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The Early Evolution of Segregation and Neighborhood Disadvantage: Evidence from Stockholm During Industrialization, 1878–1950

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Abstract

While the influence of neighborhoods on later life outcomes is well documented, the historical processes that shaped the growth and social makeup of urban areas are less understood. We address this by analyzing newly compiled geocoded data covering the entire population of Stockholm from 1878 to 1950. Until the 1920s, population growth stayed concentrated in the city center. After that point, expanding tram and light rail lines allowed the city to spread outward, creating more distance between homes and workplaces. Two main types of suburban areas emerged: some developed into enclaves for the elite, while others housed a mix of working-class and white-collar families. As a result, the upper class became more segregated from the broader population, while other social groups mixed more with each other, including the lowest-status households. Consequently, children from low-status families saw an improvement in the social standing of their closest neighbors, so poverty did not concentrate in ways that could have worsened negative neighborhood effects. We also examine the time spent in areas with high concentrations of low-status households, finding class inequality in the opportunity to escape, but little role for demographic factors such as the gender or marital status of the household head. Thus, while selective out-migration, similar to today, served to exacerbate the spatial concentration of disadvantage, the overall evolution of the spatial makeup of the city reduced negative exposure for children from the lowest-status households. Our results suggest that worse peer exposure for children from disadvantaged backgrounds is not a deterministic consequence of sprawl and elite isolation.

JEL Codes: N33, N93, R23

Keywords: segregation, neighborhoods, urbanization, industrialization, Stockholm, economic history

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1 Introduction

While it is by now well established that neighborhoods play a pivotal role in shaping the mobility experiences of individuals from poor backgrounds, particularly through their exposure to peers of higher status, less is known about the forces that shape the composition of neighborhoods themselves. The segregation patterns we can observe today are the result of a longer historical trajectory of urban development and neighborhood formation. In this paper, we examine unique data for Stockholm from 1878 to 1950, a period that allows us to trace the evolution of socioeconomic segregation throughout industrialization and the development of the first public transportation network. This technological advance enabled, for the first time, a physical separation between workplaces and homes, yet preceded the widespread influence of car-based urban development.

We find that prior to the 1920s, the expansion of the city took place within a limited geographical space, and after this the population began to sprawl out. A two-pronged picture emerges as a result. Suburban expansion led to a segregation of the upper class away from the rest of society. Trams and light rail in combination with urban planning allowed for the creation of distinctly upper-class villa neighborhoods with single-family houses, especially to the west of the central city. At the same time, the new suburbs that were not designed for the elite were quite mixed in their social structure. The central city also became more mixed over time. The trend for the other classes trumped that for the elite, resulting in a decline in aggregate measures of segregation over the period.

To examine the type of neighborhoods that children from lower-class families were exposed to, we construct measures of the social status of the closest neighbors. We find that despite the segregation of the upper class away from the rest of the population, children in unskilled households saw an improvement in their neighborhood context. In the early twentieth century, 15 percent of school-aged children from households with an unskilled head grew up in a block with 40 percent or more households from the same social class, while this had fallen to almost zero by 1950. Thus, our study shows that the segregation of the upper strata of society is a separate process from the development of neighborhood mix among the rest of the population, including the poorest.

Our study is related to several literatures. First, we contribute to the large literature on the impact of neighborhoods on later life outcomes ([Chetty and Hendren, 2016](#); [Chyn and Katz, 2021](#); [Hedman et al., 2015](#)). [Chetty et al. \(2022\)](#) finds that economic connectedness in a local area is by far the strongest predictor of upward economic mobility across counties in the United States. In the same vein, using microdata, [Hedefalk and Dribe \(2020\)](#) find that the SES of parents of nearest same-age neighbors during childhood influenced educational attainment in the Swedish city of Landskrona during the period from the 1940s to the 1960s. Since connectedness is shaped by the physical proximity of different types of peers, the extent and structure of socioeconomic

segregation is likely to greatly influence the social mobility that individuals experience. We show, however, that the process of upper-class segregation away from the rest of society did not result in worse peer exposure for children from families with an unskilled household head. Instead, the share of other unskilled households nearby declined for the average child from such a household.

Socioeconomic segregation can also have more indirect consequences. If pollution and limited access to public sanitary infrastructure, such as piped water, negatively affect individual outcomes, spatial sorting by social class implies differing levels of exposure (Banzhaf et al., 2024). Molitoris and Dribe (2016) argue that the concentration of the working class in certain areas of Stockholm partially explains the persistence of class differences in infant mortality, despite overall mortality declining before 1925 (see also Burström et al. 2005). Our finding that the unskilled group became less isolated from the rest of the population suggests that unequal exposure to harmful environmental factors is unlikely to be the main driver of the infant mortality differential. While residential sorting does not appear to be the primary culprit, unskilled workers might still have encountered other negative environmental risks at their workplaces, potentially contributing to the difference. However, this interpretation is not supported by the distinct pattern of adult mortality among migrants to Stockholm, where only male migrants faced a significant penalty that persisted even after accounting for detailed occupations, pointing to lifestyle factors as the key explanation (Berger et al., 2025; Dribe and Eriksson, 2018). Önnerfors (2021) also finds, using microdata for Södermalm, that access to water and sewage during its implementation did not show a clear SES gradient, partly because micro-level segregation was limited, thereby constraining potential inequalities¹. The same reasoning likely applies to other amenities that are at least partially tied to place, such as waste removal, public schooling, parks, and policing. As their isolation decreased, unskilled households would have experienced more equitable access to these resources.

Second, we relate to the literature on the measurement and extent of socioeconomic segregation in contemporary cities (Mutgan and Mijs, 2023; Malmberg et al., 2018; Nielsen and Hennerdal, 2017; Östh et al., 2014). Research has shown that the highest-status social groups tend to be more segregated from the rest of the urban population than the poorest households (Marcinićzak et al., 2015; Haandrikman et al., 2023).

Reardon and Bischoff (2011) also find that income segregation is higher in cities with greater income inequality, primarily driven by the macro-scale spatial separation of the rich from the rest of the population. We show that the contemporary pattern of upper-class segregation originated during this phase. Interestingly, this coincided with falling inequality and a shrinking income gap between the elite and everyone else (Bengtsson and Molinder, 2024; Roine and Waldenström, 2008), suggesting that the relationship between inequality and segregation might not be strictly causal but could result from independent processes.

¹Using building-level water connection data, it was found that 50% of working-class households had in-house water access, compared to 75% of white-collar households. Following a quick expansion of the water network, this difference was halved within a decade and almost gone within 20 years.

Third, we relate to the literature on socioeconomic segregation in historic cities. The Urban Transition project led by John R. Logan has used census microdata from the IPUMS to map individuals to addresses in several U.S. cities prior to 1920 (Logan et al., 2011, 2015). Gilliland and Olson (2010) employed data from the Canadian census to study the social geography of Montreal in 1881, pioneering the combination of mapping historic data at the micro-level with statistical measures to track levels of segregation. They also examined the issue that arises when administrative boundaries of varying sizes are used to calculate segregation and how measured segregation shifts across spatial scales. This detailed spatial coding made it possible to aggregate the census data differently. They conclude that Montreal was strongly segregated along dimensions such as ethnicity and class, but that measured segregation declined as the unit of analysis increased in size. The main focus of these and similar studies, such as Shertzer et al. (2016), Logan and Bellman (2016), and Gilliland et al. (2011), is on ethnic and religious residential segregation, combined with class, a topic with a long research tradition in the U.S. (Cutler et al., 1999; Spear, 1967). One of the few historical studies devoted exclusively to class is Brea-Martinez et al. (2024), which examines socioeconomic segregation in the medium-sized Swedish industrial city of Landskrona from 1905 to 1967. Similar to our findings, they show that the upper class became increasingly segregated from the rest of the population, while other groups remained spatially integrated. We are the first, however, to study a large city over an extended period covering early industrialization and urbanization, prior to the advent of car society. In contrast to Brea-Martinez et al. (2024), we find that unskilled households in Stockholm were initially isolated but became more integrated over time.

Fourth, we relate to the literature on how transportation technology influences segregation (Seltzer and Wadsworth, 2024; Bardaka et al., 2018; Kahn, 2007). Hisam (2024) investigates streetcar expansion in Chicago between 1900 and 1920, finding that affluent individuals clustered near streetcar lines in districts far from the Central Business District. We show that it was not sprawling development itself that led to segregation, but rather the type of housing that was built. Most newly developed areas featuring single-family houses were relatively socioeconomically integrated; only neighborhoods specifically geared toward the upper class were socially isolated. This highlights the role of urban planning when investments in transportation technology make it possible to separate home from workplace. If suburban neighborhoods are designed appropriately, they need not become bastions of heightened socioeconomic isolation.

Fifth, we contribute to the literature on escaping disadvantaged neighborhoods (South and Crowder, 1997; Quillian, 1999; Sampson and Sharkey, 2008). This research has documented how selective out-migration from poor areas can reinforce spatial inequality, as households with more resources are better able to leave while those with fewer resources remain behind. South and Crowder (1997) show that in the United States, racial disparities are a central determinant of who escapes distressed neighborhoods, with Black Americans substantially less likely to leave even after controlling for socioeconomic status. Van Ham et al. (2014) find that in contemporary

Stockholm, the neighborhood children grew up in strongly predicts their neighborhood outcomes as adults. We extend this literature by examining selective migration in an early twentieth century context, finding that class rather than demographics determined who escaped disadvantaged blocks. Our results also highlight the role of the broader urban context: in districts with less concentrated poverty and more class diversity, families found it easier to leave disadvantaged blocks.

2 Data

The data used in this project are a combination of various population registers and censuses for the city of Stockholm. The earlier part of the data (1878–1925) comes from a population registry maintained by the city, known as the Roteman archive. The Roteman archive is a longitudinal population register that was instituted to facilitate the administration of expanding municipal services in a rapidly growing urban environment. In 1877, the city council established *Mantalsnämnden*, a population and tax board responsible for appointing registrars to oversee the 16 newly formed wards of the city (Geschwind and Fogelvik, 2000). The substantial population growth in Stockholm during the latter half of the nineteenth century overwhelmed the church’s traditional record-keeping methods, especially as intra-urban migration increased. Each ward registrar, called a *Roteman* in Swedish, documented demographic events within their ward, including births, deaths, and migrations. They also gathered data on occupations, civil status, and smallpox vaccinations. As the city developed, the ward structure expanded from 16 wards in 1878 to 36 by 1926, when the system was ultimately dissolved. Over two decades, the Stockholm City Archive digitized the Roteman archive, transforming more than 6.3 million records into a machine-readable format encompassing roughly 1.8 million individuals.

The 1950 Stockholm data come from the Swedish population census. This census was collected using a combination of household forms (asking, for example, about occupation) along with information drawn from contemporaneous parish and regional registers kept by the church and the local government. The census includes information similar to that in the Roteman archive but captures only a single point in time and does not provide the same longitudinal detail. We use the portion of the census that pertains to the municipality of Stockholm.

A main contribution of this study, and a key requirement for investigating socio-spatial segregation, is the geocoding of all available population data for Stockholm during this previously underexplored era. Geocoding historical spatial information is more challenging than geocoding contemporary data because of undocumented changes over time. A ”gold standard” address or property registry typically does not exist for historical data. Most common geocoding services (e.g., Google or Bing) rely on addresses and coordinates also found in national taxation registers, which generally makes those coordinates reliable only when the match is correct. For historical data, however, matching street names and house numbers in a modern geocoder may fail, since

(as in Stockholm) these can shift location over time as the city evolves. The geocoding process we use is described in greater detail in [Önnerfors \(2025\)](#).

