	23.75	9.33	24.50	8.71	28.85	8.98	28.78	10.67	32.30	10.30
% divorced individuals	1.64	2.04	3.20	3.91	5.07	4.88	7.17	6.82	9.63	6.69
% unipersonal households	19.81	12.17	25.76	13.10	32.74	14.31	35.42	15.05	41.65	14.36
% couples with children	33.10	14.25	29.90	13.46	20.68	11.61	17.84	12.81	15.75	10.37
% lone parent with children	1.73	2.27	2.64	4.01	2.46	3.11	3.01	4.74	4.03	3.96
% couples without children	20.09	9.98	18.92	9.38	19.46	9.37	22.57	11.27	21.07	10.37

Figure A.2: Turin statistical zones ("zone statistiche")

1 Municipio
2 Palazzo Reale
3 Palazzo Carignano
4 P.za S. Carlo-P.za Carlo
5 Piazza Statuto
6 Piazza Vittorio Veneto
7 Borgo Nuovo
8 Comandi militari
9 S. Salvario-Valentino
10 Porta Nuova-San Secondo
11 Vanchiglia
12 Borgo Dora
13 Parco Michelotti-Borgo Po
14 Motovelodromo
15 Piazza Crimea
16 San Donato
17 Porta Susa-Nuovo Tribunale
18 Politecnico
19 Piazza Nizza
20 Corso Dante-Ponte Isabella
21 Gasometro
22 Vanchiglietta
23 Rossini
24 Aurora
25 Ospedale Amedeo di Savoia
26 Crocetta
27 Ospedale Mauriziano
28 Corso Lepanto
29 Campidoglio
30 La Tesoriera
31 Boringhieri
32 Cenisia
33 San Paolo
34 Monginevro
35 Polo Nord
36 Cimitero Generale
37 Maddalene
38 Monterosa
39 Monte Bianco
40 Regio Parco
41 Barriera di Milano
42 Borgata Vittoria
43 La Fossata
44 Officine Savigliano
45 Madonna di Campagna
46 Barriera di Lanzo
47 Ceronda-Martinetto
48 Lucento
49 Parco della Pellerina
50 Parella-Lionetto
51 Pozzo Strada
52 Parco Ruffini-Borgata Lesna
53 Santa Rita
54 Stadio Comunale-Piazza d'Armi
55 Istituto di Riposo vecchiaia
56 Mercati Generali
57 Molinette-Millefonti
58 Lingotto-Barriera di Nizza
59 Corso Siracusa
60 Fiat Mirafiori
61 Corso Traiano
62 Gerbido
63 Venchi Unica
64 Aeronautica
65 Le Vallette
66 Strada di Lanzo
67 Basse di Stura
68 Barriera di Stura
69 Fioccardo
70 Pilonetto
71 Madonna del Pilone
72 Sassi
73 Valgrande-Cartman
74 Val Piana-Val San Martino
75 Val Salice
76 Villaretto
77 Falchera
78 Villaggio Snia-Abbadia di Stura
79 Bertolla
80 Superga
81 Mongreno
82 Reaglie-Forni e Goffi
83 Santa Margherita
84 Eremo-Strada di Pecetto
85 San Vito
86 Parco della Rimembranza
87 Cavoretto-.Val Pattonera
88 Strada Ronchi-Tetti Gramaglia
89 Giardino Colonnetti
90 Borgata Mirafiori
91 Drosso
92 Cimitero Parco Torino sud

