American geography of opportunity reveals European origins

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A large literature documents how intergenerational mobility—the degree to which (dis)advantage is passed on from parents to children—varies across and within countries. Less is known about the origin or persistence of such differences. We show that U.S. areas populated by descendants to European immigrants have similar levels of income equality and mobility as the countries their forebears came from: highest in areas dominated by descendants to Scandinavian and German immigrants, lower in places with French or Italian heritage, and lower still in areas with British roots. Similar variation in mobility is found for the black population and when analyzing causal place effects, suggesting that mobility differences arise at the community level and extend beyond descendants of European immigrant groups. Our findings indicate that the geography of U.S. opportunity may have deeper historical roots than previously recognized.

income inequality | intergenerational mobility | melting pot | immigration

Intergenerational economic mobility—the extent to which economic status is perpetuated across generations—has become one of the defining political issues of our time. Much of this interest is motivated by the concern that growing disparities in income and wealth (1–3) are reducing the chances for children from disadvantaged backgrounds to rise through the income ranks (4, 5). Country comparisons generally support this view: persistence in income from one generation to the next is higher in unequal societies like Great Britain and the U.S., and weakest in the relatively equal Scandinavian countries (6). Among researchers and policy-makers, this inverse relationship between inequality and intergenerational mobility has become known as the "Great Gatsby Curve" (7).

Economic opportunity also varies considerably within countries. In particular, Chetty et al. (4) use administrative data to document a dramatic regional variation in intergenerational mobility within the U.S., which rivals that observed between countries. While parts of the Southeast contain places that are among the least mobile in the developed world, some areas in the Midwest show mobility rates similar to the Scandinavian countries. Evidence of stark regional divides (4, 8) that are seemingly stable over time (9) suggests that some of this variation may be historical in origin (10, 11).

An influential hypothesis contends that American society is a "melting-pot" where economic, cultural, and social characteristics of immigrant groups fade away over time (12). Yet historical scholarship notes how U.S. communities appear to be shaped by the settlement patterns of different European immigrant groups (13–15). Indeed, literature documents considerable cross-cultural variation in attitudes that predict social organization and behaviour (16–18), including views on fairness and opportunity (19). Such attitudes are transmitted from parent to child and are known to persist over multiple immigrant generations (20–23). However, it remains an open question whether the enduring divides in equality and opportunity across U.S. places are related to their different European origins.

Against this background, we make the following empirical contributions. First, we use micro-level Census data on self-reported ancestry to characterize the European origins of U.S. places. Second, we examine whether variation in income inequality and intergenerational mobility across these places mirror differences between European countries. We analyze local variation in ancestry and mobility across places, and compare "synthetic countries" in the U.S.—aggregates of places with heavy overrepresentation of European ancestral groups—to their European counterparts. Third, to identify whether this variation solely reflects mobility differences among European descendants (24, 25), or extends to local populations more broadly, we study mobility outcomes for the black population (8) and causal place effects on upward mobility (26).

Results

Case selection and data sources. Our selection of European populations is guided by available cross-country data on income mobility. Corak (6) reports such estimates for 13 countries; 8 of these are European and 7 have an ancestral population in the U.S. of at least 1 million. Ordered by decreasing size of the U.S. population, these are: United Kingdom, Germany, Italy, France, Norway, Sweden, and Denmark. Given the cultural overlap between the Scandinavian countries, we collapse them

Significance Statement

The U.S. is an immigrant nation and consists of places that differ widely in social, cultural, and economic makeup. Recent research finds striking regional variation in economic opportunity—the prospects of poor children to escape poverty as adults. Here we show that the dominant European ancestry of a place does much to explain such differences: levels of equality and mobility across U.S. communities with different European heritage mirror those across corresponding European countries. This finding sheds light on the historical roots of the American geography of opportunity.

