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Deep roots and changing fortunes: the regional geography of intergenerational mobility in the United States over the twentieth century

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SIGNIFICANCE STATEMENT

Intergenerational social mobility (ISM) in the US has declined over the last century, sparking a national debate about how to improve equality of opportunity. While recent work has exposed considerable neighborhood-scale variation in ISM, we emphasize strong temporal patterns operating across regions. Analyzing novel data spanning the twentieth century, we find that while some regions have witnessed significant relative declines in ISM, others have remained more stable. Our findings indicate that there are both powerful forces of change reducing intergenerational mobility in some regions and deeply entrenched long-term forces generating persistence in others. Improving ISM will be challenging, as policy would need to respond to both forces and do so according to their varying mixture across contexts.

ABSTRACT

New evidence shows that intergenerational social mobility (ISM) – the rate at which children born into poverty climb the income ladder – varies considerably across neighborhoods and cities in the United States. Is this current geography of opportunity something new or does it reflect a continuation of long-term trends? We construct new data on the levels and determinants of ISM across the United States over the twentieth century and find that some formerly high opportunity regions are no longer so, while other regions display consistently low levels of opportunity across the century. The changing geography of opportunity-generating economic activity restructures the landscape of intergenerational mobility, but factors associated with intraregional inequality and "deep roots" generate persistence. These two forces are most sharply evident in the sharp decline in ISM for persons who grew up in the Midwest in the late twentieth century, as high-income economic activity has shifted away from it, and the persistence of the South as a low-opportunity region even as new economic activity shifted toward it.

INTRODUCTION

The United States has long been heralded as the land of opportunity, offering unique opportunities for hard working people to escape poverty. This reputation has come under scrutiny in light of recent evidence showing that Americans' prospects of climbing the income ladder are no better than their counterparts living elsewhere (1–4). The long-term decline of American ISM rates could be attributed to common structural changes in economies and occupational structures across the developed world (5–8); to comparatively less advantaged early-life influences related to parenting, family structure, and endowments (9–13); or to different national policies in shaping the labor market and educational impacts of structural economic change (14, 15).

Over the last ten years, however, a new more nuanced perspective on American ISM has emerged. Recent research demonstrates the role of widely-varying neighborhood and family contexts in shaping life chances (16–23). There is evidence of strong relationships between life chances and variation in childhood environments related to school quality, neighborhood segregation, population structure, social capital and community cohesion, and family structure. These findings indicate that low levels of intergenerational mobility can be partly understood as "a local problem" (16, p. 1620), such that average structural transformation of the economy at the national scale, national policies, and even family endowments, are underpinned by high levels of geographical variation. As there are some local circumstances that continue to generate high ISM, this new geographically differentiated perspective provides a more optimistic picture for improving intergenerational mobility rates. Thus, the prospect of improving intergenerational mobility may not be as uniformly bleak as the national averages tend to suggest.

Much of the renewed interest in ISM has focused on recent neighborhood-scale variation. In our research, we extend this time frame in order to assess whether recently observed patterns of ISM are a continuation of long-term trends. We examine influences across 467 subregions of the country or “state economic areas” (SEAs), and further aggregate up to the scale of six major regions. As SEAs, rather than neighborhoods, are the most suitable scale for which to pursue a long-term analysis, we do not attempt to replicate or extend the neighborhood focus of recent studies. There have also been considerable changes in regional migration patterns over the long term, and thus between places of childhood, where children are exposed to environments that affect their schooling and development, and the locales where, as adults, they intersect with economic opportunities and hence are (or are not) upwardly mobile. Thus, we also consider how changing migration patterns relate to ISM.

To measure the changing geography of ISM, we reach back to the early twentieth century via a new longitudinal sample of roughly two million individuals (observed in 1920 and 1940) from the restricted complete-count decennial censuses of the United States. We build these data by applying record linkage algorithms to restricted census data made available through a collaboration between the Minnesota Population Center and Ancestry.com. We examine long-term changes in intergenerational mobility by combining these estimates with recently published data for the late twentieth century from Opportunity Insights. With these data, we can follow children born to low-income parents from childhood to adulthood. We measure ISM as the average adult income rank of children born to parents at the 25th percentile of the national income distribution and growing up in one of the 467 SEAs. Our goal here is not to definitively separate contextual from individual influences, a classic challenge in social science (24), but to measure changes in the regional geography of intergenerational mobility.

Through our analysis we investigate how ISM relates to two interacting forces. On the one hand, the geography of employment and income is transformed through large-scale creation and destruction of employment, due to waves of technological change. For example, metropolitan Detroit ranked sixth among metro areas in the USA in 1970, at the beginning of the most recent wave of creative destruction but is now ranked 59th. As people navigate major structural change, they can undergo upward or downward mobility. On the other hand, their preparation for navigating such creative destruction depends in part on deeply-rooted local structures that vary considerably across the country (25–31). We might say that in the former case, regional ISM is restructured by economy-wide forces such as technological change, while in the latter case, regional differences reflect persistent local selection and shaping of those forces through childhood environments. In what follows, we will consider the relative contributions and combinations of these economy-wide or structural forces, and historical local influences that we refer to as “deep roots.”.

RESULTS

Long-term spatial patterns in intergenerational social mobility. Fig. 1 maps upward mobility for the early and late twentieth century at the scale of SEAs (*A*-*B*) along with a cluster-derived regionalization of these patterns (*C*). **Fig. 1 *A-B*** present our preferred estimate of ISM: the expected adult income rank of children born to low-income parents, at the 25th percentile. While our preferred outcome measures are identical to those presented in recent cutting-edge studies (16), in the supplementary material we show that our geographical estimates are highly robust to decisions around measurement.

These maps reveal several instances of persistence in ISM through time. This is most evident for the South, where the ISM of children born to lower income parents has consistently lagged their counterparts elsewhere in the country. In the early and late twentieth century, the average adult income attainment of children born to parents at the 25th percentile in the South has often failed to exceed the 40th percentile. Thus, low-income children across much of the South have faced particularly severe constraints on upward mobility throughout the twentieth century.

The second source of persistence is the relatively higher ISM of children in higher income regions over twentieth century. Across the century, low-income children growing up in the SEAs of the Northeast, the Midwest and the West enjoyed some of the highest average income rank attainment as adults. Although these regions exhibited particularly high levels of ISM in the early twentieth century, their advantage had receded somewhat by the late twentieth century. Nonetheless, SEAs in these regions have continued to exhibit higher rates of upward mobility than have their counterparts in the South.

Fig. 1C presents an algorithm-based grouping of these outcomes over time (**SI Appendix S5**). Using nearest-neighbor clustering methods for the two variables presented in **Fig. 1 A-B**, we derive a series of spatiotemporal clusters. The clusters capture the intergenerational mobility experiences of six regions: Northeast, Midwest, South, Northern Plains and Mountain, Southern Plains and Mountain, and the West. These clusters are not meant to be an exhaustive regional classification of upward mobility experiences, but rather provide a series of regional trajectories to aid our discussion. We prefer these clusters to more widely used aggregations, as they are derived from the data at hand and strike an attractive balance between the four coarse census regions and the more granular, nine census divisions.

We use this grouping in **Fig. 2** to summarize trajectories of ISM across regions. We also split these regions by whether the majority of their SEA populations lived in an urban area, and we add dotted lines to represent the national averages for each period. In this scatterplot, urban and non-urban areas of the South are consistently below the national average, and fare worse than the Northeast, the Midwest and the West. This said, the advantage of these three regions in ISM over the South attenuated substantially as the century progressed.