Table A.5: Model estimates (RRR) for the likelihood of upgrading vs lateral neighborhood change

upgrading vs lateral	RRR	Robust St. Err.	[95% Conf. Interval]
Neighborhood type			
1.Recent growth	1	(.)	[1,1]
2.Elite	6.17e-10***	(1.38e-10)	[3.9e-10,9.5e-10]
3. Exclusion pocket	2.933***	(0.730)	[1.801,4.778]
4. Old Piedmont	0.158***	(0.0370)	[0.0994,0.250]
5. Diverse urban	0.629*	(0.138)	[0.409,0.969]
6. Deprived	1.495*	(0.287)	[1.026,2.179]
7. Barriera	0.859	(0.142)	[0.621,1.188]
1981	1.750***	(0.269)	[1.295,2.364]
1991	2.685***	(0.516)	[1.841,3.914]
2001	1,387	(0.298)	[0.911,2.113]
Initial status			
1.Recent growth	1,219	(0.280)	[0.777,1.913]
2.Elite	4.304***	-1,237	[2.451,7.559]
3. Exclusion pocket	0.929	(0.243)	[0.556,1.551]
4. Old Piedmont	1.719*	(0.426)	[1.057,2.795]
5. Diverse urban	1,609	(0.414)	[0.972,2.663]
6. Deprived	0.686	(0.169)	[0.423,1.111]
7. Barriera	0.742	(0.177)	[0.465,1.184]
Neighborhood type #year			
2 1981	0.672*	(0.104)	[0.495,0.911]
2 1991	0.484***	(0.0950)	[0.329,0.711]
2 2001	0.877	(0.193)	[0.570,1.349]
3 1981	0.560	(0.178)	[0.301,1.044]
3 1991	0.453*	(0.166)	[0.221,0.928]
4 1981	0.633	(0.178)	[0.364,1.098]
4 1991	0.180***	(0.0621)	[0.0917,0.354]
4 2001	0.449*	(0.147)	[0.236,0.853]
5 1981	0.773	(0.194)	[0.473,1.264]
5 1991	0.278***	(0.0792)	[0.159,0.486]
5 2001	0.605	(0.174)	[0.344,1.065]
6 1981	0.777	(0.167)	[0.510,1.184]
6 1991	0.573*	(0.140)	[0.355,0.926]
6 2001	0.488**	(0.135)	[0.283,0.840]
7 1981	0.506***	(0.102)	[0.341,0.752]
7 1991	0.239***	(0.0559)	[0.152,0.379]
7 2001	0.487**	(0.125)	[0.295,0.806]
inhabitants (/50)	0.518***	(0.0347)	[0.455,0.591]
N 13218			

Exponentiated coefficients; 95% confidence intervals in brackets
* p<0.05, ** p<0.01, *** p<0.001

Table A.6: Model estimates (RRR) for the likelihood of downgrading vs lateral neighborhood change

downgrading vs lateral			
Neighborhood type			
1.Recent growth	1	(.)	[1,1]
2.Elite	0.835	(0.165)	[0.568,1.229]
3. Exclusion pocket	0.409**	0.116)	[0.234,0.713]
4. Old Piedmont	0.670*	(0.107)	[0.491,0.915]
5. Diverse urban	0.826	(0.172)	[0.549,1.243]
6. Deprived	7.92e-10***	(1.61e-10)	[5.3e-10,1.1e-09]
7. Barriera	0.123***	(0.0219)	[0.0872,0.175]
1981	1,101	(0.162)	[0.825,1.470]
1991	1.519*	(0.274)	[1.066,2.164]
2001	0.885	(0.175)	[0.601,1.303]
Initial status			
1.Recent growth	1,264	(0.290)	[0.806,1.982]
2.Elite	0.506**	(0.128)	[0.308,0.832]
3. Exclusion pocket	2.035**	(0.533)	[1.217,3.401]
4. Old Piedmont	1,368	(0.325)	[0.859,2.179]
5. Diverse urban	1,071	(0.276)	[0.646,1.774]
6. Deprived	3.089***	(0.828)	[1.827,5.224]
7. Barriera	2.598***	(0.617)	[1.630,4.139]
Neighborhood type#year			
2 1981	0.644*	(0.139)	[0.422,0.984]
2 1991	0.815	(0.191)	[0.515,1.292]
2 2001	0.689	(0.183)	[0.409,1.158]
3 1981	1,509	(0.562)	[0.728,3.130]
3 1991	0.909	(0.406)	[0.378,2.183]
3 2001	0.562	(0.267)	[0.222,1.425]
4 1981	0.798	(0.158)	[0.541,1.177]
4 1991	0.429***	(0.0978)	[0.275,0.671]
4 2001	0.755	(0.185)	[0.467,1.220]
5 1981	0.524*	(0.133)	[0.319,0.861]
5 1991	0.168***	(0.0493)	[0.0945,0.299]
5 2001	0.232***	(0.0705)	[0.128,0.421]
6 1981	1,034	(0.165)	[0.756,1.414]
6 1991	0.731	(0.145)	[0.496,1.079]
6 2001	1,329	(0.284)	[0.875,2.019]
7 1981	1,069	(0.228)	[0.704,1.622]
7 1991	0.336***	(0.0833)	[0.207,0.546]
7 2001	1,161	(0.289)	[0.713,1.891]
inhabitants (/50)	0.588***	(0.0411)	[0.512,0.674]
N 13218			

