The Urban Tapestry

Essays on the Relationship Between Social Networks and Residential Segregation

Laura Fürsich
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ABSTRACT

Dominant explanations of segregation argue that patterns of spatial residential sorting are shaped by the aggregation of individual residential choices, guided by discrimination, differences in resources, and preference-based explanations of neighborhood ethnic composition. However, research on social networks indicates that social influence can serve as a driver of collective outcomes that result in social organization. I reconsider interactive behavior in line with the sociological literature on networks and social influence to advance the literature on how social contexts shape opportunities for interaction and how the social influence of social contexts may affect residential choices and subsequent segregation. To this end, I present three essays that address: 1) the macro implications of networked behavior in space, 2) the social influence effects of school peers during adulthood, and 3) how social contexts in neighborhoods, particularly in the form of local social infrastructure, modify the effects of social influence. In doing so, I demonstrate that network and institutional effects are empirically observable and show how they operate as mechanisms of segregation.

In the introductory chapter, I address the emerging literature on social structural sorting and detail how it can benefit from the adoption of an Analytical sociology perspective. In particular, I highlight the importance of considering interactions in space and social contexts and their importance to an understanding of persistent patterns of spatial residential segregation.

In Essay I, I provide an analytical account of how network features can shape residential segregation. I develop an Agent-based simulation similar to the seminal Schelling model but with the agents embedded in a social network structure. This allows me to experimentally manipulate network homophily, clustering, and degree to measure how each of these network features shapes segregation levels, patterns, and the stability of the social-spatial system. I show that depending on the combination of each of these features, network models can lead to even higher levels of residential sorting, driven by the interactive behavior of agents, than the seminal Schelling model. The results tie in with the classic sociological literature on social networks and highlight the importance of weak ties in tipping a social system into a segregated state.

Essay II examines the role of social influence among school peers in young adulthood. Scholarship has previously highlighted the role of kin in residential choices. However, there is less evidence about how non-kin ties can affect intra-urban residential choices. Drawing on the push-pull and housing-search model, our hypothesis posits that school peers serve as a potential pool of friends that influence one’s residential decisions. To unravel the dynamics of social influence and selection into neighborhoods, we utilize population register data and employ a cross-cohort design. Using conditional logistic regression models, we see that the influence of school peers from both the 9th and 12th grades affects residential choices during adulthood. Moreover, our analysis demonstrates that various life stages have distinct social foci, but that the persistent influence of school peers remains evident throughout.

Essay III examines how social contexts can modify social influence effects by providing an opportunity for interaction. We combine population register data with OpenStreetMap data to map the amenity landscape in Stockholm and test whether neighborhood-level infrastructure mitigates tendencies towards white flight behavior. We employ coarsened exact matching to address selection bias into neighborhoods and estimate weighted linear probability regressions to assess the probability of majority group members’ out-mobility. We find that local social amenities located on the city block can indeed reduce tendencies towards white flight behavior. However, with increasing amenity density in the neighborhoods, majority group members become more likely to engage in white flight. We conclude that amenity density allows neighborhood residents to sort into different establishments, which does not promote intragroup contact.
However, if amenities are local, which presumably facilitates frequent contact with neighbors, opportunities for interaction can reduce intolerant behavior, highlighting how social contexts are important mechanisms of segregation.
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List of Essays

This thesis is based on the following essays, which are referred to in the text by their Roman numerals.

   Author Contributions: Conceptualizing & constructing framework, Writing, Simulation & Analysis: LF

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Introduction

Spatial segregation, whereby certain groups concentrate in distinct geographic areas, often leads to unequal access to resources, opportunities, and amenities. This geographical separation can perpetuate socio-economic disparities, limiting social mobility and exacerbating existing inequalities (Chetty et al., 2014; Downey et al., 2017; Sampson et al., 2002; Sharkey, 2013). A long-standing puzzle in the social sciences concerns why despite long-standing efforts of integration, ethnic and residential segregation remains persistent (Bruch & Swait, 2019).

Standard sociological models attribute residential segregation to differences in residential choices. If people with different demographic characteristics move into different neighborhoods, the neighborhoods will become segregated along the lines of these characteristics. Models of residential segregation tend to focus on three different forces that generate differential mobility. These are not mutually exclusive but can jointly help us understand how cities become segregated. First, resource-based explanations see resource allocation as preceding emergent segregation. Core aspects discussed in this field are red lining (Mitchell & Franco, 2018) in the U.S. or the spatial distribution of tenure types in Europe (for Sweden, see Wimark et al., 2019), and resulting differences in housing prices that constraint access to neighborhoods (Musterd et al., 2016). Second, discrimination-based explanations of segregation view power discrepancies, group preferences, and constraints on available housing choices as a function of social categories, with these affecting the housing options available to people from different social backgrounds (Korver-Glenn, 2018; Quillian et al., 2019; Turner et al.,
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2002). Finally, preference-based explanations of segregation refer to taste differences with regard to housing type or the ethnic or racial composition of the neighborhood in which the dwelling is located (Bruch & Mare, 2012; Clark, 1991). In the context of preferences-based explanations, Agent-based models of segregation, such as the Schelling (1971) or Sakdoa (1971) model, show how mild in-group preferences consistently lead to segregation.

Typical applications of these three explanations do not consider how social contexts shape preferences and opportunities for residential mobility and, in the long term, segregation (Krysan & Crowder, 2017). However, individuals’ social networks are shaped by their social contexts such as schools and workplaces. We know from many domains of human life that the social influence from social networks is crucial for decision-making ranging from choices on cultural markets (Krumme et al., 2012; Salganik et al., 2006; van de Rijt, 2019) to fertility choices (Keim et al., 2009). Moreover, social influence does not require strong network ties. Instead, our behavior may be influenced by the mere observation of others whom we perceive to be similar to ourselves in terms of social or cultural characteristics (Baldassarri & Bearman, 2007; DellaPosta et al., 2015; Goldberg & Stein, 2018). Weak ties of this kind may be crucial in shaping segregation by furnishing individuals with opportunities or information that strong ties cannot provide (Granovetter, 1973).

Importantly, social influence has also been shown to impact residential decisions (Brandén, 2014; de la Prada & Tapia, 2022; Hedman, 2013; Mulder, 2007). This suggests that if social influence is not taken into consideration when attempting to understand the emergence of segregation, segregation might be attributed to differences in resources, discrimination, or preferences, when it is quite plausible that its emergence is rather due to ties between individuals with similar characteristics and the social influence that such ties exert. Despite the empirical evidence pointing to the importance of social networks and social influence on residential decisions, few studies have to date explicitly and empirically linked these socially influenced residential choices to residential segregation. The overarching aim of this thesis is therefore to contribute further to standard explanations of segregation by investigating the interplay between social contexts, the ways in which they shape opportunities for interaction and network formation, the social influence stemming from these contexts, and, in turn, how they affect segregation.

I study the interplay between social contexts and residential segregation in three essays each of which addresses a different dimension of this relationship using an Analytical sociology framework. In Essay I, I develop a theoretical simulation model to examine how social networks and their distinct features impact the emergence of residential segregation. In Essay II, I examine social influence effects of former school peers on residential choices in adulthood. Finally, in Essay III, I investigate how the local social context,
in terms of its opportunities for interaction through social infrastructure, is associated with the likelihood of white flight behavior.