In addition to these generally stable relationships, there are also some more notable changes in regional ISM performance, with two specific cases standing out. First, urban areas of the Midwest fell from having the third highest level of upward mobility in the early twentieth century, to having the third lowest level by the late twentieth century. To put this decline in perspective, ISM in the urban Midwest fell from being comparable to the high-income Northeast and West regions in the early twentieth century, to being below the national average and only slightly above the less urban areas of the South by the late twentieth century.

The second notable change is found in the Northern Plains and Mountain (“NP & M”) region which, over the twentieth century, transitioned from being a region of relatively low ISM to being the national leader. It is important to note, however, that these patterns do not mean that children growing up in this region achieved high incomes by staying in place. Rather, these are the *childhood* contexts that are most strongly associated with upward mobility, and we later show that much of the upward mobility of the Plains and Mountain areas was likely realized by children from those regions residing as adults in other places.

Characteristics of childhood context and upward mobility. We harness variation across our 467 SEAs to examine the short- and long-term contextual factors associated with these varying levels of upward mobility. **Fig. 3** provides a *prospective* analysis of the correlation between SEA attributes at the beginning of the century and upward mobility rates over the short (early twentieth century) and long term (late twentieth century). These correlations therefore paint a picture of how, based on the characteristics of SEAs in the early twentieth century, places fared in making upward mobility possible over the following century.

To capture the external or structural forces mentioned above, we categorize our SEA attributes in terms of labor markets (*A*) and urbanization (*B*); to capture long-term local forces or deep roots, we measure historical intraregional inequality (*C*) and a set of factors typically associated with the long-run sociocultural attributes of regions (*D*). *A-B* roughly corresponds to the types of jobs available in a region, while *C-D* are indicators of early life context. As noted, *A-B* are likely to vary with creative destruction, through episodic rearrangements of the geography of the economy and as older industries mature and newer sectors are created through innovation. Such rearrangements are also the result of domestic relocation and foreign offshoring (32). Taken together, they have introduced substantial turbulence into the income ranks of American regions since the mid-19th century. *C-D*, by contrast, are more stable over the long term, and so we consider them to be indicators of deep local forces embedded in the socio-cultural structures and practices of each region ("deep roots"), even if their absolute magnitudes may be influenced by external changes.

Fig. 3 reveals strong correlations between upward mobility and economic structure (labor market characteristics and urbanization); these are related over the short term, but weakly or negatively associated over the long term (*A-B*). This is particularly visible in the correlation coefficient for upward mobility and median household income per capita, which is exceptionally high at around +0.74 in the early twentieth century but had attenuated to -0.10 by the late twentieth. The attenuation of these temporal correlations implies that the leading economic regions of the early twentieth century weakened as springboards of intergenerational mobility as the century progressed.

Historical economic inequality within regions and deep roots, in contrast, exhibit a more consistent association with upward mobility (*C-D*). Notably, the correlation of upward mobility with the historical high school dropout rate, income inequality and the Black population share ranges between -0.77 and -0.36 between the early and late twentieth century. The relative stability of these correlations stand in stark relief to the more variable correlations between upward mobility and the local economic characteristics discussed above (*A-B*). The persistence of racial exclusion, inequality and historical schooling outcomes across certain SEAs, therefore, appear to have left a mark on the US landscape of opportunity that remains highly visible, even into the twenty-first century.

Does this attenuating temporal correlation of economic attributes with intergenerational mobility reflect the geographical restructuring of economic activity, or a waning of the influence of economic forces? We examine this question in **Fig. 4** by measuring the stationarity of place attributes through time, and their power to account for intergenerational mobility in each period. The blue circles reflect the share of variation in ISM explained by a given attribute in the early twentieth, and the yellow circles show the same relationship but for the late twentieth century. The value following the variables ("corr") represents the correlation coefficient for each attribute with itself across the two time periods: a measure of the temporal stability of place attributes. The combination of these metrics provides insight on whether, for example, the changing association between economic development fundamentals and upward mobility reflects the geographical restructuring of those fundamentals, or a broader waning of their influence across the century.

Our indicators of the geography and characteristics of jobs – incomes, manufacturing employment, and patenting – are revealing in this respect. On the one hand, the temporal correlations for these attributes range from 0.09 for the manufacturing employment share to 0.44 and 0.59 for patent productivity and median income, respectively. These correlations are substantially weaker than those for the urbanization measures, which range from 0.78 to 0.83. This implies that indicators of economic development are quite variable through time and do not simply track long-term urbanization patterns.

The weak to moderate correlations for economic characteristics over time reflect the well-known process of creative destruction and its geography, restructuring the distribution of US incomes and jobs across the twentieth century. Not only did the manufacturing share of jobs in the economy decline by two-thirds from the mid-twentieth century to 2015, but US manufacturing jobs and other skilled activity increasingly shifted into Southern and Southwestern states (33). The US economy therefore experienced both an aggregate loss and a substantial internal reorganization of manufacturing employment and other economic activity. The erosion of manufacturing is particularly notable in this respect because manufacturing jobs were well-remunerated in the mid-twentieth century and provided a key pathway to upward mobility in the past (34).

However, this restructuring of economic activity is not the sole driver of declining levels of upward mobility among the leading SEAs of the early twentieth century. While economic indicators accounted for 18 to 55 percent of the variation in ISM in the early twentieth century, the same indicators subsequently explain almost no variation in upward mobility in the late twentieth century. Thus, not only did the spatial distribution of economic activity shift over time, but the power of economic indicators in accounting for ISM also attenuated. This is consistent with our earlier descriptive finding that, despite being quite sparsely settled, levels of upward mobility in the Plains and Mountain regions came to surpass higher income and more industrialized regions (i.e. the Northeast, Midwest, and West). This shift implies a fundamental change in how the geography of economic activity relates to intergenerational mobility across the century.

Factors linked to economic inequality within regions and deep roots explain some of this story. Owing to the historical concentration of African Americans in the South, the Black share of SEAs is highly correlated through time at 0.89. Further, with an r-squared value of 0.46, the Black share of the population is the most powerful single place-based predictor of upward mobility in the late twentieth century. The share of variation in ISM explained by the Black population share also grew by around 15 percent across the century, suggesting that, at least geographically, the link between race and upward mobility may have strengthened over time, particularly in comparison to proximate economic determinants. Thus, both strong geographical persistence of deep roots and the increasing influence of local racial composition help explain why upward mobility in the South has continued to fare so poorly across the century. Furthermore, our data reveal lower rates of white and non-white ISM in more racially segregated places (**SI Appendix Table S3**).

The high school dropout rate and income inequality also explain high levels of variation in upward mobility. Given the large shifts in the structure of these attributes across the century, it is not surprising that the geography of schooling (*corr* = 0.11) and income inequality (*corr* = 0.48) are not as highly correlated as the Black population share (*corr* = 0.89) over time. Even despite some attenuation, however, the power of these variables in explaining ISM has remained high, and much more so than the attributes directly measuring economic development.

When viewed alongside our findings for the Black population share, this suggests that factors operating through early childhood, and linked to local sociocultural contexts (deep roots) and historical inequality, have taken center stage in driving upward mobility (35). Intuitive explanations of these patterns include the growing demand for skills and human capital acquisition in the economy, the emerging racial stratification of Northern cities, and the diminished role of manufacturing-related occupations as vehicles for upward mobility over the twentieth century.

The co-evolution of childhood context and upward mobility. We now assess the likelihood that these attributes are causally (rather than coincidentally) linked to shifts in upward mobility. It is possible that place-level associations such as those between racial composition, inequality, and upward mobility could reflect other unobserved but spatially correlated influences. For example, the negative correlation between the Black share and upward mobility may be a product of enduring economic features of the South; this possibility requires that we adopt a more formal statistical approach.