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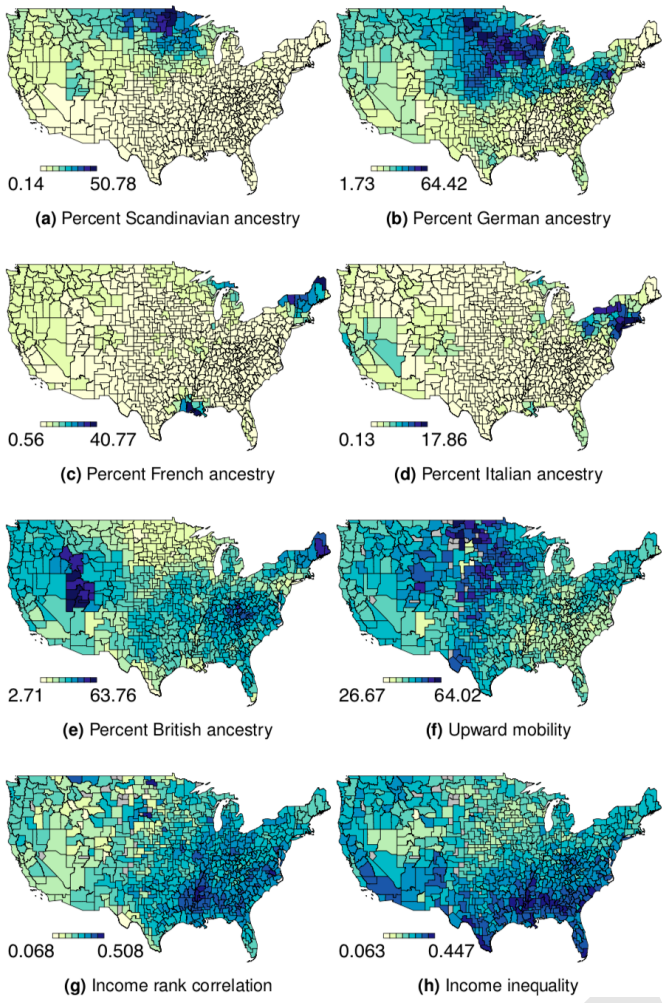

Fig. 1. U.S. geographic variation in ancestral representation, income mobility, and income inequality. Ancestry is based on figures from the 1980 Census, mobility and inequality is measured for cohorts of children born in the early 1980s (4). Upward mobility reflects the percentile in the national income distribution that a child whose parents ranked in the 25th percentile can expect to attain in adulthood. Rank correlations reflect the persistence of family income throughout the distribution. Income inequality is measured as the Gini coefficient of incomes in the parental generation, minus the top 1%. For further information on sources and definitions, see *Materials and Methods*.

throughout much of our analysis. We use individual-level data on self-identified ancestry from the 1980 U.S. Census to estimate the share of the population with these European origins for each of the 722 Commuting Zones (CZs), which are local labor markets that exhaust the contiguous United States (see *Materials and Methods*).

We focus on three different CZ-level measures of income mobility (see *Materials and Methods*): (*i*) *Upward mobility*—the expected income percentile rank in adulthood for a child born to parents in the bottom half of the distribution (4). We use separate estimates for blacks and non-Hispanic whites, and also examine a complementary measure: "rags-to-riches" mobility, which captures the probability that a child born in the bottom income quintile ends up in the top (4, 8). (*ii*) For comparability with cross-country data, we also examine the intergenerational *rank correlation*, which measures persistence throughout the distribution rather than mobility out of the bottom (4). (*iii*) We use estimates of the *causal place effect* of each CZ on upward mobility, addressing the objection that observed area differences in mobility may be driven by sorting (26).

Geography of ancestry, inequality and opportunity. Our first question is whether meaningful variation in equality and opportunity exists across areas populated by different ancestral groups. Fig. 1, *A*–*E* plots the distribution of ancestries across CZs. These maps reveal considerable clustering: Germans and Scandinavians are over-represented in the Midwest, Italian and French descendants in the Northeast, while those with British ancestry are scattered throughout the country. Present-day geographical clusters of European ancestral groups broadly reflect the historical patterns of European settlement during the Age of Mass Migration (*SI Appendix*, Fig. S2), which suggests a limited sorting over the 20th century.

