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Free to choose?

Studies of Opportunity Constraints and
the Dynamics of School Segregation

Selcan Mutgan

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ABSTRACT

As a result of the negative consequences and persistence of school segregation, its causes have received a great deal of scholarly attention across a range of disciplines. However, the existing research has tended to overlook those aspects of the segregation process that lie beyond the choice of the individual. This thesis concerns itself with the way in which opportunities are influenced and thereby constrained by hard-to-change macro structures such as the spatial distribution of individuals and organizations, individuals' social network characteristics, and population composition. To this end, the four chapters presented in the thesis focus on the key actors involved (i.e., parents, teachers, and organizations), their decisions, and how their actions are moderated by the structures in which they are embedded. All four chapters use Sweden as the empirical case, and they utilize the rich data provided by Swedish population registers.

Essay I analyzes the role played by parents' ethnicity-related school preferences in the ethnic segregation of the school system, and shows that opportunity structures are an important moderator of the effects of preferences on school segregation. By combining statistical analyses of the school choices made by all parents of compulsory school students in the Stockholm region during the years 2008 to 2017 with large-scale empirically calibrated agent-based simulations, the study shows that preferences tend to be trumped by opportunities. Although parents have ethnicity-related preferences, and although these preferences vary between different ethnic groups, parental preferences have little impact on the extent of school segregation. The main drivers of school segregation are rather to be found in the ethnic segregation of the housing market and the geographic location of schools.

Given the importance of residential segregation for school segregation, Essay II examines how residential segregation has evolved in Sweden over the last three decades. Building on entropy-based segregation measures, the study analyzes patterns of income segregation between and within income groups along different socio-demographic dimensions—migration background and family type. The findings show that the rise in income inequality witnessed over the last 30 years has been accompanied by a sharp increase in income segregation, especially for those in the bottom quartile of the income distribution. Moreover, the results show that income segregation is more extensive, and has increased at a higher rate, among individuals with children than among individuals with no children.

Essay III examines school segregation from an organizational point of view and focuses on “school closure” as a desegregation mechanism. Using large-scale simulation models calibrated using data on all schools and students in Stockholm municipality, the study examines how the closure of a school affects segregation levels, and how this effect varies with the characteristics of the closed school and the criteria used to allocate students from the closed school to other schools. The analyses show that the degree to which closing a school changes the level of segregation varies considerably between schools, and that the ethnic composition of nearby schools is an important moderator of the effect of a school closure.

Essay IV examines network dependencies in the school choices of teachers in Stockholm's upper secondary education market during the years 2000 to 2010. Using stochastic actor-oriented models, this study focuses on the factors associated with teachers' labor market mobility between

public- and private-sector schools. Controlling for various school characteristics, such as student and teacher composition, and the work environment, the results show that networks—defined as the affiliation networks formed via links to former and current co-workers—are important for the within- and between-sector school mobility of teachers.

In summary, the four studies together show that individuals' choices are considerably constrained by their opportunities. A segregated residential market determines the school opportunities available to parents, and the differentiation between public and private schools affects the workplace decisions of teachers. Overall, differences in opportunities moderate the potential effects of individual preferences and tend to reproduce existing segregation patterns.

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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.

- I. Mutgan, Selcan, Peter Hedström, and Martin Arvidsson (2021). “A Hobson’s Choice? School Segregation and Parents’ Ethnicity-Related Preferences”. *Unpublished manuscript*.
- II. Mutgan, Selcan and Jonathan J. B. Mijs (2021). “The Joint Growth of Income Inequality and Segregation in Sweden”. *Unpublished manuscript*.
- III. Mutgan, Selcan and Eduardo Tapia (2021). “School Closure as a Desegregation Policy: A comprehensive evaluation”. *Unpublished manuscript*.
- IV. Mutgan, Selcan, Christian E. G. Steglich, and Abiel Sebhatu (2021). “School Characteristics, Social Networks, and Teacher Sorting: Evidence from a segmented market”. *Unpublished manuscript*.

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Introduction

School segregation, which describes the extent to which students are unevenly distributed across schools based on certain characteristics, such as ethnic origin and socioeconomic situation, not only reflects existing social inequalities, but also deepens them.¹ Studies have found negative effects of ethnic segregation, especially for children of minority origin with lower levels of socioeconomic capital (Bygren & Szulkin, 2010; van Ham et al., 2016).² Since the composition and perceived quality of schools also influence both parents' residential choices (Bayer et al., 2007; Lareau, 2014) and teacher turnover (Barbieri et al., 2011; Boyd et al., 2009; Clotfelter et al., 2004; Elacqua et al., 2019; Falch & Strøm, 2005; Karbownik, 2014), school segregation exacerbates the disadvantageous position of already disadvantaged students by exposing them to not only unfavorable but also unstable educational environments. When children attend schools and live in neighborhoods that are segregated along ethnic and/or socioeconomic lines,

¹ See Grusky and Szelényi (2011) for a comprehensive review of the causes and consequences of social inequality.

² Whereas ethnic residential segregation tends to be associated with negative outcomes, it is important to note that the debate regarding the effects of ethnic school segregation on the school achievement of children has been rather inconclusive. Several recent studies have also found moderate positive effects of a higher level of exposure to minority populations in schools, especially for minority group students (Brandén et al., 2019; Gamoran & An, 2016; Hermansen & Birkelund, 2015). On the other hand, there is also evidence suggesting that ethnic school segregation has a negative effect on school achievement among the minority population (Bankston III & Caldas, 1996; Reardon, 2016; Ryabov & Van Hook, 2007).

they have limited interactions with other groups, and this can have consequences for integration during adulthood (Åslund et al., 2009). As a result of these negative consequences, and the persistence of school segregation, the issue has received a great deal of scholarly attention across the social sciences.

Scholarship on the causes of school segregation has largely focused on understanding how students are sorted across schools. The two main traditions in this literature focus on (1) parents' preferences, and (2) how opportunities vary between students of different backgrounds. In terms of parents' preferences, a large portion of the literature has directed considerable attention at how parents choose a school for their children, with a particular focus being directed at the type of schools that parents want for their children. Many survey-based studies and case studies show that the ethnic and socioeconomic composition of schools, student achievement, and home-to-school proximity, are important school characteristics that parents value when choosing a school (Bagley et al., 2001; Bell, 2009; Billingham & Hunt, 2016; Buckley & Schneider, M., 2003; Bunar, 2010; Rangvid, 2010; Saporito & Lareau, 1999). However, the research on student sorting has tended to overlook those aspects of segregation processes that lie beyond the choice of the individual.

Another strand of school segregation research has concerned itself with how choice opportunities vary between different groups (Denice & Gross, 2016; Hastings & Weinstein, 2008). These opportunities may be driven by inequalities in information about or access to a given school, for instance in terms of potential entrance fees, grade requirements, or which groups are targeted by advertising. Perhaps even more importantly, choice opportunities, and the resulting segregation, are also impacted by the social and political environment in which individuals are embedded, as manifested in school and residential locations, student allocation and teacher hiring policies, and social networks. For example, the residential locations of low-income parents are likely to constrain their school choice opportunities, while families with more resources are able to choose residential areas and schools that satisfy their preferences (DeLuca & Jang-Trettien, 2020). The presence or absence of certain types of schools in a city will further affect the school choices of parents, and also those of teachers in search of a new workplace. Moreover, the relative sizes of the minority and majority groups also affects opportunities to choose schools that have a certain ethnic composition. Hence, macro-social structures such as population composition, network structures, or residential segregation affect individuals' school choices by shaping their choice opportunities. Parents and teachers may prefer certain types of schools, but it is important to consider that their choices are dependent on their opportunities. Although there is an

abundance of research on how students are sorted into schools, and on variations in the opportunity structure of students from different backgrounds (Billingham & Hunt, 2016; Burgess et al., 2015; Denice & Gross, 2016; Hastings et al., 2005; Hastings & Weinstein, 2008; Renzulli & Evans, 2005; Saporito & Lareau, 1999), research has largely neglected the issue of how these two important aspects of the choice process (i.e., parents' choices and opportunity constraints) jointly influence student sorting and the resulting segregation at the macro level.

The link between preferences and opportunities is especially important because even though segregation at a given point in time constitutes a snapshot of how different groups are distributed across schools or neighborhoods (Bruch & Mare, 2006, p.274), it is the outcome of a complex social process driven by the interdependent actions of individuals. Families' school mobility decisions not only affect overall levels of segregation, but also influence the decisions of others at consecutive points in time by changing the school composition of both their former schools and their new schools. As Schelling (1971, 2006) has demonstrated, even weak in-group preferences could potentially generate high levels of residential segregation as a result of interdependencies among individuals' choices. If this were also the case for school segregation, and even if parents prefer integration with other groups up to a certain level, the interdependencies among parents' school choices might have a counter-intuitive impact on school segregation. In order to properly examine the dynamic relationship between individuals' choices (micro) and levels of segregation (macro), it is essential to take the interdependencies among individuals' decisions into account (Billari, 2015).

The mechanisms through which segregation emerges and persists are likely to be a joint outcome of the interdependencies that exist between individuals' actions and the way opportunity constraints affect their preferences and choices. For example, residential segregation (macro) is likely to moderate parents' opportunities and school choices (micro). At consecutive points in time, the school choices that have already been made will affect other parents' opportunities and choices. Hence, the school segregation that emerges over time is an outcome of not only parents' preferences, but also their opportunities and the way in which their choices are influenced by the choices of others. A failure to account for such interdependencies means making inferences about segregation processes that are entirely based either on macro-macro relations, which cannot inform us about how segregation changes or persists, or on individuals' preferences and choices, which may influence segregation at the macro level very differently as a result of the interdependencies that exist among the actions that result from individuals' preferences and opportunities. This

thesis jointly considers the two dominant factors in school choice, opportunity constraints and preferences, in order to explain how school segregation emerges and persists through the interdependent school choices of actors. In particular, the thesis is concerned with how the opportunities to attend or work at a given school are constrained by hard-to-change macro structures such as the spatial distribution of individuals and schools, individuals' social network characteristics, and the ethnic composition of the population.

Focusing on the dynamics of school segregation, the thesis asks *how do opportunity constraints impact school choices and thereby change segregation?* To this end, the four chapters of the thesis focus on the key actors involved (i.e., parents, teachers, and schools as organizations), their decisions, and how their actions are moderated by the macro structures in which they are embedded. In doing so, the thesis uses descriptive statistics, and empirical models that account for the interdependencies between individuals' actions, in order to understand how segregation has evolved over time. All four chapters use Sweden as the empirical case, and Swedish population register data.