This introductory chapter proceeds by introducing the use of Analytical sociology (AS) in theorizing about the relationship between social networks and residential segregation. I apply insights from the social structural sorting perspective (Krysan & Crowder, 2017) and describe how it may benefit from using the tools provided by AS to understand the macro-level implications of interdependent social behaviors. This is followed by a discussion of how social contexts serve as opportunities for interaction between individuals, their role in social influence processes, and how they are situated in space. I then highlight the importance of considering individuals and their reactive behaviors in the modeling of socio-spatial systems. I contextualize Stockholm and discuss its representativeness as an example for the dissertation’s empirical studies before providing a brief overview of the methods used in the essays. Finally, I conclude the chapter with a summary of each essay and a discussion of the dissertation’s contributions to the literature.
Analytical sociology is a theory-driven approach to investigating the micro-level processes and interactions that give rise to macro-level social phenomena. It studies how interdependent actors bring about collective outcomes (Arvidsson, 2022; Hedström, 2005). At its core, AS relies on a mechanistic approach (Hedström, 2005; Hedström & Ylikoski, 2010; León-Medina, 2017) to understanding complex social phenomena. It aims to develop "proper explanations [that] identify the entities, activities, and relations that jointly produce the collective outcome to be explained" (p.8, Hedström & Bearman, 2009) rather than explaining individual outcomes as a result of different social factors such as economic constraints or levels of education (Arvidsson, 2022; Coleman, 1986; Hedström, 2005).

The concept of methodological individualism is fundamental to AS and places individuals at the center of mechanism-based explanations. AS understands macro-level phenomena as consequences of the interactive behaviors of individuals. The actions and interactions of individuals are the driving force that brings about large-scale patterns of phenomena such as segregation, polarization, or inequality (Coleman, 1986; Udehn, 2002). Instead of relying on ad-hoc justification about how two macro-level phenomena might be causally linked, mechanism-based explanations provide a detailed, theory-driven account of the link between two macro phenomena and the way they are produced by interdependent actors and their behaviors (Hedström & Swedberg, 1996). Importantly, from an AS perspective, theories of action are distinct from rational choice theories (Hedström, 2005; Hedström & Ylikoski, 2014; Manzo, 2010). Actions are not necessarily characterized
by deliberation, utility maximization, and goal-oriented behavior, instead, interactions with other individuals are central to explaining behavior.

Social systems are dynamic because individuals react to the behaviors of others, making social influence a key component of social mechanisms. AS concerns itself with these dynamics by not merely explaining whether a given macro phenomenon emerges, but also uncovering the sequences of actions that bring it into being. We might for instance be interested in understanding how a system transitions into a polarized state or how a city becomes segregated. These explanations typically hinge on the pattern and structure of social influence. For example, polarization often emerges through the influence of social interactions, where individuals mutually affect each other’s opinions and attitudes (for a review, see Flache et al., 2017) and self-reinforcing dynamics of social influence can amplify even small differences (DellaPosta et al., 2015; Merton, 1968). Similarly, social influence that induces cascades of residential movement can cause neighborhood tipping, resulting in segregated spaces (Schelling, 1971). In the context of segregation research, Bruch and Mare (p.270, 2009) make an important distinction between segregation viewed as a snapshot of a fixed state and the dynamic processes that create segregation: “Segregation is the nonrandom allocation of people who belong to different groups into social positions and the associated social and physical distances between groups. Segregation per se is a static property of a population, whereas segregation processes are the actions that create and sustain segregation”.

Classic theories of segregation explain the emergence of segregation through individual residential choices that lead to homophilic clustering in space by demographic characteristics. Any housing market will offer dwellings at different price points, producing a blueprint for economic sorting. If income is correlated with race or ethnicity (which is true for most Western countries), a simple resource-based model will identify residential sorting by race or ethnicity. However, this risks painting a naïve picture of the segregation process, given that individuals’ residential choices are not made in isolation. Schelling’s (1971) canonical contribution of a simple preference model demonstrates a central feature of human behavior: the whole is more than the sum of its parts (Andersen, 1972). Schelling demonstrates how individuals’ weak preferences for in-group contact lead social systems to tip into a segregated state. Central to Schelling’s model is the interdependence of actors in the system. The contagion of neighborhood adoption in Schelling’s segregation model is modeled in a way similar to that used in Granovetter’s (1978) threshold model, where a small accumulation of adopters can trigger the system to tip. Because neighborhoods – or the availability of dwellings therein – are a limited resource in contrast to Granovetter’s application to social organization, neighborhood segregation can be modeled as a vacancy chain model. Those are a set of models in which open positions move within a system (Abbott, 1990; Bruch & Mare, 2009;
White, 1970). Initial vacancies can open up positions for actors who are not satisfied with their position on the grid, creating opportunities for others.

The study of segregation can benefit from acknowledging social influence effects and networked behavior in its modeling of macro-level patterns of segregation. In theorizing about the links between social context, social influence, and segregation, I combine insights from the social structural sorting perspective (Krysan & Crowder, 2017) with insights from Analytical sociology. The social structural sorting perspective suggests that people’s residential choices will be guided by social networks, lived experiences, and the media. It questions the idea that residential preferences translate directly into choices. Rather, it allows for information about potential residential destinations to be shaped by social networks (Brown & Moore, 1970; Bruch & Swait, 2019). While interpersonal ties may be an advantage for some groups, other groups may lack the network resources that could help them access information about specific geographic locations. As a result, networks can amplify social inequalities (DiMaggio & Garip, 2011; Merton, 1968; Montgomery, 1991).

The social structural sorting perspective (Krysan & Crowder, 2017) provides a contextual framework for understanding why certain individuals or groups are more likely to be exposed to specific social structures and how these structures shape their opportunities and constraints. It emphasizes the role of networks in constraining and shaping residential choices at different stages of the choice process from forming a set of neighborhoods to consider as residential destinations to the actual residential outcome. Analytical sociology complements the social structural sorting perspective by considering the macro-level implications of micro-level networked residential choice behavior. In thinking through the processes across different levels, AS researchers often employ the Coleman boat (Figure 1) which is a multi-level framework that facilitates the consideration of multiple layers of explanation. In its classic form, the Coleman boat comprises the macro and the micro levels, which are linked through various mechanisms. For example, the macro-level state (Social Context), i.e., the geographic distribution of individuals from a shared context, might affect individuals’ preferences for neighborhoods. This then shapes their behavioral outcomes, e.g., residential choices. Linking these micro behaviors back to the macro-level consequences (Segregation) allows us to understand how these mobility processes are amplified by interactions between individuals. In its improved form, the classic Coleman boat is extended by a feedback loop (link 3) in order to model dynamic social processes involving multiple actors (Ylikoski, 2018). If, in our example, the spatial distribution changes as a result of the residential choices of other agents, this can trigger feedback loops by changing the local environment for other agents. Consequently, it is important that the model links back to the agents. The feedback loop captures the consequences of individual actions in the system. Importantly, the micro-macro link aims to capture
potential feedback resulting from multiple individuals’ (inter)actions. In its original form, the model would not be able to capture the interactions that are central to AS.

Building on these insights, an AS approach can extend the social structural sorting perspective by highlighting the role of interactive behavior and resulting segregation dynamics at the macro level. While the social structural sorting perspective is very explicit about the role of social networks in shaping desires, beliefs, and opportunities for individuals (link 1 in the Coleman boat, see Figure 1), and their implications for residential choices (link 2), it does not explicitly acknowledge the role of interactions in social behavior and how these interactions can bring about collective outcomes (links 3 and 4).

In this thesis, I focus on the emergence of segregation produced by interdependent social behavior and describe how spatial interconnection can translate into social connections. Moreover, I argue that different social contexts – such as schools and neighborhoods – are interrelated and affect one another. Lastly, these different contexts may be linked over time, with exposure to a social context early in life shaping behavior during adulthood. Importantly, I also make explicit the micro-macro link that connects individual choices to the macro phenomenon of segregation.