We address issues related to omitted variables by estimating a series of panel regression models with two-way fixed effects. Our dependent variable here is the upward mobility rate of SEA i in period t, which we model as a function of k time-varying attributes of places (Equation 3). By including time and place fixed effects, these models leverage within-SEA variation over time to better identify the factors associated with changing intergenerational mobility rates. **Table 1** presents the results from a panel model including observations for all SEAs over time (**Col. 1**) and then also, due to the unavailability of data on the high school dropout rate of many places in the later twentieth century, a model with a reduced observation count (**Col. 2**). The fixed effects included in these models help account for potentially distorting unobserved time-invariant differences across SEAs.

In all models, median household income per capita has a strong positive coefficient. This implies that improvements in median incomes is predictive of rising upward mobility. In view of the discontinuity in the economic correlations above (**Fig. 3 *A-B***), this robust significant effect indicates that improvements in local income levels do have a significant positive effect on upward mobility. However, recall that above we showed a sharply declining overall national effect of median household income on mobility. With this decline in mind, the positive effect of average incomes on upward mobility should qualified by the fact that other determinants of mobility grew in importance over the century.

Likewise, the manufacturing employment share is also significantly positively associated with upward mobility, indicating that regions that have increased manufacturing employment (or not lose it) continued to enjoy relatively higher levels of upward mobility across the century. However, due to automation and offshoring, there is now less manufacturing employment in the economy to generate this effect. Furthermore, after adjusting for the high school dropout rate (Col. 2), patenting holds a significant negative association with upward mobility, implying that high-innovation regions are not necessarily those with the most ISM. When taken together with the positive coefficient for manufacturing employment, it may be that traditional industrial occupations, different from the highly skilled jobs related to innovation, are strong vehicles for upward mobility. Overall, our estimates imply that better economic performance tends to be associated with improvements in upward mobility, but economic improvements have been uneven and no longer reproduce the overall early-20^{th} century pattern of intergenerational mobility.

The remaining coefficients in Table 1 yield one further set of insights into recent changes in the wellsprings of ISM. Increases in intraregional income inequality, Black population shares or high school dropout rates predict declining upward mobility. Of these variables, the Black share and income inequality have particularly strong effects: an increase of one standard deviation in either variable is associated with a reduction of up to 2.4 percentile ranks in the adult earnings of children born to low-income parents. By contrast, these effects are around 50 percent larger than that for median household income (Col. 2), suggesting that deep roots and sociocultural forces are more tightly coupled to upward mobility than indicators of economic development. Taken together, these estimates conclusively point to the growing importance of racial division and inequality in shaping the national landscape of intergenerational mobility.

Internal migration and upward mobility. So far, we have documented that the geography of income, manufacturing jobs, inequality, and early childhood contextual factors influence upward mobility, but we have yet to explain how intergenerational mobility varies so widely across low-income places, or why the Plains and Mountain regions came to generate such high levels of upward mobility. This is evident in **Fig. 2**, where we showed persistently low levels of upward mobility in the South but large increases over the century for other low-income regions, particularly the NP & M region. Our final analysis provides descriptive insight on the likely role of migration in these patterns.

In the supplementary material, we show that compared to the South, the Plains and Mountains regions fare reasonably well in terms of factors linked to childhood context and intraregional inequality (**SI Appendix Table S10**). Compared to the South, the Plains and Mountains have lower high school dropout rates, lower levels of income inequality, and are more racially homogenous. In terms of income levels, however, the South and the Plains and Mountain regions all lag behind the Midwest, West and Northeast, even though the South has the second highest concentration of manufacturing -- otherwise favorable to mobility -- of the six regions. Given that the NP & M region holds no serious advantage in economic activity or urbanization but does appear to differ in terms of factors typically linked to intraregional inequality and early childhood context, we hypothesize that much of the elevated upward mobility associated with the NP & M region is driven by a combination of childhood conditions with many individuals subsequently migrating out of the region to access higher wage labor markets elsewhere.

If this is true, we would expect the NP & M region to exhibit both higher rates of outmigration and higher gains for these migrants relative to those from other low-income regions. **Fig. 5** shows the rate of outmigration and returns to migration for children born into low-income families across the century**.** Firstly, we find that the returns to migration are higher for people leaving the Plains and Mountain regions and the South than their counterparts leaving higher income regions like the Northeast, Midwest and the West (**Fig. 5 B**). This intuitive pattern is consistent across the century and confirms the role of outmigration in providing a path to upward mobility for people growing up in lower income places.

This latter intuition emerges from the fact that people leaving the NP & M region have traditionally gained more in income rank compared to the people they leave behind than have outmigrants from the South. Outmigrants from the SP & M have also tended to gain more than their counterparts in the South, but not nearly by as much as those from the NP & M region. This indicates that outmigrants from the NP & M are either more advantaged by their childhood backgrounds or they are moving to labor markets that are providing them with greater opportunities than outmigrants from these other regions; however, we are unable to distinguish between these hypotheses.

The difference in the outmigration rates are also striking in this respect (**Fig. 5 A**). While relative differences in outmigration are quite consistent across the century – low for higher income regions and high for lower income regions – the South and the NP & M stand out. Despite the South having some of the highest outmigration rates early in the century, Southern outmigration plummeted relative to the Plains and Mountain regions toward the end of the century. By contrast, the NP & M climbed to have the highest outmigration rate later in the century. The ascendance of the NP & M to be the leading (childhood) location for upward mobility coincided with people leaving the region in large numbers, likely benefitting by doing so. Targeted further research is needed to understand exactly why children born into poverty in the NP & M region may have behaved and fared differently than their counterparts elsewhere.

DISCUSSION

New evidence reveals that places have large causal impacts on childhood development and later-life outcomes (18, 36). These findings have attracted a wide range of attention and are stimulating thinking about possible place-based policies to address differences in early childhood environments. These geographical differences are observed at several different scales – within the family, the neighborhood, or the local labor market (11, 37). We have not attempted to identify the precise causal pathway through which places affect upward mobility, but rather to document the shifting regional geography (and geographical relationships) of upward mobility over the twentieth century, a topic for which there remains much to learn. Our analysis of shifts in the geography of ISM suggests that early childhood environments have, if anything, become more important, as the positive effects of economic development have waned overall.

The overall restructuring of the geography of jobs and incomes in the American economy has generated substantial change in the landscape of intergenerational mobility. Upward mobility has declined sharply in the Midwest and risen sharply in the NP & M region. For the former case, industrial automation and economic restructuring have reduced economic opportunity in the region (38), trickling down to hamper subsequent upward mobility. While this provides one explanation for why economic performance in the early twentieth century does not appear to have had a long-lasting effect on upward mobility, these changes are also likely a function of the growing value placed on education in the contemporary economy, which depends heavily on schooling, and schooling on family structures in early life. As with other recent analyses of inequality (20, 39), our story reveals strong forces of persistence: the South, which compares unfavorably in terms of schooling and other social contextual influences, has resisted major growth in upward mobility, while in relative terms, the Northeast and the West compare more favorably along both dimensions.

Intergenerational mobility is not unrelated to better basic labor market conditions and to higher household incomes. However, these are not entirely in local hands because they are partly an expression of the wider economic and geographical restructuring of the economy. At the same time, ISM is favored when deeply rooted and entrenched structures related to intraregional inequality and schooling make local opportunities more inclusive or broadly accessible to the region's households. The most favorable combination is obviously better local labor market conditions and inclusive access to quality schooling in early life.