Essay I examines *how ethnocentric school preferences and opportunity constraints jointly shape emerging segregation levels*. Given that most urban landscapes are residentially segregated, and that parents of young children tend to prefer schools close to their homes, the opportunity structures of parents are to a large extent shaped by the availability of schools close to home. In this study, together with Peter Hedström and Martin Arvidsson, I examine the extent to which parents' school preferences and school choices can influence the ethnic segregation of the school system given such constraints. More specifically, using discrete choice conditional logit models and large-scale empirically calibrated simulations, we examine how the school choices made by parents are moderated by their ethnicity-related preferences and opportunity structures, and how these school choices change the overall segregation of the school system.

In Essay II, together with Jonathan Mijs, I study residential segregation patterns in Sweden over the last three decades. Given the findings from Essay I, which show that parents are largely constrained in their school choices as a result of their residential location, this study focuses on understanding *how residential income segregation among different demographic groups has changed in Sweden* over the period examined. Based on granular descriptive analyses, we examine income inequality and income segregation for the Swedish majority group, for those of immigrant origin, and for individuals with and without a child in the household.

Essay III focuses on another understudied dimension of school segregation and examines how school closure decisions can affect school segregation. In

recent years, school closures have been implemented as a desegregation policy both in Sweden and several other countries. These policies have most often targeted minority dominated schools. However, to the best of our knowledge, no studies have examined the effectiveness of such school closure decisions. In this study, together with Eduardo Tapia, I examine *how the effects of closing a given school on levels of segregation are mediated by the local opportunity structure of the displaced students*. We specifically focus on the characteristics of the closed and destination schools, and analyze how the resulting changes in segregation are dependent on these characteristics and on the criteria used to allocate students from the closed school to other schools.

Even though school segregation research tends to focus on segregation at the student level, teachers and the way teachers are allocated to different schools also constitute an important dimension of school segregation. Hence, in Essay IV, together with Christian Steglich and Abiel Sebhatu, I study the mobility of teachers, with a special focus on the network dependencies that characterize teachers' school choices. Using a stochastic actor-based framework that jointly analyzes teachers' mobility decisions and the network dependencies present in these choices, we ask *to what extent are teachers' school choices influenced by various school characteristics, such as student and teacher composition and the work environment, and also by the social networks in which the teachers are embedded?* To the best of our knowledge this study provides the first large-scale empirical analysis of the role played by affiliation networks in teachers' workplace decisions in a segmented education market.

The remainder of this introductory chapter is organized as follows. In the next section, I briefly introduce the main theoretical foundations of the four studies, focusing on the role of preferences and opportunity structures in school segregation. Next, I present the analytical framework of the thesis. Following a short summary of the Swedish education system, I then introduce the data used in the four studies, before discussing a number of ethical considerations and the empirical strategy adopted in each of the papers. This is followed by a summary of each of the four empirical studies, and a concluding discussion of the thesis as a whole.

Preferences and Opportunities

Understanding student sorting constitutes a major concern in much of the empirical and theoretical research on the causes of school segregation. In this literature, the question of how school choice policies affect school segregation has been of central importance. In general, these policies introduce charter or private schools into a market that has been dominated by publicly owned and administered schools, or they change how students are allocated to schools. Whereas the degree of freedom to choose is dependent on the application and allocation rules applied in specific cases, these policies have, at least formally, allowed parents to choose a school for their children. Proponents argue that these policies liberate low-income parents by giving them the opportunity to leave the low-quality schools to which their children have been assigned, and by increasing the degree of parental involvement (Archbald, 2004). Moreover, school choice is seen as a way of inducing competition, which is expected to increase the quality of schools in a given city, further benefiting disadvantaged children (Levin, 2002). Opponents to such reforms, on the other hand, argue that that in most instances school choice is for the already privileged, and even though low-income parents have the chance to escape the schools their children would otherwise have been assigned to, this is also the case for the high-income parents who have greater means and opportunities for mobility (Davis, 2014; Renzulli & Evans, 2005; Saporito & Sohoni, 2006). As a result, opponents argue that free choice will reproduce social inequalities in society, since more advantaged parents are able to self-segregate, whereas parents with

fewer resources to find and choose the schools they want are still left in a disadvantaged position (Ball, 2002; Roda & Wells, 2013).

Irrespective of one's position in the school choice policy debate, however, existing scholarship on the causes of school segregation has predominantly focused on (1) the motivations and preferences of parents in their school choices, and (2) how opportunities to choose certain schools vary between students from different backgrounds. In the following, I summarize the existing literature from these two traditions.

Preferences and School Choices

School segregation at a given point in time refers to a macro state that describes the extent to which students with different ethnic, racial, or socioeconomic backgrounds attend different schools. Given this definition, most research has sought to understand student sorting and school segregation by reference to parents' preferences and choices. Mostly based on interview and survey data, these studies have consistently shown that parents' choices are driven by three main school characteristics: home-to-school distance, peer composition, and the academic achievement of students in alternative schools. Even though parents almost universally appear to pay attention to school characteristics of this kind, earlier findings also show that there are considerable heterogeneities in school preferences between parents from different ethnic and socioeconomic backgrounds.³

In interviews and surveys, ethnic composition has emerged as one of the most important school characteristics for parents' school choices. Both majority and minority group parents want their children to be surrounded by peers of similar ethnic background and of similar or higher socioeconomic status (Hastings et al., 2005). A major motivation for this preference for homophily is that parents seek schools that will improve their children's social quality of life. Children are more likely to form friendship ties with students of the same ethnic background (McPherson et al., 2001; Smith et al., 2014). For parents, then, choosing a school based on ethnocentric preferences is one way of generating a

³It should be noted that throughout this thesis I use the concept of preferences for school characteristics mainly to describe intentions to choose certain types of schools, or as a placeholder for revealed preferences in cases in which we observe a choice. As Freese puts it "The wants of others are not directly observable; instead, we often seem to infer them from the very phenomena (their behavior) that we are otherwise trying to explain" (Freese, 2011, p.95). I acknowledge that true preferences typically are not known to the analyst, but the actions that emerge as a result of these preferences are meaningful to the actors involved (Boudon, 1998, p.191). Given that the term preferences is commonly used in school segregation research, I follow this tradition.

social environment that is characterized by strong emotional support and a sense of social belonging (Leszczensky & Pink, 2015).

Ethnic homophily, however, can trigger different types of actions depending on how strong these preferences are. For example, if majority group parents have a strict preference for not sending their children to a school with a high minority presence, this may lead to so-called “white avoidance” behavior, where parents avoid choosing schools with large immigrant populations. Among others, Billingham and Hunt (2016) and Bagley et al. (2001) have found that such out-group prejudices against black populations constitute an important motivation for white parents in the US to choose not to send their children to a particular school. In a more dynamic setting, the same type of strict preference to avoid schools with a significant presence of minority group students could also lead to so-called “white-flight” behavior (Clotfelter, 1976, 2001; Renzulli & Evans, 2005; Sikkink & Emerson, 2008). That is, if the minority population in the current school increases, this may trigger out-mobility among majority group students. In the US context, it has been found that even when urban white parents want their children to experience some diversity, they do not want to send their children to schools in which black students are in the majority (Kimmelberg & Billingham, 2013).

In addition to ethnic composition, parents also place importance on the perceived quality of schools. In surveys and interviews, parents tend to explicitly mention that they want their children to attend schools with high levels of student academic achievement.⁴ However, information on student achievement is not always available. In Sweden, for example, grades are typically given for the first time in the 9th grade, whereas the parents of younger children only receive written statements describing their children’s development. Hence, while it is possible to observe the average grades of students in the 9th grade, which is the final year of compulsory education, not all compulsory schools have 9th grade students. In cases where there is no achievement data, parents tend to rely on other sources of information that serve as proxies for school quality. In general, parents perceive school quality as being positively correlated with the proportion of majority students in the school population, or with the socioeconomic composition of the student body (Bosetti, 2004; Denessen et al., 2005; Hastings et al., 2009; Schneider, M. & Buckley, 2002). For example, Kimmelberg and Billingham (2013) found that parents of high socioeconomic status were not willing to send their children to schools with a large black student

⁴Several empirical studies also show that test scores tend to serve as a proxy for school quality. See, for instance, studies by Abdulkadiroğlu et al. (2020), Ajayi and Sidibe (2020), and Akyol and Krishna (2017).

presence or to schools with a high proportion of students of low socioeconomic status, since these schools were perceived as having a lower academic quality. For the majority population, a preference for the academic success of students thus often coincides with preferences for ethnic homophily (Billingham & Hunt, 2016; Malmberg et al., 2014; Renzulli & Evans, 2005). For minority populations, on the other hand, the choice between school quality and quality of the social context in school may be a trade-off, since ethnic homophily preferences may be associated with higher social quality but lower academic quality.

Moreover, a sufficiently short home-to-school distance constitutes an equally crucial preference for parents across countries with different institutional settings, irrespective of the parents' socioeconomic status or ethnicity (for Sweden, see Anderson, E. et al., 2012; for the UK, Burgess et al., 2015; for the US, Hastings et al., 2005; for Holland, Karsten et al., 2003; and for Germany, see Schneider, K. et al., 2012). However, despite parents having similar distance preferences, the socioeconomic background of students plays a mediating role in relation to parents' choices, since students from backgrounds characterized by high socioeconomic status have greater opportunities to travel to schools located further from home, while students from low socioeconomic status backgrounds have less opportunity to do so (Anderson, E. et al., 2012; Buckley & Schneider, M., 2003; Hastings et al., 2005).⁵

The existing literature on school sorting has found that parents across countries with different institutional settings tend to value similar school characteristics, and that parental preferences are characterized by heterogeneities based on the parents' ethnic/racial background and socioeconomic situation. However, whereas preference-based school choice studies acknowledge that parents' opportunities to choose schools may be restricted by economic constraints, it is only recently that studies of school choice, and studies of choice behavior more generally, have started to consider a wider range of factors that might constrain individuals' opportunities.

⁵Several studies have found that both wealthy and poor families participate in making school choices (Burgess et al., 2019; Saporito & Lareau, 1999). It is also important to note that staying at the local school does not necessarily signal an absence of choice. In most cases, opting out of a local public school is directly associated with an active school choice, and certain parental characteristics are highly correlated with choices of this kind. Among others, Bosetti (2004) and Bunar (2010) have found that parents who actively choose a school tend to be better educated, have higher levels of income, and are less likely to be unemployed. However, opting into the local area school, especially for minority ethnic groups, may also signal an active choice to adopt a self-segregating behavior (Denessen et al., 2005).

