



Long-term decline in intergenerational mobility in the United States since the 1850s

Xi Song^a, Catherine G. Massey^b, Karen A. Rolf^c, Joseph P. Ferrie^d, Jonathan L. Rothbaum^e, and Yu Xie^{f,1}

^aDepartment of Sociology, University of Pennsylvania, Philadelphia, PA 19104; ^bWelch Consulting, Bryan, TX 77802; ^cGrace Abbott School of Social Work, University of Nebraska at Omaha, Omaha, NE 68182; ^dDepartment of Economics, Northwestern University, Evanston, IL 60208; ^eSocial, Economic, and Housing Statistics Division, US Census Bureau, Washington, DC 20233; and ^fDepartment of Sociology, Princeton University, Princeton, NJ 08544

Contributed by Yu Xie, October 4, 2019 (sent for review March 25, 2019; reviewed by Miles Corak and David B. Grusky)

We make use of newly available data that include roughly 5 million linked household and population records from 1850 to 2015 to document long-term trends in intergenerational social mobility in the United States. Intergenerational mobility declined substantially over the past 150 y, but more slowly than previously thought. Intergenerational occupational rank–rank correlations increased from less than 0.17 to as high as 0.32, but most of this change occurred to Americans born before 1900. After controlling for the relatively high mobility of persons from farm origins, we find that intergenerational social mobility has been remarkably stable. In contrast with relative stability in rank-based measures of mobility, absolute mobility for the non-farm population—the fraction of offspring whose occupational ranks are higher than those of their parents—increased for birth cohorts born prior to 1900 and has fallen for those born after 1940.

intergenerational mobility | US history | inequality | occupation | US Census

Intergenerational social mobility, or simply “mobility,” refers to the extent of difference (or, conversely, similarity) in social status between parents and offspring. Social mobility has been a persistent theme throughout US history, reflecting Americans’ collective belief in their country being a “land of opportunity,” a society that provides equal opportunities for individuals from poor and rich families alike. While this belief is widely held among the public, little is known about how mobility opportunities and outcomes have changed over time. Compared to the well-established knowledge of historical levels of economic inequality (1, 2), evidence of long-term trends in intergenerational mobility is largely absent. Most studies hitherto have relied on data from a small set of cities (3–5) or from 2 snapshots in time (6–9), both of which limit the generalizability of their findings. Prior research has also used different measures of social status, such as education, occupation, income, or wealth, or even indirect status indicators based on individuals’ names (10, 11). Inconsistency across these studies has prevented researchers extending their findings to a broader historical spectrum.

The present study provides long-term intergenerational mobility trends based on a consistent, occupation-based measure from 1850 to 2015 using data drawn from linked US population and household administrative records. In recent years, social scientists and policy makers have voiced concerns that rising economic inequality may have led to declines in social mobility. However, after decades of research, the link between the 2 is still unclear (12–15). On the one hand, cross-country comparisons suggest a negative relationship between income inequality and intergenerational mobility—a higher correlation between offspring’s earnings and that of their parents in countries with higher Gini coefficients than in those with lower inequality (16). On the other hand, research on the United States has revealed constancy in intergenerational persistence of income and occupational status since the 1970s, an era when economic inequality has substantially increased (17, 18). Hence, there is a

real need to establish the empirical pattern of long-term mobility before we can accept or reject claims about its causes and consequences.

Our long-term mobility analysis relies on data pertaining to more than 5 million Americans linked to their parents using occupational measures and statistical methods that are consistent over time. The data include father–son dyads from linked full-count federal population censuses spanning 1850–1880, 1880–1910, and 1910–1940, and from the Current Population Survey 1973–1990 linked to both the 1940 and 2000 censuses and the 2001–2015 American Community Surveys (ACSs). For cross-validation purposes, we supplement the analysis with well-established mobility data from 11 large-scale cross-sectional and longitudinal social surveys. To address data limitations in previous research, we pool multiple data sources to create nationally representative samples of white males born in the United States in 16 consecutive 10-y cohorts between 1830 and 1980.

We accomplish 3 interrelated objectives in this paper. First, we estimate the overall trend in intergenerational mobility based on the correlation between parents’ and offspring’s occupational percentile ranks. Unlike some widely used occupational indices, such as the Duncan socioeconomic index score (19), the relative statuses of the same occupations have necessarily changed over time as the overall occupational structure changed. For example, as we will show, the percentile ranks of clerical workers declined

Significance

We document long-term trends in intergenerational occupational mobility for US native-born men using population registers and survey data from 1850 to 2015. We find substantial declines in social mobility over the past 165 y. However, contrary to public perception, most of the decline happened to Americans born prior to 1900, rather than more recently, and was largely driven by the movement of children from farm to manufacturing sectors during industrialization. The proportion of sons who experienced absolute upward mobility increased for birth cohorts born prior to 1900 and has fallen for those born after 1940. One implication is that recent birth cohorts experienced less upward mobility than their parents or grandparents.

Author contributions: X.S., K.A.R., J.P.F., and Y.X. designed research; X.S., C.G.M., J.P.F., and Y.X. performed research; Y.X. contributed new reagents/analytic tools; X.S., C.G.M., J.P.F., and J.L.R. analyzed data; and X.S., C.G.M., K.A.R., J.P.F., J.L.R., and Y.X. wrote the paper.

Reviewers: M.C., City University of New York; and D.B.G., Stanford University.

The authors declare no competing interest.

This open access article is distributed under [Creative Commons Attribution-NonCommercial-NoDerivatives License 4.0 \(CC BY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Data deposition: The programming code and data have been deposited on Open Science Framework and is available at <https://osf.io/6c58f/>.

See Commentary on page 23.

¹To whom correspondence may be addressed. Email: yuxie@princeton.edu.

This article contains supporting information online at <https://www.pnas.org/lookup/suppl/doi:10.1073/pnas.1905094116/-DCSupplemental>.

First published November 25, 2019.

when professional, managerial, and executive jobs at the top end of the occupational distribution expanded. As a result, a clerical worker's relative standing in his birth cohort would have decreased even when his father had also been a clerical worker. Second, we consider how the mobility trends were affected by rapid industrialization in the second half of the 19th century and examine how our observed trend is sensitive to the exclusion of mobility from farm to nonfarm jobs. Finally, we measure changes in absolute mobility—including both upward mobility and downward mobility—using the rank-ordered scale of occupations. Among the 70 microclass occupations analyzed in the present study, we estimate the fractions of children in each birth cohort whose occupational ranks are above, below, or approximately the same as those of their fathers. We use occupational ranks rather than percentile ranks to measure absolute mobility because the former captures moving up or down the social ladder, whereas the latter is confounded by “involuntary mobility” caused by changing marginal distributions of occupations.