Figure 1: Improved Coleman boat following Ylikoski (2018). Own adaptation.
Social contexts are environments within which individuals engage in social interactions, encompassing entities such as schools, neighborhoods, leisure activities, and workplaces. In combination with daily mobility patterns, they define where individuals spend their time in cities or communities, commonly referred to as activity spaces (Brown & Moore, 1970; Cagney et al., 2020). In the context of this thesis, I focus on their role in providing opportunities for interaction. The frequency and quality of social interactions within one's social context can significantly impact the acquisition of cultural norms, beliefs, and attitudes. These interactions serve as conduits through which individuals learn and internalize societal values, ultimately contributing to the development of a shared cultural framework within a given social group (Aschaffenburg & Maas, 1997; Bourdieu, 1986; Nagel et al., 2011).

These social contexts can also serve as a defining factor in the formation of social ties that extend beyond jointly participating in a social context. Depending on the life stage, friends are likely to be selected from school during youth, from work during mid-life, and from voluntary groups or neighborhoods later in life (Thomas, 2019), highlighting a shift in social foci over the life course. Those social foci may be institutionalized and often bring together people with similar social or demographic characteristics (Feld, 1981, 1982; Gamm, 2001). Different social foci provide an opportunity to form new ties, but the interactions in such spaces may also lead to social influence effects through the observation of choices by others. Even if they are strangers, the revealed choices of others can result in indirect social influence because
individuals assume similarities based on their presence in similar social contexts (Goldberg & Stein, 2018).

Social contexts can be spatially coupled, some very tightly such as the location of elementary schools and parental residential locations, and some more loosely, such as workplaces and residential locations. Further, there may also be cross-domain effects. The organizational setup of religious institutions might alter incentives for residential choices. Gamm (2001) presents a compelling argument for how spatially situated organizations systematically influence residential choices. He places neighborhood institutions – churches, synagogues, community centers, schools – at the center of his explanation of why members of different denominations make particular systematic residential choices. While many white ethnics have left urban centers behind in the U.S. in the 1950s, Gamm argues that basic institutional rules explain the difference between Catholics and Jews in their attachment to neighborhoods. For Catholics, parishes are spatially bound to the community in which they live. Moving out of a neighborhood implies the loss of social ties. This is not the case for Jewish institutions, which are characterized by portability and autonomy, exacerbating the Jewish urban exodus. As a result of this selective urban exodus, inner-city neighborhoods in central Boston that had previously integrated African Americans and Jews became more homogeneously African American due to the way organizational structures embed their members in communities.

However, segregation across social contexts is commonplace (Blau & Schwartz, 1997), which means that not everyone has equal access to the same social contexts. For example, parents make residential choices based on the reputation of the local schools (Holme, 2002; Lareau, 2014) and choose schools on the basis of their ethnic composition (E. Andersson et al., 2010). Thus, parents implicitly impact the degree of homophily in friendship networks through their residential choices. Via choices such as the school to which they send their children, parents affect the probability of children encountering and forming friendships with peers of different ethnicities (Van Tubergen & Smith, 2018). These effects are not necessarily independent of one another. Rather, parents might make certain residential choices that reflect their preference for homophily in the neighborhood and that also allow children to access schools that satisfy the parents’ schooling-related preferences (Rich & Owens, 2023). The places we live in play a crucial role in determining access to social contexts, creating a scenario in which living conditions affect accessibility to and participation in various social settings.

Spatial Coupling of Social Contexts
Propinquity effects, the idea that agents in close residential proximity are more likely to form connections, remains a key concept that identifies spatial effects on social networks (Festinger et al., 1950; Park, 1924; Teig et al., 2009).
The structure of a network can also be a factor in the emergence of groups in social networks. The formation of friendships with friends-of-friends – i.e., triadic closure—is a key feature in network evolution (Asikainen et al., 2020; Jackson & Rogers, 2007; Scholz et al., 2014; Verbrugge, 1979). And proximity enables triadic closure: people are more likely to form friendships in shared social environments across a variety of contexts (Adams et al., 2012; Breiger, 1974; Feld, 1982; Festinger et al., 1950; Preciado et al., 2012).

Spatial proximity can also imply a shared social context, which might affect individuals through exposure to dis(advantage). The effects of disadvantage have long been a focus in the literature on neighborhood effects, linking the population composition of a neighborhood to different socio-economic outcomes (Jencks & Mayer, 1990; Wilson, 1987). There is now a large body of empirical research showing the socio-demographic implications of neighborhood contexts. Prominently, Chetty and colleagues (e.g., Chetty & Hendren, 2018; Chetty et al., 2014, 2016) have exploited the quasi-experimental allocation of housing vouchers to experimentally manipulate the social residential environments of low-income families with small children. The associations are striking. For example, if children from low-income families in the U.S. were to grow up in high-income neighborhoods, their income during adulthood is estimated to increase by 20%. These insights carry over to the European context, where in Sweden, for example, neighborhood resources can help children overcome disadvantages associated with the socioeconomic status of their family (Brandén et al., 2023). Beyond potential earnings and academic achievement, neighborhood composition can impact children in many ways, among them educational attainment, health outcomes, and the probability of criminal behavior (for reviews, see Galster & Sharkey, 2017; Sampson et al., 2002; Sharkey & Faber, 2014). However, focusing on residential propinquity alone ignores a much broader set of social contexts that are linked together in space and time and that extend beyond the residential neighborhood, such as social organizations or schools (Rich & Owens, 2023; Sharkey & Faber, 2014).

Within cities, school segregation tells us a lot about the social context outside children’s homes. When attending school, children are exposed to their peers without the supervision of parents, giving children the chance to be introduced to new values or ideas by their classmates (Rosenqvist, 2018). Residential context and school context are often spatially coupled – residential location governs access to schools for most children in both the U.S. (Weininger, 2014) and Sweden (Mutgan & Tapia, 2023). In the U.S., integrated schools are regarded as a significant means of reducing social barriers among various racial and ethnic groups with the idea being that shared school attendance among children from diverse racial and ethnic backgrounds, can forge close bonds that transcend these divisions (Wells & Crain, 1994). However, more recent empirical research shows that shared school attendance does not necessarily lead to inter-group friendships. De-
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Pending on the local context, namely the degree of ethnic stratification between schools, there is variation in the within-school formation of group identities and in the resulting inter-group tie formation (Kruse & Kroneberg, 2019). Consequently, even without parental supervision, the degree of sorting between schools can increase or decrease the salience of ethnic group membership, which highlights the importance of taking social spatial contexts into account.

Opportunities for interaction give rise to interdependent behavior

The opportunity structure for interaction in social contexts can vary. For example, within workplaces, individuals might be assigned tasks or teams, potentially leading to more exposure between groups (Mutz & Mondak, 2006). Between-group contact is more likely to foster inter-racial tie formation if the group shares a common goal and if contact is frequent (Allport, 1954). If these groups also perform tasks that require them to work together, the team becomes functionally interdependent (Kokkonen et al., 2015; Lindenberg, 1997). Ties between co-workers have for example been found to be more heterogeneous in terms of race and religion than ties formed elsewhere (McPherson et al., 2001). Taken together, social contexts differ in the way they provide opportunities for interaction, which can impact the network features that result from social contexts, and this can in turn have an impact on macro-level outcomes that are driven by interactive behavior (Centola & Macy, 2007; Granovetter, 1978; Watts & Strogatz, 1998).

The opportunities for interaction can be formalized or informal. Most schools and workplaces provide a formalized venue for interaction and an expectation that interaction will be substantial, which is not necessarily the case in neighborhoods (Kokkonen et al., 2015). This lack of formal interdependence might be altered via neighborhood organizations. If organizations foster frequent and intimate interaction, they have the potential to become an arena that connects neighbors. Urban design can enhance the probability of tie formation (Teig et al., 2009) and foster the development of tight-knit communities (Grannis, 1998). Klinenberg (2015, 2018) suggests that social infrastructure that incentivizes individuals to spend time in public may have a transformational role for cities by increasing social cohesion, which has a substantial impact on civic participation (Putnam, 2000). Such infrastructure can be publicly funded, but third places like cafés or bookstores can also enhance trust and community (Oldenberg, 1989).