Constrained Opportunities

“Opportunities” can be defined as the set of alternatives that can feasibly be chosen given the universe of all potential choice options and various constraints on finding and accessing these alternatives (Petersen, 2011; Stovel & Fountain, 2011). Opportunities may be constrained by the ways in which people search and find preferred schools, or by macro-level structures such as residential segregation, population structure, or the social networks in which individuals are embedded. For example, parents (but also teachers) tend to have different sets of choice alternatives depending on their residential location. Relative group sizes in a city or local area influence the extent to which different groups are likely to attend the same schools. Moreover, if individuals rely on their social networks to gather information about schools, pre-existing networks may determine which options they are aware of.

Cognitive Limitations

Much of the literature on student sorting relies on the assumption that parents are able to navigate the education market freely and to make well-informed decisions based on the characteristics of schools and on their educational aspirations for their children. As such, parents are assumed to be well aware of their options, able to calculate the benefits and costs associated with a given school choice, and, perhaps more importantly, free to choose a school that fulfills their expectations and satisfies their preferences. Framed in this way, however, school choice is a complex task that requires a high level of cognitive effort. When faced with complex decision tasks, humans tend to simplify the problem and to use heuristics, rather than making the elaborate calculations that preference-based theories tend to assume (Hollis & Sugden, 1993; Kahneman, 2003; Simon, 1986).

One procedure individuals often use to simplify choices among discrete alternatives (such as school or residential choices) is to adopt a two-step choice process (Elster, 1984; Kahneman & Tversky, 1979; Krysan & Crowder, 2017; Swait & Ben-Akiva, 1987). That is, when faced with a complex choice task, individuals first create a feasible choice set based either on preferences for certain types of schools, or the feasibility of different choices, and in the second stage they make a choice among these alternatives. The formation of such “consideration sets” (Shocker et al., 1991), or “evoked sets” (Howard & Sheth, 1969), has been widely used in the judgement and decision-making literature. In social settings, feasible choice sets can be developed in various ways:

In some contexts, more complex decision-making rules apply, while simple heuristics are used in others, and feasible choice sets may also be formed as a result of external factors that constrain opportunities (Bruch & Feinberg, 2017; Hauser, 2014; Stouffer, 1940; Zeng & Xie, 2008). Despite differences in the operationalization of this multistage process (see Hauser, 2014, for a review), the common understanding is that choice set formation is not directly observable by the analyst.

The role of this two-step process in school choice has been subject to special scrutiny in the US. The studies in question have consistently found that parents tend to use school characteristics, such as racial composition or school location, as decision aids when narrowing their options to form a manageable choice set (Buckley & Schneider, M., 2003). Based on a web-based information search data, Schneider and Buckley (2002) found that parents primarily used information on the racial composition of the student body, school location, and student achievement, as a means of narrowing down their choice sets. As such, pre-existing parental preferences help parents narrow down their options, but in relation to the universe of all potential choices, this process also involves the formation of preferences for certain schools. These studies have also noted that there are differences in the way different racial or socioeconomic groups form their feasible choice sets (Bell, 2009): while white parents tend to eliminate schools with a large presence of black students prior to considering other factors, black parents tend to prioritize other factors from the beginning (Bagley et al., 2001; Saporito & Lareau, 1999). For example, although home-to-school distance is important for all racial groups, black families tend to employ a wider search distance than white parents, especially if they are looking for schools of higher quality than those in their local neighborhood (Denice & Gross, 2016). In more recent research, Burdick-Will et al. (2020) have further shown that student mobility between schools forms a kind of transfer network between the schools in question, which well predicts the school choices of parents at consecutive points in time.

Whereas the above-mentioned studies assume that parents are able to access information about most schools, it is important to acknowledge that parents may not be fully aware of their potential choice options. Individuals tend to limit their information searches due to a lack of resources, impatience, or simply because they are satisfied with the information they have on a few choice alternatives (Simon, 1967). For instance, in an interview-based study illustrating the importance of Simon's (1956) distinction between optimizing and satisficing behavior, Holme (2002) found that parents who claimed to choose a residential location based on their school preferences had rarely conducted a large-scale

search for information about schools. Rather, they were content with the information they received from their social networks about the overall quality of a small number of schools. Moreover, given that gathering information requires both time and a certain level of education to understand and process the information, this process tends to be more costly for disadvantaged families (Hastings & Weinstein, 2008). Hence, potential variations in resources for accessing information about schools also influence the opportunity structure of parents (Ajayi et al., 2017, 2020; Bell, 2009; Hastings & Weinstein, 2008; Schneider, M. et al., 1998).

Spatial Structure: Location

In addition to cognitive limitations, there are also spatial constraints on choice alternatives (Swait, 1984; Swait & Ben-Akiva, 1987). Even if we assume that individuals are able to calculate their relative long-run returns for a given set of options, there may be external factors that shape these options. Hence, although individuals resort to simple heuristics at the time of making a choice, their opportunities may already be constrained by external factors (Bruch & Feinberg, 2017; Bruch & Swait, 2019).

Given that a school's proximity to home is one of the school characteristics most valued by parents, we would expect the locations of schools and residential homes to be important constraints on school choice opportunities. Stated simply, if there is ethnic/racial or socioeconomic residential segregation in a given city, and if most parents send their children to nearby schools, the composition of the schools under consideration will reflect the student composition in their neighborhoods. If a family living in a minority dominated neighborhood wants to send its child to a majority dominated school, it is unlikely to find such schools close to home. Using an empirical framework and detailed school and residential location data from the UK, Burgess et al. (2015) and Burgess and Briggs (2010) have shown that residential location and eligibility rules based on school proximity affect the access of disadvantaged students to good schools. Moreover, Denice and Gross (2016) have found that proximity preferences tend to dominate school choices even in cases where parents have preferences for other school characteristics:

“Even under an open-enrollment choice system that includes all public school options and removes many of the logistical barriers to exercising choice found in other settings—that is, a best-case scenario for realizing the ideals of liberating minority and

disadvantaged students from underperforming schools—parents’ school choices are still largely determined by where they live.” (Denice & Gross, 2016, p.317)

While residential segregation limits parents’ school options, this relationship is rarely deterministic. Existing scholarship focuses on two potential reasons why school choice may still be an important determinant of school segregation. The first is the opportunity to opt out of local schools, and the second is the opportunity for parents to move to neighborhoods that are closer to desirable schools.

The literature on the impact of school choice policies on segregation tends to extrapolate from findings based on the decomposition of residential and school segregation. For instance, one common methodology in such studies has been to counterfactually assign students to one of the nearest public schools, and to then compare the resulting school segregation with the observed school segregation (Allen, 2007; Boterman, 2019; Östh et al., 2013; Yang Hansen & Gustafsson, 2016); another has been to compare changes in school and residential segregation over time using descriptive segregation measures (Frankenberg, 2013). In the simulation studies, the difference between the counterfactual case and the observed ethnic and socioeconomic segregation is assumed to be the effect of school choice policies on school segregation, net of residential segregation (see also Böhlmark et al., 2015, for a study using multivariate linear regressions). Overall, existing studies suggest that even though school choice plays a role, its effect on school segregation tends to be less than that of residential segregation. However, there are two problems with such simulation-based counterfactual approaches. First, these studies rarely consider the opportunity constraints to which parents are subject in systems based on school choice. Second, they compare a school ecology that includes private and charter schools with a system in which no such schools exist. Since population composition and residential segregation also change over time, it is not possible to know whether the nearby public schools that are used in the counterfactual analyses would be the only available schools had there been no private (or charter) schools. Hence, on the basis of this type of counterfactual design, it is not in fact possible to infer how school choices affect school segregation.

The second reason school choices may still influence school segregation despite the strong association between residential segregation and school segregation is found in the possibility of residential mobility based on school preference. Rather than assuming that residential location is a given, as is the case in most of the above-mentioned studies, this line of research focuses on

how parents form their school choice opportunities by moving into a specific neighborhood. A number of the seminal studies on residential choice based on school choice have found that there are stark differences in the ways in which low- and high-income parents move between residential locations. Whereas high-income parents are able to sort themselves into neighborhoods based on their preferred school alternatives, the residential moves of low-income parents tend to be decoupled from school preferences, and are mostly driven by economic concerns (Barrow, 2002; DeLuca, 2012; Lareau, 2014). Hence, even when families are residentially mobile, their opportunities to choose a residential location are constrained by other factors, such as income or discrimination in the housing market, and such mobility tends therefore to reproduce residential segregation (Bruch, 2014; Bruch & Mare, 2011; Sampson & Sharkey, 2008).

In contrast to the assumption of earlier studies that families tend to residentially relocate with a school preference in mind, recent findings from the US (Cuddy et al., 2020) and Finland (Bernelius & Vaattovaara, 2016) suggest that residential segregation is an important driver of school segregation, but that school preferences do not play a major role in residential choices. Moreover, research also suggests that allowing parents to make a school choice may even decrease residential segregation, since it tends to be less costly than a residential move (Rich et al., 2021). Overall, scholarship on school choice consistently points to the fact that residential location is an important opportunity constraint, and that school opportunities vary by residential location (Anderson, E. et al., 2012). On the other hand, the findings on how school choice, and the resulting school segregation, is affected by residential relocation and the school opportunities of different groups is inconclusive at best, which reflects the complexity of the problem of student sorting.

Social Structure: Interpersonal Ties

In addition to spatial constraints, individuals' opportunities are also formed by their social relations. Individuals are embedded in social structures that sustain their position in a community (such as a friendship network) through repeated interaction, but that also serve as sources of social capital for those in advantageous positions within a given social structure (Burt, 2004; Coleman, 1988; Feld, 1981; McPherson et al., 2001). Interpersonal ties, especially those with people in different communities, help individuals gather information from various sources, which is also useful in relation to belief formation and the facilitation of action (Granovetter, 1973). As Granovetter (1985) has argued,

this embeddedness of individuals in social networks requires us to study how behavior is shaped by these relations.