In finding a persistently strong link between income inequality and upward mobility, we add another layer to these two common forces listed above. It is challenging to nail down exactly why worsening income inequality reduces upward mobility (40, 41), but it is plausible that local inequality levels not only influence the willingness of communities to invest in public goods, but may also stratify the labor market so as to inhibit individuals from climbing the national income ladder (16, 31). From our data, we complement other findings in situating inequality alongside early childhood and labor market contexts as key forces affecting upward mobility.

Moreover, our investigation into the rising rates of upward mobility in the NP & M has shed light on the importance of migration. It appears that the coupling of improvements in early-life conditions with outmigration from the region, has provided a pathway to higher income jobs. The changing situation of the NP & M region and the long-term decline of intergenerational mobility is even more remarkable when contextualized by the fact that the United States has undergone a long-term decline in interregional migration (27, 42, 43). This raises a crucial question for continued research: why is outmigration not uniformly high across various low-income places and the children who grow up there? While there has been a great deal of discussion on this question, even recently so within the context of the uneven patterns and returns to migration by race (27, 44), we can gain further insight on this issue, and its link to intergenerational mobility, by leveraging vast new spatial and temporal data sources like those employed here.

Furthermore, we have not fully contended with the critical factor of race. The average outmigrant from the South is more likely to be Black than the average outmigrant from the Plains and Mountain regions. Although, in the supplemental material, we show that our geographical estimates are robust to restricting our sample to only white fathers and sons, we still do not know how much of the regional difference in the rates and returns to migration are attributable to childhood context (also influenced by race relations), and how much is due to racial discrimination in labor markets, locally or at migrants' destinations. While both factors are likely at play, disentangling the complicated pathways through which race influences upward mobility requires sustained and focused work (44, 45).

We conclude by highlighting two constraints in studying long-term intergenerational mobility. First, while the contemporary ISM data capture the experiences of both males and females, the historical data only apply to males. The historical focus on males reflects technical constraints in following females from childhood to adulthood, due to last name changes through marriage. While we cannot currently resolve this issue, we anticipate future work on gender-based differences in intergenerational mobility over the long term. Second, while we employ the most up-to-date approaches to measure income in the past, our income measures are not fully consistent between the early and late twentieth century. As such, we have avoided making strong claims regarding shifts in overall intergenerational mobility *levels*. Further work that leverages smaller samples with detailed income data are better positioned to undertake such an investigation (46).

MATERIALS AND METHODS

This analysis rests on linking previously published estimates of intergenerational mobility from the late twentieth century with new intergenerational mobility estimates for the early twentieth century. For the late twentieth century, we relied on county-level estimates published by Opportunity Insights of the expected (adult) income rank of children whose parents were at the 25th percentile of the national income distribution based on rank-rank regression analysis and, constructed using linked data from the Internal Revenue Service. In prior studies, this measure has been referred to as "absolute upward mobility" (16).

We generate a comparable measure for the early twentieth century using income scores (see **SI Appendix S2**). The census did not collect consistent information on annual income prior to 1940, and then only did so for waged workers, excluding farmers and the self-employed. Thus, there is no direct income measure in the 1920 census and only a partial measure for the 1940 census. We overcome this constraint by using the income returns from 1940 to impute an income score in 1920 and 1940 (47, 48). This income score is the log of earnings associated with the interaction of 3-digit occupation (49), immigrant status, and census division, as measured in the 1940 census. We estimate farmer income levels by applying ratios between farmers and laborers wages derived from the 1960 census (50).

We use these imputed income scores with a newly linked sample of 1.9 million father-son pairs, observed in 1920 and 1940. We created this sample by applying automated record linkage algorithms to the restricted non-anonymized 1920 and 1940 censuses of the United States (51, 52). We describe these approaches in detail in **SI Appendix S1**, where we also demonstrate the robustness of our results to a wide range of contentious record linkage issues including false positives, inconsistent reporting, and sample attrition (53, 54). To summarize these robustness exercises: the large sample size and the aggregation of our upward mobility estimates to SEAs heavily dampens bias due to record linkage errors (**SI Appendix Table S4**).

We used these data to estimate upward mobility rates across childhood locations in the early twentieth century. We first ranked all children and parents on their income score by birth cohort in 1920 and 1940. Then, restricting the sample to children born to parents below the 50th percentile of the income score distribution in 1920, we measured the average income rank of children growing up in each SEA or region. We estimated geographical variation in intergenerational mobility using the following model:

$$Y(Son\ rank\ 1940)_{ij} = B_0 + B_1 SEA\ 1920_1 + B_2 Birth\ cohort_2 + B_3 Father\ rank\ 1920_3 \quad (1)$$

where the *SEA 1920* parameter in Equation 1 references the impact, conditional on birth cohort and fathers' rank, of growing up in each state economic area for the adult income rank of sons born to low-income parents. We use this model then to generate an average adult income rank for children born at the 25th percentile of the national distribution in each SEA. These estimates can be interpreted as the expected 1940 income rank of sons who were 32 years old in 1940 and whose fathers were at the 25th percentile in 1920, based on a regression where the observations are families below the 50th percentile in 1920.

To examine change over time within our panel model framework, we stack the early twentieth century estimates of upward mobility with the late twentieth century estimates from Opportunity Insights. Combining these estimates with other SEA characteristics allows us to estimate the two-way fixed effect regression models presented in Table 1 (55). Which, in its general form, is specified as:

$$Y_{it} = a_i + \gamma_t + BX_{it} + \varepsilon_{it} \quad (2)$$

where a_i and γ_t are unit and time fixed effects, respectively, and BX_{it} refers to a given variable of interest. In our context, these models are specified as:

$$Y(Upward\ mobility)_{it} = SEA_i + Period_t + \sum_{k=1..k} BX_{kit} + \varepsilon_{it} \quad (3)$$

where the dependent variable is our measure of absolute upward mobility for SEA *i* in time *t*. *SEA* and *Period* refer to the two-way fixed effects for unit and time, respectively, and our *k* variables of interest are measured independently for each SEA *i* in period *t*. In our models that include the two-way fixed effects, our primary source of variation are within-unit differences over time. If increases in a given SEA attribute (e.g. median household income, high school dropout rate) are positively associated with upward mobility, we expect $\beta_k > 0$, and if that attribute is negatively associated with upward mobility, we expect $\beta_k < 0$.