Fig. 1, *F*–*H*, displays measures of inequality and mobility (analogous maps for upward mobility among blacks and non-Hispanic whites, rags-to-riches mobility, as well as causal place effects, are displayed in *SI Appendix*, Fig. S3). Areas with a concentration of German and Scandinavian ancestry belong to the most upwardly mobile, while persistence is higher in areas with British ancestry. Moreover, CZs with higher rates of upward mobility, or lower rates of intergenerational persistence, tend to have a more equal distribution of incomes, in line with the Great Gatsby Curve (GGC) (4).

CZ-level correlations: ancestry and mobility. We assess the link between European origins and intergenerational mobility more directly in Fig. 2, where we also take race differences into account. Doing so is not only vital to accurately reflect the U.S. opportunity structure (8), but also speaks directly to the hypothesis that mobility differences may extend beyond European descendants to local populations more broadly.

Fig. 2 displays binned scatter plots of the link between upward mobility and the concentration of each ancestry, distinguishing between outcomes for non-Hispanic whites and blacks. These correlations range from strongly positive for Scandinavian (non-Hisp. whites: $r = 0.638$, 95% CI: $0.592, 0.679$; blacks: $r = 0.356$, 95% CI: $0.285, 0.423$, *SI Appendix*, Table S2), to sharply negative for British ancestry shares (non-Hisp. whites: $r = -0.535$, 95% CI: $-0.585, -0.481$; blacks: $r = -0.132$, 95% CI: $-0.209, -0.053$, *SI Appendix*, Table S2). Several of these correlations are similar in size to important mobility correlates reported by Chetty et al. (4), including income inequality ($r = -0.66$), the fraction of black residents ($r = -0.58$), or teenage birth rates ($r = -0.61$).

We document cross-CZ gradients for the full range of mobility metrics in *SI Appendix* (Fig. S5–S6, first column of Table S8–S10). The correlations are similar, including for causal place effects—and here gradients are especially marked for children who grew up in the bottom half of the income distribution (*SI Appendix*, Fig. S5). Moreover, given that ancestry shares are heavily skewed (*SI Appendix*, Table S3), we confirm that patterns are similar when we transform each ancestry share to the ln of 1 plus the percentage who report a given ancestry (*SI Appendix*, Fig. S4).

Robustness to statistical confounders. We further examine the robustness of these relationships in multivariate CZ-level regressions adjusting for a range of potential economic, demographic,