There are two main reasons that social networks are important for individuals' opportunities. To begin with, social networks facilitate access to information that might otherwise be impossible to reach. Social structures thus serve as information channels (Coleman, 1988). Because people tend to trust the information they receive from their friends and acquaintances, the information received via social networks tends also to facilitate action (Granovetter, 1973, 1985; Small, Forthcoming). Research on student sorting has found that parents tend to rely on information about schools gathered from their social networks (Ball & Vincent, 1998; Bell, 2009; Holme, 2002; Schneider, M. et al., 1997; Weininger, 2014). For teachers, as well, insider information gathered via affiliation networks has been found to be of key importance to their workplace choices. Teachers also believe that there is a higher likelihood of being hired by schools to which they have personal and professional ties (Cannata, 2011; Jabbar et al., 2020). However, no large-scale empirical research has to date examined the extent to which school sorting is affected by the information that parents and teachers gather via their social networks.

In addition, social networks tend to reproduce the inequalities they already reflect (Blau, 1977b; Marwell & Morrissey, 2020; Trimble & Kmec, 2011). Social networks are formed and maintained by homophily or co-participation in the same foci – such as a neighborhood, or workplace (Feld, 1981; McPherson et al., 2001). Hence, the information flow within different networks is likely to be stratified and homogenous as a result of the homophily of such networks, and individuals' limited access to the information that is disseminated in other networks (Fernandez & Fernandez-Mateo, 2006). If a teacher has only worked in private schools, and only in a few schools, it is likely that the first-hand information she is able to provide to colleagues will also be constrained by this limited experience. Similarly, social networks among parents are likely to be stratified by socioeconomic status, driven by the members' occupation, residential location, and level of income. Hence, the information disseminated through these networks will also be stratified. As was found by Schneider et al. (1997), parents of high socioeconomic status tend to have access to better quality information about schools via their networks than parents of low socioeconomic status. As a result of variation in the content and quality of the available information, individuals who are embedded in different networks are also likely to take actions that tend to reproduce the inequalities between different groups.

Population Structure

Last but not least, access to certain types of school is also constrained by population structure. In a multiethnic society, variations in the composition of schools depend on the relative sizes of different groups. While population characteristics (such as ethnicity or socioeconomic factors) form the social space, the structure of the population (relative group sizes) constrains opportunities for intergroup contact: As the size of the in-group increases, the probability of exposure to in-group members also increases (Blau, 1977a; Moody, 2001). While for the minority group, decreasing in-group size leads to a higher probability of intergroup contact, for the majority group, decreasing in-group size among minorities leads to a lower probability of intergroup contact. If we assume that there are two ethnic groups in a city, but that one group has a very small population, even if the minority group students are perfectly integrated, the number of schools comprised exclusively of majority group students will still be much higher. Hence, even when a family from the majority group wants to choose an integrated school, the probability that their child will attend a majority-group dominated school remains much higher.

Whereas the above example only considers one characteristic of individuals and schools, i.e., ethnic background, Blau's theory of social structure and the research on organizational competition further elaborates that if people belong to different groups on the basis of different characteristics, such as age, ethnicity, socioeconomic status, etc., this will further influence the likelihood of intergroup contact (Blau, 1977a, 1994; Bruch, 2014; McPherson & Smith-Lovin, 1987; Moody, 2001). That is, as the number of people in an ethnic group increases, it is likely that these individuals will also become stratified in terms of other characteristics, such as age, or socioeconomic status. For instance, if there was no correlation between socioeconomic situation and ethnic background of students, one would expect that friendships formed on the basis of socioeconomic status would increase the likelihood of interethnic contact of students. However, in cities where residential and school segregation is prevalent, and where, for example, socioeconomic conditions and ethnic background are strongly correlated, the likelihood of interethnic contact will decrease even further. Hence, income segregation coupled with ethnic segregation will increase in-group contacts among the ethnic minorities, but will decrease the likelihood of contact with the majority group (Blau, 1977a, p.92).

The importance of such population characteristics for school choice is that schools shape social structure by organizing interpersonal relations among students. Hence, the intergroup contacts of students are constrained by

the dimensions of the social space that is defined by the socio-demographic characteristics of the students at each school, such as ethnic background and socioeconomic status. Furthermore, when schools are segregated, the between-neighborhood variation in school characteristics further influences the school choice opportunities of parents (McPherson, 1983, 2004). The so-called ‘Blau space’ approach (McPherson, 2004) constitutes a good means of understanding how school segregation and population characteristics shape social structure and intergroup relations. Considering only two attributes of schools, home-to-school distance and the ethnic composition of schools, the uneven ethnic distribution of students between schools that is driven by residential segregation will also mean that the “availability” of schools with a certain ethnic population will be limited across different neighborhoods. Hence, the greater the salience of home-to-school distance for parents’ choice-set considerations, the more constrained parents will be in terms of the school characteristics that they can choose between.

To summarize, although parents tend to state certain school preferences in interviews and surveys, and although these preferences tend to differ on the basis of ethnic/racial and socioeconomic background, school choice is ultimately a result of both preferences and constraints. Parents’ school choices can exacerbate or attenuate the level of between-school ethnic segregation only to the extent that they are able to choose schools that allow them to further segregate or integrate their children. Even in cases where the majority group prefers integration, this can only be realized if there are enough schools to satisfy these integrative preferences. Hence, in order to understand the emergence and persistence of segregation, we must go beyond individual preferences and choices, and also study the role played by opportunity constraints in student sorting.

Analytical Framework

“What I have been describing is the problem of moving from a model of individual behavior to a theory of the behavior of a system composed of these individuals, taking social organization explicitly into account in making this transition, rather than assuming it away. This, I believe, is the central intellectual problem in the social sciences.”

(Coleman, 1984, p.86)

In studying the dynamics of school segregation, this thesis embraces the analytical sociology framework. Substantively, analytical sociology strives to understand aggregate social outcomes through theoretically grounded, mechanism-based explanations that aim to narrow the gap between the macro-level social outcome to be explained and the constituent entities and activities that bring about that outcome (Hedström & Bearman, 2011; Hedström & Swedberg, 1998; Hedström & Ylikoski, 2010). Neither macro-macro associations nor statistical associations at the micro level are sufficient to understand how an aggregate outcome comes about (Freese, 2011; Goldstein, 2011; Hedström & Udehn, 2011). Instead, the essence of analytical sociological explanations involves studying the behaviors of individual actors, understanding the structural constraints within which these actors operate, and understanding how the interdependent actions of the individual actors relate to the aggregate outcome at issue.

Whereas many prominent studies on the causes of school segregation have tended to rely on statistical associations between the determinants of individuals' school choices, these associations give little indication of the processes through which segregation emerges. Mechanism-based explanations, on the other hand, aim to provide a deeper understanding of how school segregation regularly comes about. In doing so, they attempt to achieve a balance between generalizability and specificity. Simple models that are abstracted away from their real-world context, such as Schelling's segregation model, can be very useful as a guiding principle to test our expectations across a variety of scope conditions. However, abstract models of this kind are less likely to provide explanations for specific cases. On the other hand, complex models that are more realistic may be conditioned by the properties of a very specific situation, which means that they cannot then be applied to any other setting (Schelling, 2006, p.89). Against this background, mechanism-based explanations attempt to strike a balance between the two, and they provide us with tools that are appropriate for middle-range theorizing (Merton, 1968). Being quite distinct from case studies, mechanism-based explanations of segregation processes seek semi-general explanations that may be applied to different institutional contexts or even to different domains of segregation (Hedström & Bearman, 2011).

There are three key components of mechanism-based explanations that will assist in understanding the approach this thesis employs towards the dynamics of school segregation: (1) The structural embeddedness of actors; (2) Interdependency; (3) The link between individuals' actions (micro) and aggregate outcomes (macro).

Mechanism-based explanations describe how a macro-level phenomenon comes about on the basis of its constituent elements: *actors and their structural embeddedness*. Given that school segregation is produced by the school choices of parents (with young children) or teachers, the actors involved in school segregation are parents or teachers, depending on the domain of study. However, explanations of the segregation process cannot only be made dependent on the actions of individual actors and the reasons for these actions. As was discussed in the previous section, school choices are heavily dependent on the opportunity constraints that affect parents. As Petersen has noted, "The concept of opportunity arises integrally in analyzing the choices agents make" (Petersen, 2011, p.116). Despite our intuitions about how parents choose a school, for example, since parents are embedded in social structures that both constrain their opportunities and form their preferences, proposed explanations of school choice and the resulting school segregation must also take situational mechanisms of this kind into account.

In addition, since individuals are embedded in social situations, their actions can be directly influenced by other people's actions, i.e., *micro-micro interdependence*, or by changes at the macro level that affect their opportunities and preferences, i.e., *macro-micro interdependence*. Schelling (1998) describes the differences between these two types of interaction by reference to the behavior of drivers on a highway: When a driver changes lane because another car is approaching from the rear, she interacts with an individual; on the other hand, when the driver adjusts her speed of the car in line with the average speed of the other drivers on the highway, then she interacts with the aggregate. As applied to school choice, an example for the first type of interaction (i.e., actions that directly influence the actions of another person) would be that when a student leaves one school, the student opens up a vacant position in the school, which allows another student to move into the school (see also "vacancy chains" in White, 1970). The second type of interaction, i.e., between macro and micro, can occur as a response to the macro-level properties of the system, such as the ethnic composition of schools, or admission policies. For instance, if the school admission policy is based on school catchment areas, parents may relocate to a neighborhood in which they can access a preferred school. It could also be the case that when a new school opens in a city, this will change the school choice opportunities of parents and lead some parents to choose the new school. Consequently, these macro-micro types of interdependencies also lead to a cascade of school mobility events among other students. That is, the between-school mobility of students due to a change at the macro level will affect the composition of these students' schools of origin and destination. These changes in school characteristics then further influence the choice opportunities of others.

Finally, given that both these kinds of interdependencies influence individuals' actions, explanations that ignore such interdependencies, and that instead focus exclusively on individual preferences or opportunities, can lead to a biased understanding of how segregation evolves (Coleman, 1984). Schelling's segregation model (1971, 2006) shows *the importance of studying the relationship between individual behavior (micro) and aggregate social outcomes (macro)*. In his checkerboard neighborhood segregation model, Schelling shows that even weak in-group preferences, as a result of social interdependencies, can lead to segregation levels that are much higher than those preferred by the individuals involved. This model, however, is rather simple, and is stripped of all choice constraints. Notwithstanding this, it still constitutes a useful framework for understanding the role of social interdependencies in the dynamic relationship between individuals' actions and aggregate outcomes.