We find that the correlation between parent's and offspring's occupational percentile ranks increased considerably among Americans born prior to 1900 but remained largely constant thereafter. When mobility of farm-origin children is excluded, the overall trend persists but to a lesser degree. Our results provide evidence in support of the Lipset–Zetterberg hypothesis (20), which states that nonfarm mobility rates are largely invariant (21). The trend for absolute mobility is different, however: Upward mobility increased for birth cohorts prior to 1900 but has fallen for those born after 1940.

Results

Changing Occupational Percentile Ranks. We begin by showing changes in percentile ranks by occupation to provide a broader historical context for our study of trends in intergenerational social mobility. Occupational percentile ranks are defined based on the educational distribution of workers within each occupation. We allow the percentile ranks to vary by birth cohort. A higher percentile rank suggests a higher occupational status, or more highly educated workers within that occupation. Due to the expansion of high-status occupations over time, most occupations have experienced a long-term decline in percentile ranks (*SI Appendix, Fig. S1*). Only a few occupations, mostly at the extreme top of the distribution, such as jurist, health professional, scientist, architect, and engineer, have remained stable in percentile ranks. This downward trend in occupation percentile ranking has been driven by the expansion of secondary education, especially the high school movement during the 1910s to 1940s (22), and the resulting upgrading of skills within occupations over time. Additional analyses shown in the appendixes suggest that the relative rank orders of occupations (“Treiman's rank”) have been largely stable, but the percentile ranks declined as a result of the evolving US occupational structure. Fig. 1 provides an illustration of this trend using changing percentile ranks from 5 out of the 70 microclass occupations. The standing of jurists has been consistently high over time because the law has been one of the most prestigious and highly selective occupations as well as a small profession. By contrast, the relative status of managerial and sales occupations has declined not only because of the increased share of workers in these occupations but, more importantly, because occupations of higher status experienced rapid expansion during the same period. Overall, status distances between occupations ranked at the top and middle levels, such as between jurist and sales worker, have widened over time, because of the falling ranks of the latter. Despite the substantial shrinkage of agricultural occupations (shown in *SI Appendix, Tables S3 and S4*), the extremely low percentile scores of farm laborers endured through time.

Long-Term Trends in Intergenerational Mobility. Fig. 2 presents our primary estimates of intergenerational rank–rank correlations by son's birth cohort. Alternatively, we can also show father–son correlations by father's birth cohort.* The solid circles with capped spikes represent the point estimates and 95% confidence intervals of the rank–rank correlations between fathers and sons for the 1830–1980 birth cohorts from the linked census and survey data. Confidence intervals for estimates from linked historical census data for birth cohorts prior to 1910 are narrower than those from linked census–Current Population Survey (CPS) samples due to the greater sample sizes of the former (*SI Appendix, Table S1*). The series in diamond symbols represent the rank–rank correlations estimated from weighted ordinary least-squares (OLS) regressions with standardized coefficients for the 1900–1980 birth cohorts using pooled social survey data. Correlation estimates from social surveys, in general, are higher than those from linked censuses, potentially attributable to more measurement errors in the linked data. As robustness checks, we relax the assumption that occupations are strictly rank ordered and conduct sensitivity analyses with alternative statistical techniques, such as the Altham index (23, 24) and log-linear models for contingency tables (25–28).† Results from the sensitivity analyses are highly consistent with those reported here.

The correlation estimates in Fig. 2 show that intergenerational mobility has changed substantially over the past 150 y. Rank–rank correlations based on linked census and survey estimates increased from roughly 0.17 for the 1830 birth cohort to 0.32 for the 1980 birth cohort, suggesting an average increase of 0.01 in every 10 y.‡ This result is consistent with earlier findings by Long and Ferrie (8), which show a similar trend but rely on only 2 point-in-time estimates from the mid-19th century and the late 20th century. However, changes in mobility are not paced evenly over time. The correlations increased dramatically before the 1900 birth cohort and gradually slowed down and stabilized thereafter. One explanation for the historical trend in social mobility is the accelerated progress of industrialization in the United States during the 19th century, particularly the unprecedented demographic and economic transformations caused by the decline of the agricultural population. We single out this mechanism and discuss its implication for patterns and processes of social mobility in the next section.

Intergenerational rank–rank correlations have changed little, if at all, since the beginning of the 20th century. This trend is consistent with recent findings from Chetty et al. (17) and Hout (18), who use similar rank-based methods for data that cover only the 1970s to the present. Indeed, the dominant hypothesis in the literature was long ago proposed by Featherman et al. (13), that relative mobility in all industrialized societies is constant or trendless, although empirical research using log-linear analysis has documented increases in relative mobility in some industrialized societies (e.g., refs. 29–31). Besides the long-term trend, we also observe small short-term fluctuations, for example, the recent drop in the intergenerational correlation estimated from pooled social surveys for the 1950 cohort (born between 1946 and 1955), namely the early baby-boomer generation. This finding is not novel; a few prior studies having found similar patterns (14, 32). For example, Beller and Hout

*The exact numbers of the rank–rank correlation estimates are shown in *SI Appendix, Tables S10 and S11*.

†The methods are described in *SI Appendix, section S8*, and results are presented in *SI Appendix, Tables S12–S14*.

‡Because the 2 linked samples were produced using different linking methods, we caution against conclusions drawn from direct comparisons of mobility estimates. Instead, we focus on trends within a data source.

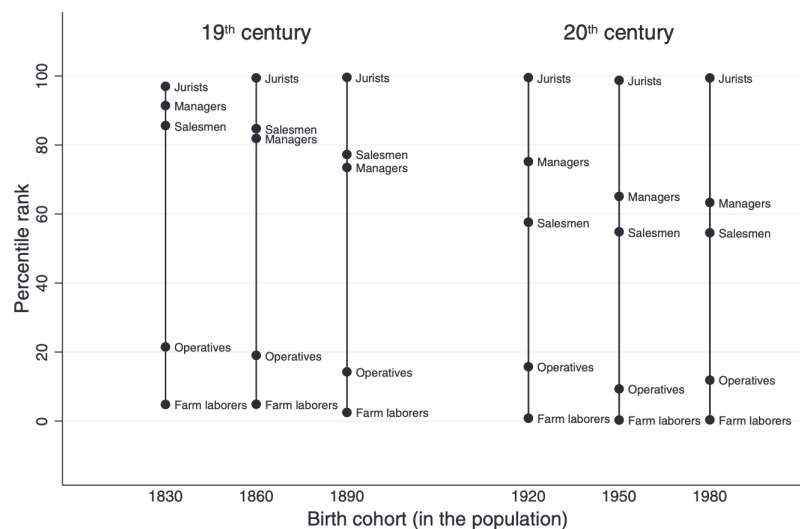


Fig. 1. Trends in occupational percentile ranks among select occupations. Data sources: IPUMS US Population Censuses full count 1850, 1880, 1900, 1910, 1920, 1930, 1940; 1% samples 1860, 1870, 1950; 5% samples, 1960, 1980, 1990, 2000; 6% sample, 1970; ACS 2001–2015. Notes: The figure shows changes in percentile ranks for 5 out of the 70 microclass occupations defined in *SI Appendix, Table S1*. The percentile ranks are estimated from occupation-specific educational distributions by birth cohort using all men and women aged 25 to 64 in population censuses. The methodology is described in *SI Appendix, section S4*. Percentile rank changes for all of the birth cohorts and microclass occupations are shown in *SI Appendix, Fig. S1*. The graph suggests that distances between top-ranked occupations, such as between jurists and managers, have increased over time because of the growth of professional, managerial, and upper nonmanual occupations at the top end of the distribution.