The definition of which areas belong to Stockholm has changed over time, and identifying accurate boundaries is not always straightforward. Until 1912, the city was defined as the inner parishes of Norrmalm, Östermalm, Södermalm, and Kungsholmen. In 1913, the southern parish of Brännkyrka was added; in 1916, Bromma; and in 1949, Spånga ([Ström, 2005](#)). For the purposes of this study, 19 parishes were included in the final sample.² Overall, the deviation between the official population and the population that we are able to geocode is small, never more than 8 percent up or down.

Population counts for the included study population are shown in Table 1. For 1878–1925 (the Roteman archive period), the "Official population" column, used for comparison with our counts, comes from a Stockholm city analysis report ([Ström, 2005](#)). Because the Roteman archive was a continuous population register rather than an official census,³ its figures may differ from the official counts. It could, for instance, include temporary seasonal workers who might not appear in an official census. For 1950, the "Official population" column represents the total parish population of the 19 parishes included in this study. That year, the non-geocoded portion (about 7%) is a mixed group: some addresses were not successfully matched against either old (1925) or new (2023) registries, likely because they had been rebuilt in the intervening years. The 1940s in particular saw extensive building activity in the southern parts of Stockholm, which aligns with the fact that 27% of the 1950 non-geocoded population resided in the southern Brännkyrka and Enskede parishes.

²Adolf Fredrik, Bromma, Brännkyrka, Engelbrekt, Enskede, Gustav Vasa, Hedvig Eleonora, Högalid, Jakob, Johannes, Katarina, Klara, Kungsholm, Maria, Matteus, Nikolai, Oscar, Sankt Göran, and Sofia. Spånga parish was not included in the final sample due to administrative changes which made geocoding difficult (Spånga was prior to 1949 part of Spånga Landskommun, which was dissolved and absorbed by different municipalities. The 1950 census therefore has incorrect placenames on many addresses in Spånga, which resulted in a low geocoding percentage).

³The population counts from the Roteman archive used in this study are based on a mid-year count (that is, everyone present in the archive on the 1st of July each given year).

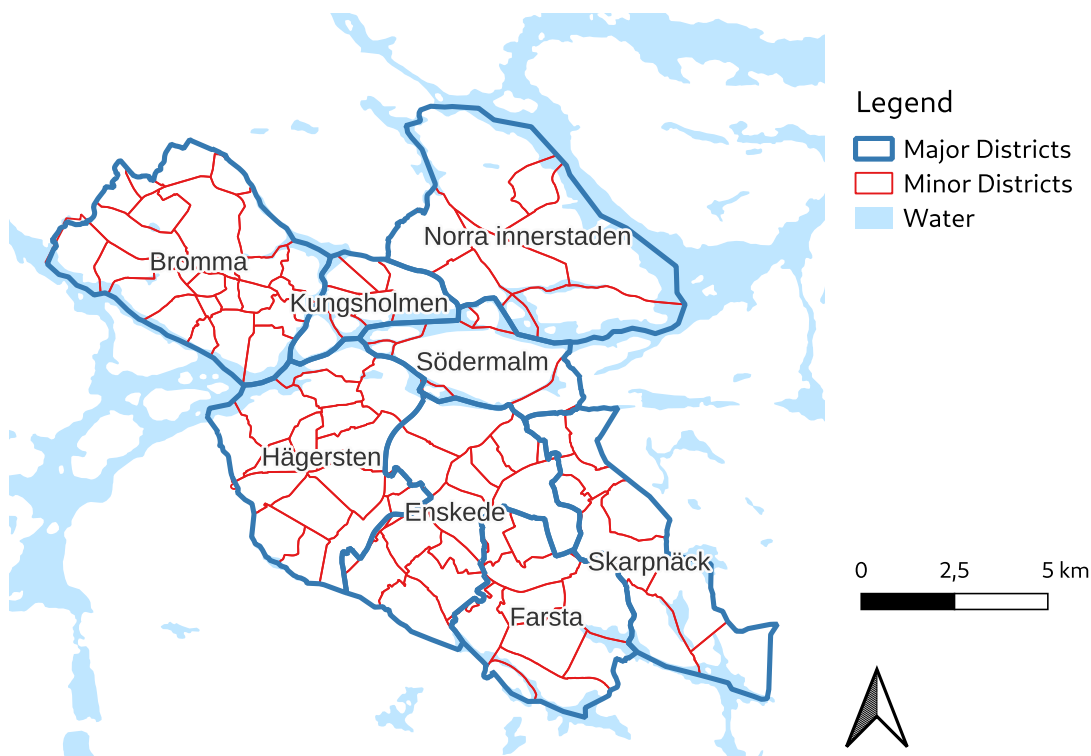
Table 1: Study population

Year	Individuals with geocode	Official population	Deviation (1)/(2)	No. of blocks
1878	174,395	161,722	1.08	692
1880	173,083	167,868	1.03	705
1885	209,931	211,138	0.99	777
1890	243,123	245,331	0.99	829
1895	263,863	267,100	0.99	841
1900	298,177	300,523	0.99	926
1905	322,961	324,488	1.00	948
1910	346,194	343,832	1.01	987
1915	389,120	392,427	0.99	1,274
1920	420,600	419,788	1.00	1,355
1925	423,945	442,528	0.96	1,585
1950	670,136	721,863	0.93	4,104

In this paper, we measure socioeconomic status (SES) using the HISCO/HISCLASS classification systems for occupational titles. These systems divide occupations into 12 classes, ranging from group 1 ("Higher managers") to group 12 ("Unskilled agricultural workers"). We use an aggregated version of the scheme that consolidates these into six classes: "1. Higher managers and professionals," "2. Lower managers and professionals," "3. Medium skilled workers," "4. Farmers," "5. Lower skilled workers," and "6. Unskilled workers." Because group 4, farmers, is not relevant to an urban environment like Stockholm, we effectively use five groups in our analysis. There is also a sizable subset of households lacking a HISCLASS designation, consisting primarily of widows, who could belong to any social stratum. In the analysis of multiclass segregation, we perform a sensitivity analysis including this group as a separate class. This does not change the conclusions.

In the analysis, we also make use of a modern division of Stockholm into districts (*stadsdelar*) from Stockholm Municipality. These districts align with common area distinctions used in government as well as in daily speech. The districts are shown in Figure 1. We assign blocks to districts based on their geographical location.

Figure 1: Map of city districts (major and minor)



Note: The map displays the boundaries of major districts (dark blue) and minor districts (red) within Stockholm municipality. Major districts labeled include Bromma, Kungsholmen, Norra innerstaden, Södermalm, Hägersten, Enskede, Skarpnäck, and Farsta. Water bodies are shown in light blue.

3 Measurement of Residential Segregation

Broadly, two main theoretical frameworks address residential segregation: constraint-based and preference-based models. Constraint-based models view segregation as a product of economic and institutional forces. A cornerstone of this approach is spatial assimilation theory, which originated in the early 20th-century Chicago School of Sociology. Building on [Park \(1915\)](#) and [Burgess \(1928\)](#), spatial assimilation theory posits that population groups adapt to the economic constraints imposed by labor and housing markets. Because these resources are unequally distributed across socioeconomic groups and neighborhoods, spatial segregation arises. If resources were more equitably allocated, economic assimilation would promote spatial assimilation and thus reduce segregation. [Massey and Denton \(1988\)](#) expanded on spatial assimilation theory within the U.S. context, observing that residential segregation often persists despite economic assimilation. Preference-based models, such as Schelling's tipping model, instead emphasize how individual or group preferences for neighbors can lead to significant spatial clustering, even when

economic barriers are less pronounced.

Measuring segregation is inherently complex. As [Johnston et al. \(2014\)](#) argue, no single index can capture the full variety of spatial processes that unfold over time. Early contributions by [Duncan and Duncan \(1955\)](#) introduced the index of dissimilarity, which dominated segregation measurement for decades. [Massey and Denton \(1988\)](#) later broadened this landscape by highlighting five dimensions of segregation: evenness, exposure, concentration, centralization, and clustering. Subsequent research, such as Logan and Parman’s work in economic history, underscores that reliance on large spatial units like census tracts may obscure block-to-block segregation ([Lichter et al., 2024](#)).

Leveraging the high level of detail in our Stockholm dataset, we measure segregation across multiple spatial scales using three complementary indices. First, we use the Theil H index, a multigroup measure of segregation that captures how unevenly different socioeconomic groups are distributed across spatial units. The index compares each group’s share of the population in a given block to its share in the overall city, thereby providing a single summary statistic for multigroup segregation. Second, following [Massey and Denton \(1988\)](#), we calculate an adjusted isolation index at the block-level to capture the probability that a member of a particular group encounters a member of the same group, adjusted for group size. This allows us to examine how the spatial isolation of each social class evolved over time. Third, we employ the Shannon diversity index at the district-level to gauge the overall socioeconomic mix within larger spatial units and track changes in this mix over time.

4 Context: Stockholm During Industrialization

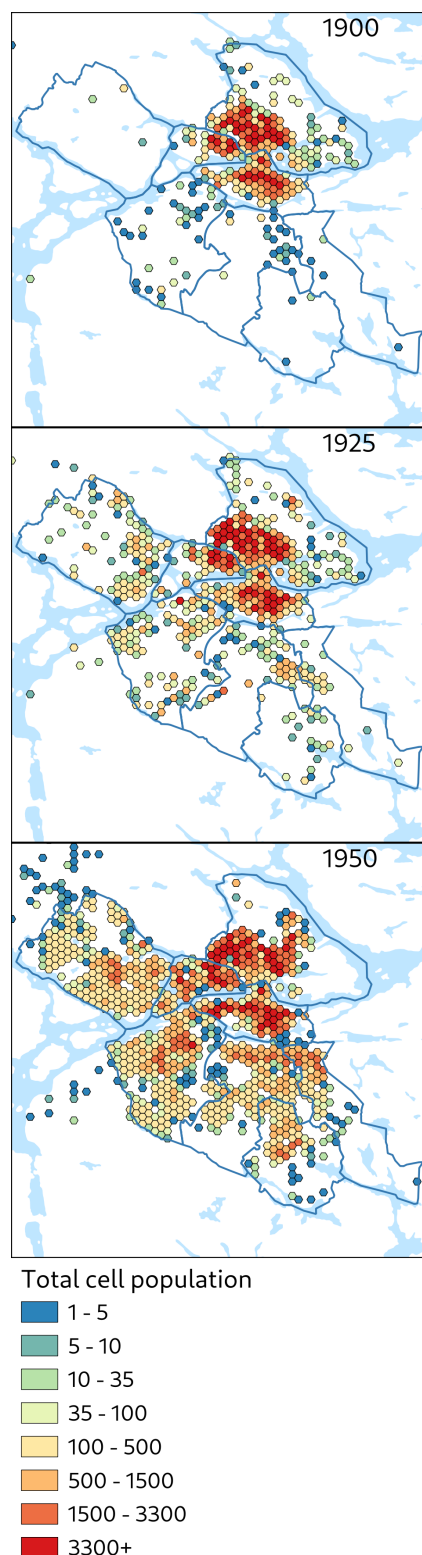


Figure 2: Map of Population Distribution, 1900, 1925, and 1950

Stockholm, the capital and largest city of Sweden, grew rapidly during the Great Power Era and the Thirty Years' War, partly due to its administrative importance. After a phase of relative decline in the late eighteenth and early nineteenth centuries, the city began expanding again from the 1850s onward (Söderberg et al., 2003). By the turn of the twentieth century, it was home to several major manufacturing firms, particularly in engineering, such as LM Ericsson and Separator. At the same time, it evolved into a hub for services, hosting government agencies and corporate headquarters (William-Olsson, 1937). As a consequence, the population rose from around 170,000 in 1880 to 420,000 by 1920, and further to about 750,000 by 1950, mainly through migration from other areas of Sweden.