The existence of the two types of interdependencies—between macro and micro via situational mechanisms, and between individuals' actions—means that aggregate social outcomes cannot be explained exclusively by reference to individuals' preferences (Anderson, P. W., 1972; Simon, 1996).

Figure 1: Core elements of macro explanations (Ylikoski, 2016).

As applied to school segregation, the way in which parents' school choices influence and are influenced by segregation can be described schematically using a Coleman diagram, as shown in Figure 1. Here, the dynamics of ethnic school segregation are modeled as a partly endogenous process in which, at the first step, a specific set of macro properties—such as the level of ethnic segregation and the ethnic composition of nearby schools—affect both parents' opportunities and the extent to which they are satisfied with the schools included in their feasible choice set (arrow 1). A change in these macro properties means that parents' choices are likely to be different from those that would have been made in the absence of such a change (arrow 2). The resulting between-school mobility is likely to change the ethnic composition of schools and the level of segregation (arrow 4). In addition, these compositional changes affect other parents' opportunities and their degree of satisfaction with their current schools (arrow 3), and this will influence their decisions as to whether to keep their children in their current school or move them to a new school (arrow 2), and so on. These interdependent and socially conditioned parental decisions will determine the extent to which the school system as a whole becomes more or less segregated (arrow 4).

Although the majority of the school segregation literature has focused on parents' preferences, feedback mechanisms of this kind have rarely been considered. Hence, often due to a lack of data tracking large interacting populations of individuals over time, existing studies have failed to account for micro-macro interdependencies. While more studies have focused on the dynamic relationship between micro and macro in the field of residential segregation (Bruch, 2014; Bruch & Mare, 2006; Clark & Fossett, 2008; Zhang, 2004) and labor market segregation (Arvidsson et al., 2021), very few studies have explicitly analyzed the links between micro behavior and macro outcomes in relation to school segregation (Figure 1, arrow 4). There are a few notable exceptions, however (Sage & Flache, 2021; Stoica & Flache, 2014). These studies have focused on the relative importance of home-to-school distance and ethnic homophily preferences using rather abstract and stylized simulation models. Since highly simplified models tend to assume much more homogeneity in the properties of actors, and of the social environments in which they are embedded, than is observed in the real world, there is a considerable gap between the world as assumed by such models and the world as we know it, and this raises concerns with regard to their explanatory value (e.g., Hedström & Manzo, 2015). Hence, as has been discussed above, empirical realism is especially important when studying processes of this kind.

The Swedish Case

Over recent decades, the educational systems of many Western countries have shifted towards choice-based systems, giving some freedom of choice to parents. In practice, school choice policies range from those that give parents a relatively large degree of freedom to choose between schools, to those that allow only limited freedom to parents, giving them the opportunity to opt out of an assigned public school and to choose another. For example, controlled choice policies allow parents to choose among the public schools that lie within the catchment area of their residential location. On the other hand, open enrollment policies allow parents to choose any public school within the city, while the choice of private schools will be limited to those who can afford them. Among the systems that provide the largest degree of freedom of choice, we find the universal choice policies that aim to eliminate all limitations based on ability, socioeconomic status, or residential location.

In 1992, Sweden shifted from a school enrollment system based on catchment areas to a universal voucher system (Böhlmark & Lindahl, 2007). This policy change introduced both parental choice and independent schools to the education market. The independent schools (*friskolor* in Swedish, similar to voucher schools in the US context) are mostly for-profit, private establishments that receive the same amount of public per-pupil funding as the public schools. Further, schools are not allowed to charge fees, nor are they allowed to select their students on the basis of ability or ethnic or socioeconomic background (Kessel, 2018). Despite some small differences between municipalities, a first-

come first-served rule guides admission processes in independent compulsory schools. For public schools, by contrast, parents can select a certain number of preferred public schools via a centralized municipal pupil allocation system. If the number of students interested in a specific public school exceeds the number of available places, students who live close to the school, or who have a sibling at the school, are prioritized in the admission process. Moreover, if students do not actively select a school, they are automatically placed in one of the public schools near to their home. The number of compulsory level students (grade levels 1 to 9) enrolled in independent schools has increased considerably over the years, from virtually zero in the early 1990s to 172,000 in 2020 (15% of all compulsory school students). Moreover, in 2020, 822 of a total of 4,803 schools were independent, comprising 17% of all compulsory level schools in Sweden (Skolverket, 2021).

Figure 2: Total number of immigration and emigration events between 1840 and 2020. (Data Source: SCB, 2020)

In addition to these major education reforms that have affected the opportunity structure of students and teachers, Sweden has also undergone substantial demographic changes that have further affected the level of ethnic school segregation. As can be seen from Figure 2, while Sweden was mainly a country of emigration at the beginning of 1900s, the country has since become a country of net immigration, particularly since World War II. The total number of

foreign-born individuals increased from approximately 300,000 (4% of the total population) in 1960 to 2 million (20% of the total population) in 2020 (20% of the total population). Including individuals with foreign-born parents increases this number even further, to 2.7 million (SCB, 2021).

Trends in School Segregation in Stockholm

These changes in the composition of the population have had a substantial impact on both residential and school segregation in Sweden. Ethnic school segregation is a relatively new phenomenon, since Sweden's population remained relatively homogenous until the late 70s. However, mostly as a result of data limitations, the available information on compulsory school segregation in Sweden during the years prior to 2008 is limited to segregation among 9th grade students (the final grade in compulsory education).

Figure 3: Ethnic school segregation in Stockholm. (a) Segregation between Swedish majority and minority group students in different grades in Stockholm municipality between 2008 and 2017. (b) Segregation among all compulsory students (grades 1-9). The figure shows two-group segregation between majority and minority group students (gray line), multigroup segregation between all eight groups (black line), and segregation among the seven minority groups (red line). Calculations are based on individual level administrative register data (see details below).

The figures presented above show how ethnic school segregation changed between 2008 and 2017 in the municipality of Stockholm. The students have

been categorized as being of Swedish origin if at least one of their parents was born in Sweden (72% of all students in Stockholm municipality schools in 2017), and otherwise as being minority group students. The minority group students have been further sub-divided into seven groups based on the parents' and students' countries of origin, using a majority rule that prioritizes the mother's country of birth. The seven groups are: (1) Nordic and Western, (2) Eastern European and Balkan, (3) Middle Eastern, Iranian, and Turkish, (4) Iraqi, (5) South or Central American, (6) African, and (7) Asian.⁶ Theil's segregation index (also known as the information theory index, H) is used to measure the level of segregation. This measure is an entropy-based segregation measure, and it ranges between zero and one. A value of zero indicates that the ethnic composition of each school, based on the categories mentioned above, is identical to the ethnic composition of the overall student population. Positive values indicate the degree to which the ethnic composition of a given school deviates from this no-segregation benchmark. A value of one indicates complete segregation, i.e., a situation in which all students attend schools at which all the other students belong to the same ethnic group as themselves. One of the advantages of the information theory index is that it is suited to measuring both two-group and multi-group segregation. Moreover, since it can be decomposed, it makes it possible to understand the extent to which segregation within the school system is due to segregation within or between groups (Frankel & Volij, 2011; Reardon & O'Sullivan, 2004).

Focusing on two-group segregation between majority and minority group students, panel a in Figure 3 shows that segregation among the 9th grade students slightly increased between 2008 and 2012, and that it has since remained relatively stable (blue line, panel a). We can also see that younger children are more segregated than older children, and that there was a slight decrease in the level of segregation between 2012 and 2017. Furthermore, panel b in Figure 3 shows that the overall level of segregation among all students in Stockholm is mainly the result of segregation between the majority and the minority group (gray line). The level of segregation among the seven minority groups is rather low, around 0.13, and was stable between 2008 and 2017 (red line).

⁶The same categorization is also used in Essay I. Whereas the Iraqi and Swedish categories are single-country categories, other groups include several countries of origin. The Iraqi group has been separated from the Middle Eastern group since it comprises a sufficiently large number of individuals to be treated as a single-country category (accounting for 4.2% of all students in Stockholm municipality between 2008 and 2017). The members of this group are also among those who have arrived in Sweden most recently.

Data and Methods

Data

This thesis aims to understand segregation processes in terms of socially conditioned school choices. The thesis consists of four co-authored studies. Essays I and III empirically examine how the mobility of students between schools affects school segregation. Essay IV focuses on the labor market mobility of teachers, directing special attention at the role of social networks. Essay II analyzes trends in income segregation in Sweden, with a particular focus on families with children. All four studies are based on Swedish register data. In addition, Essay I utilizes data from the World Values Survey.

Swedish registers contain individual-level records that are collected by various administrative authorities. For example, the Swedish Tax Agency collects residential, economic, and demographic information on all individuals living in Sweden, while the Swedish National Agency for Education maintains records on the educational trajectory of all students, such as grade scores and which schools they attend. Since all the registers employed in this thesis use the same (anonymized) ID for each individual, school, and workplace, it is possible to link the various registers together. In addition, the registers include spatial information on the locations of individuals' homes, schools, and workplaces at the 100 by 100-meter square level. The data thus include detailed information on the demographic background, residential location, family ties, and migration histories of every resident in Sweden; school IDs, school locations, and exam

results for every student; and detailed information on labor market activities for every adult. Overall, the registers are of very high quality and missing data are almost non-existent.

One advantage of using register data in school mobility research is that it provides the possibility of observing the “revealed choices” of individuals. While the stated preferences obtained via survey data may be biased, as individuals may not want to disclose their prejudices, and while survey data may not reflect the constraints and interdependencies present within the system (Buckley & Schneider, M., 2003), mobility histories obtained via observational data such as those contained in the Swedish registers allow us to study the choices made by heterogeneous individuals between schools with different characteristics (Bruch & Mare, 2012). Using this type of data, it is possible to focus on observables that capture the ways in which parents’ revealed preferences for different schools are socially conditioned by their own backgrounds, their socioeconomic characteristics, their previous school decisions, the socio-demographic characteristics of schools, and the decisions made by other actors in the system. Furthermore, given that the registers cover the entire population over a long period of time, we have complete information about individuals’ contexts, such as the composition of neighborhoods, schools, and workplaces.