These findings highlight that across social contexts, opportunities for interaction are stratified by social and demographic characteristics. Settings may vary in the degree to which they allow for interactions, and with regard to the longevity, intensity, and frequency of these interactions. Importantly, they also vary in the degree to which they bring people with different characteristics together. Often, selection into contexts is guided by homophily.
Sorting may occur in relation to a number of different factors. Residential patterns in cities may follow divisions based on income or ethnicity, or both (Reardon et al., 2008), however, political and religious sorting is more salient between larger regions (Bishop, 2009). Altogether, there is evidence that the choices that lead to sorting may result from overlapping processes across multiple dimensions (Bruch & Mare, 2009) that are shaped by interdependent behavior.

Considering these interactions between individuals is important for understanding segregation. Changes in contextual composition can trigger individual behavior, leading to changes at the macro level. In the context of residential segregation, individuals from the majority group react to an influx of minority members into their immediate neighborhood with an increased probability of leaving the neighborhood (Bråmå, 2006; de la Prada, 2023; Grodzins, 1957; South & Crowder, 1998). However, the reaction to such exogenous changes may be dependent on the opportunity structure, e.g., the potential set of alternatives. For example, policymakers have suggested and implemented strategic closures of schools with high proportions of minority students. These interventions, however, do not necessarily lead to less school segregation between different groups. Rather, the displaced students’ opportunity structure – e.g., the proximity, composition, and availability of alternative schools – is an important factor in relation to the way macro-level school segregation will be affected (Mutgan & Tapia, 2023).

Perceptions of the availability of opportunities shapes a variety of outcomes (Day & Fiske, 2017; Hochschild, 1995; McCall, 2013). Information on available opportunities can stem directly or indirectly from networks. Theories of cognitive knowledge suggest that individuals create mental maps which are individualized representations of a city (Downs & Stea, 1973; Gould & White, 2012; Van Kempen & Şüle Özüenkren, 1998), often based on personal experience. Consequently, the geographic location of social contexts that individuals frequent are an important element in such mental maps, potentially defining an individuals’ awareness space in a city. Modeling the decision-making process linked to residential relocation, Krysan and Bader (2009) show that individuals often only consider a small subset of potential destinations. In combination with affordability constraints, discriminatory practices (realized or expected), and racial differences in preferences, mental maps can be a deciding factor in what becomes part of the consideration set. As a result, many of the determinants of residential sorting are social and structural, resulting in the reproduction of existing patterns of segregation (Krysan & Crowder, 2017; Sampson, 2012; Sharkey, 2013).

Taken together, the evidence described above suggests that social networks in the form of interpersonal ties serve as dynamic forces that both sustain and shape social contexts and that are often embedded in and constrained by space. These networks provide access to social capital (Coleman, 1988), and facilitate the exchange of resources, information, and support.
Interdependence in Social Contexts

among individuals and groups. Thus, organizations can build community and provide a framework of reference, in turn fostering the development and accumulation of social capital, underpinning the cohesiveness and effectiveness of these social entities. Understanding how the different domains interact can provide a new perspective on geographies of opportunities, linking social contexts to physical and organizational spaces and opening new pathways to understanding geographies of opportunities.

This thesis contributes to the understanding of residential segregation by bridging the gap between empirical evidence highlighting the significance of social networks and social influence in residential decisions and linking these socially influenced choices to segregation. The overarching aim is to enhance standard explanations of segregation by exploring the interplay between social contexts, their influence on interaction opportunities, and the subsequent impact on segregation. The contributions of this research are studied in three related essays, two of which are empirical and focus on the Swedish capital city of Stockholm. I continue this chapter by presenting information on the population composition, patterns of residential segregation, and important axes of inequality in Stockholm.
The Empirical Case: The Greater Stockholm Area

In this thesis, the empirical chapters focus on the Greater Stockholm area\(^1\), which since 2005 includes all municipalities in Stockholm County. Stockholm County encompassed 1.6 million people in 1990 and 2.3 million in 2017, which corresponds to about 19\% (23\%) of the entire Swedish population in 1990 (2017) (see Figure 2). Stockholm has been growing continuously over recent decades, with an increase of around 24,000 individuals per year between 1990 and 2017.

Stockholm’s population composition, as well as Sweden’s population composition at large, has undergone a large shift over the last century. Starting as a country dominated by out-migration, in the aftermath of World War II Sweden became a country characterized by high in-migration. In more recent years, the 2003 Iraq War, the freedom of movement for EU workers in 2004, and from 2013 onwards a large number of migrants and refugees from Africa and the Middle East, have all impacted the immigrant composition of both Sweden and Stockholm. Between 1991 and 2017, the proportion of first and second generation immigrants in Stockholm County has increased (Figure 3). In 1991, the majority of first generation immigrants in Stockholm County migrated from Western Europe and North America. This composition has shifted towards the end of the study period with an increasing proportion of first generation immigrants migrated from other regions of the world (Figure 4).

\(^1\)In Essay III, I focus on the central part of Stockholm County encompassing Stockholm and its surrounding municipalities.
The Empirical Case

Figure 2: Population and Population Growth in Sweden and Stockholm. The bars represent the total population in Sweden (blue) and Stockholm (grey). The dashed lines indicated annual population growth in Sweden (blue) and Stockholm (black). Data Source: SCB (Statistical Database).

The population of Stockholm is more educated than the rest of the country (see Figure 5) with 29% of individuals having post-secondary education of 3 years or more, while the average for Sweden is 21%. Internal migrants to Stockholm are on average better educated and have higher incomes than those who do not migrate to Stockholm (Keuschnigg et al., 2019). Within Stockholm, both income inequality and income segregation have been growing since the 1990’s (Mutgan & Mijs, 2023). The spatial segregation of different income groups is largely due to the increasing isolation of low-income groups (Haandrikman et al., 2021; Mutgan & Tapia, 2023). Segregation in larger Swedish cities is characterized by higher levels of macro-scale segregation than that found in smaller cities (Östh et al., 2015). It has been argued that this is driven by wealthy, native Swedes avoiding moving into areas with substantial immigrant populations (Bråmå, 2006), while immigrants are more likely to move into neighborhoods with larger immigrant populations (Müller et al., 2018).

Overall, Stockholm is more diverse, richer, better educated, more unequal, and more macro-segregated than most other municipalities in Sweden (de la Prada, 2021; Hársman, 2006; Mutgan & Mijs, 2023; Östh et al., 2015). This mirrors the divide between capital cities and the rest of the country in other European nations. Generally speaking, there is segregation in these other capital cities too, but Stockholm has particularly high levels of macro-
Figure 3: Population Composition in Stockholm County in 1991 and 2017. Individuals are classified as first generation immigrants if they are born abroad, and as second generation immigrant if both parents were born abroad. If both parents and the individual are born in Sweden they are categorized as Swedish Ancestry. Data Source: Authors’ calculations using Swedish population registers provided by SCB.

Figure 4: Composition of first generation immigrant population in Stockholm County in 1991 and 2017. The region of origin refers to where individuals were born. Data Source: Authors’ calculations using Swedish population registers provided by SCB.
scale poverty segregation and high local poverty concentration (Haandrikman et al., 2021). Importantly, across a variety of European cities, high-income households live more segregated than low-income households (Musterd, 2005; Tammaru et al., 2015), because majority-group members with the financial resources are able to realize their housing preferences (Östh et al., 2015; Tunström & Wang, 2019).