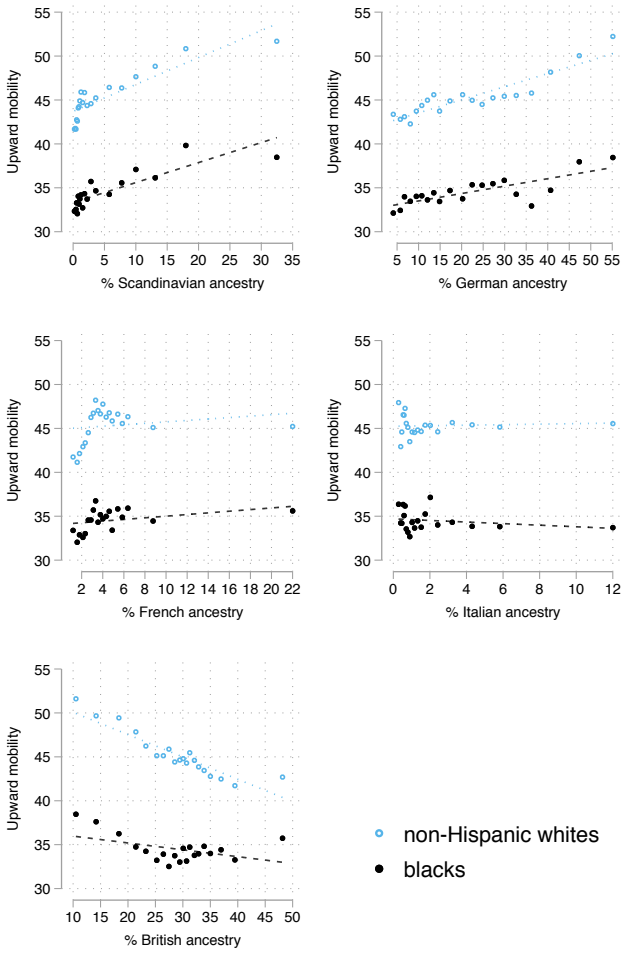

Fig. 2. Upward mobility by race and CZ-level ancestry. The horizontal axis displays the percentage reporting a given ancestry in the 1980 Census. The vertical axis displays the expected percentile in the national income distribution for a child whose parents ranked at the 25th percentile (8). All CZs are grouped into 20 equal-sized bins based on each respective ancestry share. Circles denote the mean level of upward mobility and the mean ancestry share within each bin. Also shown are best-fit lines estimated using linear regressions on the underlying (ungrouped) data for blacks and non-Hispanic whites respectively.

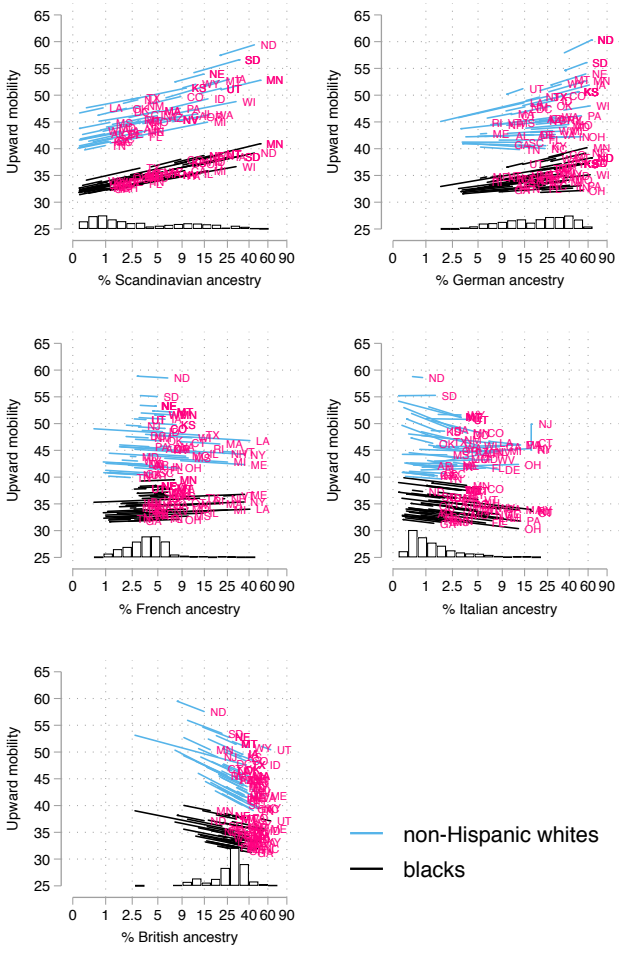

Fig. 3. Upward mobility by state, race, and CZ-level ancestry. The horizontal axis displays the percentage reporting a given ancestry in the 1980 Census. The vertical axis displays the expected percentile in the national income distribution for a child whose parents ranked at the 25th percentile (8), predicted from a series of bivariate hierarchical linear models using variation at the CZ level with state-varying intercepts and slopes. Ancestry percentages have been log-transformed, labeling on the horizontal axis refers to untransformed values. Histograms represent the distribution of each ancestry across CZs.

and regional confounders (*SI Appendix*, Section 2.4; see *SI Appendix*, Sections 1.3–1.4, for a more detailed description of the statistical controls). Gradients in terms of upward mobility (for all, blacks, and non-Hispanic whites), rank correlations, rags-to-riches mobility, and causal place effects remain largely stable with the inclusion of these covariates (*SI Appendix*, Tables S5-S10). Given the divide in mobility between the North and South, we also confirm that all our key results remain robust to the exclusion of all Southern states (*SI Appendix*, Section 2.10), which have a lower representation of European ancestral groups except the British (Fig. 1).