(32) show that occupational mobility temporarily increased during the 1970s, compared with the preceding period of the 1940s through the 1960s and the subsequent period of the 1980s and 1990s. However, because our statistical tests show only a marginally significant change from 1950 to 1960 ($P = 0.032$) and this cohort is missing in the linked contemporary census and survey data, we consider the deviation of the 1950 birth cohort best interpreted as suggestive. Proper interpretation of this deviation awaits future research with further evidence. Overall, our analysis reveals the global trend in intergenerational mobility as an S-shaped curve with a long plateau phase in the second half of the 20th century.

A Closer Look at Farming. Farmers, including ranchers, farm managers, foremen, and laborers, constitute a unique, and typically the largest occupation in preindustrial agricultural societies. They played a distinct role in the evolution of social mobility in the United States and elsewhere during the 19th and 20th centuries (8, 9). The dominant inflow into the farming sector consists of children of farm origins, not only because farmers were once positioned at the bottom of the social stratification system, but also because farmer fathers can directly transmit their statuses to their sons via the inheritance of land and farming knowledge. During the historical period under study, the US economy experienced an increase in the farm population from 4.9 million in 1850 to a peak of 32.5 million in 1916, and a gradual decrease since World War I to 2.1 million in 2012.⁸ However, the proportion of the agricultural population has consistently decreased over time from more than 57% in the 1800 birth cohort to 13% in the 1900 cohort (Fig. 3A and *SI Appendix, Table S5*), despite the rapid growth of the total population, the expansion of the frontier, and the rise and fall of southern plantations. Industrialization and urbanization opened up new upward

mobility opportunities for children of agricultural workers, many of whom migrated from farms to booming towns and cities to become operative workers, blacksmiths, bricklayers, truck drivers, sales workers, and other types of lower manual workers (*SI Appendix, Table S9*).

We examine the special role of farming in shaping the trend in social mobility, separating the analysis of mobility outcomes of farm-origin sons from the rest of the population. Fig. 3B suggests that the mean percentile ranks of sons of farmers and farm laborers have declined over time. In particular, those born before 1880 experienced more upward mobility—entering lower- to middle-class occupations at the 40th to 55th percentiles—than those in subsequent cohorts. The trend has become relatively stable in recent decades, with the share of agricultural workers diminished to less than 2% of the total labor force.

Fig. 3C shows intergenerational percentile rank–rank correlations after farm-origin sons are excluded. The linked census estimates changed little over most cohorts born between 1820 and 1910, fluctuating between 0.22 and 0.26, except for a brief increase for the 1870 and 1880 birth cohorts. The unusual experiences of the 1870 and 1880 cohorts coincided with major social transformations in US history. These cohorts grew up during the Gilded Age, an era of rapid expansion of industrialization accompanied by extreme poverty, high concentration of wealth, and persistence of inequality across generations. Some later may have experienced downward mobility or changes in occupations in their forties and fifties as they lived through World War I, the Great Depression, and the influx of low-skilled immigrants from Europe as well as the mass internal labor market movement caused by the Great Migration. However, our data do not allow us to trace these life cycle changes in mobility because most sons were observed in their thirties in our intergenerational sample (33, 34). After a long and stable trend between the 1900 and 1960 cohorts, estimated rank–rank correlations rose for the most recent cohorts, suggesting a declining turn in social mobility. However, large

⁸See *Historical Statistics of the United States, Colonial Times to 1970*, Table K 1–16, Table D 75–84 (55), and 2012 Census Highlights (56). Also see *SI Appendix, Fig. S4*.

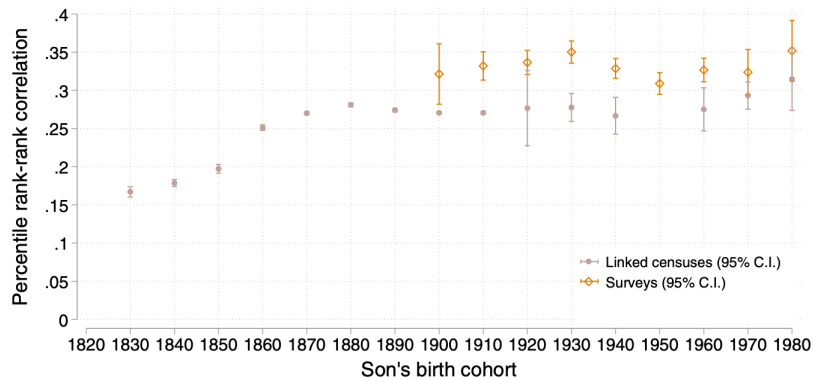


Fig. 2. Trends in intergenerational rank-rank correlation over son's birth cohort. Data sources: Linked censuses include linked historical census data 1850–1880, 1880–1910, 1910–1940; linked contemporary data using census 1940 to CPS (1973, 1979, 1980–1990) and CPS to census 2000/ACS 2001–2015. Survey data include General Social Surveys 1972–2016; Health and Retirement Study 1992–2010; National Longitudinal Survey–Older Men 1966–1990; National Longitudinal Survey–Young Men 1966–1981; National Longitudinal Survey of Youth 79, 1979–2012; National Survey of Families and Households, 1987, 1993, 2002; Occupational Changes in a Generation I and II; Panel Study of Income Dynamics (Survey Research Center [SRC] sample), 1968–2015; Survey of Income and Program Participation, 1986, 1987, 1988; Wisconsin Longitudinal Study, 1957–2011. Notes: The figure plots the estimated correlation in occupational percentile ranks between fathers and sons over 16 birth cohorts of sons. The series of solid circles plots the point estimates of the rank-rank correlations between fathers and sons for the 1830–1980 birth cohorts of sons. The 1950 birth cohort (sons born between 1946 and 1955) is missing because these individuals were not observed during their childhoods in either the linked historical censuses or the contemporary linked CPS-Census/ACS data, which is necessary to make the father-son link. The series in diamond symbols plots the rank-rank correlations estimated from weighted OLS regressions for the 1900–1980 birth cohorts from pooled contemporary social surveys. The weights are constructed from the original sampling probability weight variable in each survey as well as an additional weight variable that takes into account variation in sample size by birth cohort across surveys. The capped spikes refer to 95% confidence intervals of the correlation estimates. Because of the smaller sample size of the survey data relative to the linked census data, the survey estimates show a higher level of uncertainty reflected in wider confidence intervals. See *SI Appendix, Table S10* for the exact numbers of the estimates.

confidence intervals and few data points for these recent cohorts limit our ability to draw firm conclusions.[¶]

In the broader time horizon being studied, the trend (shown in Fig. 3C) still suggests lower mobility for the 1960–1980 birth cohorts than for the 1830–1860 cohorts. It is possible that demographic changes in fertility rates and timing have reduced family size and strengthened intergenerational ties between parents and offspring. However, other mechanisms, such as the development of modern education systems, the increasing number of occupations that require postsecondary degrees for entry, and the rapid expansion of occupational licensing, may also explain changes in intergenerational mobility and warrant considerations in future research.