This rapid population growth transformed the city's spatial structure. Figure 2 illustrates the population distribution in 1900, 1925, and 1950, with each dot representing a populated block and its size reflecting the number of households. In 1900, nearly all residents lived in one of the central districts of Gamla stan, Norrmalm, Kungsholmen, Östermalm, and Södermalm. By 1925, some suburbs had begun to form in the western and southern parts, though they remained sparsely populated. These new suburbs lay in the former independent municipalities of Brännkyrka and Bromma, which Stockholm incorporated in 1913 and 1916, respectively. By 1950, suburban development had intensified considerably.

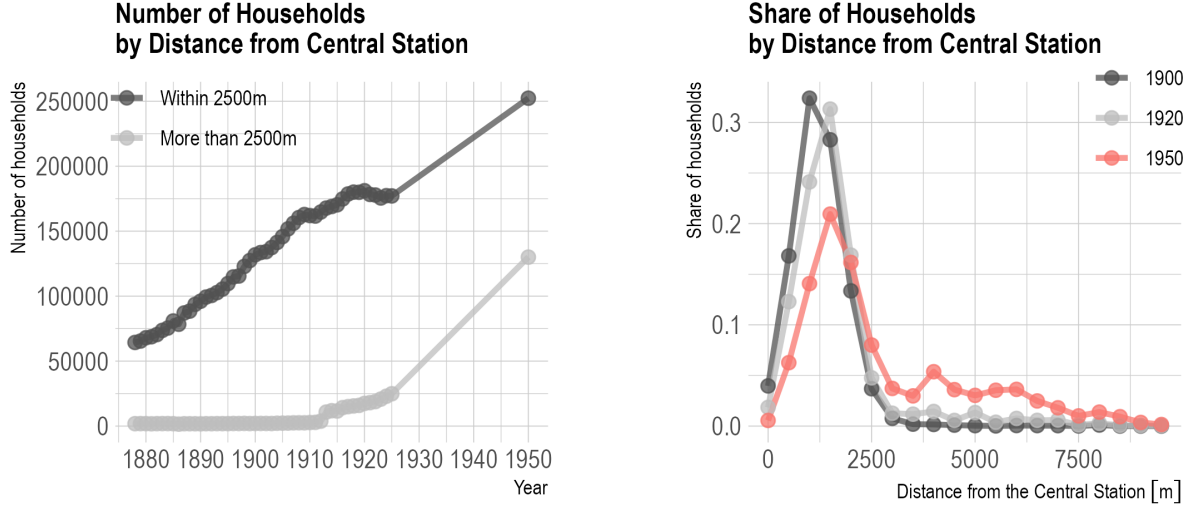
Figure 3 shows how this expansion took shape by illustrating the number of households located

at various distances from the central station. The left panel reveals that, until 1920, almost all new construction occurred within 2.5 kilometers of the station. Afterward, the growth of tram and light rail encouraged residential settlement farther out, and by 1950, 125,000 households lived in the new suburbs. The right panel demonstrates the magnitude of this shift: more than 95 percent of residents lived within 2.5 kilometers prior to 1920, but by 1950 that share had dropped to just under 60 percent, with the remaining 40 percent settling in outlying areas.

The development of public transportation was central to this suburban expansion. Stockholm's first tram line, drawn by horses, opened in 1877 and served central districts north of the Old Town before later expanding south. In 1901, electric trams were introduced, enabling longer routes and facilitating residential settlement in the periphery. A comprehensive metro system was commissioned in 1945, and the first stations opened in 1950, linking the southern suburbs to central Södermalm via the "Green Line" (Gullberg, 2001).

Urban planning evolved alongside these transportation developments. From the late nineteenth century until about 1930, planning was guided by the Lindhagen plan, which adhered to classical principles by laying out blocks in a grid pattern with broad boulevards. Around the early twentieth century, however, this strict grid approach gave way to more flexible planning that adapted to terrain (Hall, 1991). The new suburbs in the recently incorporated areas to the west and south were developed according to garden city principles (Rådberg, 1988). In the 1920s, the city launched a homeownership ("*Egnahem*") program, featuring house models designed by municipal officials. The municipality offered public land at below market prices and provided building materials, while future homeowners contributed their own labor to construction. Together, these measures made homeownership more affordable for a wider segment of the population (Stockholm stad, 1937). The 1930s saw the breakthrough of modernist urban planning in Sweden, with several areas constructed according to functionalist ideals. In the 1940s, the idea of community centers and the neighborhood unit came to the fore. Towards the end of the decade, the English New Town concept was adapted to local Swedish requirements and introduced as the "ABC community", with blocks or flats arranged around the center and single-family homes further out (Gullberg, 2001).

Figure 3: Population by Distance from Central Station



Note: The left panel displays the number of households residing within 2,500 meters of the Central Station (dark line) versus more than 2,500 meters away (gray line) from 1880 to 1950. The right panel shows the distribution of households by distance from the Central Station in meters for three benchmark years: 1900, 1920, and 1950.

Housing market conditions also changed substantially over this period. According to the index constructed by [Edvinsson et al. \(2021\)](#), house prices relative to GDP per capita stood at a peak around 1900 but began to decline around the time of World War I, and then again more continuously from the 1930s onwards. As part of a nationwide wartime policy, rents were frozen in 1942. This freeze remained in effect until 1968, when it was replaced by a negotiated system. As a result, while rents were generally determined by the market for most of the period under study, they were still fixed at their January 1, 1942, levels in 1950. Following the freeze, most newly constructed rental apartments were municipally owned and received state subsidies. Co-operative apartments also became increasingly common and were sold on the open market, as were single-family homes in the new suburbs. Rental rates for newly built or vacant properties were determined by local "rent committees" rather than landlords, although landlords were allowed to raise rents to cover maintenance costs or renovations ([Gullberg, 2001](#)). The fast growth of the population still exerted pressure on the housing market, especially in the early postwar period, and because of the rent freeze, prices might not reflect the availability of housing. This is reflected in the fact that prices for apartment buildings fell in real terms while prices for small houses remained stable ([Söderberg et al., 2014](#); [Roine and Waldenström, 2009](#)). There are also

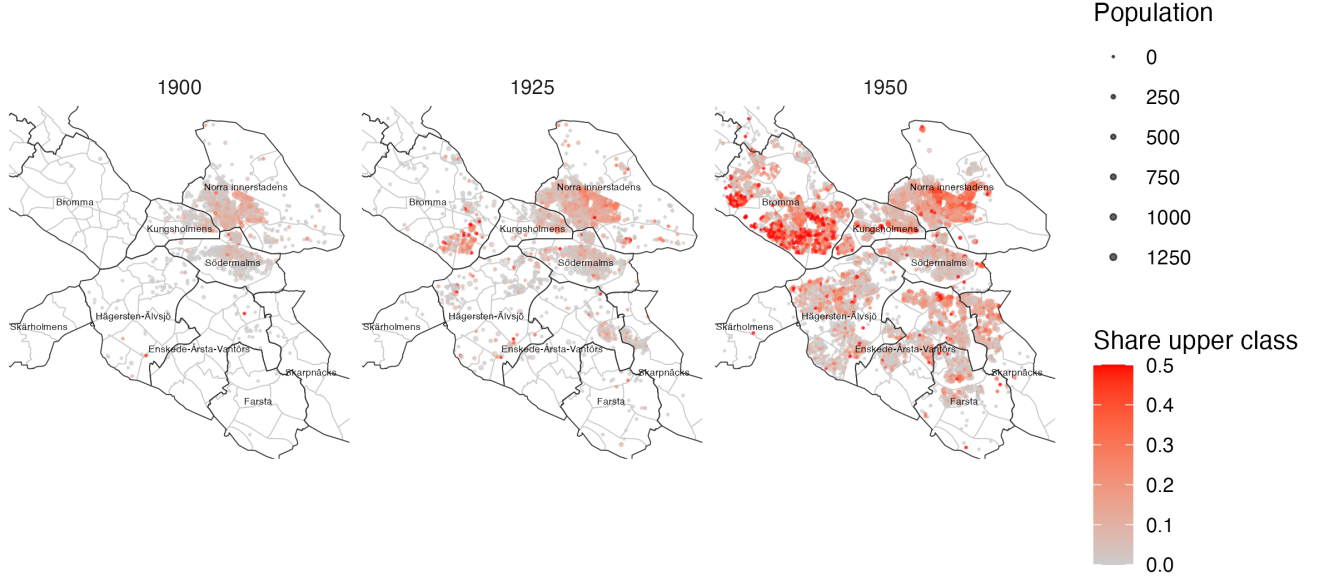
examples of the city government putting out posters warning people not to move to the city before having secured an apartment.

These housing market developments occurred alongside a dramatic compression of incomes. In the early twentieth century, Stockholm displayed marked income inequality: the top 10 percent of earners accounted for more than 60 percent of total income. However, this share declined significantly after 1920, falling to just above 30 percent by 1950 (Bengtsson and Molinder, 2024). The income advantage of the economic elite, consisting primarily of CEOs, merchants, and professionals such as doctors, lawyers, and professors, waned considerably over time (Bengtsson and Molinder, 2021). Figure 17 in the Appendix presents the mean relative income of the five classes used in our segregation analysis, illustrating this sharp drop in relative incomes among the elite. Together, the expansion of affordable housing in the suburbs, falling house prices, and declining income inequality meant that the constraints on residential choice facing lower-class households loosened considerably over the period.

5 Where did the Rich and Poor Live?

We begin our analysis by mapping the spatial distribution of the highest and lowest socioeconomic groups of households for three benchmark years: 1900, 1925, and 1950. Figure 4 shows the share of households headed by higher managers and professionals. In 1900, there are only a few noticeable clusters for this group, although they do appear somewhat concentrated in the Östermalm area to the east within the central city. By 1925, Östermalm had become a more pronounced area of concentration, and the early suburbs in Bromma to the west were already revealing a strong elite presence. By 1950, this pattern had intensified: Bromma's suburbs were heavily dominated by the upper class, and Östermalm, along with the adjacent Ladugärdet area, had also become more exclusively upper class. There were a few scattered neighborhoods in the south that also showed a higher share of elite households.