Variation across and within states. Independent variation in mobility for blacks and in terms of causal place effects suggests that mobility differences are to some extent ecological—that is, not only due to individuals of different ancestry being more or less mobile. However, such differences could arise either between or within states, with potentially different implications for the mechanisms involved (e.g., state-wide economic policy vs. local differences in school quality or social capital). In *SI Appendix*, Table S11, we estimate a set of mixed-effects models, distinguishing covariation within and between states. Here we use log-transformed ancestry shares, which are more symmetrically distributed than the raw percentages (see *SI Appendix*, Table S3). These models show that while between-effects are generally larger, a substantial portion of ancestry gradients occurs within states. A visual summary of these associations is shown in Fig. 3, which further introduces random slopes for each state—confirming that patterns are relatively uniform and not confined to any one part of the country.

Synthetic countries in the U.S. Next, to allow a more direct comparison with the cross-national literature, we construct "synthetic countries" by aggregating economic outcomes across CZs weighted by their ancestry shares (see *Materials and Methods*). For each European country, we thus obtain a synthetic U.S. counterpart consisting of a weighted average of CZs.

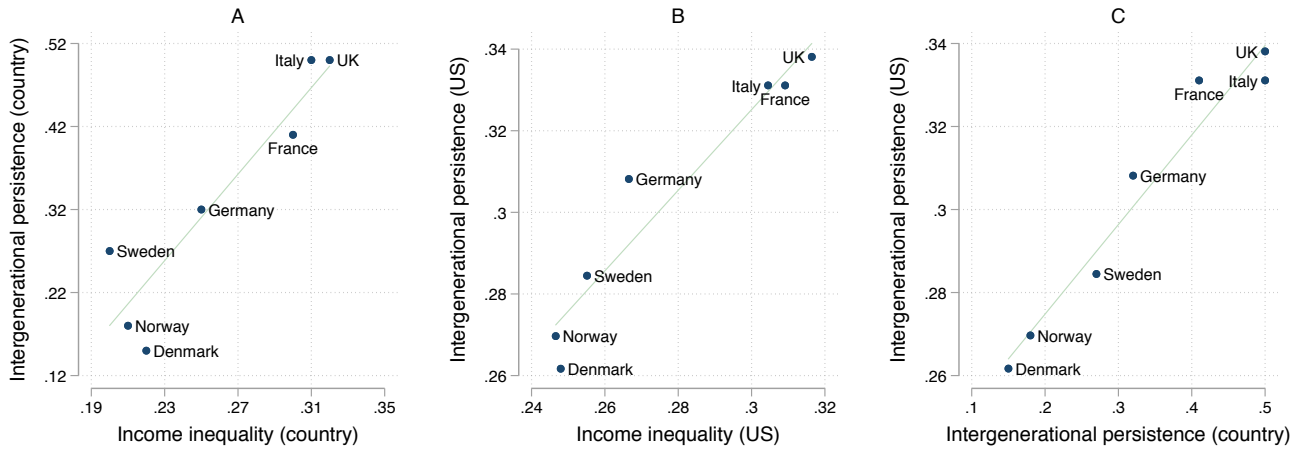

Fig. 4. Income inequality and intergenerational persistence in Europe and synthetic countries within the U.S. (*A*) Income inequality and intergenerational persistence in Europe. These data are from Corak (6) and depict the so-called Great Gatsby Curve (GGC). Income inequality is measured as the Gini coefficient in family income around 1985, and persistence as the father-to-son elasticity in long-run earnings for cohorts born around 1960. (*B*) The counterpart to the GGC across synthetic countries within the U.S. Income inequality is measured as the Gini coefficient in family income of parents in the Chetty et al. (4) data (minus the top 1% share), and persistence as the family income rank correlation for daughters and sons born in the early 1980s. Synthetic country estimates are U.S.-wide averages with weights assigned based on the CZ-level representation of each ancestral group. (*C*) Intergenerational income persistence in Europe and U.S. compared. Axes in panel *C* have the same definition as vertical axes in *A* and *B*. Superimposed lines represent the least-squares line of best fit. For further information on sources and definitions, see *Materials and Methods*.