Overall, the decline of the agricultural population during the 19th century is associated with an unprecedented increase in intergenerational rank-rank correlation. This result offers some support to the Lipset-Zetterberg hypothesis (20, 21), later revised by Hauser et al. (36) and Featherman et al. (13), that variations in intergenerational mobility rates across countries and time largely depend on the size and structure of the agricultural sector. For most birth cohorts after 1860 and before 1960, mobility net of structural changes—mostly driven by the movement from farm to factory during industrialization—exhibits no discernible trend over time. However, in addition to the long-term trend, we also observe short-term fluctuations for the 1870–1880 and 1950 birth cohorts.

Absolute Mobility among Nonagricultural Occupations. The rank-rank correlation results provide a historical trend in relative

mobility—how the child's occupational percentile ranking resembles that of his parents in the social hierarchy. However, the public and policy makers are often concerned with the absolute amount of upward and downward mobility opportunities faced by Americans today compared with in the past. A recent *Science* article reports that “the fraction of children who earn more than their parents” has declined from 90% for children born in 1940 to 50% for children born in the 1980s (37). How to define absolute mobility with occupation is less clear than the case with income. In particular, upward mobility may result from 2 sources, either individuals entering an occupation with a higher social status than that of their parents or individuals entering the same occupation as their parents but the social status of the occupation per se has increased over time. The opposite is true for downward mobility.

Given this methodological problem, we chose to measure absolute mobility by changes in occupational ranks (Treiman's rank) between generations. Consistent over time, Treiman's rank of occupations is a good absolute measure of status, capturing the rank order of occupations unaffected by the marginal distribution of occupational compositions. We converted Treiman's rank into a scale ranging from 0 to 100 and measured occupational ranks of fathers and sons based on sons' birth cohorts. An upward move refers to mobility of a son to an occupation 7.5 points above that of the person's father; a downward move is defined likewise (also see ref. 18). In *SI Appendix*, we show similar results from sensitivity analyses using different definitions of absolute mobility. As discussed earlier, a large proportion of upward mobility was driven by the outflow of children of farmers, as the number of agricultural jobs shrank throughout the 19th and 20th centuries (9). For this reason, we exclude persons with farm origins and focus on absolute mobility among nonfarm occupations.

The trends in upward and downward mobility in Fig. 4A show a striking divide before and after the 1940 birth cohort. The gap between the 2 mobility rates was small before the 1850 birth cohort and grew substantially from the 1860 to the 1890 cohort

[¶]Mitnik et al. (35) have shown a similar trend in the increase in intergenerational social reproduction for recent decades since the 1970s. They argue that the increase in intergenerational reproduction is driven by individuals of professional-managerial family origins. To assess this explanation, we conducted an additional analysis in *SI Appendix, section 11*. We found evidence suggesting the rise of sons in managerial and professional workers does drive the increase in intergenerational persistence of occupation.

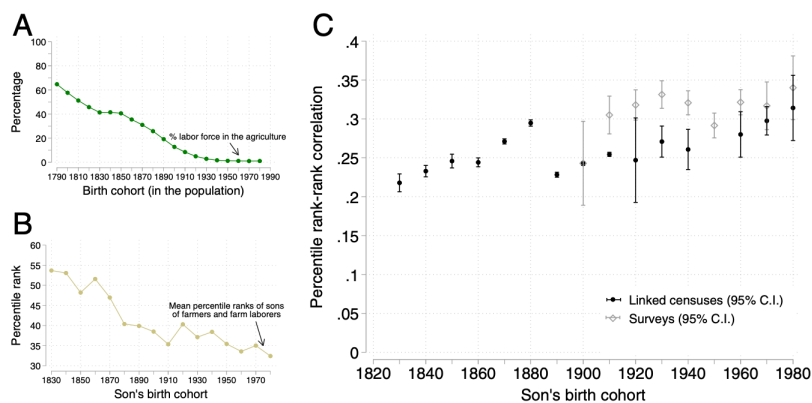


Fig. 3. Changes in the agricultural population and trends in intergenerational mobility among the nonagricultural population. Data sources: Linked historical census data 1850–1880, 1880–1910, 1910–1940; linked contemporary data using Census 1940 to CPS (1973, 1979, 1980–1990) and CPS to Census 2000/ACS 2001–2015. General Social Surveys 1972–2016; Health and Retirement Study 1992–2010; National Longitudinal Survey–Older Men 1966–1990; National Longitudinal Survey–Young Men 1966–1981; National Longitudinal Survey of Youth 79, 1979–2012; National Survey of Families and Households, 1987, 1993, 2002; Occupational Changes in a Generation I and II; Panel Study of Income Dynamics (SRC sample), 1968–2015; Survey of Income and Program Participation, 1986, 1987, 1988; Wisconsin Longitudinal Study, 1957–2011. Notes: *A* plots the share of the labor force in agriculture over time. *B* plots percentile ranks of sons of farmers and farm laborers over 16 birth cohorts of sons. *C* plots the estimated correlation in occupational percentile ranks between fathers and sons over 16 birth cohorts of sons. The sample excludes fathers who are either farmers or farm laborers. The series of solid circles plots the point estimates of the rank–rank correlations between fathers and sons for the 1830–1980 birth cohorts of sons. The 1950 birth cohort (sons born between 1946 and 1955) is missing because these individuals were not observed during their childhoods in either the linked historical censuses or the contemporary linked CPS–Census/ACS data, which is necessary to make the father–son link. The series in diamond symbols plots the rank–rank correlations estimated from weighted OLS regressions for the 1900–1980 birth cohorts from pooled contemporary social surveys. The weights are constructed from the original sampling probability weight variable in each survey as well as an additional weight variable that takes into account variation in sample size by birth cohort across surveys. The capped spikes refer to 95% confidence intervals of the correlation estimates. See *SI Appendix, Table S10* for the exact numbers of the estimates.

due to a rapid increase in upward mobility.[#] Before and after the break (1890–1910 and 1920–1930), estimates based on either linked census or survey data are consistent in showing no large changes in absolute mobility. However, the upward and downward mobility trends started to reverse in 1940 and in recent birth cohorts converged to levels experienced at the end of the 19th century, lending support to the public’s concern and popular speculation that upward mobility has fallen in tandem with rising downward mobility. One implication is that the prospects for entering high-status occupations have worsened for the recent cohorts born after the 1940s. The low rates of upward mobility for recent cohorts may not be exceptional in US history: Absolute mobility rates were low for birth cohorts born during the Antebellum era. However, the sharp increase in downward mobility rates experienced by 1940–1960 cohorts, most of whom belong to the baby boomer generation, seems to be a new phenomenon in recent US history.