Income and ethnic residential segregation are highly correlated. Low-income families often cannot make choices that match their residential preferences (DeLuca & Jang-Trettien, 2020), while affluent migrants have a higher probability of out-mobility from poorer areas (Fjellborg, 2021). Poorer areas on the outskirts of Stockholm can be quite ethnically diverse with a mix of immigrants from low-income European, African, the Middle Eastern, East Asian, and South American countries (Åslund et al., 2010; Tunström & Wang, 2019).

Sweden’s urban housing market is defined by a boom in public investment in housing from the post-war era, followed by a significant shift towards market-based allocation mechanisms. The Million Programme (miljonprogrammet), initiated in the late 1960s, constituted a monumental effort to address a severe housing shortage (Hall & Vidén, 2005). Its legacy includes the construction of large-scale housing estates, reflecting a tradition of social housing and a relatively low rate of homeownership. Most of the housing was built in peripheral locations with a uniformity of both design and tenure. These dwellings and their location in the city continue to shape residential patterns. Today, many of the neighborhoods that were developed during the Million Programme have become highly segregated and are mostly occupied by the immigrant population (Rokem & Vaughan, 2018). Moreover, since the 1990’s, Sweden has experienced a turn towards neoliberalism, marked by market-oriented reforms and reduced state intervention (R. Andersson & Turner, 2014). In the housing sector, this shift involved deregulation, liberalization of rents, and the sale of public housing to private entities. The tenure conversions from public to private housing are largely concentrated in central Stockholm (Fjellborg, 2018). Today, state subsidies for housing construction are drastically reduced or eliminated (Lindbom, 2001, 2007) and much of the new construction by private developers is focused on building for the (upper-) middle class, resulting in a housing shortage (R. Andersson et al., 2010), which is particularly severe for low-income groups, immigrants, and young people (Grundström, 2016).

Taken together, the housing distribution and the transformation of Stockholm’s housing landscape through the conversion from public rental to private housing, particularly in central areas, has contributed to increased homogeneity. Queue-based rental housing allocation, in combination with the high cost of entering homeownership in central areas, has pushed newcomers and low-income households to the fringes of the city (Haandrikman et al., 2021; Tunström & Wang, 2019). Thus, suburbs exhibit higher levels of
poverty and ethnic diversity, reflecting macro-scale segregation. Education and financial resources play pivotal roles in residents’ ability to move away from distressed areas, highlighting socio-economic challenges.

Stockholm, with its unique geography and historical background, has distinctive characteristics. Nevertheless, the challenges and segregation patterns it is grappling with are common issues shared by many other metropolitan areas. The availability of longitudinal full population register data on Stockholm provides an opportunity to investigate how social contexts can contribute to residential segregation.

Figure 5: Level of education for population in Stockholm County and all of Sweden in 2014. The colors indicate educational levels. Data Source: SCB (Statistical Database).
Data & Methods

Data and ethical considerations

In this thesis, I study how social contexts matter for residential choices and subsequently for residential segregation. In the empirical chapters, I use Swedish population register data available at the Institute for Analytical Sociology via SCB (statistiska centralbyrån, Statistics Sweden), which cover the entire population of Sweden, with granular data available from 1990 to 2017.

The data used in Essay I are exclusively drawn from Agent-based Models and do not correspond to any actual persons. In Essay II, we focus on how networks formed at schools during childhood and adolescence can shape choices during adulthood. This research question requires longitudinal data for a complete set of school peers. Population register data allow us to link social contexts from early schooling to residential choices up to the age of 42 for the oldest cohort. In Essay III, we also rely on Swedish register data, as they allow us to observe compositional changes on the residential block level to measure white flight behavior. However, since register data do not contain detailed information on the built environment and the availability of amenities in the local neighborhoods, we combine it with OpenStreetMap data provided by GeoFabrik (2023) to map the local amenity landscape. Below I describe my data sources in more detail.

Population Register Data

Keeping records has a long tradition in the Nordic countries. What is known today as Swedish register data started in the form of church registers in 1686.
and was centralized in 1960 under the umbrella of SCB (2022b). This early implementation of a generalized record allows for the integration of a broad set of data tables. Not only is this information available in independent data tables, but the central social security number that is used by many areas of the Swedish bureaucracy allows linkage across domains. These domains include, but are not limited to, information on residence, workplace, property ownership, income, education, civil status, and country of birth.

Careja and Bevelander (p. 6, 2018) summarize the main benefits of using register data for research on integration, benefits that correspond well with the work conducted in this dissertation. First, the data contains complete information. SCB collects information on all individuals who are registered in Sweden. This also means that data are collected on small population groups. Information on e.g., small occupational groups or immigrants from specific places is often not covered sufficiently in survey data. The main reason for this, beyond small population size, is a higher drop-out rate for immigrants in survey studies (Dustmann & Weiss, 2007; Edin et al., 2000). This higher drop-out is in turn linked to the way that the lives of immigrants – especially upon arrival to the destination country – are much more likely to be in flux and characterized by residential mobility, or to individuals experiencing difficulties with the language of the destination country. Second, the registers provide longitudinal data, which allows researchers to observe long-term outcomes and the trajectories of individuals, including migrants. Research has for example used this longitudinal aspect of Swedish register data to understand how the composition of initial settlement can factor into labor market trajectories (Edin et al., 2003). It allows researchers to track individuals or cohorts over extended periods, providing insights into trends and changes. Third, the data are accurate. The data records accurate information on anything that is registered with the Swedish Tax Agency (Skatteverket). Importantly, this allows researchers to observe changes in e.g., employment status or residential address. Fourth, the data are less sensitive to biases of self-reporting and, fifth, they avoid biases of sample selection. Both these factors are known to present challenges to the validity of survey-based research, which other countries such as Germany and the UK employ to collect data on their migrant populations (Berk, 1983; Kreuter et al., 2010).

However, the data might also have some blind spots. Since the empirical chapters in this thesis are concerned with residential choices and ethnic residential segregation, I focus on aspects of residential location and ethnicity in the Swedish register data. A first concern regarding the data is that individuals might not live where they are registered. The housing market in Stockholm is very competitive and seniority-based allocation mechanisms make it difficult – especially for immigrants – to compete on the housing market. Consequently, a large, informal second-hand rental market has emerged in which individuals sublet rooms or entire apartments for periods of time (Grander, 2017). Some of these sublets are not legal, which makes it less
likely for subletters to register their de facto place of residence. If people do not register a change of address with the Swedish Tax Agency, residential changes will not be observed in the data. In addition, the data – per definition – does not cover anyone who does not register themselves in Sweden, even though they might live in Sweden. Such groups include non-registered refugees or individuals who are registered in another country, but working in Sweden temporarily (SCB, 2020). Both factors represent a challenge to the notion of complete and accurate information. For these particular groups, additional survey instruments might constitute a better data source than full population registers. For 2019, SCB estimated the total measurement error in registered addresses to be 2.1% in 2019 (p. 15, SCB, 2022a).

In addition, information on ethnicity, political party membership, and sexual orientation is not recorded by SCB (for a detailed list, see p. 128 in SCB, 2020). It is important to note the lack of information on ethnicity, given the focus of this thesis on residential segregation. In this sense, Swedish population register data differ from large-scale survey data such as the U.S. census data, in which individuals self-identify their race explicitly in the questionnaire. The Swedish registers are based on administrative records used for taxation purposes, and even though the tax agency automatically collects information on the citizenship and country of birth of immigrants who apply for Swedish social security numbers, race (Black, White, Hispanic, Asian, Indigenous, or others) is a non-relevant category for taxation purposes. Moreover, while data on citizenship is available, it is not necessarily a useful way of identifying immigrants due to two main issues (Careja & Bevelander, 2018). First, if a person acquires Swedish citizenship, only the Swedish citizenship is recorded, irrespective of whether the individual has another. Second, even if an individual holds one or multiple citizenships other than the Swedish one, only the one the person uses to register in Sweden is recorded. As a result of the historical processes that have shaped the available data, researchers have inferred ethnicity based on ancestral categorizations and country of birth (Jarvis et al., 2017). In the (Swedish) registers, this method can be used to back-trace individuals’ ancestry for up to three generations.