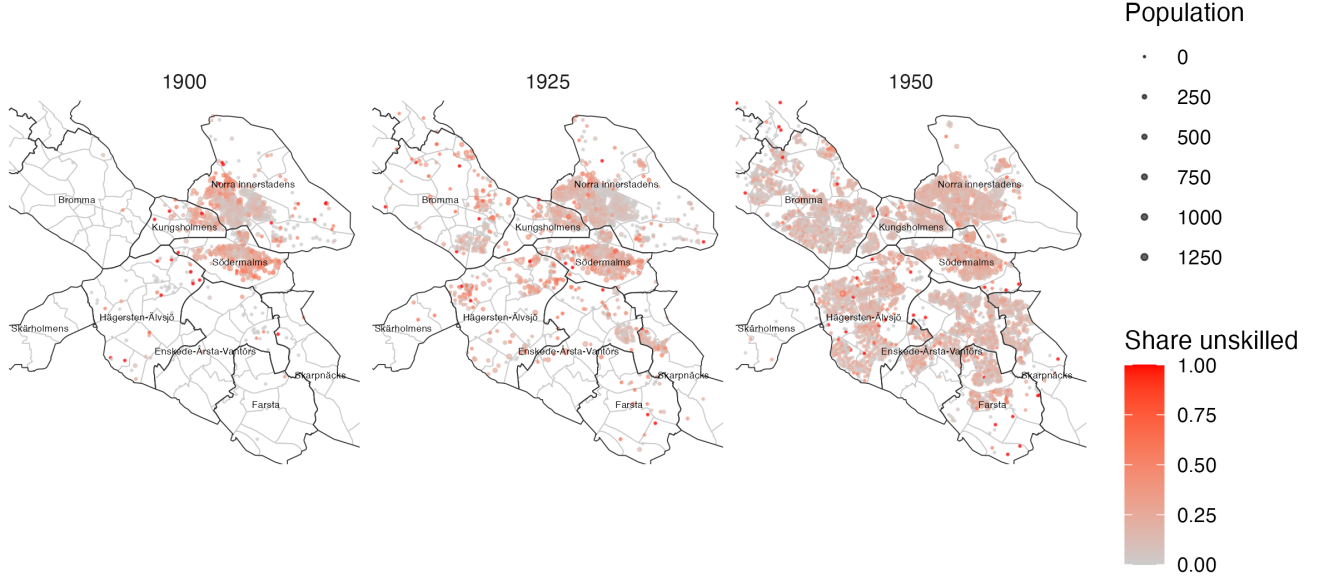
Figure 4: Share of Higher Professionals and Manager Household Heads By Block



Note: Each dot represents a block, with dot size proportional to the number of households. Color intensity indicates the share of households headed by higher managers and professionals, ranging from light (low share) to dark red (high share, up to 0.5).

The corresponding map for unskilled households, presented in Figure 5, does not show the same level of spatial clustering in the later period. In 1900, there were some concentrations on Södermalm, often regarded as the city's main working-class district, and on the outskirts of the Kungsholmen and Vasastan areas, which were still undergoing development at the time. Södermalm and Kungsholmen, in particular, were home to numerous industrial employers. By 1925, it is difficult to identify any strong concentrations, whether in the central city or in the suburbs, a pattern that became even more pronounced by 1950. Thus, unskilled households followed a path of decreasing spatial isolation, in stark contrast to the elite. The same maps for the three intermediate classes are available in the appendix.

Figure 5: Share of Unskilled Household Heads By Block



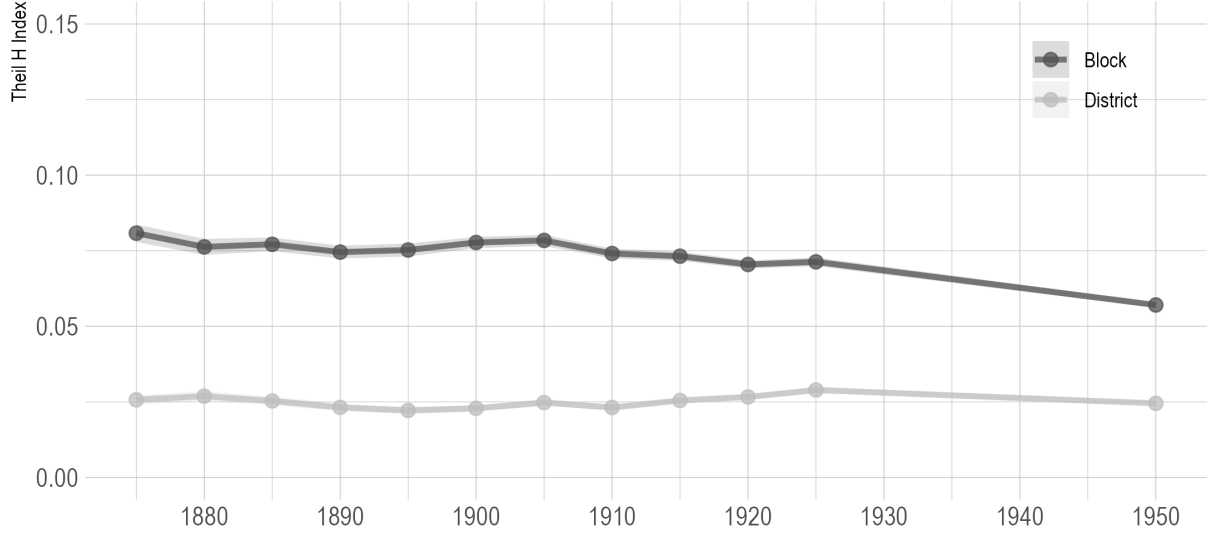
Note: Each dot represents a block, with dot size proportional to the number of households. Color intensity indicates the share of households headed by unskilled workers, ranging from light (low share) to dark red (high share, up to 1.0).

6 The Evolution of Segregation

To examine patterns of segregation more formally, we analyze time trends using indices. Figure 6 displays the Theil H index of residential segregation, calculated at both the block and city-district-levels for our five social classes. The Theil index ranges between 0 and 1, with higher values indicating greater segregation.

Several observations can be made. First, as expected, segregation is higher at the block-level than at the district-level. Nevertheless, even block-level segregation remains low overall, never exceeding 0.1. It also shows a downward trend over time, particularly marked in the late nineteenth century and again between 1925 and 1950, finishing at just 0.05. District-level segregation remained stable at very low levels throughout. These values can be compared to the average Theil H index for whites, Blacks, Hispanics, and Asians across U.S. metropolitan areas in 1990, which stood at approximately 0.3 (Elbers, 2021).

Figure 6: Multiclass Segregation

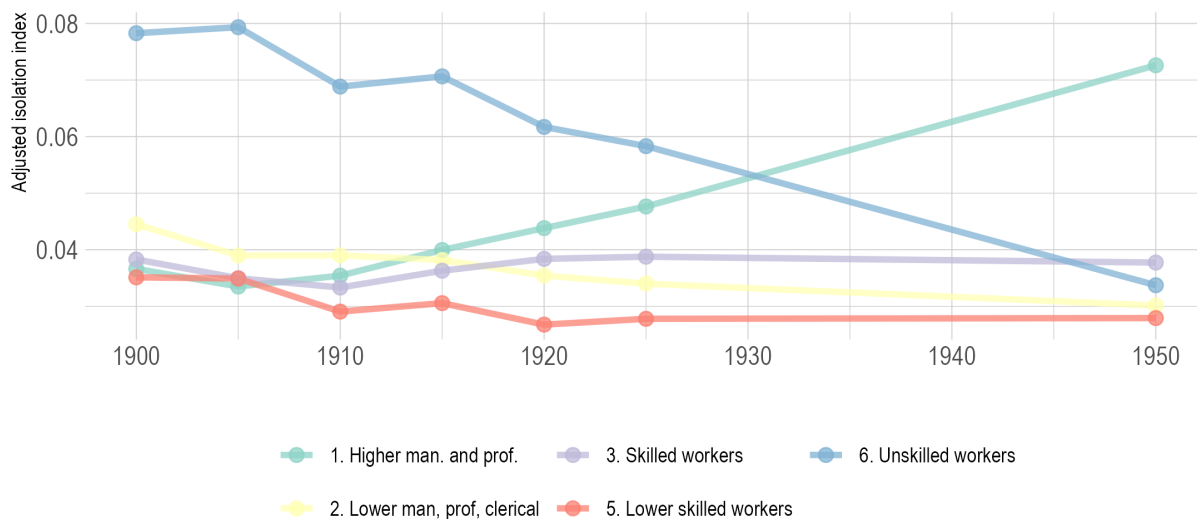


Note: This figure shows the five-year average of Theil H Index of residential segregation based on block or district as the observational unit and the five HISCLASS categories as population groups. 95% bootstrap standard errors based on 100 iterations are shown.

Although the maps suggest a divergent pattern for the classes at the end of the spectrum, with higher managers and professionals appearing more clustered over time and unskilled households more evenly dispersed, the aggregate trend indicates falling block-level segregation and stable, very low district-level segregation.

To dissect these trends more thoroughly, Figure 7 presents the adjusted isolation index for each of the five classes. Up to the 1920s, unskilled households were the most isolated, with an index value of roughly 0.08. This figure remained steady until about 1915, when it began to decline significantly; by 1950, it had converged with the levels of lower-skilled and medium-skilled workers. Over the same period, higher managers and professionals experienced a rapid increase in their isolation and eventually surpassed unskilled households as the most segregated group, climbing from below 0.04 to about 0.07. Meanwhile, lower-skilled and skilled worker households consistently showed very low and stable levels of isolation. The group of lower managers, professionals, and clerical workers, which initially had higher isolation than the top group, saw a decline to the same low level as the lower-skilled and skilled groups by the 1910s.

Figure 7: Adjusted Isolation Index



Note: The figure displays the adjusted isolation index for each of the five HISCLASS categories from 1900 to 1950, calculated at the block-level. The adjusted isolation index measures the degree to which members of a group are exposed to other members of the same group, adjusted for group size. Higher values indicate greater spatial isolation from other groups.

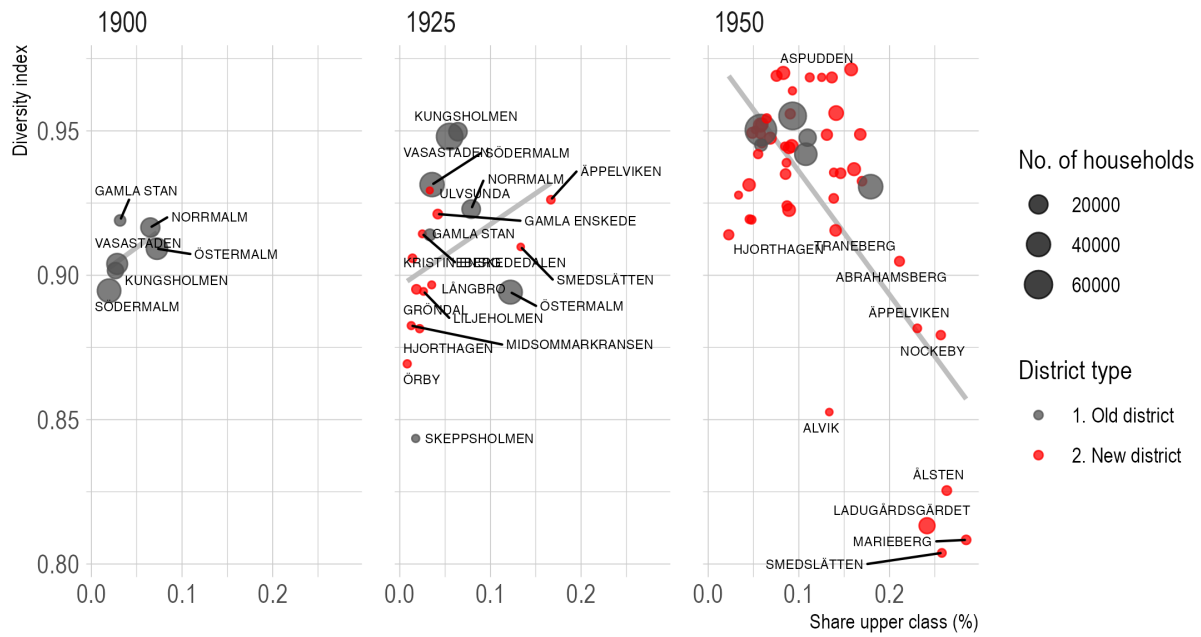
Figure 8 provides another perspective on this process, plotting each district's share of higher managers and professionals (the "elite share") against the Shannon diversity index for the mixing of the five classes. The figure covers 1900, 1925, and 1950, excluding any district with fewer than 1,000 households. We distinguish between the original central districts and the newer suburban districts.