Exponentiated coefficients; 95% confidence intervals in brackets
* p<0.05, ** p<0.01, *** p<0.001

Table A.7: Kaplan–Meier survival estimates.

Time (years)	Beg.Total	Fail	Survival Function	Std. Error	[95% Conf.Int.]	
1	2.2e+06	191607	0.9185	0.0002	0.9182	0.9189
2	2.1e+06	170776	0.8485	0.0002	0.8480	0.8489
3	2.0e+06	149026	0.7890	0.0003	0.7885	0.7895
4	1.9e+06	125258	0.7402	0.0003	0.7396	0.7407
5	1.9e+06	108456	0.6988	0.0003	0.6982	0.6994
6	1.8e+06	97319	0.6624	0.0003	0.6618	0.6630
7	1.7e+06	84070	0.6315	0.0003	0.6309	0.6320
8	1.7e+06	74356	0.6044	0.0003	0.6038	0.6050
9	1.6e+06	68749	0.5797	0.0003	0.5791	0.5803
10	1.6e+06	66008	0.5564	0.0003	0.5557	0.5570
15	1.4e+06	289341	0.4576	0.0003	0.4570	0.4582
20	1.2e+06	248670	0.3787	0.0003	0.3781	0.3793
25	1.1e+06	279475	0.2983	0.0003	0.2978	0.2988
30	958296	287889	0.2255	0.0002	0.2251	0.2260
35	831052	220030	0.1764	0.0002	0.1760	0.1768
40	706138	150411	0.1452	0.0002	0.1448	0.1455
45	563337	98400	0.1244	0.0002	0.1241	0.1247
50	435122	64141	0.1093	0.0002	0.1090	0.1096
55	311061	46275	0.0966	0.0002	0.0963	0.0969
60	221164	32429	0.0855	0.0001	0.0852	0.0858
65	161256	22674	0.0758	0.0001	0.0755	0.0761
70	116995	15065	0.0680	0.0001	0.0677	0.0683
75	81940	9871	0.0616	0.0001	0.0613	0.0619
80	49170	7145	0.0551	0.0001	0.0548	0.0554
85	24408	5139	0.0477	0.0002	0.0474	0.0480
90	9000	3148	0.0389	0.0002	0.0385	0.0393