Discussion

Our empirical analyses show a long-term decline of intergenerational social mobility in the United States since the 1850s, despite short-term, small fluctuations among some birth cohorts. The broad trend is largely resistant to the 2 world wars, the Great Depression of the 1930s, the rise and fall of blue-collar workers, and other social changes, on both large and small scales. The occupational percentile rank–rank correlation between fathers and sons has increased from 0.17 in the 1830 birth cohort to as high as 0.27 in the 1900 cohort and 0.32 in the 1980 cohort. Although income inequality has risen sharply since the 1970s (38), the trend in social mobility has remained largely stable during that same period. This suggests strong inertia of relative intergenerational mobility, which seems resistant to influences of short-term major social transformations, even if they may have a

large impact on some subpopulations. To put it another way, social transitions may have changed the overall opportunities for moving up or down, but not relative mobility chances.

A further analysis that separates the farm and nonfarm populations shows that industrialization is a major—if not the only—determinant of broader trends in social mobility. The farming population experienced an epochal decline from 1850 to 1910, with continuing repercussions up to the present. The massive outflow of offspring of farm origins was both a cause and a consequence of the shrinking agricultural sector. When changes in the agricultural population are accounted for, intergenerational social mobility changed little during the 19th century except among the 1870 and 1880 birth cohorts and has fallen slightly since 1940. Still the decline in farming does not explain away all of the observed changes in intergenerational mobility in this period. We leave the challenge of identifying other contributing social forces that explain the trend to future studies.

Absolute mobility changed more over time than relative mobility. Specifically, sons’ prospects of achieving a higher status than their fathers diminished during the 20th century, especially for those born after the 1940s. This result confirms prior research showing that upward mobility is no longer the “dominant feature of American labor markets” (18). Prior to this decline, American society experienced almost 100 y of increases in upward mobility opportunities, whereas the trend in downward mobility has changed less. As a result, the disparity between upward and downward mobility rates first diverged, then converged. That the present levels of upward and downward mobility are slightly different is alarming, especially in light of a concurrent trend in rising economic inequality. Although the exact rates of absolute mobility may depend on the level of aggregation at which occupations are classified, it is evident that recent birth cohorts experience less upward mobility than their parents’ or even grandparents’ generation.

[#]Note that lines between 1910 and 1920 are not connected, as estimates from linked historical censuses and contemporary census-survey data are not directly comparable.

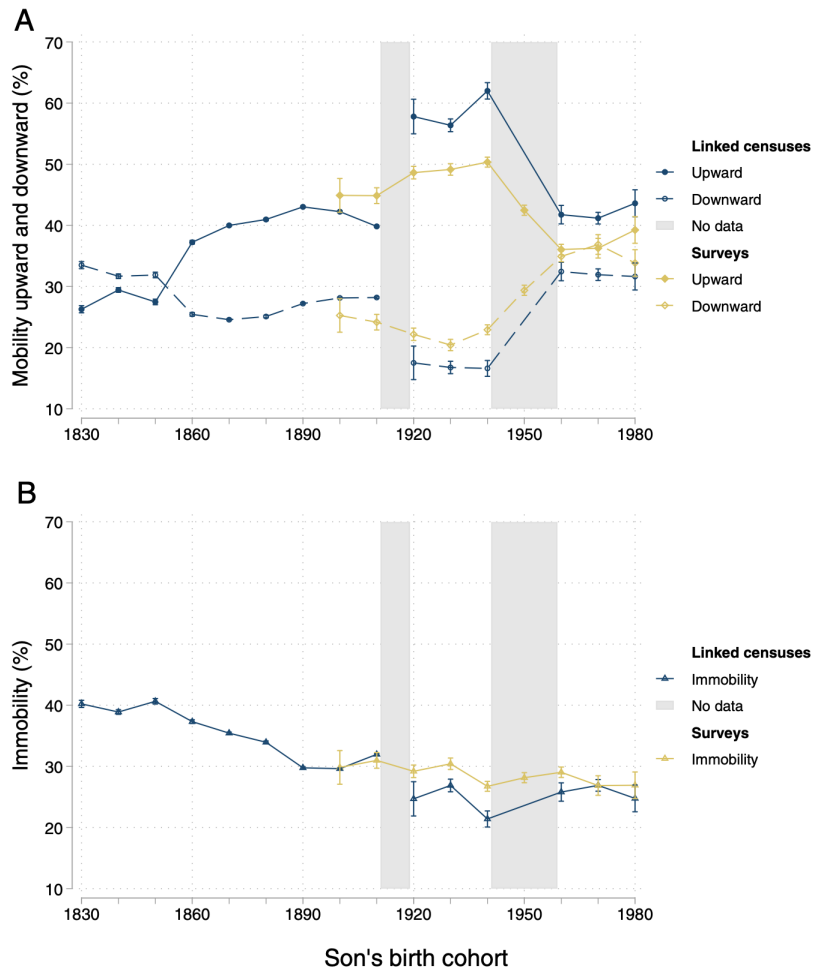


Fig. 4. Absolute mobility by son's birth cohort among the nonagricultural population. (A) Changing upward and downward mobility over sons' birth cohorts from 1830 to 1980. (B) The changing proportion of the population that experienced no intergenerational mobility over the same birth cohorts of sons. Data sources: Linked historical census data 1850–1880, 1880–1910, 1910–1940; linked contemporary data using Census 1940 to CPS (1973, 1979, 1980–1990) and CPS to Census 2000/ACS 2001–2015. General Social Surveys 1972–2016; Health and Retirement Study 1992–2010; National Longitudinal Survey–Older Men 1966–1990; National Longitudinal Survey–Young Men 1966–1981; National Longitudinal Survey of Youth 79, 1979–2012; National Survey of Families and Households, 1987, 1993, 2002; Occupational Changes in a Generation I and II; Panel Study of Income Dynamics (SRC sample), 1968–2015; Survey of Income and Program Participation, 1986, 1987, 1988; Wisconsin Longitudinal Study, 1957–2011. Notes: We assume that the father's occupational rank is determined by the rank of the same occupation in the son's birth cohort. We first converted all fathers' and sons' microclass occupations into the simple rank from 1 to 70 based on rankings of occupations in the son's birth cohort. We then normalized the rank, yielding a scale ranging from 0 to 100. An upward move is mobility to an occupation 7.5 points above that of the person's father; a downward move is mobility to an occupation 7.5 points below that of the person's father. The sample is restricted to men with nonfarm origins, 25 to 64 y old. The 1950 birth cohort (sons born between 1946 and 1955) is missing because these individuals were not observed during their childhoods in either the linked historical censuses or the contemporary linked CPS-Census/ACS data, which is necessary to make the father–son link. Additional analyses that rely on different definitions of absolute mobility are shown in *SI Appendix*, Figs. S8 and S9.