In 1900, when almost the entire population lived in the central districts, the areas with a higher share of elite households, particularly Normalm and Östermalm, actually tended to have higher class diversity. This pattern remained visible in 1925, even as some suburban districts began to develop. Among the central districts, Södermalm, Kungsholmen, and Vasastaden, which were largely working class, became more diverse over time (moving toward the upper-left corner in the figure), while Östermalm became less diverse.

Among the newly formed suburban districts, most had very few elite households but showed varying degrees of class diversity. For instance, Hjorthagen and Örby were dominated by working-class households, whereas Gamla Enskede exhibited a diverse class mix. By 1950, however, a clear negative relationship had emerged between the elite share and overall diversity: several

areas had an elite share in excess of 20 percent and displayed very low diversity. This consisted predominantly of western suburban neighborhoods in Bromma, as well as Ladugårdsgärdet just northeast of Östermalm. By contrast, most of the newer districts with a low elite share saw increases in diversity between 1925 and 1950, moving upwards in the graph.

Figure 8: Composition of Stockholm Districts, 1900, 1925, and 1950



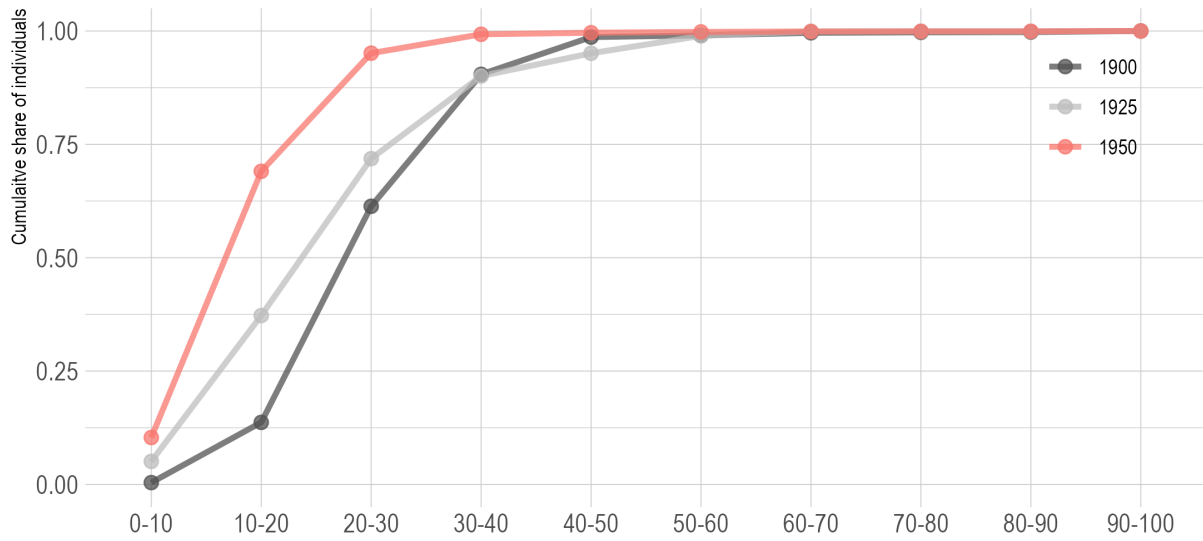
Note: Each point represents a district, with size proportional to the number of households. The x-axis shows the share of households headed by higher managers and professionals. The y-axis shows the Shannon diversity index measuring the mix of the five social classes. Gray points indicate old central districts; red points indicate new suburban districts. Districts with fewer than 1,000 households are excluded.

7 The Impact on Neighborhood Context

How did the two-pronged trajectory of segregation outlined above affect the neighborhood context of children? In this section, we focus on school-aged children (ages 7–14) from households with an unskilled household head, since they are most likely to experience the negative effects of living in a disadvantaged neighborhood with many other unskilled households.

As a first attempt to examine this question, Figure 9 plots the cumulative share of school-aged children from unskilled households who lived in blocks with various proportions of other unskilled households, shown separately for 1900, 1925, and 1950. In 1900, the cumulative curve indicates that only about 60 percent of these children lived in a block where fewer than 30 percent of residents were from unskilled households. By 1950, however, this had increased to more than 90 percent, suggesting a clear fall in the exposure to neighborhood disadvantage.

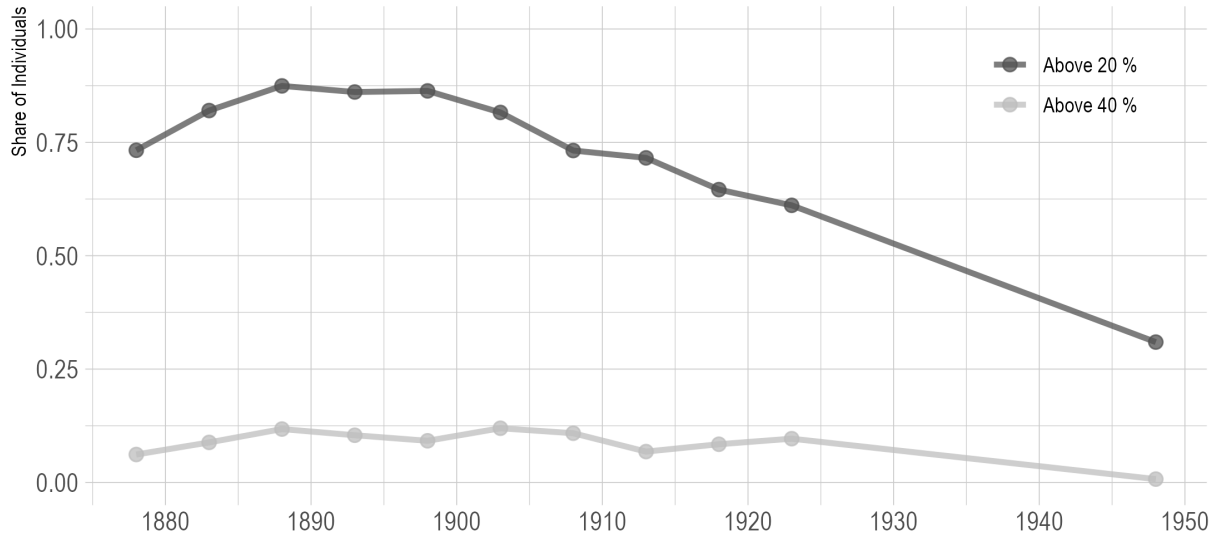
Figure 9: Cumulative share of individuals aged 7–14 in unskilled households exposed to other unskilled households in the block



Note: The x-axis shows bins of block-level unskilled household shares (in percent). The y-axis shows the cumulative share of children aged 7–14 from unskilled households living in blocks up to that threshold. Lines are shown separately for 1900, 1925, and 1950.

Figure 10 shows the trend over time by plotting the share of school-aged children from unskilled households who were exposed to blocks with more than 40 percent and more than 20 percent unskilled households, respectively. The time trend confirms the results from Figure 9, revealing a decline in the share of children living in blocks with high concentrations of unskilled households. Specifically, the proportion living in a block with at least 20 percent unskilled households fell from over 80 percent around 1900 to under 40 percent by 1950. The share in blocks with more than 40 percent unskilled households, which stood at around 15 percent in the early period, dropped to almost zero by 1950.

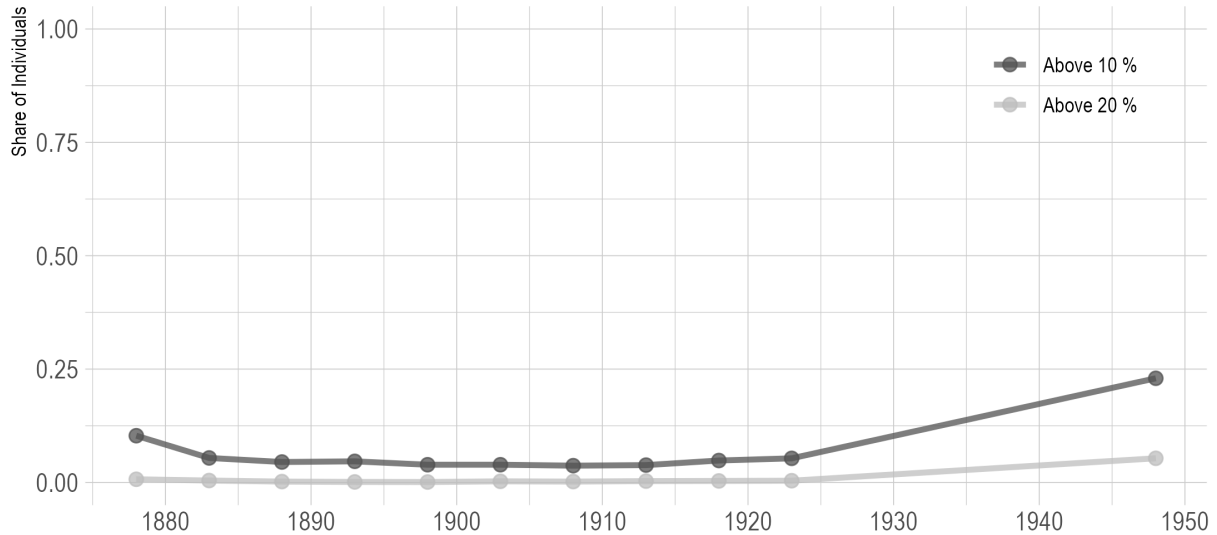
Figure 10: Share of individuals aged 7–14 in unskilled households exposed to other unskilled households in the block



Note: The figure shows the share of children aged 7–14 from unskilled households who lived in blocks where more than 20 percent (dark line) or more than 40 percent (gray line) of households were headed by unskilled workers, from 1878 to 1950.

Figure 11 reverses the perspective, examining instead the exposure of children in unskilled households to households of higher managers and professionals. The exposure to higher class households was found by [Hedefalk and Dribe \(2020\)](#) to have the strongest impact on children’s future educational attainment. Interestingly, despite the increased segregation of elite households from the rest of the population, the drastically decreased isolation of unskilled households meant that, by 1950, these children were actually more likely to live in a block with at least 10 percent of higher manager or professional households compared to earlier years.

Figure 11: Share of individuals aged 7–14 in unskilled households exposed to higher manager and professional households in the block



Note: The figure shows the share of children aged 7–14 from unskilled households who lived in blocks where more than 10 percent (dark line) or more than 20 percent (gray line) of households were headed by higher managers and professionals, from 1878 to 1950.