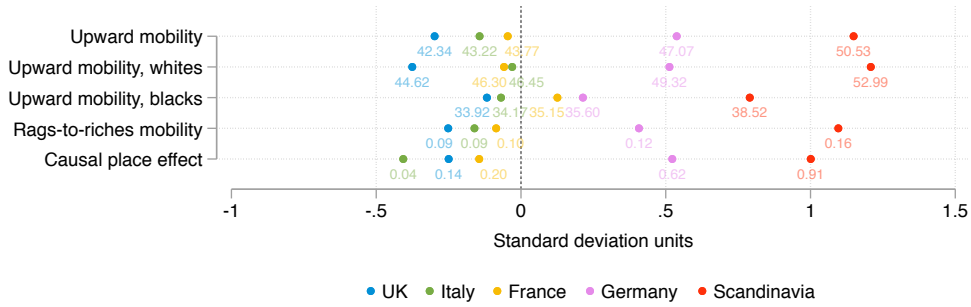

Fig. 5. Alternative metrics of intergenerational mobility for synthetic countries. Upward mobility reflects the expected adult income percentile for a child born to parents at the 25th percentile; rags-to-riches mobility the probability of transitioning from the bottom to top income quintile; and causal place effect the yearly percentage gain in income from spending one additional year of childhood in a CZ, for children in the bottom half of the income distribution. The horizontal axis expresses differences in (unweighted) standard deviation units calculated across the universe of all CZs on the U.S. mainland.

GGC in Europe and synthetic countries. As a baseline, we first reproduce the GGC between European countries using data from Corak (6). Fig. 4, *A* displays the familiar relationship between income inequality (the Gini coefficient) and father-to-son income elasticities, showing that more unequal countries exhibit a higher degree of intergenerational persistence—that is, less economic mobility. In Fig. 4, *B* we display the corresponding synthetic country estimates from U.S. data using rank correlations, the mobility measure which comes closest to the elasticities in international data.* Comparison of Fig. 4, *A* and *B* reveals a close resemblance between European countries and their synthetic U.S. counterparts. Fig. 4, *C* directly compares European elasticities and U.S. rank correlations, showing a high correlation ($r = 0.98$, the Gini is similarly correlated at $r = 0.97$, *SI Appendix*, Table S1).

Mobility variation across synthetic countries. In Fig. 5, we extend the synthetic country approach to the broader range of mobility metrics, most of which have no direct counterpart in international data. To gauge the magnitude of these estimates, we scale the horizontal axis by the (unweighted) mean and SD of each metric across all CZs on the U.S. mainland.

Synthetic Britain and Italy are consistently below the U.S.-wide mean on all mobility metrics, while synthetic Scandinavia scores ∼1 SD above it, with synthetic Germany and France scoring between these extremes. For example, the expected income rank in adulthood for a child born in the bottom half of the income distribution (upward mobility) in synthetic Britain is 42.34, compared to 50.53 in synthetic Scandinavia; the 8.19 percentile distance between them amounts to 1.45 SDs.