Materials and Methods

Data. Drawing from hundreds of millions of original records, we analyze the mobility experiences of several million unique individuals and their families. Our mobility data include 4 major sources: 1) cross-sectional Integrated Public Use Microdata Series (IPUMS) US population census data from 1850 to 2000 and the ACS from 2001 to 2015 (39); 2) 3 linked samples of complete-count historical censuses, 1850–1880, 1880–1910, and 1910–1940 (40); 3) the Current Population Survey Annual Social and Economic Supplement (CPS-ASEC 1973–1990) data linked to both the 1940 census and the 2000 long-form census and the ACS (2001–2015); and 4) for cross-validation purposes, 11 large-scale social surveys that have been used in previous studies on intergenerational social mobility (see a summary in *SI Appendix*).

We first generate population-level occupational percentile ranks for workers aged 25 to 64 using the IPUMS of US censuses from 1850 to 2000 and ACS from 2001 to 2015. Each birth cohort has its own occupational percentile ranks derived from the educational distribution by occupation and the

relative sizes of different occupations.[†] The construction of percentile ranks is described in the next section. We linked a sample of sons to their fathers to create father–son dyads. We first targeted sons aged 0 to 17 residing with their fathers in the 1850 full-count census, and then searched for occupation information of these sons in the 1880 full-count census. The procedure was repeated for linking the 1880 census to the 1910 census and linking the 1910 census to the 1940 census.^{**} Demographic characteristics, including first

[†]The literacy rate was used instead of education before 1940, as the education variable was not collected in early censuses. The percentile rank estimates of occupations include both males and females because the occupational status of men in a certain occupation also depends on the composition and characteristics of women in that occupation [see an extensive discussion on this methodological concern in Hauser and Warren (57)].

^{**}See *SI Appendix* for a detailed explanation of the linkage techniques used to link across the 1850–1940 censuses.

and last name, age, birthplace, and both parents' birthplaces were used to link records across censuses. Each individual's own birthplace and the birthplaces of both parents were required to match exactly, but a difference of up to 3 y in anticipated age across census observations was allowed. For names, the linking method required that Soundex phonetic codes for first and last name match exactly, keeping the potential match with the closest name distance.

To create a contemporary sample across the 20th century, our approach to father–son linking relied on the complete count 1940 Population Census, the 1973–1990 CPS-ASEC, the 2000 Census long form, and the 2001–2015 ACS. The Census Bureau's protected identification keys (PIKs) system was used to link individuals across data sources. PIKs are assigned by the person identification validation system (PVS), which uses a probabilistic matching algorithm to compare characteristics of records in census and survey data to characteristics of records in a reference file constructed from the Social Security Administration NUMIDENT file and other administrative data. These characteristics may include Social Security number, full name, date of birth, address, and parents' names, depending on the information available in the census or survey. The PIK uniquely identifies a particular person and allows us to link individuals across PIKed data sources. Details on the data linking procedures, representativeness, and potential biases are discussed in *SI Appendix*.

For cross-validation purposes, our analyses also include 11 large-scale datasets from the General Social Survey (41), Health and Retirement Study (42), National Longitudinal Survey of Older Men, National Longitudinal Survey of Young Men (43), National Longitudinal Survey of Youth 79 (44), National Survey of Families and Households (45), Occupational Changes in a Generation Survey I and II (46), Panel Study of Income Dynamics (47), Survey of Income and Program Participation (48), and Wisconsin Longitudinal Study (49). These data have been extensively used in the intergenerational social mobility literature. Except for the Wisconsin Longitudinal Study, all of the other datasets draw on nationally representative samples, either cross-sectional or longitudinal. We harmonized person weight variables across samples and included a standardized weight variable in all of the regression analyses.

Occupational Measures. We measure socioeconomic status by occupation, for both substantive and practical reasons. As a measure of social status, occupation is more stable and less age or year dependent than income and wealth and thus has been widely used in prior research on mobility (50). It is also one of the socioeconomic measures that have been consistently collected in the federal censuses and most social surveys.^{††} We first harmonized all occupational variables from different data sources into standard 1950 Census Bureau occupation codes. For historical census data, the IPUMS has already recoded all occupational variables into the 1950 classification. To enhance comparability across years, we mapped occupations coded in 1970–2000 occupational schemes into the 1950 scheme. New occupations that did not emerge until recently, such as computer programmer, computer systems analyst, and software engineer, were coded into a broader category “professional, technical & kindred workers (nec).” The standard 1950 occupational classification scheme consists of 283 occupational categories, but not all of the occupations are consistently observed across sample years.^{††} We then mapped the 1950 occupations into Weeden and Grusky's (51) microclass occupational scheme that is widely used in comparative studies on intergenerational mobility (52–54). The revised scheme includes 70 occupations with nonzero observations for all years. The occupations are detailed enough to constitute a basis for constructing a continuous distribution of occupational percentiles in capturing status hierarchy across occupations while also containing sufficient cases within

each occupation for a given census year. All of the crosswalk files are included in *SI Appendix*.

Occupational Percentile Rank–Rank Correlation. We converted occupation into a relative status measure based on occupational percentile ranks relying on 2 assumptions. First, occupations are stable over the life course of an individual (no age effect). The estimates of intergenerational social mobility do not depend on the ages of fathers and sons at which their occupations are measured, typically after age 30. Second, occupation status is rank-ordered across different occupations but is largely invariant within a given occupation. Although not strictly true, both assumptions are good approximations to social reality and thus have been widely accepted in the past sociological literature. We pooled all IPUMS population census and ACS data from 1850 to 2015 and generated occupational percentiles in 4 steps. We first created occupational statuses based on the educational distribution within each occupation for a given birth cohort. Based on the educational distribution of workers in an occupation, occupational status score was computed as the mean educational percentile within a cohort: $S_{i,t} = \sum_x P(x|i, t) Q_t(r^x)$, where $P(x|i, t)$ is the proportion of educational level x in occupation i and birth cohort t , and $Q_t(r^x)$ is the percentile rank of educational level x in birth cohort t .

Next, we ranked occupations from 1 to 70 within each cohort based on occupational status scores. This simple rank is similar to Treiman's (50) work on occupational prestige, with occupations ranked from low to high based on prestige scores. In this study, we refer to this rank as Treiman's rank. We then converted the occupational ranks into person-level percentile ranks by taking into account relative occupational sizes and smoothing out fluctuations with a moving average method. The resulting occupation-based percentile rank indicates a person's relative socioeconomic status within a birth cohort. This measure assigns a score X to an occupation in which incumbents' average educational attainment is roughly equal to or greater than that of X percent of same-cohort workers in the labor force. We use the midpoint to adjust percentile ranks of tied occupations. A higher percentile rank indicates a higher social status. Last, we obtained cohort-specific percentile ranks for fathers' and sons' microclass occupations in all of the father–son dyad data from the linked administrative sources and social surveys. The occupational percentile statistics by birth cohort and related data and documentation files can be downloaded from the project website.