There is an ongoing discussion about the lack of race identifiers in Swedish register data in academia and beyond (Al-Zubaidi, 2022; Crouch, 2022). Legally, data on ethnicity and race can be collected, albeit the UN stresses the need to consider the necessity of such data collection (UN Recommendations on Statistical Data Collection regarding Ethnicity, point 2.160). The UN report stresses the increasing importance of collecting data on ethnicity as a means of understanding policies that affect migration and integration. As such, knowledge on demographic patterns can allow for an understanding of race-based discrimination and go beyond ethnic identifiers. Race information can allow us to capture the realized choices made by individuals and provide insights into how people who belong to different
Data & Methods

groups fare differently in the education system, on the labor market, and in their residential choices.

In terms of research ethics, analyzing register data poses unique challenges. According to the Act Concerning the Ethical Review of Research Involving Humans (Utbildningsdepartementet, 2003), individuals must consent to participation in research projects (see also SND, 2022). Despite population register data being made available for research, informed consent cannot be obtained from the individuals included in these data. However, the Swedish Research Council lifts the requirement for informed consent and if obtaining it is “impossible, or if it would mean an unreasonably great work effort” (p.31, Swedish Research Council, 2017). Nevertheless, all research using individual-level register data must obtain ethical approval from the Swedish Ethical Review Authority. This project is covered by Ethical Review Number DNR 2013/850-31. All individual-level data used in this thesis have been handled on servers provided by SCB. Researchers can access these data via SCB’s Micro Data On-Line Access Service (MONA), which is protected by two-factor authentication. To gain access to MONA, researchers have to sign a contract that specifies the terms of data use. The infrastructure provides access to register data with pseudo-anonymized identifiers, that allow for linkage across registers but that differ from the social security number.

SCB (2021) discusses their data protection policy in detail. In accordance with Art. 2, 3, 85, and 86 of the GDPR and Chapter 2, Section 7 of the Act on Supplementary Provisions (p.2), SCB notes that information from population register data – in line with maintaining the privacy of individuals – can be published in scientific journals or other outlets in accordance with the Freedom of the Press Act and the Fundamental Law on Freedom of Expression.

The research community has greatly benefited from the depth of (Swedish) register data. In the context of this thesis, the lack of reported ethnicity or race is circumvented by using ancestry-based definitions of ethnicity (Jarvis et al., 2017). While the data contain certain blind spots, their wide coverage and longitudinal character mean that they provide a unique data source for studying the relationship between social contexts and residential segregation.

OpenStreetMap Data

In Essay III, we combine the population register data with data from OpenStreetMap (OSM) in order to obtain a detailed map of amenities in neighborhoods. OSM is a community-driven open data source that collects spatial information and allows individuals to contribute by interpreting and integrating local information (Volunteered Geographic Information (VGI), Goodchild, 2007) based on their local knowledge and GPS traces (Arsanjani et al., 2015; Haklay & Weber, 2008). In December 2014 OSM had almost 1.9 million users (Arsanjani et al., 2015). OSM data are freely available and their
popularity among researchers in the social sciences and computational social science is rapidly increasing. Generally speaking, OSM data are often used to map the built environment and they provide detailed insights into road networks, transportation systems (e.g., Gil, 2015) and amenity landscapes (e.g., Juhász et al., 2023; Nilforoshan et al., 2023).

The issue of data quality is the subject of considerable discussion among OSM users (for methods of data quality assurance, see Goodchild & Li, 2012). VGI systems, such as OSM data, generally suffer a cognition bias – individuals report places as they experience them – which becomes a problem if there is a change in spatial cognition that affects the interpretation of the local environment, e.g., if a construction site changes pedestrian routing (Hashemi & Abbaspour, 2015). In Essay III, we use OSM data from one year (2014), with the intention of capturing the local amenity landscape and the amenity density of neighborhoods. Both these indicators are intended to capture how individuals experience their city, which means that cognition bias is not an issue. Importantly, the OSM project has an editing feature that allows its contributors to correct information. This functionality has its limits, since it is likely to work better in densely populated areas (Goodchild & Li, 2012). However, for European cities, Hertfort et al. (2023) estimate the completeness of buildings mapped in OSM data at 72% with greater accuracy for highly developed urban centers. Stockholm is characterized by high urban density and high development indices, indicating that OSM constitutes a suitable data source for the analysis of the amenity landscape in Stockholm.

We access OSM data through GeoFabrik (2023), a commercial provider of geo-referenced data. GeoFabrik bases its products on OSM data and provides free access to raw data files. The company is run by active and experienced OSM contributors. This provides an additional layer of data quality assurance.

Methods

The thesis employs different analytical methods. In Essay I, I develop an Agent-based model that integrates a social network with spatial segregation. In Essay II, which is co-authored with Benjamin F. Jarvis, we use discrete choice methods to assess the effect of peer proximity in residential choice. In Essay III, which is co-authored with Sarah Valdez, we pre-process the data using Coarsened Exact Matching to ensure that the groups under comparison are comparable and use weighted probability models to predict out-mobility from residential blocks.

Agent-Based Models

Agent-based models (ABMs) are computer simulations that can be employed as social laboratories. They allow researchers to build (social) systems from
the bottom up and create counterfactual instances to test the implications of a theoretically derived mechanism (for a general overview, see e.g., Miller & Page, 2007). The social system consists of agents (e.g., individuals, firms, organizations) with certain attributes. Their behavior is guided by a set of rules defined by the researcher. In observing the macro phenomena that result from these defined parameters, ABMs can assess the generative capacity of a mechanism (p. 147, Manzo, 2010). This models the link between micro and macro levels, a central theme in Analytical sociology. Simply extrapolating macro phenomena such as segregation from aggregated individual behavior would lead to potentially wrong conclusions, given that individuals’ behaviors are interdependent (Andersen, 1972). Because of these interdependencies and complex feedback loops, ABMs are often relied upon by AS researchers to study mechanism-based explanations (Hedström, 2005; Keuschnigg et al., 2017). ABMs are a powerful tool for modeling complexity in social systems due to their ability to capture the non-linear interactions and emergent behaviors that characterize many social phenomena.

In Essay I, I develop an ABM that explicitly formulates a network structure, which allows me to manipulate network features and observe how agents make interdependent residential choices under an a priori specified behavior mechanism. The spatial dynamics of residential mobility driven by network ties can be manifold, reinforcing and counteracting each other. To understand the role of network ties for residential segregation, I simulate segregation dynamics under alternative assumptions about networks. I define networks by their homophily, degree, and clustering in the setup stage of the model and simulate whether and at what scale segregation emerges under these particular network features.

Discrete Choice Models

A discrete choice model is a statistical framework used to analyze and predict choices made by individuals when faced with a set of distinct alternatives (McFadden, 1978). These models assume that individuals make choices based on the utility they derive from each alternative. We assess the utility by obtaining choice probabilities using a multinomial logistic regression (Ben-Akiva & Lerman, 1985; Train, 2009).

Discrete choice models usually model one-sided choices. In Essay II we utilize this method to model how individuals choose neighborhoods. This allows us to observe how different alternative-specific characteristics affect the individual’s probability of choosing a certain neighborhood. Individuals are faced with possible neighborhood alternatives and we extrapolate the role of neighborhood characteristics through revealed choices. In our case, we infer preferences for the proximity to school peers from realized neighborhood choices in conjunction with other neighborhood characteristics. To assess the role of characteristics of the individual in making a particular neighborhood
choice, we interact the individual characteristic with the alternative specific neighborhood characteristic. This allows us to answer for example, whether individuals are more or less likely to select into neighborhoods with others who have the same ethnic background.