Gradients are similar in terms of upward mobility for blacks and non-Hispanic whites, and when measured by the rank

*Here we focus on rank correlations, rather than upward mobility, because the former are closer in nature to the elasticities available in international data. In *Materials and Methods* we discuss the analogy between the two. Both are measures of persistence, but rank correlations tend to be less dispersed: Bratberg et al. (27) report estimates for Germany, Norway, and Sweden that fall in the range 0.21–0.25. Following Chetty et al. (4), we also focus on income inequality minus the top 1% income share to reduce the influence of outliers. However, in *SI Appendix*, Fig. S8, we replicate the relationship using Gini coefficients based on the entire income distribution.

correlation. A similar pattern is also evident for the causal place effect on adult income among children who grow up in households below the median. The fact that each ancestry constitutes a minority within its own synthetic country makes it unlikely that these estimates are driven purely by the response of same-ancestry individuals to the concentration of their own group (*SI Appendix*, Table S12). We interpret this as further evidence that places with different European origins shape mobility outcomes for the local population more broadly.

Discussion

A growing literature finds that the persistence of economic status is strongest in unequal societies such as Great Britain or Italy, and weaker in countries like the Scandinavian welfare states (6). While the U.S. ranks among the least equal and mobile countries in the developed world, recent work has uncovered that it consists of places that span the global mobility distribution (4). We link these two observations by studying the microcosm of Europe that arose as millions of immigrants crossed the Atlantic and settled the U.S. over a century ago.

Our results show a striking resemblance in gradients of equality and intergenerational mobility between European countries and U.S. locations where descendants to these European immigrant groups live today. We find similar variation in upward mobility for the black minority population, and in terms of causal place effects—suggesting that areas of different heritage generate disparate outcomes also for those not belonging to the ancestral groups we study. These differences are quantitatively important. For example, the percentage of Scandinavian descent correlates as closely with upward mobility as nearly any of the demographic, institutional, and economic correlates that Chetty et al. (4) explore in their work. Together, this assigns a potentially important role to historical factors in understanding the patchwork of U.S. opportunity today.

We interpret our findings as suggesting that places—rather than people—with different European origins differ in ways that shape opportunity. Yet more work is needed to shed light on the causal pathways that link different European origins to the present-day opportunity structure. In particular, historical scholars have emphasized that immigrants who settled the U.S. during its formative period found little by the way of social structure where they came (28), making it plausible that a myriad of cultural, economic, and social institutions trace their origins to these settler populations. We provide an exploratory analysis of such contemporary differences in local institutions (*SI Appendix*, Section 2.6), which should guide further inquiries into the extent to which European immigrants brought with them different beliefs, ideas, and values that may have shaped the formation and evolution of U.S. communities.

Materials and Methods

Replication materials. Materials necessary to reproduce all findings can be accessed via a repository at the Open Science Framework (https://osf.io/5w7kf/).

Measures of ancestry. To estimate the ancestral composition of CZs, we use data from the 5% sample of the 1980 U.S. Census made available through IPUMS (29), which align with the mobility metrics that are based on cohorts born in the early 1980s. Ancestry is defined by the Census Bureau as "a person's ethnic origin, heritage, descent, or 'roots,' which may reflect their place of birth, place of birth of parents or ancestors, and ethnic identities that have evolved within the U.S." and is based on self-identification. When defining European ancestry shares, we include all available subcategories (*SI Appendix*, Section 1.1). To map respondents' county group of enumeration to CZs, we use crosswalks created by David Dorn (30).

Measures of mobility and inequality. The literature on economic mobility has generated a variety of measures, of which the most common is the intergenerational elasticity (IGE) of incomes. This statistic, which simply reflects the derivative of expected log child income ($\ln y_t$) with respect to log parent income ($\ln y_{t-1}$) is usually estimated using ordinary least squares, yielding the expression:

$$IGE = \frac{Cov(\ln y_t, \ln y_{t-1})}{Var(\ln y_{t-1})} = Corr(\ln y_t, \ln y_{t-1}) \frac{\sqrt{Var(\ln y_t)}}{\sqrt{Var(\ln y_{t-1})}}.$$