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FIGURES AND TABLES

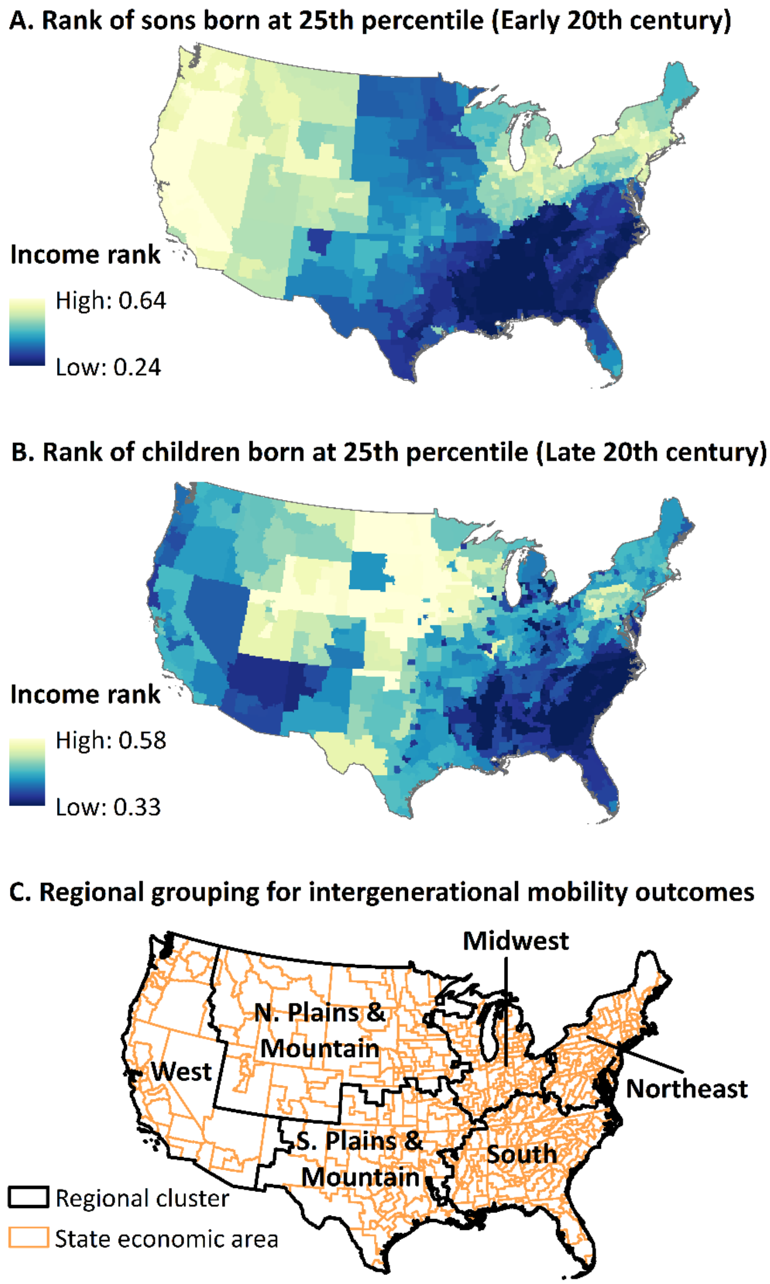

Figure 1. The geography of intergenerational mobility in the early and late twentieth century

Notes: Maps of average adult income rank for children born to parents at the 25th in the early twentieth century (A) and in the late twentieth century (B) measured at the SEA scale, accompanied by cluster-based aggregation of outcomes into six regions across both periods (C) (**SI Appendix SI5**). Estimates from the early twentieth century are based on the adult income scores for males from the 1900-1915 birth cohorts (A), and those from the late twentieth century are based on estimates for all children from 1980-82 birth cohorts observed in Internal Revenue Service records (B) (see **SI Appendix SI2** for discussion of measures). Maps were rendered using the Lambert Conformal Projection.

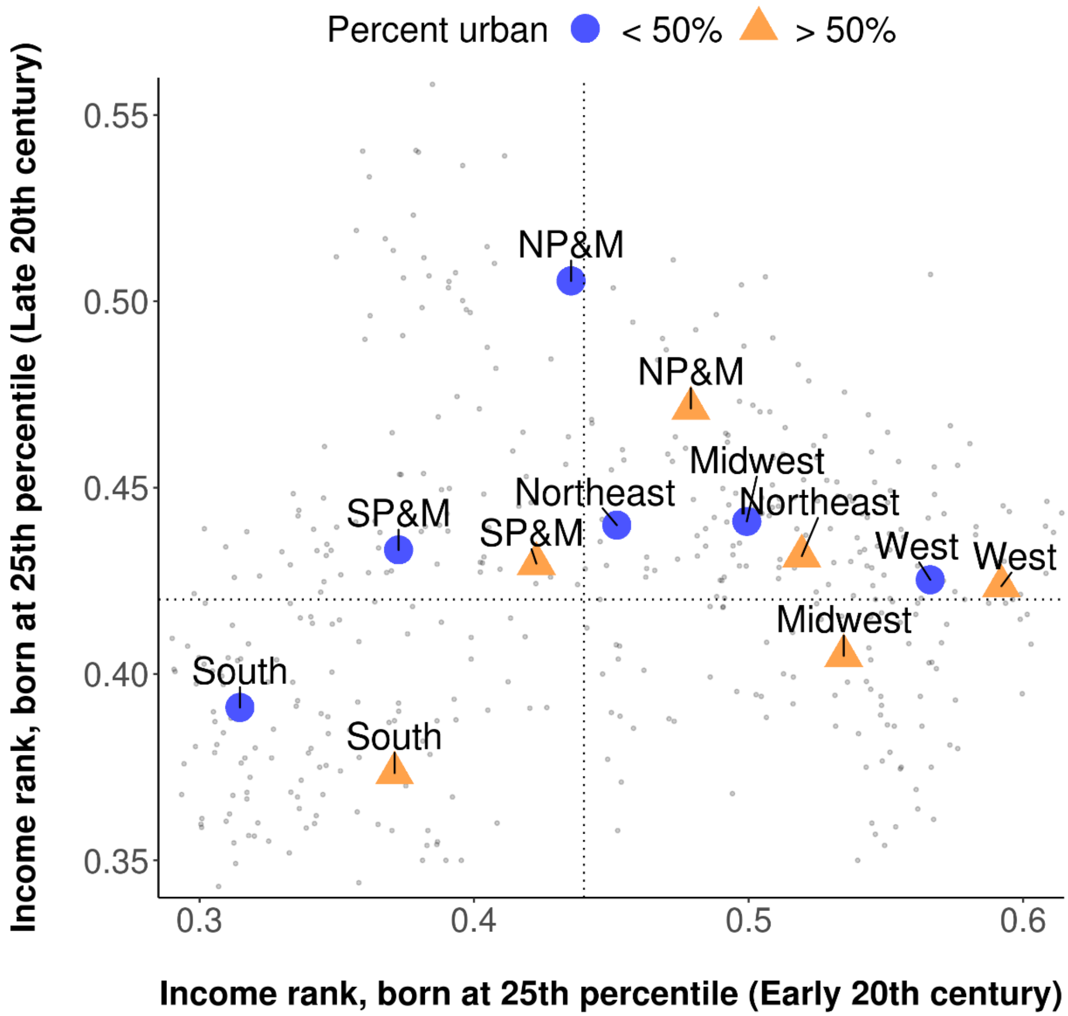

Figure 2. Regional differences in intergenerational mobility over the twentieth century

Notes: Scatterplot of intergenerational mobility levels of SEAs and regions in the early twentieth century and the late twentieth century. The larger points in the foreground show the regional average adult income rank for children across the two periods of observation, and the smaller background points show the same values but for state economic areas. The regions are split by SEAs with populations above and below 50 percent living in urban areas. The dotted lines along the X and Y axes represent the national averages for the X and Y values, respectively. For visual reasons, we abbreviate the Northern Plains and Mountain ("NP & M") and Southern Plains and Mountain ("SP & M") regions. As the regions are an exact aggregation of the SEAs, the SEA estimates uniquely correspond to a single region. We present the exact delineation of these coarser regions in Figure 1C. The creation of this regional aggregation is described in **SI Appendix SI5**.