The possibility to model how attributes matter for possible choices highlights one main advantage of discrete choice models compared to commonly applied regression-based approaches that focus on the characteristics of individuals. Neighborhood choice is a complex process that involves pairing available neighborhood options with different alternative-specific characteristics and should be modeled as such (Bruch & Mare, 2012).

Coarsened Exact Matching

Many processes that are of interest to sociologists are difficult to study as a result of selection into treatment (Manski, 1993). For example, individuals are more likely to choose neighborhoods that are occupied by others who are similar to them. It then becomes difficult to distinguish whether an effect is due to a variable of interest or to a certain group being more likely to receive the treatment from that variable. Matching can be employed to address these concerns and to ensure comparability between two groups by balancing the covariate distribution between the treated and the control group (Stuart, 2010). Somewhat simplified, the aim is to create two groups that have an equal probability of receiving the treatment, but where one group is treated whereas the other is not. The goal is to emulate a randomized controlled trial (RCT), which is considered the gold standard for estimating causal effects. RCTs are not always feasible or ethical. Matching attempts to mimic the random assignment of subjects to treatment and control groups by creating balanced groups in terms of observed covariates, providing a closer approximation to the conditions of an experiment. If the adjustment through matching is successful, we can use this pre-processed data to estimate effects more plausibly (Dunning, 2008).

In Essay III, we pre-process data using Coarsened Exact Matching (Iacus et al., 2009) to increase the plausibility of identifying a true effect from a shift in the immigrant composition in the local neighborhood. Coarsened Exact Matching is a non-parametric matching approach that groups values of continuous covariates into categories, thereby creating discrete strata. It ensures that treated and control units with the same stratum membership have identical covariate values. This technique aims to achieve exact balance on covariates while discarding the excess covariate information. CEM often leads to a better balance between treatment and control groups while preserving a larger portion of the sample size than compared to other matching methods (Iacus et al., 2012). This is important for maintaining statistical power and precision in estimating causal effects.
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We use Swedish register data to adjust for covariates that affect the probability of out-mobility, which is our variable of interest. The data are rich in observable covariates, which allows us to achieve balance between the treated and control groups for variables we identify as important based on previous research. Matching can also be seen as a way of reducing reliance on specific modeling assumptions (Ho et al., 2007). Instead of relying solely on a statistical model to control for covariates, matching directly addresses potential imbalances in observed characteristics between treatment and control groups. After pre-processing the data, we estimate differences in out-mobility for the treated and non-treated groups using weighted probability models.
Appended Essays

Essay I: How Do Social Network Features Shape Segregation? A Simulation Study

The structure of social networks can shape collective outcomes by providing conduits for social influence, affecting the diffusion of information, shaping individual behaviors, and contributing to the emergence of inequality (Baldassarri & Bearman, 2007; Centola & Macy, 2007; Granovetter, 1973, 1978; Hedström, 1994). Thus, social networks describe the interaction structure for interdependent choices which have been shown to enhance initial small differences in popularity (Merton, 1968), creating amplified macro-level inequality (DiMaggio & Garip, 2011).

In the context of segregation research, Schelling (1971) has shown that such interdependent actions of individuals can tip the social system into a segregated state. However, Schelling’s model pertains to social influence from co-ethnics, whereas empirical networks are far more complex. Drawing on the growing literature that considers social networks as drivers of residential choices (Krysan & Crowder, 2017; Mulder, 2018; Sampson et al., 2002; Sharkey, 2013), I analytically assess the role of different network structures in shaping patterns of spatial sorting.

I develop an Agent-based model to simulate how segregation in social networks contributes to residential segregation by experimentally manipulating network homophily, degree, and clustering. I find that network homophily defines the level of segregation and that a reduction in network clustering increases macro-level segregation. In other words, indirect social
influence effects via ties of ties can foster large-scale patterns of residential sorting. However, networks with low levels of clustering also require substantial additional moves to tip the system into a segregated state.

These results tie in with the sociological literature on networks. While networks of weak ties can foster social organization by enabling the flow of information through otherwise unconnected areas in a network (Granovetter, 1973), I find that networks of weak ties characterized by low transitivity can also enhance macro-level spatial sorting, highlighting the role of bridging ties for collective outcomes (Burt, 1992, 2004). This theoretical simulation model establishes a framework for future research, providing insights into the empirical calibration of Agent-based models and highlighting the role of weak ties in the emergence of spatial segregation.

Essay II: The Effect of School Peers on Residential Mobility in Young Adulthood

Co-authored with Benjamin F. Jarvis

Social influence is of significance for various aspects of individual decisions in different social domains, impacting choices ranging from consumer behavior to career decisions and health-related choices (Bernardi & Klärner, 2014; Granovetter, 1995; Grinblatt et al., 2008; Schaefer et al., 2013). These effects play a crucial role in shaping broader social phenomena, influencing patterns of inequality and the spread of information (Arvidsson et al., 2021; Centola & Macy, 2007). The strength and structure of social influence are pivotal factors in understanding large-scale social dynamics. Building on the push-pull (Rossi, 1955; Sabagh et al., 1969; Wolpert, 1965) and the housing search model (Brown & Moore, 1970), we hypothesize that the location of friends may be an important source of social influence in residential choices.

There is increasing evidence that the location of kin ties affects the probability and destination of intra-urban mobility (Hedman, 2013; Michielin et al., 2008; Spring et al., 2017), but less research has focused on non-kin ties. A notable exception is found in research on call logs, which indicates that individuals are more likely to move within the vicinity of their call contacts (Büchel et al., 2020). These data, however, offer little insight into the characteristics and origins of these social connections and they might be confounded by selection effects.

Differentiating social influence effects from selection effects based on homophily is not trivial because social influence processes are often confounded by homophily (Shalizi & Thomas, 2011). We adopt a cross-cohort design proposed by Dahl and Sorenson (2010a, 2010b), identify school peers of individuals in addition to students who attended the same school but three years prior using population register data in Stockholm, and reformulate Dahl and Sorenson’s approach in spatial terms to measure the effect of average distance to school peers in intra-urban residential choice. We use
conditional logistic choice models of neighborhood selection (Bruch & Mare, 2012; McFadden, 1978) to assess the role of neighborhood characteristics in observed choices and estimate the effect of the distance to own school peers normalized by the distance to the residential locations of previous school peers. We assess how social influence changes with different life course events that alter one’s social foci. Our findings show persisting social influence effects of 9th and 12th grade school peers on residential choices in adulthood. The importance of social influence from school peers differs over the life course. The social influence of 9th grade school peers can be replaced while attending university, but this effect is only temporary. We find no replacement of peer influence for 12th grade peers, which we attribute to the sorting that already goes into high school choice. Since we control for the density of other university students in the residential neighborhood, we expect that this attenuation is due to network replacement rather than the co-presence of students in the neighborhoods close to the university. The results highlight the potential for long-term effects of sorting between schools, with the potential for continuous sorting into other contexts. Here, we explore residential sorting, but the effects might also extend to other domains such as workplaces or universities.


Co-authored with Sarah Valdez

Social infrastructure provides opportunities for interaction in public spaces (Klinenberg, 2018; Latham & Layton, 2019). This infrastructure includes amenities such as libraries, parks, sports pitches, religious buildings, markets, coffee shops, and pubs. Previous research suggests that social infrastructure can help overcome social isolation and tendencies towards homophily in social networks (Forrest & Kearns, 2001; Klinenberg, 2015; Wiltse, 2007).