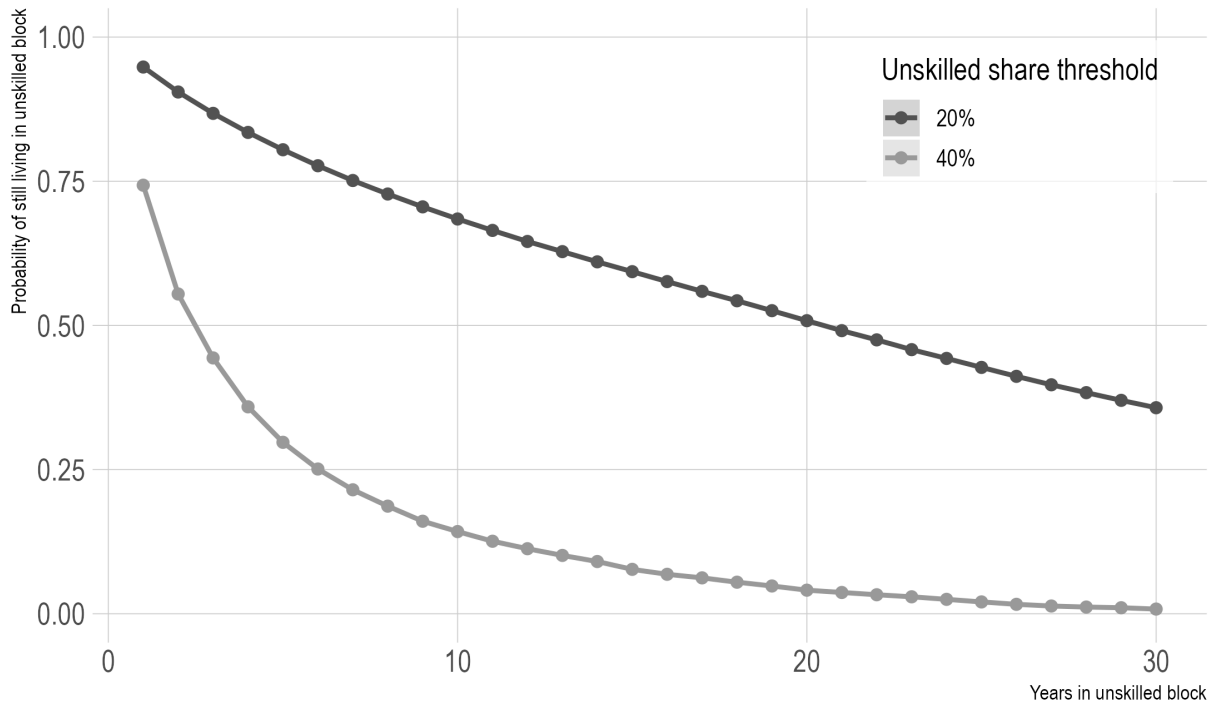
8 Who Escaped a Disadvantaged Neighborhood?

A final way to assess the exposure of children from unskilled households to neighborhood disadvantage is to examine how common it was to remain in such areas for a long time. If neighborhood disadvantage is only temporary, it is of less concern. It is also an indication of the extent of residential fluidity, marking whether lower status households had access to more advantaged areas of the city.

The panel aspect of the data for 1878–1925 allows us to track individuals over time and observe persistence in particular locations. The basic pattern is shown in Figure 12, which plots survival curves for individuals with an unskilled household head who, at some point, lived in a block where at least 40 percent or at least 20 percent of households were unskilled, respectively. Among those in blocks with 40 percent or more unskilled households, very few (only about 25 percent) still lived there after five years, and even fewer remained after ten years. Nevertheless, a notable subset continued living in such disadvantaged contexts for as long as 20 years. Comparing this to the survival graph for 20 percent or more unskilled households clearly suggests that individuals

in areas with many underprivileged households tended to seek opportunities to move elsewhere, and most also managed to leave, although it sometimes took quite some time.

Figure 12: Survival curves showing the probability of remaining in a block with varying unskilled household shares



Note: Kaplan-Meier survival curves showing the probability of remaining in a block where at least 20 percent (dark line) or at least 40 percent (gray line) of households were headed by unskilled workers, by years since first observation in such a block. The sample consists of individuals from unskilled households observed in the Roteman archive (1878–1925). Tick marks indicate censored observations.

Despite the overall decline in exposure to other unskilled households, and despite the fact that most individuals did not remain long in a disadvantaged neighborhood, a subset of children stayed in these areas for extended periods. Understanding who managed to escape and who remained is important for assessing whether selective mobility served to reinforce or attenuate spatial disadvantage. Research on contemporary cities has shown that households with more resources disproportionately leave low-income neighborhoods, creating a pattern of selective migration that reproduces concentrated poverty (Andersson and Bråmă, 2004; Andersson, 2013). Van Ham et al. (2014) find that in modern Stockholm, the socioeconomic composition of the neighborhood children lived in before leaving the parental home strongly predicts their neighborhood outcomes

as adults, with those from poorer areas spending more time in disadvantaged neighborhoods later in life.

To examine whether similar dynamics operated in early twentieth century Stockholm, we estimate a Cox proportional hazard model analyzing the duration until children left a disadvantaged block. Since exposure to blocks with 40 percent or more unskilled households was rare throughout the period, we focus on children living in blocks where at least 20 percent of households were headed by unskilled workers. We include children from all social classes to examine whether the probability of leaving varied by the household head’s occupation. In addition, we test whether demographic characteristics of families, including gender, age, and marital status of the household head, as well as the number of children, affected mobility out of these areas.

Descriptive statistics for the sample are presented in Table 2. The sample comprises over 51,000 children aged 7 to 14 who at some point resided in a block meeting our threshold. More than half eventually left such a block during the observation period, while the remainder were censored. The median duration in a disadvantaged block was 5 years, though with substantial variation. The sample is broadly distributed across social classes, with foremen and skilled workers (26 percent) and unskilled workers (21 percent) representing the largest shares.

Figure 13 presents the results graphically, with full regression output available in Table 3 in Appendix B. A hazard ratio below one indicates a lower probability of leaving compared to the reference group (higher managers and professionals), while a ratio above one indicates a higher probability.

Table 2: Descriptive Statistics: Sample Characteristics

Variable	N / Mean	% / SD
<i>Panel A: Sample Overview</i>		
Total observations	51,353	
Exits from disadvantaged block	28,936	56.3%
Right-censored (no exit observed)	22,417	43.7%
<i>Panel B: Duration (years)</i>		
Mean duration	8.01	(8.58)
Median duration	5	
Median duration (exiters)	5	
Median duration (stayers)	5	
Range	1–48	
<i>Panel C: Demographic Characteristics</i>		
Age at entry (years)	10.26	(2.02)
Female household head	8,339	16.2%
Married household head	37,950	73.9%
Number of children in household	739.4	(2077.84)
Household head age (years)	42.4	(9.35)
<i>Panel D: Household Head Class</i>		
Higher managers/professionals	7,663	14.9%
Lower managers/professionals	10,423	20.3%
Foremen/skilled workers	13,318	25.9%
Lower skilled workers	6,011	11.7%
Unskilled workers	10,756	20.9%
No occupation	2,786	5.4%
<i>Panel E: Entry Cohort</i>		
1870s	10,996	21.4%
1880s	12,299	23.9%
1890s	7,514	14.6%
1900s	7,214	14%
1910s	9,366	18.2%
1920s	3,964	7.7%

Notes: Sample consists of children aged 7–14 at entry to a disadvantaged block (20% unskilled households). Standard deviations in parentheses.

Figure 13: Results from Cox Proportional Hazard Model on the Probability of Leaving an Area with more than 20 Percent Unskilled Households



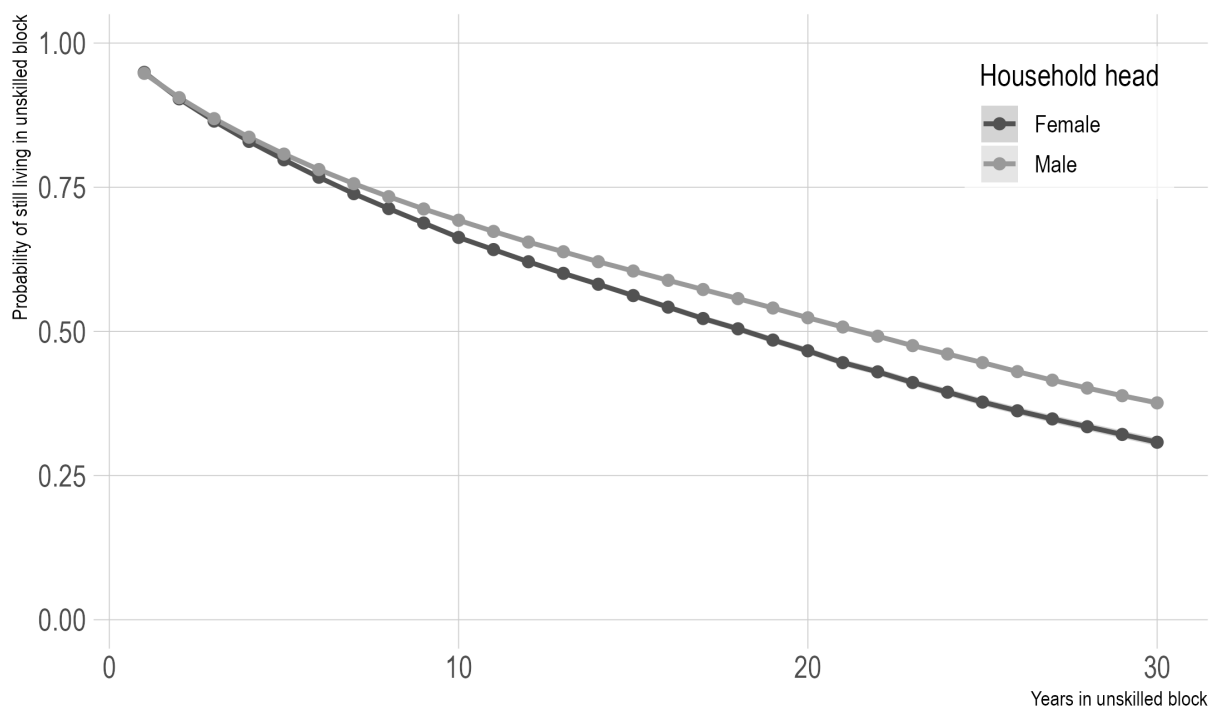
Note: Hazard ratios from a Cox proportional hazard model (Model 1) estimating the probability of leaving a block where more than 20 percent of households were headed by unskilled workers. The reference category for social class is higher managers and professionals. Horizontal lines show 95 percent confidence intervals. A hazard ratio below 1 indicates a lower probability of leaving compared to the reference group; a ratio above 1 indicates a higher probability.

The results reveal a striking contrast between demographic and class-based predictors. Demographic factors, including the number of children, marital status, and age of the household head, show no meaningful association with the probability of leaving. There is a small positive effect on leaving of having a female household head, but Figure 14 shows that the difference in survival curves is small. This finding echoes Sampson and Sharkey (2008), who demonstrate that in Chicago, demographic factors account for only a small share of variation in neighborhood trajectories, with racial sorting instead playing the dominant role.