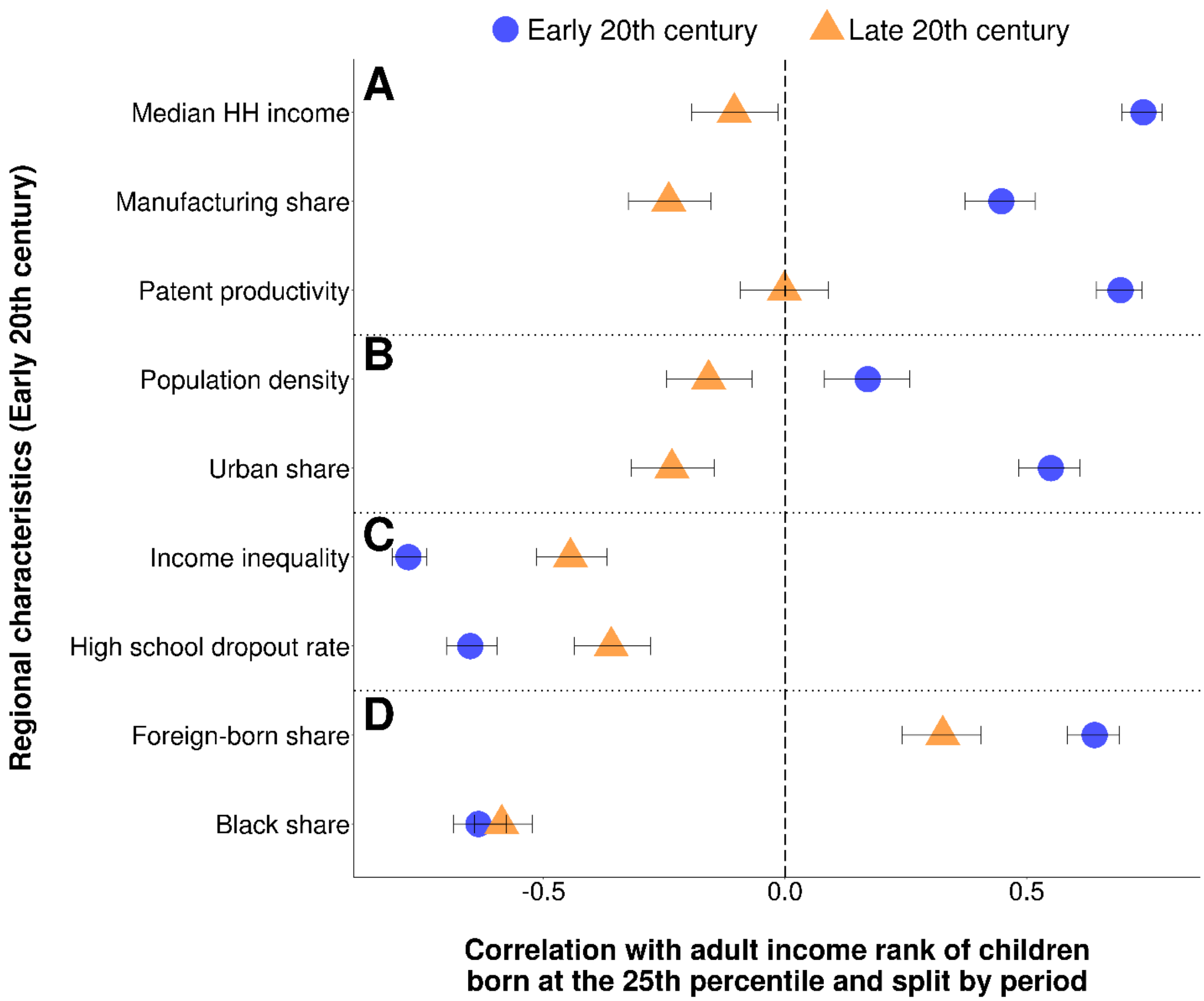

Figure 3. Characteristics of state economic areas in early twentieth century with adult income rank of children born to parents at the 25th percentile

Notes: This plot shows the correlation coefficients between the characteristics of state economic areas in the early twentieth century with the average adult income rank children born at the 25th percentile in the early and the late twentieth century. Most of these SEA characteristics were obtained from Opportunity Insights (late twentieth century) or derived by us from the complete-count census of 1920 (early twentieth century). We categorize the SEA attributes as relating to labor markets (*A*), urbanization (*B*), intraregional inequality (*C*) and factors typically associated with the long-run sociocultural attributes of places (*D*). **SI Appendix S3** provides full details on each of these characteristics and their derivation.

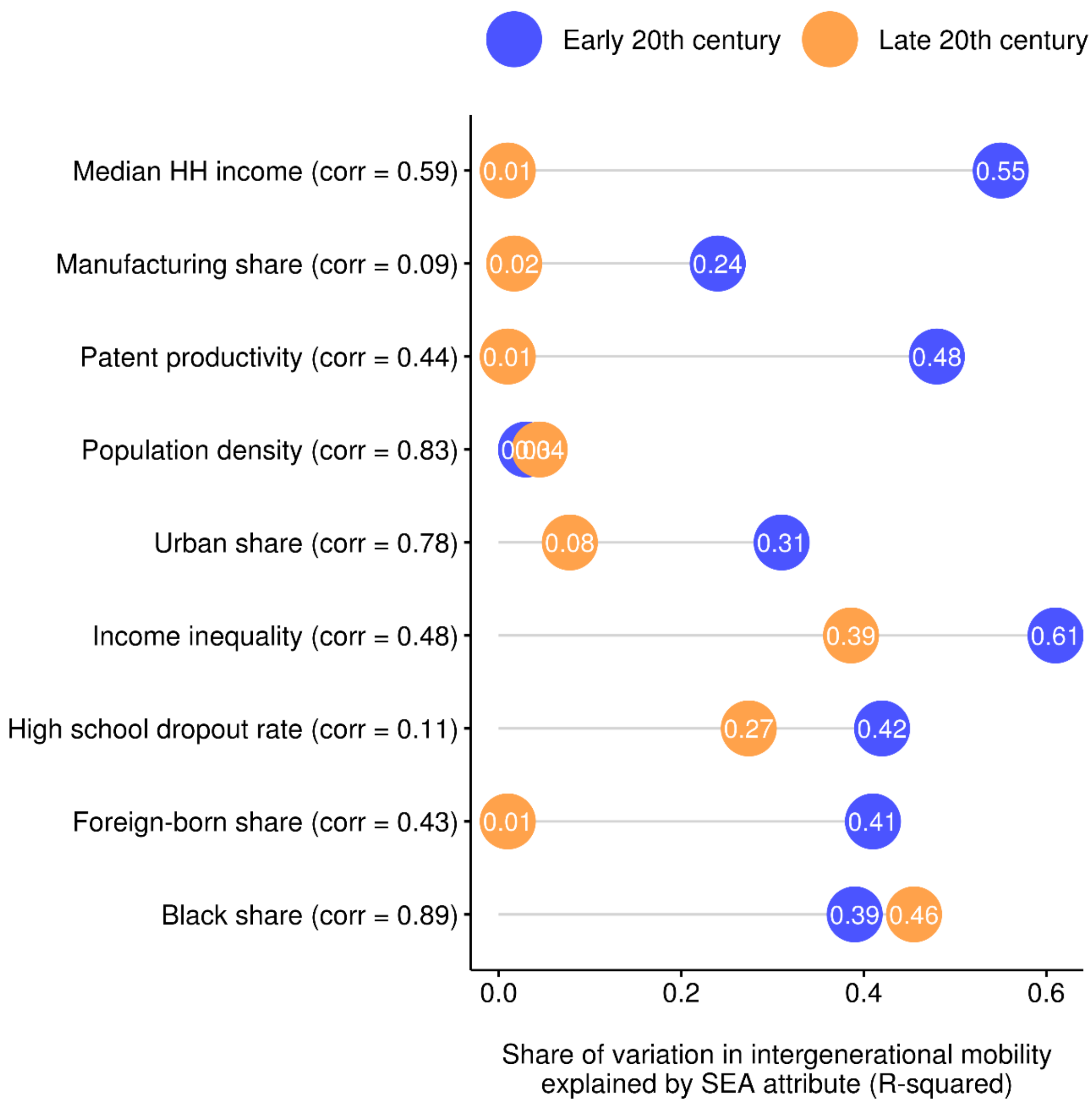

Figure 4. Explanatory power of SEA characteristics in accounting for the average adult income rank of children born to parents at the 25^{th} percentile

Notes: The chart shows the share of variation in the adult income rank of children explained by single SEA characteristics, early and late twentieth century. The values inside the circles show the r-squared values from one of 18 univariate regressions where the dependent variable is the adult income rank of children born to parents at the 25^{th} percentile in the early (yellow) or the late (blue) twentieth century, and the independent variable is one of the nine SEA characteristics (y-axis), observed is the early or late twentieth century, respectively.