Table A.8: Survival function by neighborhood types

time (years)	1.Recent growth	2. Elite	3.Exclusion pocket	4. Old Piedmont	5. Diverse urban	6. Deprived	7. Barriera
1	0.9251	0.9296	0.8900	0.9390	0.8956	0.8892	0.9224
2	0.8602	0.8655	0.8067	0.8844	0.8030	0.8026	0.8548
3	0.8029	0.8085	0.7256	0.8380	0.7268	0.7310	0.7980
4	0.7532	0.7644	0.6642	0.7990	0.6680	0.6740	0.7503
5	0.7087	0.7276	0.6194	0.7654	0.6204	0.6256	0.7096
6	0.6695	0.6954	0.5798	0.7351	0.5791	0.5844	0.6734
7	0.6350	0.6683	0.5454	0.7096	0.5456	0.5502	0.6421
8	0.6039	0.6439	0.5174	0.6870	0.5174	0.5208	0.6146
9	0.5747	0.6208	0.4899	0.6666	0.4918	0.4947	0.5896
10	0.5467	0.5994	0.4642	0.6470	0.4682	0.4703	0.5656
15	0.4207	0.5064	0.3483	0.5618	0.3747	0.3698	0.4665
20	0.3227	0.4321	0.2553	0.4910	0.3058	0.2900	0.3863
25	0.2298	0.3596	0.1673	0.4118	0.2419	0.2105	0.3032
30	0.1584	0.2826	0.1143	0.3241	0.1843	0.1534	0.2275
35	0.1162	0.2260	0.0855	0.2604	0.1424	0.1200	0.1760
40	0.0904	0.1865	0.0674	0.2196	0.1141	0.0991	0.1440
45	0.0735	0.1583	0.0559	0.1920	0.0952	0.0848	0.1235
50	0.0615	0.1372	0.0476	0.1719	0.0816	0.0741	0.1087
55	0.0523	0.1196	0.0401	0.1548	0.0706	0.0646	0.0961
60	0.0443	0.1050	0.0339	0.1398	0.0615	0.0563	0.0847
65	0.0382	0.0928	0.0289	0.1261	0.0532	0.0490	0.0752
70	0.0336	0.0829	0.0245	0.1154	0.0471	0.0428	0.0670
75	0.0297	0.0749	0.0213	0.1065	0.0419	0.0380	0.0604
80	0.0259	0.0671	0.0188	0.0971	0.0368	0.0330	0.0536
85	0.0223	0.0592	0.0155	0.0862	0.0311	0.0273	0.0457
90	0.0178	0.0500	0.0112	0.0722	0.0250	0.0207	0.0363

Table A.9: Log-rank test for equality of survivor functions

Log-rank test for equality of survivor functions		
Neighborhood type	Events observed	Events expected
1. Recent growth	304852	256119.19
2. Elite	199131	223123.50
3. Exclusion pocket	70153	50400.56
4. Old Piedmont	580142	738366.71
5. Diverse urban	244071	208930.02
6. Deprived	434420	353647.51
7. Barriera	1060540	1062721.51
Total	2893309	2893309.00
Chi2(6) = 78921.39		
Pr>chi2 = 0.0000		

Table A.10: Descriptive statistics for covariates for the model about the likelihood of lateral, upward or downward movements