Essay I uses data on all compulsory school students in Stockholm municipality and its 10 immediate neighboring municipalities between 2008 and 2017. The student data are further complemented with information on residential and school locations, links to parents and siblings, and parental income. Essay II employs data on income inequality for all individuals aged 18-65 in Sweden between 1978 and 2017, and data focused on residential segregation for all those living in Stockholm, Malmö, and Gothenburg between 1990 and 2017. The individual-level data include disposable income (from the longitudinal labor market registers), residential location, demographic information, and household composition (for example, whether there is a child in the household). Essay III uses data on students and schools in Stockholm municipality in 2017, with a principal focus on the demographic background of students and the location of schools. Finally, Essay IV, is based on teaching-staff registers, which provide detailed workplace histories for all teachers between 1978 and 2010. For Essay IV, which has a focus on social networks, the register data allow us to form complete affiliation networks for teachers, based on co-employment. In addition, the essay uses income data, data on residential and school locations, demographic information, and student data for all schools for the years between 2000 and 2010.

Despite the full coverage and richness of the register data, they are also associated with limitations in that they are “large-N” but “small-T” data. For example, in Essay IV, which focuses on labor market mobility, the data on teachers’ workplaces are drawn from the school registers, which are reported by the schools to the Swedish National Agency for Education, and which refer to the situation on October 15 each year. However, the information on teachers’ salaries and residential locations comes from the tax registers, and refers to the situation as of December 31 each year. Hence, there may be certain discrepancies due to timing issues. Also, when it comes to school information on students, the register data mainly provide *de jure* information, and the exact timing of events is mostly unknown. Furthermore, due to the existence of unregistered emigrants, there may be some over-coverage of the immigrant population (Monti et al., 2020).

In addition to register data, Essay I uses the Inglehart-Welzel Cultural Map of the World for the period 2010-2014, which is based on data from the World Values Survey (WVS) (Inglehart & Welzel, 2010). The map defines cultural similarities for all countries that are included in the survey (Inglehart, 1997). Different countries’ coordinates on the map are defined using a factor analysis based on certain questions in the World Values Survey, and they are updated after each wave. We use the locations of countries on this map in order to create a measure of perceived cultural (dis)similarity between students, based on their parents’ country of birth in the register data. This information from the WVS is used as an indicator of how individuals with different backgrounds may perceive one another.

There are several other cultural maps in the literature, most notably that presented by Hofstede (1980, 2011), which was originally based on a sample of IBM employees around the world, and that presented by Schwartz (1994), who used a sample comprised of teachers and university students. The reason we use the Inglehart-Welzel version is that it provides wider coverage and is based on a demographically representative sample, and since the map changes over time based on the data collected in new waves of the WVS, it is easier to identify time frames that overlap with register data. A few recent studies have also argued that the factors described in these different maps are rather similar, even though the factors are labelled differently (Fog, 2021; Kaasa, 2021).

Ethical Considerations

Although the administrative data have been made available for research purposes, since they were not collected for this reason, it is not possible to satisfy the rule of obtaining “informed consent from study subjects”. However, the Personal Data Act in Sweden exempts researchers from obtaining such consent “if it is impossible, or if it would mean an unreasonably great work effort” (Swedish Research Council, 2017, p.31). Research using individual-level register data, however, must be subjected to detailed ethical review by the Swedish Ethical Review Authority if the data include sensitive personal information. The project of which this thesis constitutes a part has been ethically vetted and approved (DNR 2013/850-31).

One of the most sensitive issues in relation to the data employed in the thesis involves the collection of data on the ethnic and racial identity of individuals. The European Council Racial Equality Directive (European Commission, 2007) addresses the issue of discrimination based on racial and ethnic origin, and also raises the importance of facilitating the collection of data that can capture the ethnic identity of individuals in order to combat discrimination. In most member states in Europe, the collection of racial and ethnic origin data is not a common practice. In Sweden, the Personal Data Act prohibits the processing of data on the ethnic identification of individuals or data that may reveal the ethnic identity of individuals (SCB, 2002). Ethnic segregation research in Sweden is therefore based on data on individuals’ countries of origin. In the Swedish context, and in this thesis, “ethnicity” refers to individuals’ countries of origin, and the term “ethnic composition” refers to the composition of schools or neighborhoods in terms of the students’ or residents’ countries of origin. This operationalization is in line with the requirements of the Swedish Discrimination Act, the Personal Data Act, and the European Data Act.

Another ethical concern is related to the privacy of individuals and the use of personal information. Studying school segregation in depth, and understanding the dynamics of the processes involved, requires data from several sources. Processing such detailed information requires that great care is taken to avoid the possibility of individuals being identified or of unauthorized access to their information. One possible way of solving this problem is by pseudo-anonymizing the individual information to such an extent that while it remains possible to link information from different registers, it is not possible to identify individuals directly (Swedish Research Council, 2017). For this thesis, the register data were accessed via Statistics Sweden (SCB). SCB anonymizes the data by creating unique serial numbers for each individual in the study

population. Each researcher signs a contract specifying the terms of data use. Data access and analysis then take place via SCB's Micro Data On-Line Access service (MONA), using a secure VPN connection. The use of this secure system, in combination with anonymized individual data, makes it possible to guarantee the confidentiality of individuals' personal information.

Methods

The four studies in the thesis use different analytical methods. Essay I uses a combination of discrete choice conditional logit modeling and empirically calibrated agent-based simulations. Essay II uses different segregation measures to describe trends in income segregation. Essay III employs empirically calibrated agent-based simulations. Finally, Essay IV uses stochastic actor-oriented modeling and empirically calibrated simulations.

Discrete Choice Conditional Logit Models

Discrete choice models describe the choices made by individuals from among a finite set of discrete alternatives, mainly via the use of multinomial logistic regressions (Ben-Akiva & Lerman, 1985; Train, 2009).⁷ These models, originally developed by Daniel McFadden (1978) to study travel and location choices, have also been employed in segregation research focused on residential choices (Bayer et al., 2007; Bruch & Mare, 2006), and school choices (Agarwal & Somaini, 2020; Borghans et al., 2015; Burgess et al., 2015).

One of the main advantages of discrete choice models is that they allow for the study of choice as a function of alternative-specific characteristics. For example, in school choice studies, one might want to understand whether the characteristics of a given school, such as its student composition or location, make it more or less likely that the school will be chosen by parents. Questions of this kind, which are aimed at understanding how students with certain attributes are matched to schools with various characteristics (one-sided matching), can be studied using discrete choice models.⁸ These models assume and estimate a probability function that is conditional on the attributes of the alternatives in

⁷Discrete choice conditional logit models are one type of choice models. Typically, choice models are based on random utility theory, and various other extensions also exist, such as multinomial probit models or generalized extreme value models.

⁸The models can also be extended into two-sided matching models (Logan, 1996), in which students are matched to schools in their choice sets, but where schools with certain characteristics also choose from the pool of students who apply to them.

one's choice set, and also on the interactions between these attributes and the characteristics of the choice makers. Moreover, the models allow for non-linear effects, as well as for the possibility of assigning different choice sets to different decision makers.

Discrete choice models can be used both with observed choice data, to study the revealed preferences of decision makers, and with survey data, to study stated preferences (Bruch & Mare, 2012). Given that Essay I employs register data that provide information on which schools students are attending, it is a study of revealed parental choices. Unlike stated preference surveys, which provide the survey respondents with a well-articulated, limited choice set, in revealed preference studies, a crucial step in the choice modeling involves understanding the opportunity structure of the choice makers (Ben-Akiva & Lerman, 1985; McFadden, 2005). Given that parents value home-to-school proximity, Essay I relies on a distance-based school search criterion to define parents' choice sets. There are no fixed catchment areas in Stockholm, with students instead being allocated to schools based on home-to-school distances. For this reason, the choice sets have been formed on the basis of egocentric catchment areas that differ for each student, rather than on the school-centric areas employed in previous studies (Burgess et al., 2015).

Stochastic Actor-Oriented Models (SAOMs)

Stochastic Actor-Oriented Models (Snijders, 1996, 2017), describe network change by accounting for the self-reinforcing feedback processes between behavioral change, changes in individual attributes, and the endogeneity present in social networks (how network ties influence each other) in a discrete choice setting (Steglich et al., 2010). They are actor oriented, since the individuals are assumed to choose their ties based on their own characteristics, characteristics of the alter, and the endogenous network properties. SAOMs are especially useful in longitudinal network analyses when the aim is to estimate the parameters of tie change (endowment, tie break, or tie formation) based on individual-level characteristics and network dependencies (Snijders et al., 2010).

Stochastic actor-oriented models study network change based on the assumption that, between two discrete time points (specified as different years in Essay IV), the formation of ties takes place in continuous time. This assumption is modeled using a Markov chain process, and the estimation procedure uses a simulation-based statistical inference approach that estimates the parameters that yield the best match for the network changes that occur from

one observation point to the next via successive changes in the network ties of individuals (Macy & Flache, 2011, p.261; Steglich & Snijders, Forthcoming).

Similar to the discrete choice conditional logit models, one advantage of the use of SAOMs is that these models describe the changes in between-actor network ties over time depending on characteristics of the ego, the alter, and the network. Moreover, the models can be used to study both one-mode networks, such as friendship networks (Block & Grund, 2014; Boda et al., 2020) and two-mode networks (see also Benton, 2016; Snijders et al., 2013). The ties in a two-mode network are formed through participation in the same set of activities or by being employed at the same workplace. In the two-mode teacher-affiliation networks examined in Essay IV, ties between teachers are formed through employment at the same school.

Moreover, SAOMs are built on a simulation framework that is designed to capture how macro-level network properties influence network change via actors' choices, and how such changes produce the network properties observed at the next observation point (Stadtfeld, 2018). In models with good convergence, the simulated data match the observed data, hence increasing both the empirical realism of the models and the validity of the parameter estimates (Steglich & Snijders, Forthcoming). Despite having major advantages, these models tend to take a great deal of time to estimate, especially when using large networks, as is the case in Essay IV, and the estimates tend to be sensitive to outliers.

Empirically Calibrated Agent-Based Models

Even though discrete choice models and stochastic actor-oriented models are useful for understanding the factors that influence individuals' choices, these models can only provide a partial understanding of social phenomenon. As has been noted by Watts (2014), sociologists tend to rely on common sense to provide rational explanations for human actions, suggesting also that these represent the true causal explanations of macro-social outcomes (see also Boudon, 1998, p.185). As was discussed in Section 3, however, macro-level social phenomena are brought about by complex social processes that cannot be reduced to individuals' preferences and opportunities. Hence, choice models (or other statistical inference models, depending on the type of study) need to be complemented with models that account for the complex interdependencies present in social systems in order to provide information on the relationship between micro and macro. In Essays I, III, and IV, this is achieved via the use of empirically calibrated agent-based simulations.