Data Sharing and Replication Materials. IPUMS US Population Census data from 1850 to 2000 and ACS data from 2001 to 2015 are publicly available at the IPUMS USA website (<https://usa.ipums.org/usa/>). The linked historical Census data can be downloaded from the project archive (<https://osf.io/6c58f/>). The linked contemporary Census and survey data are available for researchers to request through the Federal Statistical Research Data Centers network (<https://www.census.gov/about/adrm/linkage/projects/clip.html>). Health and Retirement Study (HRS) occupation data are only available in HRS restricted data but can be accessed via the virtual desktop infrastructure and traditional licensing (<https://hrs.isr.umich.edu/data-products/restricted-data>). All other social survey data are publicly available, and the download information can be found in *SI Appendix*. Code for data analysis is archived on Open Science Framework (<https://osf.io/6c58f/>).

ACKNOWLEDGMENTS. Any views expressed herein are those of the authors and not necessarily those of the US Census Bureau. This work was conducted under Census Bureau Data Management System Project 967 and Center for Medicare and Medicaid Services Project 1580. Earlier versions of this paper have been presented at the 2017 RC28 Conference in Cologne, Germany; the 2017 Population Association of America conference in Chicago, IL; the workshop on Comparative Intergenerational Social Mobility at Princeton University; the Center for the Study of Economy and Society at Cornell University; the Intergenerational Mobility and Income Inequality workshop at the University of Haifa; the Department of Sociology at the University of Wisconsin–Madison; the California Center for Population Research at the University of California, Los Angeles; the Department of Sociology at the University of Pennsylvania; the Center on Population Dynamics at McGill University; and the Population Research Institute at Pennsylvania State University. We thank Hao Dong for help on the HRS restricted data application and analysis; and our research interns, Kai Feng, Yuqing Hu, Di Tong, Chuqiao Yuan, Xiaohang Zhao, and Xia Zheng, for outstanding research assistance. We thank Jennie Brand, Cameron Campbell, Marcy Carlson, Siwei Cheng, Thomas DiPrete, Felix Elwert, Eric Grodsky, Tod Hamilton, Robert Hauser, Joseph Hotz, Michael Hout, Hiroshi Ishida, Douglas Massey, Ellis Monk, Pamela Oliver, Fabian Pfeffer, James Raymo, Elizabeth Roberto, Christine Schwartz, Timothy Smeeding, Donald Treiman, Wout Ultee, Kim Weeden, Meir Yaish, Xiang Zhou, and numerous seminar participants for helpful comments and discussions.

^{††}Income and occupational mobility both have their own strengths and limitations. One problem with income measure is that it is simply not possible for historical data. The 1940 census is the first federal census with data on income, whereas detailed occupation has always been asked in federal censuses. Also, income measures may contain more measurement errors due to year-to-year income fluctuations, and thus a single-year income measure may not be a good proxy of lifetime income. In addition, intergenerational income mobility may be more age dependent than occupational mobility, the so-called life cycle bias. Feigenbaum (5) compares intergenerational mobility in Iowa between 1915 and 1940 based on income, years of education, occupation, and names, and shows differences among these measures.

^{††}For example, during some years, farm laborers are further divided into code 820 (farm laborers as waged workers), code 830 (farm laborers as unpaid family workers), and code 840 (farm service laborers as self-employed), but for most years, only a single farm laborer category was used.