	1971			1981			1991			2001		
	lateral	up	down	lateral	up	down	lateral	up	down	lateral	up	down
Women	31.5	37.4	31.2	35.3	35.5	29.2	34.8	35.5	29.8	38.4	32.0	29.7
Men	31.2	38.0	30.8	34.2	36.6	29.3	34.6	36.1	29.3	38.0	31.7	30.3
18-34 years old	29.8	39.3	30.9	31.6	39.1	29.3	33.7	37.7	28.6	36.8	32.9	30.3
35-49 years old	33.1	36.0	30.8	37.0	33.9	29.1	35.6	35.0	29.4	38.0	32.7	29.3
50-64 years old	32.9	35.2	31.9	39.7	30.9	29.4	36.0	31.1	32.8	40.8	28.7	30.5
>=65 years old	32.8	35.6	31.6	40.4	31.6	28.0	37.0	31.8	31.2	42.4	28.1	29.5
Place of birth												
Piedmont	32.2	37.4	30.5	34.6	35.8	29.6	34.2	35.5	30.3	37.8	32.1	30.1
Southern Italian regions	29.4	38.9	31.7	34.4	37.1	28.5	35.7	37.0	27.3	40.1	32.5	27.4
Other Italian regions	33.3	35.7	30.9	36.7	33.4	29.9	35.6	32.6	31.8	39.7	29.7	30.6
High-income foreign countries	33.8	36.0	30.3	33.7	37.7	28.5	33.6	37.2	29.2	36.2	33.5	30.3
Low-income foreign countries	31.5	36.8	31.7	33.4	35.9	30.7	30.8	35.7	33.4	33.9	29.3	36.8
Education attainment												
College	35.1	34.0	30.9	35.2	37.4	27.4	33.9	35.6	30.5	36.3	32.6	31.1
High school	30.4	38.2	31.4	32.5	37.4	30.2	33.3	35.4	31.2	36.8	32.0	31.2
Secondary school	30.7	39.1	30.2	33.6	37.3	29.1	34.9	36.8	28.3	39.0	32.2	28.8
Not secondary school	31.7	37.1	31.3	37.3	33.6	29.1	36.5	34.2	29.2	41.4	29.6	29.0
Occupational status												
Employed	30.9	38.4	30.7	34.2	36.8	28.9	34.9	36.7	28.5	37.7	33.0	29.2
Unemployed	27.4	40.5	32.1	30.2	39.5	30.3	33.1	38.0	28.9	36.7	32.4	30.8
Inactive	32.1	36.4	31.5	36.2	34.0	29.8	34.4	33.4	32.1	38.3	29.3	32.4
Retired	33.0	35.5	31.5	40.4	31.6	28.0	36.5	32.4	31.1	42.7	28.2	29.1
Civil status												
Married	33.4	35.8	30.8	37.3	34.3	28.4	37.1	34.8	28.1	40.4	31.7	28.0
Unmarried	27.4	41.5	31.1	30.2	39.8	30.1	32.0	37.5	30.6	35.7	32.5	31.7
Widowed	32.3	35.9	31.8	39.3	31.1	29.6	36.1	31.8	32.1	42.3	28.9	28.8
Divorced	27.7	38.0	34.3	30.9	35.7	33.4	32.7	34.2	33.1	36.7	30.8	32.6
Household with children												
No children	30.7	38.3	31.0	34.6	35.9	29.5	34.1	35.4	30.5	37.9	31.4	30.8
0-5 years old	32.2	35.8	31.9	35.0	35.9	29.1	37.2	36.6	26.2	39.5	33.5	27.0
6-11 years old	32.3	37.3	30.4	35.1	36.5	28.5	35.9	36.3	27.9	38.9	32.1	29.0
12-17 years old	30.6	39.5	30.0	34.6	36.2	29.2	34.1	36.3	29.6	38.0	32.6	29.4
Ownership	35.6	36.4	28.0	37.5	36.2	26.4	35.8	36.4	27.8	39.6	32.4	28.0
Not ownership	30.3	38.0	31.7	33.8	36.0	30.2	33.9	35.4	30.7	36.7	31.2	32.1
Overcrowed dwelling	30.7	39.7	29.6	35.8	37.4	26.8	36.9	38.0	25.1	39.3	34.8	25.9
Not overcrowded dwelling	32.3	34.9	32.8	34.2	34.8	31.0	33.6	34.6	31.8	37.7	30.6	31.7
Neighborhood type												
1. Recent growth	40.3	24.3	35.3	25.4	34.8	39.8	18.2	36.9	44.9	18.9	32.7	48.4
2.Elite	32.9		67.1	35.4		64.6	29.7		70.3	31.5		68.5
3. Esclusion pocket	11.9	77.7	10.4	4.3	73.5	22.2	2.1	82.3	15.6	6.0	69.8	24.1
4. Old Piedmont	30.3	10.8	58.8	38.1	9.8	52.1	38.5	7.9	53.6	40.3	6.5	53.2
5. Diverse urban	12.3	34.9	52.8	16.4	36.0	47.6	16.7	38.4	44.9	21.1	38.2	40.7
6. Deprived	18.3	81.7		24.8	75.2		18.5	81.5		25.0	75.0	
7. Barriera	35.9	51.7	12.4	47.6	40.7	11.8	48.4	42.7	8.9	47.3	41.4	11.3

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