In Fig. 4, we use IGE estimates for sons born around 1960 and their fathers, derived from nationally representative data and corrected for measurement error, and estimates of income inequality around 1985 as reported by Corak (6). However, sensitivity to marginal distributions and the ages at which income is measured has led recent research to prefer the rank-order correlation (4), which represents a similar derivative where each variable has instead been transformed to percentile ranks, estimated as:

$$\rho_R = \frac{Cov(R[y_t], R[y_{t-1}])}{Var(R[y_{t-1}])} = Corr(R[y_t], R[y_{t-1}]).$$

In Fig. 1 and 4, we use data from Chetty et al. (4) on the rank-rank regression slope for U.S. CZs where children born in 1980–82 and their parents are ranked in the national income distribution. Child income is measured as mean family income in 2011–2012 when children are approximately 30 years old, while parent income is measured by mean family income between 1996–2000. IGEs and rank correlations are similar in that they measure persistence of income throughout the distribution, but are uninformative about whether mobility is driven by improved prospects for those at the bottom. In Fig. 1 and 5, we therefore also use CZ-level data from Chetty et al. (4) on upward mobility for the 1980–82 birth cohorts. Upward mobility is defined as the income rank expectation for a child born to parents at the 25th percentile of the national income distribution, which equals the average rank of children born into the bottom half of the distribution given the linearity of the rank-rank relationship. In Fig. 2, 3, and 5, we use CZ-level measures of upward mobility separately by race for the 1978–83 birth cohorts from Chetty et al. (8). In Fig 5, we also present a conceptually similar CZ-level measure of upward mobility from Chetty et al. (4) for the 1980–85 birth cohorts, which corresponds to the probability that a child born to parents in the bottom quintile of the national income distribution reaches the top quintile in adulthood. In addition, we use estimates of causal place effects from Chetty and Hendren (26) in Fig 5. For each CZ, they estimate a causal exposure effect for children born to parents at the 25th (and 75th) income percentile, which corresponds to the expected percentage increase in household income at age 26 relative to the national mean from spending one additional year of childhood in that CZ. Note that all mobility measures are not available for the universe of CZs. Throughout the analysis, we always include all CZs in the contiguous U.S. with non-missing data for each respective metric (n = 610–722; see *SI Appendix*, Table S3).

In Fig. 1, and 4, we use CZ-level measures of income inequality obtained from Chetty et al. (4). Inequality is measured by the Gini coefficient of income among parents to children in the 1980–82 birth cohorts, where incomes are top coded at $100 million. Chetty et al. report two versions of the CZ-level Gini coefficient, one calculated on the whole population and one subtracting the top 1% income share. We use the latter to reduce the influence of outliers and measurement error in top incomes. However, in *SI Appendix*, Fig. S8, we replicate the relationship using Gini coefficients based on the entire income distribution.

Mixed regression models. In Fig. 3, we display predicted state-level slopes from a mixed regression model of the form:

$$\theta_c = \alpha_s + \beta_s \Big(ln(1 + a_c) \Big) + u_c,$$

where θ represents the CZ-level parameter of interest, modeled as a function of each CZ's proportional representation of a given ancestry a (subscript c is for CZ). We let intercept (α_s) and slope (β_s) coefficients vary at the state level (subscript s), and estimate models for each ancestry, as well as for black and non-Hispanic white mobility, separately (*SI Appendix*, Section 2.5).

Synthetic countries. In Fig. 4 and 5, we present inequality and intergenerational mobility estimates for synthetic countries. When constructing synthetic countries, we weight the relevant population parameters at the CZ level as a function of each group's proportional representation:

$$\theta_a = \sum_{c=1}^{n} a_c \left(\frac{a_c}{A_c}\right) \theta_c \Bigg/ \sum_{c=1}^{n} a_c \left(\frac{a_c}{A_c}\right),$$

where θ again represents the parameter of interest (subscript a denotes ancestry), a_c is the proportion of inhabitants who belong to a given ancestral group a, and A_c is the proportion who report any of the ancestries in our study (*SI Appendix*, Section 1.5). The bracketed expression places a lower weight on areas where other ancestries used in the analyses are heavily represented; alternative estimates excluding this penalty are reported in *SI Appendix*, Section 2.8.

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