1. A. B. Atkinson, T. Piketty, E. Saez, Top incomes in the long run of history. *J. Econ. Lit.* **49**, 3–71 (2011).
2. T. Piketty, E. Saez, Income inequality in the United States, 1913–1998. *Q. J. Econ.* **118**, 1–41 (2003).
3. D. Grusky, “American occupational mobility in the 19th and 20th centuries,” PhD dissertation, University of Wisconsin–Madison, Madison, WI (1987).
4. S. Thernstrom, *The Other Bostonians: Poverty and Progress in the American Metropolis, 1880–1970* (Harvard University Press, Cambridge, MA, 1973).
5. J. J. Feigenbaum, Multiple measures of historical intergenerational mobility: Iowa 1915 to 1940. *Econ. J.* **128**, F446–F481 (2018).
6. A. M. Guest, N. S. Landale, J. C. McCann, Intergenerational occupational mobility in the late 19th century United States. *Soc. Forces* **68**, 351–378 (1989).
7. M. Hout, A. M. Guest, Intergenerational occupational mobility in Great Britain and the United States since 1850: Comment. *Am. Econ. Rev.* **103**, 2021–2040 (2013).
8. J. Long, J. Ferrie, Intergenerational occupational mobility in Great Britain and the United States since 1850. *Am. Econ. Rev.* **103**, 1109–1137 (2013).
9. Y. Xie, A. Killewald, Intergenerational occupational mobility in Great Britain and the United States since 1850: Comment. *Am. Econ. Rev.* **103**, 2003–2020 (2013).
10. G. Clark, *The Son Also Rises: Surnames and the History of Social Mobility* (Princeton University Press, 2014).
11. C. Olivetti, M. D. Paserman, In the name of the son (and the daughter): Intergenerational mobility in the United States, 1850–1940. *Am. Econ. Rev.* **105**, 2695–2724 (2015).
12. D. Bloome, Income inequality and intergenerational income mobility in the United States. *Soc. Forces* **93**, 1047–1080 (2015).
13. D. L. Featherman, F. L. Jones, R. M. Hauser, Assumptions of social mobility research in the US: The case of occupational status. *Soc. Sci. Res.* **4**, 329–360 (1975).
14. M. Hout, More universalism, less structural mobility: The American occupational structure in the 1980s. *Am. J. Sociol.* **93**, 1358–1400 (1988).
15. C. I. Lee, G. Solon, Trends in intergenerational income mobility. *Rev. Econ. Stat.* **91**, 766–772 (2009).
16. M. Corak, Income inequality, equality of opportunity, and intergenerational mobility. *J. Econ. Perspect.* **27**, 79–102 (2013).
17. R. Chetty, N. Hendren, P. Kline, E. Saez, N. Turner, Is the United States still a land of opportunity? Recent trends in intergenerational mobility. *Am. Econ. Rev.* **104**, 141–147 (2014).
18. M. Hout, Americans’ occupational status reflects the status of both of their parents. *Proc. Natl. Acad. Sci. U.S.A.* **115**, 9527–9532 (2018).
19. O. D. Duncan, “A socioeconomic index for all occupations, and properties and characteristics of the socioeconomic index” in *Occupations and Social Status*, A. Reiss, Ed. (Free Press of Glencoe, New York, 1961), pp. 109–161.
20. S. M. Lipset, R. Bendix, *Social Mobility in Industrial Society* (University of California Press, 1959).
21. M. Hout, T. A. DiPrete, What we have learned: RC28’s contributions to knowledge about social stratification. *Res. Soc. Stratif. Mobil.* **24**, 1–20 (2006).
22. C. Goldin, America’s graduation from high school: The evolution and spread of secondary schooling in the twentieth century. *J. Econ. Hist.* **58**, 345–374 (1998).
23. P. M. Altham, The measurement of association of rows and columns for an $r \times s$ contingency table. *J. R. Stat. Soc. B* **32**, 63–73 (1970).
24. P. M. Altham, J. P. Ferrie Comparing contingency tables tools for analyzing data from two groups cross-classified by two characteristics. *Hist. Methods J. Quant. Interdiscip. Hist.* **40**, 3–16 (2007).
25. A. Agresti, *Categorical Data Analysis* (Wiley, 2013).
26. L. A. Goodman, Multiplicative models for the analysis of occupational mobility tables and other kinds of cross-classification tables. *Am. J. Sociol.* **84**, 804–819 (1979).
27. L. A. Goodman, M. Hout, Statistical methods and graphical displays for comparing how two-way associations vary among countries, among groups, or over time. *Sociol. Methodol.* **28**, 175–230 (1998).
28. Y. Xie, The log-multiplicative layer effect model for comparing mobility tables. *Am. Sociol. Rev.* **57**, 380–395 (1992).
29. H. B. Ganzeboom, R. Luijck, D. J. Treiman, Intergenerational class mobility in comparative perspective. *Res. Soc. Stratif. Mobil.* **8**, 3–84 (1989).
30. R. Breen, J. O. Jonsson, Explaining change in social fluidity: Educational equalization and educational expansion in twentieth-century Sweden. *Am. J. Sociol.* **112**, 1775–1810 (2007).
31. L. A. Vallet, K. Riley, Forty years of social mobility in France: Change in social fluidity in the light of recent models. *Rev. Fr. Sociol.* **42**, 5–64 (2001).
32. E. Beller, M. Hout, Intergenerational social mobility: The United States in comparative perspective. *Future Child.* **16**, 19–36 (2006).
33. P. Catron, The citizenship advantage: Immigrant socioeconomic attainment in the age of mass migration. *Am. J. Sociol.* **124**, 999–1042 (2019).
34. M. Ruef, A. Grigoryeva, Jim Crow, ethnic enclave, and status attainment: Occupational mobility among U.S. blacks, 1880–1940. *Am. J. Sociol.* **124**, 814–859 (2018).
35. P. A. Mitnik, E. Cumberworth, D. B. Grusky, Social mobility in a high-inequality regime. *Ann. Am. Acad. Pol. Soc. Sci.* **663**, 140–184 (2016).
36. R. M. Hauser, J. N. Koffel, H. P. Travis, P. J. Dickinson, Temporal change in occupational mobility: Evidence for men in the United States. *Am. Sociol. Rev.* **40**, 279–297 (1975).
37. R. Chetty et al., The fading American dream: Trends in absolute income mobility since 1940. *Science* **356**, 398–406 (2017).
38. F. Alvaredo, L. Chancel, T. Piketty, E. Saez, G. Zucman, *World Inequality Report 2018* (Belknap Press of Harvard University Press, 2018).
39. S. Ruggles et al., *IPUMS USA: Version 9.0* (IPUMS, Minneapolis, MN, 2019).
40. J. Ferrie, Linked historical census data 1850–1940 [dataset]. Open Science Framework. <https://osf.io/6c58f/>. Deposited 2 October 2019.
41. NORC at the University of Chicago, General Social Surveys, 1972–2016 [Data file and code book] (2018). <http://gssdataexplorer.norc.org>. Accessed 12 November 2019.
42. Institute for Social Research, University of Michigan, The Health and Retirement Study [Data file and codebook] (2010). <http://hrsonline.isr.umich.edu/>. Accessed 12 November 2019.
43. US Bureau of Labor Statistics, National Longitudinal Survey of Older and Young Men [Data file and codebook] (2018). <https://www.nlsinfo.org/content/cohorts/older-and-young-men>. Accessed 12 November 2019.
44. US Bureau of Labor Statistics, National Longitudinal Survey of Youth 1979 [Data file and codebook] (2018). <https://www.nlsinfo.org/content/cohorts/nlsy79>. Accessed 12 November 2019.
45. Center for Demography and Ecology at the University of Wisconsin-Madison, National Survey of Families and Households [Data file and codebook] (2018). <https://www.ssc.wisc.edu/nsfh/>. Accessed 12 November 2019.
46. Inter-university Consortium for Political and Social Research, University of Michigan, Occupational Changes in a Generation, 1962 and 1973 [Data file and codebook] (2018). <https://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/6162>. Accessed 12 November 2019.
47. Institute for Social Research, University of Michigan, Panel Study of Income Dynamics [Data file and codebook] (2018). <https://psidonline.isr.umich.edu/default.aspx>. Accessed 12 November 2019.
48. US Census Bureau, Survey of Income and Program Participation [Data file and codebook] (2018). <https://www.census.gov/sipp/>. Accessed 12 November 2019.
49. University of Wisconsin-Madison, Wisconsin Longitudinal Study [Data file and codebook] (2018). <https://www.ssc.wisc.edu/wlsresearch/>. Accessed 12 November 2019.
50. D. J. Treiman, *Occupational Prestige in Comparative Perspective* (Academic Press, 1977).
51. K. A. Weeden, D. B. Grusky, The case for a new class map. *Am. J. Sociol.* **111**, 141–212 (2005).
52. J. O. Jonsson, M. Di Carlo, M. C. Brinton, D. B. Grusky, R. Pollak, Microclass mobility: Social reproduction in four countries. *Am. J. Sociol.* **114**, 977–1036 (2009).
53. J. O. Jonsson, D. B. Grusky, R. Pollak, M. Di Carlo, C. Mood, “Occupations and social mobility: Gradational, big-class, and micro-class reproduction in comparative perspective” in *Persistence, Privilege, and Parenting: The Comparative Study of Intergenerational Mobility*, T. M. Smeeding, R. Erikson, M. Jantti, Eds. (Russell Sage Foundation, New York, 2011), pp. 138–171.
54. K. A. Weeden, D. B. Grusky, The three worlds of inequality. *Am. J. Sociol.* **117**, 1723–1785 (2012).
55. US Census Bureau, *Historical Statistics of the United States, Colonial Times to 1970* (US Department of Commerce, Bureau of the Census, 1975).
56. US Department of Agriculture, National Agricultural Statistics Service, 2012 Census Highlights (2014). <https://www.nass.usda.gov/Publications/Highlights/index.php>. Accessed 3 October 2019.
57. R. M. Hauser, J. R. Warren, Socioeconomic indexes for occupations: A review, update, and critique. *Sociol. Methodol.* **27**, 177–298 (1997).