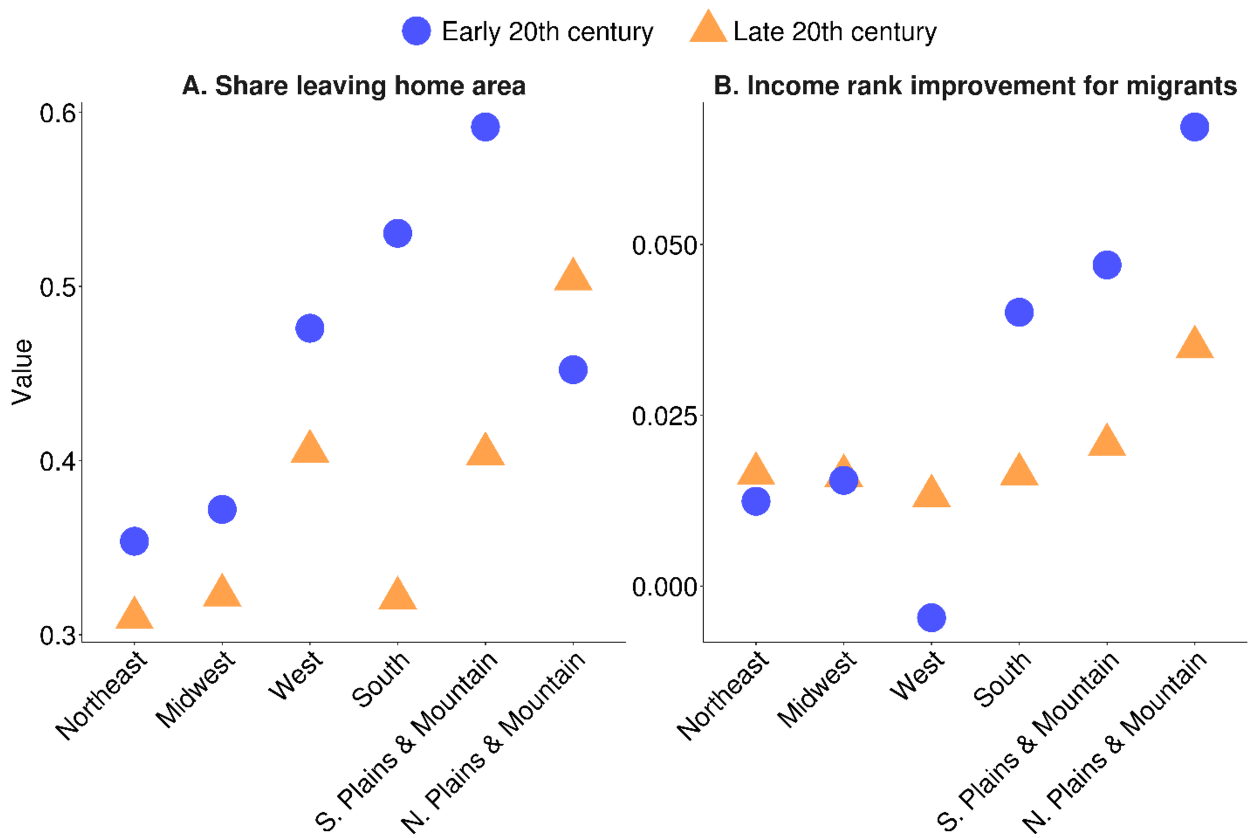

Figure 5. Outmigration rates and within-region comparison of returns to migration by region

Notes: Plot of outmigration rates and return to migration by region. The title for the y-axis of each figure is presented in the title of each respective panel. For the late twentieth century, our measure of outmigration is from Opportunity Insights and is based on the share of individuals leaving their childhood census tracts. The data from the early twentieth century are derived directly from our linked sample and capture whether individuals left their childhood state economic area. Although the discrepancy between these data sources likely introduces measurement error into the intertemporal comparison, the SEA is the finest scale consistent geographical aggregation available to use in the census. **SI Appendix S4** describes these characteristics and their measurement.

		Y = Adult income rank of children born to parents at the 25th percentile (1)	(2)
Economic structure & urbanization	Median household income (p.c.)	0.0134*** (0.004)	0.0140*** (0.004)
	Share in manufacturing	0.00831*** (0.003)	0.0130*** (0.003)
	Patent productivity	0.00294 (0.004)	-0.00606** (0.003)
	Urban share	-0.0100 (0.007)	0.00602 (0.006)
Intraregional inequality & deep roots	High school dropout rate	-	-0.0192*** (0.003)
	Income inequality	-0.0399*** (0.004)	-0.0221*** (0.004)
	Black share	-0.0373*** (0.009)	-0.0239*** (0.007)
	Foreign-born share	0.00844** (0.004)	0.00470 (0.004)
	Constant	0.439*** (0.002)	0.428*** (0.002)
	Observations	934	728
	R2	0.790	0.843
	Adjusted R2	0.573	0.679
	SEA & Period FE	Yes	Yes
	Robust standard errors	Yes	Yes
	Restricted to SEAs with schooling data?	No	Yes

Standard errors in parentheses, * p < 0.10, ** p < 0.05, *** p < 0.01

Table 1. Panel regression model of upward mobility regressed on SEA characteristics in the early and late twentieth century.

Note: Table of coefficients from two panel regression models, where the dependent variables are the average adult income ranks of children in SEAs born to parents at the 25th percentile in the early or late twentieth century. As we lack complete data on the high school dropout rate for the late twentieth century, we present a model with full observations without the high school dropout rate (Column 1), and a model with reduced observations that includes the high school dropout rate (Column 2). All independent variables are transformed into standard units with a mean of zero and a standard deviation of one. In **SI Appendix Table S13**, we show that our estimates are robust to dropping the South from the analysis.

REFERENCES

1. R. Abramitzky, L. P. Boustan, E. Jácome, S. Pérez, "Intergenerational Mobility of Immigrants in the US over Two Centuries" (National Bureau of Economic Research, 2019).

2. R. Chetty, *et al.*, The Fading American Dream: Trends in Absolute Income Mobility Since 1940. *Science* **356**, 398–406 (2017).

3. J. Long, J. Ferrie, Intergenerational Occupational Mobility in Great Britain and the United States Since 1850: Reply. *The American Economic Review* **103**, 2041–2049 (2013).

4. X. Song, *et al.*, Long-term decline in intergenerational mobility in the United States since the 1850s. *Proceedings of the National Academy of Sciences* **117**, 251–258 (2020).

5. E. Beller, M. Hout, Intergenerational social mobility: the United States in comparative perspective. *The Future of Children* **16**, 19–36 (2006).

6. P. M. Blau, O. D. Duncan, *The American Occupational Structure* (New York: Wiley, 1967).

7. R. Erikson, J. H. Goldthorpe, *The constant flux: A study of class mobility in industrial societies* (Oxford University Press, USA, 1992).

8. M. Hout, More Universalism, Less Structural Mobility: The American Occupational Structure in the 1980 s. *American Journal of sociology* **93**, 1358 (1988).