Agent-based models are a special type of simulation models (mostly computer based) that help us to understand complex processes by taking into account the heterogeneous behavior of individual actors, how these actors interact, and the environment in which they are embedded (Gilbert, 2008; Miller & Page, 2007). Given that experiments in social systems are often unfeasible and unethical, counter-factual simulations using agent-based models provide a type of flight-simulator for social scientists, making it possible to test how different characteristics of the constituent entities, and various behavioral rules for their activities, bring about a specific macro phenomenon (Epstein, 1999; Hedström, 2005; Schelling, 1971). For instance, Schelling's checkerboard exercise constitutes an example of an agent-based model that shows how individuals' location choices, based on their ethnic preferences, affect residential segregation. In the social sciences, abstract agent-based models of this kind are used, as Macy and Willer (2002) have put it, "for theoretical research". As such, the value of simulations is first and foremost associated with their potential for theory building.

The advantage of these abstract models is the opportunity they provide to form general expectations about a given phenomenon. On the other hand, the models tend to be less relevant for the explanation of empirically observed outcomes, since they are detached from empirical data. Hence, they rarely provide an explanation for the actual generative processes that explain an observed macro outcome, and as is discussed in Essay I, they may for this reason lead to misleading and incorrect explanations. One way of increasing the empirical realism of these models is to base them on data that better describe the actual actions of individuals, and the nature of the social and physical environment in which the actors are embedded (Epstein, 1999; Hedström, 2005; Hedström & Manzo, 2015).

The degree to which empirical data are incorporated into agent-based models affects the level of empirical realism, but also affects the complexity of the models (Bruch & Atwell, 2015). Whereas empirical realism is important for explanations, highly realistic models risk becoming overly complicated and specific to a given case. Moreover, as the models become more complex, they also become less tractable, and it thus becomes more difficult to understand the mechanisms through which macro phenomena emerge (Axtell, 2000; Bruch & Atwell, 2015; Coleman, 1994, p. 19; León-Medina, 2017). Nonetheless, the amount of data required remains dependent on the research question, but also on whether data are available (Bruch & Atwell, 2015).

So-called *empirically calibrated agent-based models* allow researchers to study a given macro-level phenomenon using a realistic representation of the situation

based on empirically relevant characteristics of agents and their environment (Tapia, 2021). These models are especially useful (1) to verify the relationship between micro and macro, (2) to counterfactually test the extent to which a macro outcome may be attributable to various micro mechanisms, (3) to examine how different manipulations of the relevant micro mechanisms affect the macro outcome, and (4) to study policy-oriented questions addressing the potential unintended consequences of policy implementation.

In general, empirically calibrated models are useful in assisting us to understand the processes that unfold as a result of some change at the macro level, or through the interdependent actions of individuals. In addition to the empirical realism provided by these models, they help us to validate simulation findings and to test which social mechanisms provide a more realistic explanation as to how macro phenomena come about (Boero & Squazzoni, 2005). The rule of thumb for validation in empirically grounded simulations has traditionally been to compare the simulated macro-level outcomes to the empirical data, as implied by Epstein's (1999) widely cited quote: "If you didn't grow it, you didn't explain its emergence". However, since multiple behavioral specifications and situational mechanisms may generate the same macro-level result, it becomes even more important to use empirical micro data to specify the details of simulation models if we are ever to understand *how* the macro-level outcomes are generated (Boero & Squazzoni, 2005; León-Medina, 2017; Macy & Flache, 2011).

In three of the four studies presented in this thesis, empirically calibrated simulations are used to answer different questions. Essay I employs empirically calibrated agent-based simulations to validate the generative sufficiency of the micro model. Moreover, it uses counter-factual simulations to test a theoretical mechanism, namely how parents' opportunity constraints and preferences jointly influence school segregation. Essay III tests the potential effectiveness of school closure as a desegregation policy in order to understand how opportunity structures and different student allocation criteria moderate the effect of school closures on segregation. Using an approach similar to that employed in Essay I, Essay IV uses counter-factual empirically calibrated agent-based simulations to test the extent to which different factors that influence teachers' workplace choices can account for the total level of observed mobility between schools.

Appended Essays

Essay I

Scholarship on the emergence and persistence of school segregation is largely divided into two theoretical streams: Studies focused on school choices and preferences, and studies focused on how school opportunities vary between individuals. Given that most urban landscapes are residentially segregated, and that parents of young children tend to prefer schools located close to their homes, the opportunity structures of parents are to a large degree shaped by the characteristics of nearby schools. However, since parents' choices, school characteristics, population demographics, and the macro-social structure are all interdependent, the contribution made by parents' preferences to overall patterns of segregation is potentially too complex to be modeled using standard regression models (Krysan & Crowder, 2017, p.175).

Using large-scale empirically calibrated simulation models and discrete choice models, this paper examines the extent to which the school preferences and opportunity constraints of parents jointly shape the observed levels of school segregation. The analyses are based on register data and include all compulsory school students in Stockholm municipality and the 10 neighboring municipalities between 2008 and 2017. Altogether our data include 556 schools and 286,082 students from grades 1 to 9. Using discrete choice models, we analyze the revealed preferences of parents who belong to one of eight ancestry groups (1. Swedish, 2. Nordic and Western, 3. Eastern European and Balkan, 4.

Middle Eastern, Iranian, and Turkish, 5. Iraqi, 6. South or Central American, 7. African, and 8. Asian). Choice models are estimated separately for each of these eight groups. These stratified models provide the behavioral rules for our simulations. Using counterfactual empirically calibrated agent-based models, we then test how the school choices of parents are moderated by their ethnicity-related preferences and their opportunity structures, and how these school choices affect the overall level of segregation within the school system over time.

Our findings show that even though the ethnic composition of schools plays a role in parents' school choices, and even though parents' ethnic preferences vary between different ethnic groups, these preferences have only a marginal impact on school segregation. Instead, the main drivers of school segregation are the ethnic segregation of the housing market and the geographic location of schools. When students are residentially segregated, the schools located close to students' homes tend to reflect the ethnic composition of the school-age population of the neighborhood in question. Hence, although parents have ethnicity-related preferences, and although these preferences vary between different ethnic groups, as a result of residential segregation they face a choice situation in which the alternatives are practically indistinguishable from one another. As a result, choosing among these rather homogenous school alternatives generates a self-reinforcing process whereby school segregation is highly dependent on residential segregation.

Essay II

Essay I shows that, in Sweden, the school choices of parents are largely constrained by their residential location. The predominantly US-based literature on the residential segregation of parents and households further suggests that income inequality is highly associated with residential income segregation, and that ethnic and income segregation tend to be positively correlated. Given that Sweden has seen the largest increase in income inequality of all Western OECD countries over recent decades (OECD, 2015), Essay II explores the trends in income segregation among the working age population in Sweden, and also among different ethnic (majority and minority) and demographic groups (those with and without a child in the household).

Using unique individual-level longitudinal population data, which allow for an investigation of regional variations and group differences over a long, but recent, period of time, from 1978 to 2017, we first analyze trends in income inequality among the working age population (18–65) in Sweden as a whole, and

in the country's most populous municipalities: Stockholm, Gothenburg, and Malmö. Our findings show that, based on Theil's index of income inequality, income inequality grew by around 200 % between 1978 and 2017. In the final year covered by the study, income inequality was much more pronounced in Stockholm than in the two other municipalities examined, and in Malmö the level of income inequality was slightly lower than the average for the country as a whole.

Against the backdrop of this increase in income inequality, we then examine the trends in income segregation between neighborhoods in the three municipalities using various segregation indices based on entropy measures. Our findings show that patterns of residential income segregation over the past 30 years are best characterized as involving the growing isolation of low-income groups. Further, among the two ethnic groups examined in the study, we find lower levels of income segregation among the ethnic minority population in all three cities, despite the fact that income disparities are greater within the minority group, especially in Gothenburg and Malmö. Our findings also show that income segregation in Sweden has increased among both households with children and households without children; however, income segregation is both expressed more strongly and has grown at a faster rate among individuals with children, and particularly among affluent parents.

Essay III

Across different countries, the persistence of ethnic school segregation has led to an increased debate about new policy designs to tackle school segregation. School closure is one such policy that has recently been discussed and implemented in various cities in the US and Europe, including Sweden. The policy mostly targets schools with a high proportion of minority students. Whereas the literature on school closure as a desegregation policy has tended to focus on the causes of school closures, or the academic achievement of displaced students, no systematic empirical analyses have to date evaluated the effectiveness of school closure as means of decreasing school segregation.

Given that the current forms of policy implementation tend to target mainly one type of school (those with a high proportion of minority group students), based on established findings from the school segregation literature, this study challenges the expectations associated with the closure of schools of this kind. We argue that the characteristics of a closed school are not alone a sufficient basis for forming expectations about the effects of the closure of a given school on school segregation. Instead, it is important to analyze how closed school

characteristics, in interaction with the opportunity structure of students and the reallocation criteria used to assign students to alternative schools, together produce observed levels of segregation.

Using data on all compulsory schools and students in Stockholm municipality, we study the closure of each school in our data in an empirically calibrated simulation setting. More specifically, we focus on the effects of ethnic composition and the size of the closed schools, the local opportunity structure for displaced students based on the compositional (dis)similarity between the origin school and the schools in the local neighborhood, and different reallocation criteria (homophilous and heterophilous assignment, assignment to the nearest school, and random allocation). We then evaluate how levels of segregation change following the closure of each school in Stockholm municipality. Changes in levels of segregation at the city and local levels are measured using the information theory index, whereas changes in segregation at the individual level are examined in terms of the out-group exposure of minority group students.

Our findings show that the effects of a school closure are primarily dependent on the local opportunity structure of the displaced students and the reallocation criteria employed. Whereas the closure of larger schools and schools that are more ethnically homogenous tends to decrease segregation at the city and local levels, the extent of this decrease is dependent on the reallocation criterion and the opportunity structure of students. In contrast to current expectations, we find that the closure of schools with a high proportion of majority students decreases segregation more than the closure of schools dominated by minority students, especially when the closed school is surrounded by ethnically dissimilar schools.