In contrast to demographics, the household head's social class strongly predicts the likelihood of escape. Children in unskilled worker households faced only half the probability of leaving compared to those from elite households. Lower skilled workers, skilled workers, and those with no recorded occupation fared somewhat better than the unskilled, but still showed hazard ratios roughly 30 percent below the elite. Only children from lower manager and professional households approached the mobility rates of the highest class. Figure 15 illustrates these class

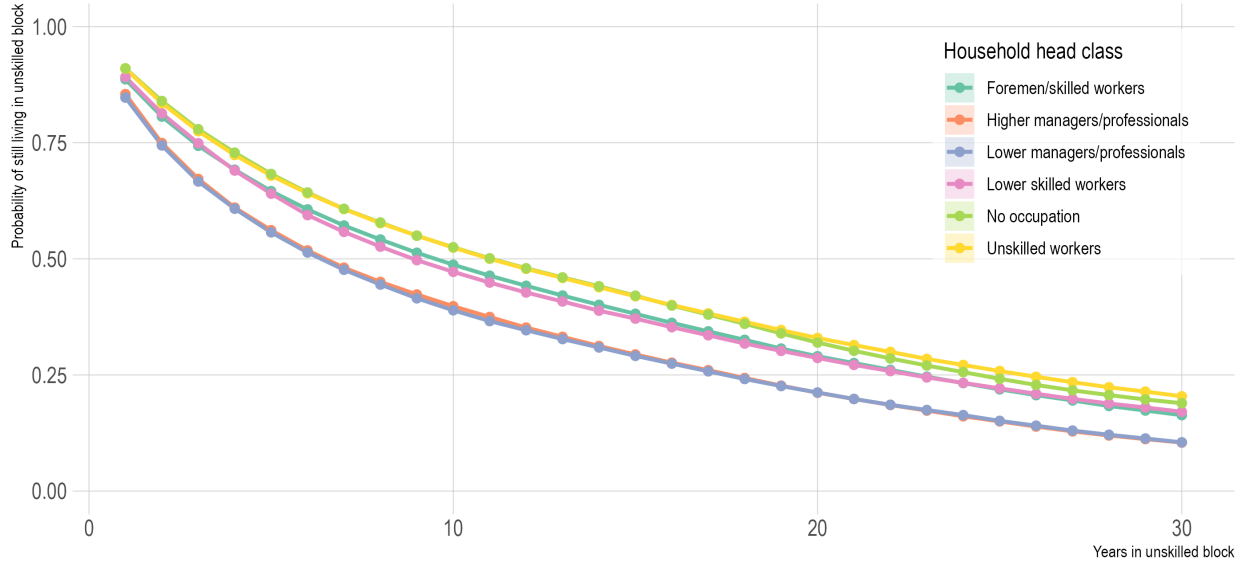
gradients: after 10 years, fewer than 30 percent of children from elite households remained in a disadvantaged block, compared to more than half of those from unskilled households.

Figure 14: Survival Curves by Gender of Household Head



Note: Kaplan-Meier survival curves showing the probability of remaining in a block where at least 20 percent of households were headed by unskilled workers, by years since first observation in such a block. Curves shown separately for children in households with a female versus male household head.

Figure 15: Survival Curves by Social Class of Household Head



Note: Kaplan-Meier survival curves showing the probability of remaining in a block where at least 20 percent of households were headed by unskilled workers, by years since first observation in such a block. Curves shown separately for each household head social class category.

These mobility patterns suggest that selective migration served to reinforce the spatial concentration of disadvantage, as lower-class families were more likely to remain while those with greater resources left. In this sense, early twentieth century Stockholm exhibited dynamics similar to those documented in contemporary settings (Andersson and BråmÅ, 2004; Quillian, 1999). The absence of demographic effects also implies that single mothers, for instance, were not especially susceptible to prolonged residence in disadvantaged areas, a finding that may reflect the particular social context of the period.

American research on neighborhood mobility has emphasized racial disparities as a central determinant of who escapes poor neighborhoods (South and Crowder, 1997; Quillian, 1999). South and Crowder (1997) show that Black Americans are substantially less likely than whites to leave distressed areas, even after controlling for socioeconomic status and demographic characteristics. In early twentieth century Stockholm, however, racial and ethnic heterogeneity was minimal, rendering this dimension largely irrelevant. Instead, class emerged as the primary axis of stratification in residential mobility.

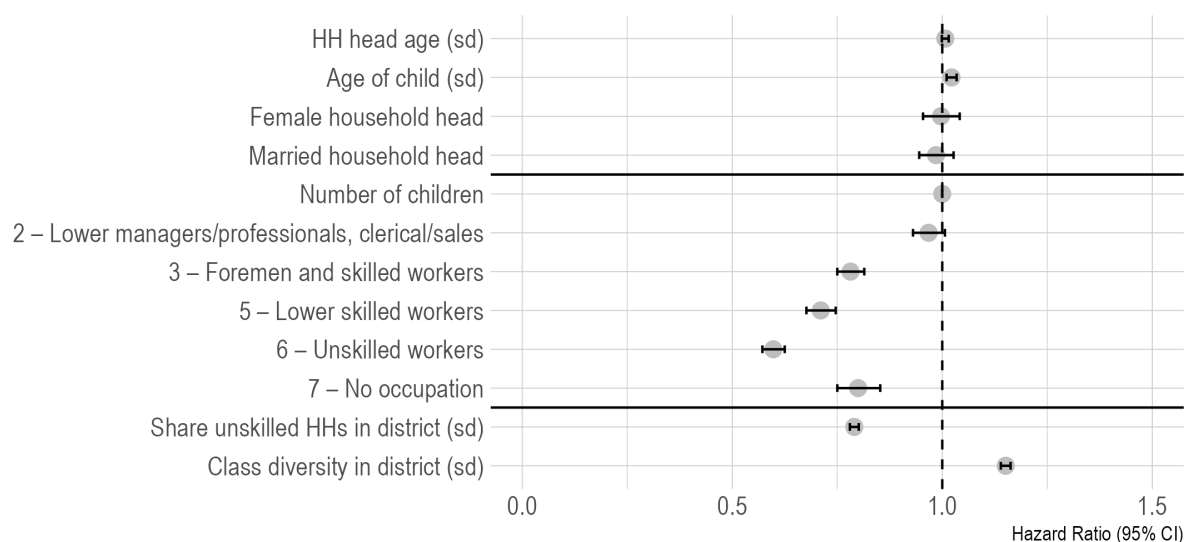
Two other theoretical perspectives from South and Crowder (1997) prove more applicable to

our setting. The human capital model posits that families seek the most desirable neighborhood available given their financial constraints, with mobility decisions shaped by needs associated with their position in the life course. Our finding that class strongly predicts escape while demographics do not suggests that economic resources were indeed the binding constraint, but that family structure per se did not systematically disadvantage certain household types.

The housing availability model offers additional insight. [South and Crowder \(1997\)](#) argue that characteristics of the broader metropolitan area, particularly the supply of housing in nondistressed areas and the degree of residential integration by poverty status, shape the likelihood of escaping disadvantaged neighborhoods. Where nonpoor areas are more accessible and less segregated, residents of poor neighborhoods face lower barriers to exit. [Nieuwenhuis et al. \(2020\)](#) similarly emphasize that the broader segregation and inequality context conditions spatial mobility, finding that in highly segregated cities, opportunities to move to better neighborhoods are more constrained.

To test whether neighborhood context mattered in Stockholm, we extend the baseline model by adding two variables measured at the district-level: the share of unskilled households in the district and the class diversity of the district (both standardized). [Figure 16](#) presents the results. Both variables significantly predict the probability of leaving, but in opposite directions. A higher concentration of unskilled households in the surrounding district reduces the likelihood of escape, while greater class diversity increases it. These findings align with the housing availability model: in districts with less concentrated poverty and more social mixing, families could remain in the same broader area, near workplaces, schools, and social networks, while still finding opportunities to move to a better block.

Figure 16: Extended Cox Model: Adding District-Level Characteristics



Note: Hazard ratios from an extended Cox proportional hazard model (Model 2) estimating the probability of leaving a block where more than 20 percent of households were headed by unskilled workers. This model adds two variables measured at the district-level to the baseline specification: the share of unskilled households in the district and the class diversity of the district (both standardized). The reference category for social class is higher managers and professionals. Horizontal lines show 95 percent confidence intervals. Full regression results for both models are presented in Table 3.

These results must be interpreted in light of the low level of segregation at the district-level in Stockholm during this period. As shown in Figure 6, segregation measured at the district-level remained minimal throughout. This means that even when children grew up in blocks with a concentration of lower-class families, the surrounding areas typically contained a more diverse social mix. Few families were subjected to the kind of large scale poverty concentration that characterizes many contemporary urban settings.

The limited extent of segregation at the district-level also has implications for how neighborhood effects might have operated. Environmental mechanisms, such as differential exposure to pollution or proximity to industrial hazards, are unlikely to vary substantially at the block-level alone. Similarly, institutional factors like schooling would have promoted social mixing: school catchment areas encompassed many blocks, so children from disadvantaged blocks would have attended school alongside peers from more diverse backgrounds. The concentration of disadvantage at the micro-level, combined with integration at the district-level, suggests that the most

harmful neighborhood effects may have been attenuated in early twentieth century Stockholm.

9 Conclusions

This paper uses newly geocoded historical census data to examine the evolution of residential segregation in Stockholm from 1878 to 1950. We document four main findings.

First, suburbanization from the 1920s onward heightened the spatial separation of the upper class, as trams and light rail enabled the elite to establish exclusive villa neighborhoods in the western suburbs. However, unskilled households experienced reduced spatial isolation over time, with newly developed suburban areas characterized by considerable social mixing rather than class homogeneity.

Second, children from unskilled households benefited from improving neighborhood conditions. The share living in blocks with high concentrations of other unskilled families declined dramatically, and by 1950 such children were more likely to have neighbors from the highest social class, even as the elite became more segregated overall. This demonstrates that the segregation of the upper strata can be a distinct process from the development of neighborhood composition among the rest of the population.

Third, our results challenge the assumed link between segregation and income inequality. The income advantage of the elite fell from seven times the average to just three times, yet elite isolation increased. This suggests the relationship may not be strictly causal.

Fourth, selective migration reinforced the spatial concentration of poverty. Children from unskilled households faced only half the probability of leaving a disadvantaged block compared to those from elite households, while demographic factors played no meaningful role. Districts with less concentrated poverty and more class diversity facilitated escape.

These findings carry implications for understanding urban development. Transportation infrastructure and housing choices drove segregation patterns, but the consequences depended critically on the type of housing built. Most newly developed suburban areas were relatively integrated; only neighborhoods specifically designed for the upper class became socially isolated. The limited extent of segregation at the district-level also suggests that the most harmful neighborhood effects may have been attenuated in early twentieth century Stockholm. The upper class enclaves established during this period remain among the most exclusive neighborhoods in Stockholm today, highlighting both the persistence of spatial inequality and the potential for planning choices to shape long run outcomes.