In this paper, we test the effects of social infrastructure on social cohesion in the context of white flight behavior, which refers to the increased probability of out-mobility as a reaction to an increasing number of out-group members in the neighborhood. There is evidence for white flight behavior in Sweden (Bråmå, 2006), primarily when changes in neighborhood composition occur in the immediate vicinity of one’s residential address (de la Prada, 2023). We combine Swedish population registers, which allows us to capture demographic variables and longitudinal information on residency including moves, with OpenStreetMap (OSM) data obtained via GeoFabrik (GeoFabrik, 2023) to map the amenity landscape in Stockholm. We employ Coarsened Exact Matching (Iacus et al., 2009) and pre-process the data to mitigate selection into neighborhoods based on demographic and neighborhood compositional variables.
Our results indicate that local social infrastructure located directly on one's residential block can eliminate an increase in the probability of out-mobility for Swedes who experience an increase in the proportion of non-Western immigrants on their block. However, high amenity density in the residential neighborhood has the opposite effect. With increasing amenity density, the probability of out-mobility increases for the group exposed to an increase in the proportion of non-Western immigrants.

The mitigating effects of local social infrastructure on white flight behavior are in line with research on the contact hypothesis, which states that intergroup contact is more efficient in reducing intergroup prejudice if it occurs frequently (Allport, 1954; Pettigrew & Tropp, 2006). We attribute the negative effects of amenity density on tolerance to improved information about neighborhood composition and the probability of sorting into different amenities, if there are multiple amenities to choose from. This insight represents an important contribution to the literature on segregation, improving our understanding of the role of the built environment.
Discussion & Conclusion

This thesis delves into the interplay of social contexts, residential choices, and segregation and adds to the growing literature linking segregation to social networks (Krysan & Crowder, 2017; Sampson et al., 2002; Sharkey, 2013). Using theoretical principles from Analytical sociology, I focus on the complex interactions among individuals in a social system that bring about macro phenomena such as segregation. In Analytical sociology, we aim to theorize about a process in order to find a parsimonious description of a mechanism, much like in complexity science (Krakauer, 2019). Consequently, rather than taking a reductionist approach that aims to uncover the most detailed levels of a system, I focus on the dynamic interactions among individuals and how their actions and reactions allow for the rise of residential segregation whilst maintaining empirical realism (Hedström & Ylikoski, 2014).

Building on these theoretical foundations, this thesis makes important contributions to our understanding of segregation. Essay I marks an important departure from the social structural sorting perspective (Krysan & Crowder, 2017), and from other accounts of a cycle of segregation (Tammaru et al., 2021; Van Ham et al., 2018), in that it specifies the micro-macro link that connects individual behavior guided by networks to the emergence of segregation. Modeling the social influence through network ties, I show that the structure of a network is important for macro-level outcomes. While Granovetter (1973) demonstrates that structural properties that allow for shortcuts through the network topology (p.704, Centola & Macy, 2007) can facilitate social organization, I show how weak ties can also lead to segregation in space. In line with Watts and Strogatz’s (1998) argument that the
de-clustering of networks can increase the rate of adoption as a result of decreased distance between network ties, I show that de-clustering of networks can lead to the adoption of neighborhoods by larger cliques and can in consequence increase the level of segregation in space.

Second, existing research has largely studied the effects of segregation in different contexts as independent outcomes. However, different social contexts and their effects are intertwined and should be studied like that. For instance, social influence effects might occur much later than exposure in social contexts. Essay II shows that social influence from a shared social context can be a mechanism that fosters these cross-domain effects. Once established, social ties can have enduring social influence effects over the life course, but under certain circumstances, social foci can shift (Feld, 1981, 1982; Thomas, 2019).

In line with a structuralist view, both the physical and social environments play a role in constraining individual options and providing opportunities for interaction (Blau, 1977; Blau & Schwartz, 1997). In Essay III, we show that the amenity landscape in a city is crucial to shaping opportunities for interaction and in turn the probability of intolerant behavior. While local infrastructure can mitigate tendencies towards white flight, high amenity density has the opposite effect, which we attribute to lifestyle sorting. Thus, whether or not individuals exhibit intolerance within an urban area in the form of white flight behavior is moderated by physical proximity to opportunities for interaction, rendering heterogeneity in effects across space.

Taken together, I show that the network and institutional effects proposed as part of the social structural sorting perspective are not only empirically observable but that these structural sorting effects operate as mechanisms of segregation.

This thesis marks an invitation for future research to build on its insights as a means of furthering our understanding of network effects in segregation research. The insights from this thesis highlight that there are cross-domain effects between schools and neighborhoods, with school composition shaping future neighborhood composition through networks, indicating a path dependency. Further research should focus on modeling the path-dependencies of social contexts in more detail.

One way to approach this question might be through modeling multiplex networks (Gluckman, 1955; Verbrugge, 1979). Individuals are simultaneously embedded in various social contexts – i.e., family, school, work, and leisure organizations – that can be the source of social influence. Importantly, such an approach can benefit from analyzing heterogeneous ties, rather than analyzing reciprocal ties between individuals (Kivela et al., 2014). Identifying networks from different social contexts, and labeling their edges by origin, provides the opportunity to investigate beyond one or two networks of social influence, while also considering how these networks, and the fea-
tures of their structure, interact to induce segregation patterns or other forms of inequality.

Ties can span different contexts, but also extend across the life course. As a consequence of overlapping ties across social contexts, ties formed earlier in life may affect important life course trajectories via social influence. School peers might affect which university individuals attend and with whom they become friends at the next stage of life. To understand temporal effects that can perpetuate patterns of inequality and spatial segregation, it is essential to analytically combine processes of social influence and choice processes in other domains. Schools, universities, and workplaces can provide venues for interaction with a new set of people, changing beliefs, preferences, and opportunities previously held by an individual (Aschaffenburg & Maas, 1997; Bourdieu, 1986; Nagel et al., 2011). Exposure to new ideas can alter values regarding e.g., diversity, and inter-group contact can efface preconceptions held against minorities (Allport, 1954; Pettigrew & Tropp, 2006), which can, in turn, affect access to opportunities, and alter residential choices.

Moreover, some of these choices can occur in conjunction. High mobility rates in connection with the birth of a child might indicate a response to the need for a larger dwelling (e.g., Clark, 2013), but also that parents might be making strategic decisions to access neighborhoods with adequate schools (Lareau, 2014; Rich & Owens, 2023; Rivkin, 1994), and obtaining information on the desirability of schools from networks formed at amenities such as playgrounds (Bader et al., 2019). Consequently, parents implicitly make decisions about their offspring’s school peers during childhood but also about their potential friends, who will affect residential or other choices during adulthood. The degree to which neighborhood preferences can be materialized, however, largely depends on financial resources and social capital (DeLuca & Jang-Trettien, 2020). Through subsequent path-dependencies, children of low-income other otherwise resource-poor families might find themselves “stuck in place” (Sharkey, 2013). These path-dependencies might be important in understanding how to develop policy interventions could be developed to break inter-generational cycles of segregation.

Taken together, this thesis demonstrates the role of social contexts and networks for residential segregation. It shows that opportunities for interaction can amplify the structure and shape of social influence and that segregated social contexts can create cliques within which social influence can foster long-term sorting effects. From a policy perspective, it suggests that opportunities for interactions in the urban space have to be designed in a way that allows for repeated interaction, in order to facilitate the positive effects of tolerance through inter-group contact. These initial sorting effects can otherwise become amplified by the reflexivity in individuals’ behavior, which introduces feedback loops of actions, that give rise to the emergence of segregation.
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Bibliography


Essays

The essays associated with this thesis have been removed for copyright reasons. For more details about these see:

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The Urban Tapestry

Essays on the Relationship Between Social Networks and Residential Segregation

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