Essay IV

Existing labor turnover theories (such as that of Jovanovic, 1979) tend to assume that job search is driven by imperfect information, and that the true quality of workplaces and employees is only known once there is a match between the two. Hence, opportunities to access information about potential workplaces during job search are important for better quality matches between employers and employees (Stovel & Fountain, 2011, p.371). In the context of such information gathering, individuals often rely on interpersonal relations. Existing scholarship has established that high levels of teacher turnover are associated with student composition and the job satisfaction experienced by teachers as a result of work-environment characteristics, rather than with monetary gain. In this study, we

argue that in addition to various school characteristics, in a segmented labor market in which school characteristics and teachers' affiliation networks are largely stratified by sector, teachers' job search and their mobility within and between sectors will be moderated by their social networks.

We use stochastic actor-oriented modeling to test how the affiliation networks formed by teachers since 1978 affect teacher to school matches in Stockholm County between 2000 and 2010. We focus on teachers who teach core-curricular subjects (Math, Swedish, English) at upper secondary schools in Stockholm County. More specifically, we study whether having ties to alternative schools via former and current colleagues increases the likelihood of school mobility among teachers within the public and private sectors, and also the likelihood of between-sector transitions. In doing so, we control for a wider range of school characteristics than is usual in the existing literature. For instance, we study not only the student composition of schools, but also teacher composition, the characteristics of teachers themselves, home-to-school distance, and work-environment characteristics (i.e., the number of reported complaints and incidents of disorder in schools). Using the generative properties of stochastic actor-oriented modeling, we also test whether these factors that influence teachers' workplace choices can account for the within- and between-sector mobility of teachers at the aggregate level in a counter-factual simulation setting.

Our findings suggest that the public-private segmentation of the Swedish labor market for teachers has created compositional differences that are likely to reinforce and exacerbate inequalities between the two sectors as employers. For example, we find that public sector teachers are more likely to move to private schools if they are in a relatively precarious situation, for example if they have a temporary contract at their current public school, have less experience, are not certified, or are employed at multiple schools in a given year. On the other hand, private sector teachers tend to move to public schools if these schools have a higher proportion of teachers on temporary contracts, if the schools are newly opened, or if the teacher is more experienced or holds a teaching certificate. Given that these results are highly driven by existing compositional differences between the public and private sectors, network-based hiring and job search practices will further benefit teachers who tend to have larger networks, and they are also likely to exacerbate the differences between the two sectors over time. Finally, using counter-factual simulations, we demonstrate that whereas networks and other school characteristics are important at the individual level, this does not always translate into these factors having relevance for turnover rates at the macro level.

Discussion and Conclusions

This thesis, with its four empirical studies, provides a broader understanding of how individual preferences and school opportunities jointly create a self-reinforcing feedback process that perpetuates school segregation. The segregation present in the residential and school markets structures the school choice opportunities of parents, and the differentiation between public and private schools affects the workplace decisions of teachers. Overall, differences in opportunities moderate the potential effects of individual preferences and tend to reproduce existing segregation patterns.

In line with the distinction between economics and sociology suggested by Duesenberry (1960, p.233), the literature on school segregation has either emphasized the importance of the choices made by parents, or the importance of their lack of opportunities to choose. Those focusing on the importance of choices have consistently shown that parents' school choices are largely driven by ethnocentric preferences and a preference for schools located close to home. Those focusing on the constraints on parents' opportunities have instead shown that using residential choices as a means of making school choices is a possibility for the wealthy, but not for the poor, which serves to differentiate parents' opportunity structures (see also Petersen, 2011, p.126). Moreover, given that individuals are embedded in social networks, variations in these networks further influence both school opportunities and the school choices made by teachers and parents.

Preferences and opportunities, however, have rarely been studied in a dynamic context in order to understand how they jointly influence segregation at the macro level. The findings from Essay I and Essay III show that changes in school segregation cannot be understood by exclusively focusing on the way in which students are sorted across schools. Given the persistence of residential segregation shown in Essay II, Essays I and III add to the existing literature by demonstrating that the effects of student between-school mobility on school segregation are heavily dependent on residential segregation and students' local opportunity structures. In addition, Essay IV shows the importance of teachers' social networks and place of residence for workplace choices at the individual level, and demonstrates that differences in teacher characteristics between the public and private sectors tend to limit the likelihood of transitioning to the other sector.

This thesis makes two main contributions to our understanding of the dynamics of school segregation. First, it shows the importance of jointly addressing the opportunity constraints experienced by individuals and their preferences and choices. Opportunities and choices are distinct but interdependent constituents of macro-level outcomes (Logan, 1996). While opportunities are mostly formed by hard-to-change macro structures, they nonetheless constrain individuals' choices. Moreover, given that macro structures are formed by the interdependent actions of individuals, opportunities are also indirectly influenced by the choices of others.

In the context of school choice, parents and teachers are assumed to make voluntary school choices. However, as is shown by Essays I, III, and IV, individuals' choices are very much moderated by their access to certain schools. Both for teachers and parents, proximity to school is an important criterion for school choice. Given that neither individuals nor schools are randomly distributed across neighborhoods, proximity preference also impose constraints on school opportunities. Moreover, given that teachers (but also parents) are embedded in social structures that reflect the inequalities present in the education market and in society at large, their school choices are also moderated by differential access to information about alternative schools.

Second, using an analytical sociological framework, this thesis demonstrates that inferences about school segregation processes that are solely based on individual-level attributes and individuals' choices are inadequate as a means of addressing the link between the micro and macro levels. Understanding micro-level determinants is important, since there are regularities in the school choices of individuals. However, given the existence of heterogeneities between the (revealed) preferences of individuals, of nonlinearities in the ways in

which individuals react to certain school characteristics, and given also the interdependencies that exist among choices in a longitudinal setting, individual-level preferences and choices are not a sufficient basis for making inferences about the emergence of macro-social outcomes.

In contrast, a mechanism-based approach that explicitly links the micro and the macro has the advantage of providing an understanding of how the different constituents of school segregation, and their actions, generate the levels of segregation we observe. For instance, by means of counter-factual simulations, Essay I demonstrates how parents' preferences are constrained by their school opportunities, and how different preferences and opportunities affect segregation at the macro level. Similarly, by focusing on the interaction between the population structure in different schools and neighborhoods, Essay III shows that opportunity constraints can limit the effectiveness of school closure as a desegregation policy. Moreover, a mechanism-based approach also helps us understand the importance of certain parameters in relation to others, by allowing us to identify exceptions to the regularities (Schelling, 1998, p.36). For instance, the simulation approach used in Essay IV demonstrates that the significance of a parameter at the micro level does not always translate into the same variable having relevance for macro-level outcomes.

The simulation approach used throughout this thesis also demonstrates the importance of studying the micro-macro link using empirical data. In the field of residential and school segregation, Schelling's segregation model has been extended and modified in numerous different ways. However, these models tend to be stylized, and highly simplified segregation models rarely take the opportunity structures of agents into account. The empirically calibrated approach, as used for instance in Essay I, shows that as a result of the self-reinforcing mechanisms that exist between the opportunity structure of individuals and their interdependent choices, even drastic interventions focused on preferences generate only marginal changes in segregation. In this way, empirically calibrated models demonstrate that residential segregation can offset the potential influence of parents' preferences on school segregation. Further, given that path dependency plays a major role in school and residential segregation, while stylized models whose initial conditions are based on random allocation tend to generate high levels of segregation even with minor interventions, data driven models show that this is not the case in the real world. Since the properties of both actors and the social environments in which they are embedded are too heterogeneous to be captured by stylized models, there is a considerable gap between the world as assumed by these models and the world as

we know it. Hence, data driven simulation models increase the empirical realism of our models and also allow us to capture the complexity of the real world.

Rather than an end in itself, this thesis ought to be viewed as a point of departure for future studies that will improve our understanding of the dynamics of school segregation. The findings from each of the four studies suggest a number of natural extensions that would help us better understand the mechanisms through which school segregation emerges and persists. To begin with, while Essay I shows that residential segregation is an important driver of school segregation, thus corroborating earlier studies (Böhlmark et al., 2016; Thelin & Nedomysl, 2015), our study takes the residential choices of parents as given. Even though one might expect similar opportunity constraints to play a role in the residential choices of parents (see Bruch, 2014, for example), Essay II shows that, in Sweden, the segregation of affluence has increased among individuals with children. Against the backdrop of recent findings from the US showing that the growth of charter schools has led to a marginal decrease in residential segregation among families with children (Rich et al., 2021), future research should focus on how residential and school segregation are related, and on the extent to which this is a result of parents' school and residential choices. Since the school choices of parents can also affect their residential choices (Lareau & Goyette, 2014), it is essential to understand how parents are sorted between neighborhoods with respect to their school choices, and how this, in turn, affects school segregation at the macro level.

In addition, Essay II demonstrates that the growth of income segregation in Sweden can mainly be characterized as involving the segregation of poverty. Understanding the mechanisms by which individuals on low incomes become more isolated (Sampson & Morenoff, 2006), and the extent to which this segregation of poverty leads to the socioeconomic segregation of children, and also how children's opportunity structures are constrained as a result of residential segregation, would be valuable additions to the findings on ethnic school segregation presented in Essays I and III.

While there is no consensus on how feasible choice sets should be defined in revealed choice studies, in Essays I and III, we only consider one type of choice set formation. If, for example, it were possible to access the actual travel times between the home and alternative schools based on public transportation routes, and if complex models were employed to form individualized choice sets, these feasible choice sets would be likely to be more homogenous than those employed in our own simulations. Hence, future research might pay more attention to the ways in which parents operationalize the two-step choice process in relation to their school choices.

As regards teachers' labor market choices, Essay IV shows that proximity to schools constitutes an important determinant for the workplace choices of teachers. Given that Edmark (2019) has shown that private schools tend to choose their locations strategically, it may be important to understand the extent to which such location choices are dependent on the composition of the teachers living nearby, and whether the mobility of teachers to such new schools affects students in the schools from which these teachers move. Although there is an association between teacher mobility and student achievement, no studies have examined the feedback dynamics between these two factors using the type of mechanism-based approach advocated in this thesis.

In sum, the analytical framework of this thesis, together with the four studies, demonstrates the importance of explaining macro-level social phenomena by reference to the interdependent actions of individuals and the situational mechanisms that result in variations in the preferences and opportunities of individuals. A segregated residential market will structure the school opportunities of both parents and teachers, and this variation in opportunities affects the resulting school choices. Such differences in opportunities moderate the potential effects of individuals' preferences and tend to reproduce existing segregation patterns. When school segregation and residential segregation are highly dependent on one another, and when complex social processes involve heterogeneities and interdependencies, any policy design that fails to acknowledge such interdependencies is likely to result in unintended consequences.

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