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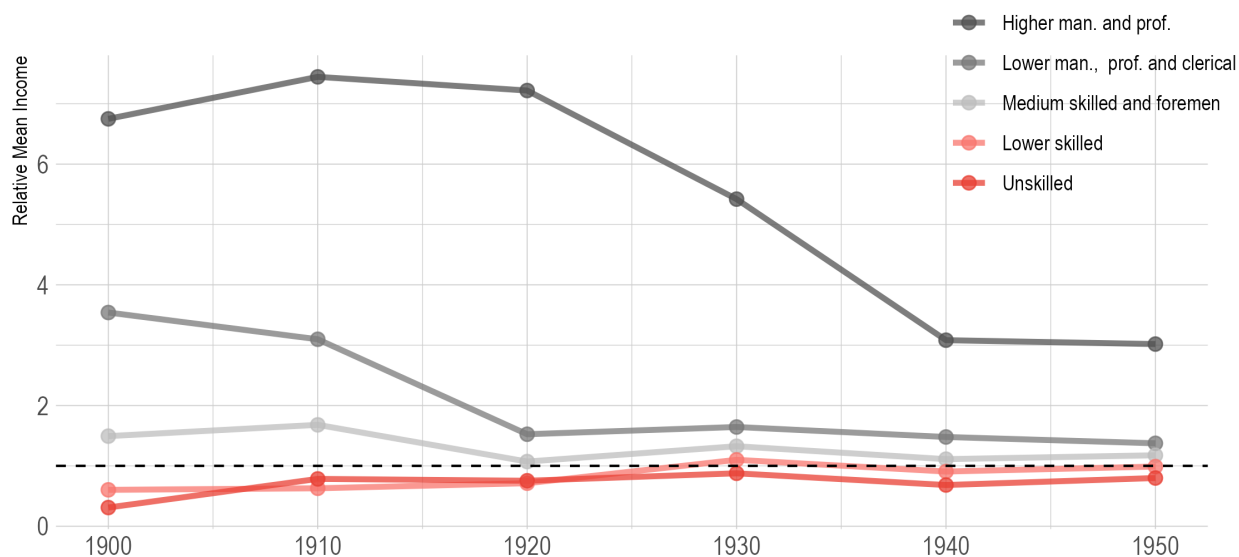
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A Additional Figures

In this appendix, we provide some additional figures. Figure 17 shows the evolution of relative income for the five classes that we use in the analysis. It shows that up until 1920, the income advantage of the elite group of higher managers and professionals is stable at about seven times the mean. After this date, it starts to fall precipitously until 1940 when it is down to just three times. The income advantage of the second highest group of lower managers, professionals, and clerical personnel also fell, from 3.5 times the average to just 1.5 times, but this took place prior to 1920. Overall the income difference between the social classes became much smaller over time, even though the income advantage of the elite remained substantial.

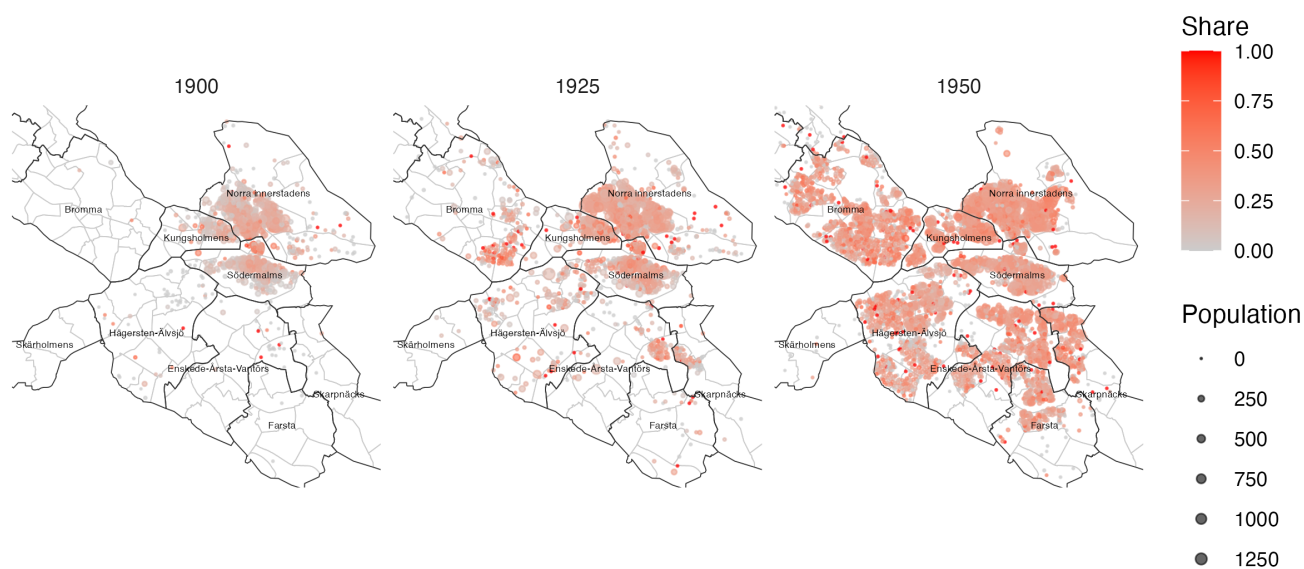
Figure 17: Relative Mean Income by HISCLASS Group, 1900–1950



Note: The figure shows mean income by HISCLASS group relative to the overall mean in Stockholm between 1900 and 1950.

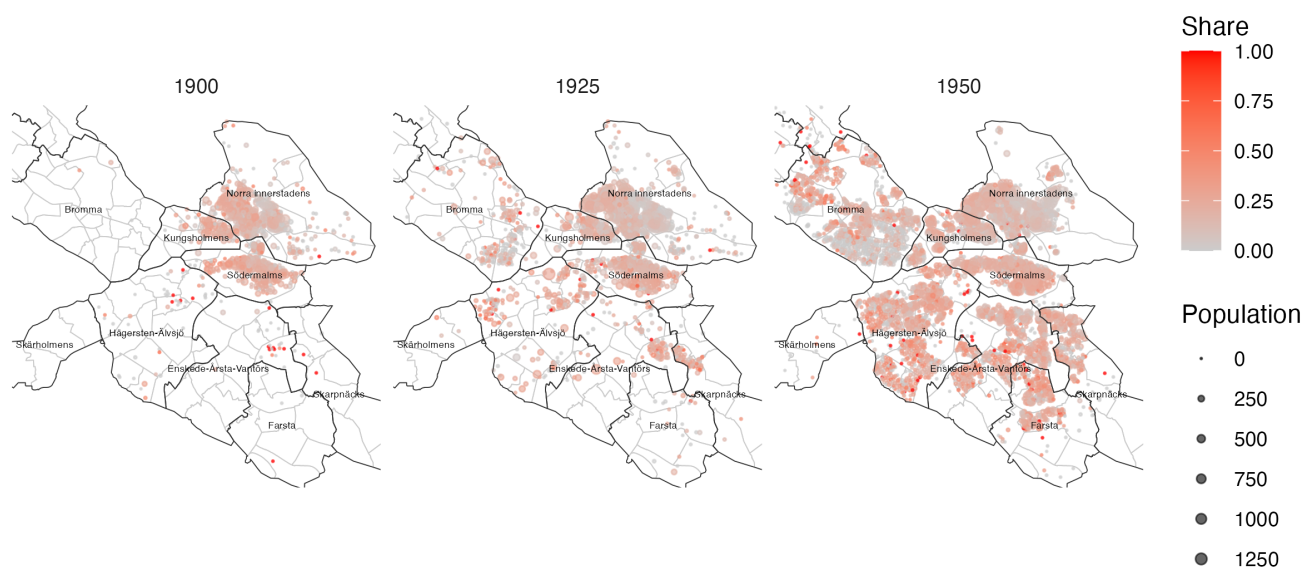
Source: Based on data from [Bengtsson and Molinder \(2024\)](#).

Figure 18: Share of Lower Managers, Professionals, and Clerical Household Heads By Block



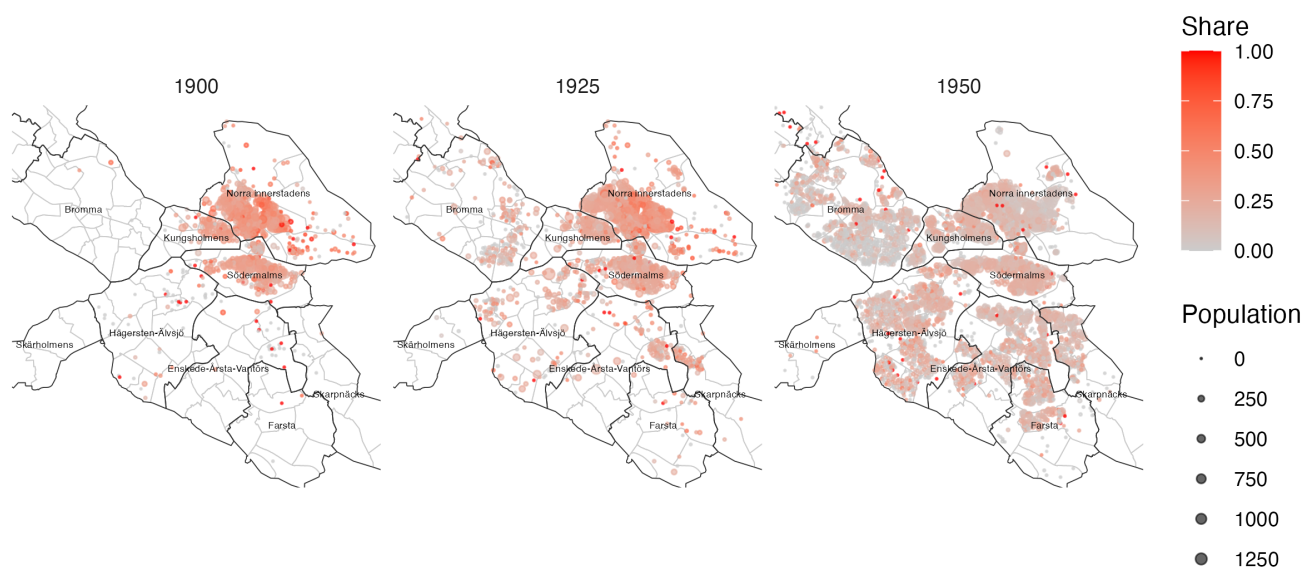
Note: Each dot represents a block, with dot size proportional to the number of households. Color intensity indicates the share of households headed by lower managers, professionals, and clerical workers.

Figure 19: Share of Medium Skilled Worker and Foremen Household Heads By Block



Note: Each dot represents a block, with dot size proportional to the number of households. Color intensity indicates the share of households headed by medium skilled workers and foremen.

Figure 20: Share of Lower Skilled Worker Household Heads By Block



Note: Each dot represents a block, with dot size proportional to the number of households. Color intensity indicates the share of households headed by lower skilled workers.

B Additional Tables

This appendix presents the full regression results for the Cox proportional hazard models discussed in the main text.

Table 3: Cox Proportional Hazards Models: Determinants of Leaving a Disadvantaged Neighborhood

Variable	Model 1		Model 2	
	Coefficient	Hazard Ratio	Coefficient	Hazard Ratio
<i>Demographics</i>				
Female household head	0.011 (0.022)	1.011	-0.003 (0.022)	0.997
Married household head	-0.021 (0.021)	0.979	-0.015 (0.021)	0.985
Number of children	-0.000*** (0.000)	1.000	-0.000*** (0.000)	1.000
Household head age (std.)	0.011*** (0.004)	1.011	0.007* (0.004)	1.007
Age at entry (std.)	0.026*** (0.006)	1.026	0.022*** (0.006)	1.022
<i>Household head class (ref: Higher managers)</i>				
Lower managers/professionals	-0.028 (0.020)	0.972	-0.033 (0.020)	0.968
Foremen/skilled workers	-0.289*** (0.021)	0.749	-0.246*** (0.021)	0.782
Lower skilled workers	-0.392*** (0.025)	0.676	-0.342*** (0.025)	0.711
Unskilled workers	-0.588*** (0.023)	0.555	-0.514*** (0.023)	0.598
No occupation	-0.276*** (0.033)	0.759	-0.224*** (0.033)	0.800
<i>Neighborhood characteristics</i>				
Share unskilled in district (std.)			-0.235*** (0.007)	0.791
Class diversity in district (std.)			0.141*** (0.005)	1.151
Observations	51,353		51,353	
Events	28,936		28,936	
Log-likelihood	-286160.1		-285321.3	
AIC	572342.2		570668.6	

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Sample: Children aged 7–14 at entry to disadvantaged block ($\geq 20\%$ unskilled households).

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