9. G. Clark, *The Son Also Rises: Surnames and the History of Social Mobility* (Princeton University Press, 2014).

10. J. J. Heckman, Skill formation and the economics of investing in disadvantaged children. *Science* **312**, 1900–1902 (2006).

11. R. Gallagher, R. Kaestner, J. Persky, The geography of family differences and intergenerational mobility. *Journal of Economic Geography* **19**, 589–618 (2019).

12. R. D. Mare, Educational homogamy in two gilded ages: Evidence from inter-generational social mobility data. *The ANNALS of the American Academy of Political and Social Science* **663**, 117–139 (2016).

13. F. T. Pfeffer, Multigenerational approaches to social mobility. A multifaceted research agenda. *Research in social stratification and mobility* **35**, 1 (2014).

14. A. E. Raftery, M. Hout, Maximally maintained inequality: Expansion, reform, and opportunity in Irish education, 1921-75. *Sociology of education*, 41–62 (1993).

15. C. Goldin, L. Katz, *The race between education and technology* (Harvard University Press, 2009) (March 20, 2014).

16. R. Chetty, N. Hendren, P. Kline, E. Saez, Where is the land of opportunity? The geography of intergenerational mobility in the United States. *The Quarterly Journal of Economics* **129**, 1553–1623 (2014).

17. R. Chetty, N. Hendren, L. F. Katz, The effects of exposure to better neighborhoods on children: New evidence from the Moving to Opportunity experiment. *The American Economic Review* **106**, 855–902 (2016).

18. R. Chetty, N. Hendren, The impacts of neighborhoods on intergenerational mobility I: Childhood exposure effects. *The Quarterly Journal of Economics* **133**, 1107–1162 (2018).

19. J. Rothwell, D. Massey, Geographic effects on intergenerational income mobility. *Economic Geography* **91**, 83–106 (2015).

20. R. J. Sampson, *Great American city: Chicago and the enduring neighborhood effect* (University of Chicago Press, 2012).

21. R. J. Sampson, Neighbourhood effects and beyond: Explaining the paradoxes of inequality in the changing American metropolis. *Urban Studies*, 0042098018795363 (2018).

22. R. Manduca, R. J. Sampson, Punishing and toxic neighborhood environments independently predict the intergenerational social mobility of black and white children. *Proceedings of the National Academy of Sciences* **116**, 7772–7777 (2019).

23. F. Torche, Analyses of intergenerational mobility: An interdisciplinary review. *The ANNALS of the American Academy of Political and Social Science* **657**, 37–62 (2015).

24. R. M. Hauser, Context and consex: a cautionary tale. *American Journal of Sociology*, 645–664 (1970).

25. T. Berger, Places of persistence: Slavery and the geography of intergenerational mobility in the United States. *Demography* **55**, 1547–1565 (2018).

26. T. Berger, P. Engzell, American geography of opportunity reveals European origins. *Proceedings of the National Academy of Sciences* **116**, 6045–6050 (2019).

27. E. Derenoncourt, "Can you move to opportunity? Evidence from the Great Migration" (Mimeo., Harvard University, 2018).

28. R. D. Putnam, *Our kids: The American dream in crisis* (Simon and Schuster, 2016) (October 24, 2016).

29. A. Rodríguez-Pose, V. von Berlepsch, When Migrants Rule: The Legacy of Mass Migration on Economic Development in the United States. *Annals of the Association of American Geographers* **104**, 628–651 (2014).

30. H. R. Tan, "Three lessons for labor economics from history." (2019).

31. J. Trounstine, Segregation and inequality in public goods. *American Journal of Political Science* **60**, 709–725 (2016).

32. T. Kemeny, M. Storper, Superstar cities and left-behind places: disruptive innovation, labor demand, and interregional Inequality (2020).

33. M. Storper, *Keys to the City: How Economics, Institutions, Social Interaction, and Politics Shape Development* (Princeton University Press, 2013) (March 22, 2014).

34. A. Portes, M. Zhou, The new second generation: Segmented assimilation and its variants. *The annals of the American academy of political and social science* **530**, 74–96 (1993).

35. H. Tan, "A Different Land of Opportunity: The Geography of Intergenerational Mobility in the Early 20th-Century US" (Boston University Working Paper, 2018).

36. R. Chetty, N. Hendren, The impacts of neighborhoods on intergenerational mobility II: County-level estimates. *The Quarterly Journal of Economics* **133**, 1163–1228 (2018).

37. J. J. Heckman, G. Karapakula, "Intergenerational and intragenerational externalities of the Perry Preschool Project" (National Bureau of Economic Research, 2019).

38. T. Berger, P. Engzell, Intergenerational Mobility in the Fourth Industrial Revolution (2020).

39. D. S. Connor, M. P. Gutmann, A. R. Cunningham, K. K. Clement, S. Leyk, How Entrenched Is the Spatial Structure of Inequality in Cities? Evidence from the Integration of Census and Housing Data for Denver from 1940 to 2016. *Annals of the American Association of Geographers*, 1–18 (2019).

40. M. Hout, T. A. DiPrete, What we have learned: RC28's contributions to knowledge about social stratification. *Research in Social Stratification and Mobility* **24**, 1–20 (2006).

41. F. Torche, Intergenerational mobility and equality of opportunity. *European Journal of Sociology* **56**, 343–371 (2015).

42. N. Rivers, R. Wright, M. Ellis, The great recession and the migration redistribution of blacks and whites in the US South. *Growth and Change* **46**, 611–630 (2015).

43. R. Wright, M. Ellis, Where science, technology, engineering, and mathematics (STEM) graduates move: Human capital, employment patterns, and interstate migration in the United States. *Population, Space and Place* **25**, e2224 (2019).

44. L. Boustan, *Competition in the Promised Land: Black Migrants in Northern Cities and Labor Markets* (Princeton University Press, 2016) (May 22, 2016).

45. D. Conley, *Being black, living in the red: Race, wealth, and social policy in America* (Univ of California Press, 2010).

46. J. Feigenbaum, Intergenerational Mobility during the Great Depression. *Working Paper* (2015).

47. R. Abramitzky, L. P. Boustan, D. Connor, "Leaving the Enclave: Historical Evidence on Immigrant Mobility from the Industrial Removal Office" (National Bureau of Economic Research Working Paper Series, 2020).

48. R. Abramitzky, L. Boustan, E. Jacome, S. Perez, Intergenerational Mobility of Immigrants over Two Centuries. *National Bureau of Economic Research Working Paper Series* (2019).

49. S. Ruggles, K. Genadek, R. Goeken, J. Grover, M. Sobek, *Integrated Public Use Microdata Series: Version 7.0 [Machine-readable database]* (University of Minnesota, 2017).

50. W. J. Collins, M. Wanamaker, Up from Slavery? African American Intergenerational Economic Mobility Since 1880. *NBER Working Paper Series* (2017).

51. R. Abramitzky, L. Boustan, K. Eriksson, Europe's Tired, Poor, Huddled Masses: Self-Selection and Economic Outcomes in the Age of Mass Migration. *American Economic Review* **102**, 1832–1856 (2012).

52. R. Abramitzky, L. Boustan, K. Eriksson, A Nation of Immigrants: Assimilation and Economic Outcomes in the Age of Mass Migration. *Journal of Political Economy* **122** (2014).

53. M. Bailey, C. Cole, M. Henderson, C. Massey, "How Well Do Automated Methods Perform in Historical Samples? Evidence from New Ground Truth" (National Bureau of Economic Research, 2017).

54. S. Ruggles, C. Fitch, E. Roberts, Historical Census Record Linkage. *Minnesota Population Center* **Working Paper No. 2017-3** (2017).

55. P. D. Allison, *Fixed effects regression models* (SAGE publications, 2009).