

Intergenerational Mobility at the Top of the Educational Distribution

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Abstract

Research has shown that intergenerational mobility is higher among individuals with a college degree than those with lower levels of schooling. However, mobility declines among graduate degree holders. This finding questions the meritocratic power of higher education. Prior research has been hampered, however, by the small samples of advanced degree holders in representative surveys. Drawing on a large longitudinal data set of PhD holders—the Survey of Doctorate Recipients—this study examines intergenerational mobility among the American educational elite, separately for men and women and different racial/ethnic groups. Results show substantial mobility among PhD holders. The association between parents' education and adult children's earnings is moderate among men and nonexistent among women with doctoral degrees. However, women's earnings converge to an average level that is much lower than men's, signaling “perverse openness” for women even at the top of the educational distribution. Among men, there is variation in mobility by race and ethnicity. The intergenerational socioeconomic association is null for Asian men, small for white and black men, and more pronounced for Hispanics. Educational and occupational mediators account for intergenerational association among blacks and whites but not Hispanic men. A doctoral degree largely detaches individuals from their social origins in the United States, but it does not eliminate all sources of inequality.

Keywords

class inequality, higher education, meritocracy, intergenerational mobility, graduate education

Higher education is claimed to be the great equalizer in that it removes individuals from the advantages and disadvantages of birth. In practice, this means that once individuals attain a college degree, their economic position as adults is only weakly—or not at all—correlated with their social origins. Empirical research in the United States supports this claim. Early research from the 1970s found that among college graduates, social origins are not correlated with occupational class position (Hauser and Logan 1992; Hout 1984, 1988). This finding indicated that a college degree opened opportunity for economic success to everyone who attained the degree, regardless of their social origins.¹ Recent research confirms this finding for younger cohorts. Pfeffer and Hertel

(2015) showed that the substantial class mobility among college graduates found in the 1970s was not a historical anomaly but rather pertains to cohorts born between the 1920s and 1970s. Torche (2011) found that the association between parents' economic resources and adult children's economic well-being was weaker among BA holders than those with lower levels of education. At the

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same time, Torche found that the mobility payoff of higher education did not extend to those who attained a graduate degree. Among the growing number of individuals who attain master's, first professional, and doctoral degrees in the United States, the intergenerational association reemerged across all measures of economic well-being, particularly for men.

The reemergence of intergenerational association among men with an advanced degree is both puzzling and disturbing because it questions the meritocratic role of higher education. If a college degree allows people to overcome their disadvantaged origins, then a graduate degree should do so even more. Two main factors have been invoked to explain why higher levels of schooling should provide an avenue for mobility. First, labor markets for highly skilled workers are claimed to be more meritocratic than labor markets for those with lower skill levels, leaving little latitude for exclusionary social network effects (Breen and Jonsson 2007). Organizational research shows that the bureaucratized contexts in which college graduates are likely to be employed may limit discretion that results in ascriptive allocation or rewards. Bureaucratic organizations could operate as "great levelers" (Baron et al. 2007) because formal criteria for hiring and promotion reduce subjectivity in personnel decisions, ensuring that rewards reflect role-specific qualifications and performance (Bielby, Smith, and Berger 2010; Cook and Waters 1998; Elvira and Graham 2002; Reskin 2000; Tomaskovic-Devey 1993).

The second factor accounting for the observed meritocratic power of higher education refers to unobserved selectivity of those who attain advanced levels of schooling. Students from disadvantaged origins face greater obstacles to pursue graduate education than their more advantaged peers in terms of academic preparation, prior student loan debt, and opportunity cost of education (Perna 2004; Posselt and Grodsky 2017). As a result, low-income youth who pursue education beyond compulsory levels are likely to be positively selected on unobserved attributes, such as motivation and ability, which may have substantial returns in the labor market (Mare 1980, 1993).

Both these arguments—the meritocracy of skilled labor markets and positive selectivity of college graduates from disadvantaged origins—suggest that there should be even higher mobility among advanced degree holders than college graduates. Labor markets for workers with graduate

degrees should be even more meritocratic than labor market for college graduates, leaving little leeway for the influence of social origins-based cultural capital or social networks (Jackson 2007). Advanced degrees typically provide more specific and technically sophisticated skills than those acquired through a bachelor's degree. Furthermore, attending graduate school involves spending additional time in the educational system, undergoing not only formal training but also professional socialization as well as building social connections (Torche 2011). Extended exposure to the education system may foster networks of professional referral among students from poor backgrounds, further opening opportunities to detach themselves from their disadvantaged origins. From this perspective, advanced degree holders offer a litmus test of the meritocratic power of higher education: If there is a segment of the population for whom specialized skills and credentials attained over years of intensive training should trump *any* influence of class-based social and cultural capital, it should be among those with graduate degrees.

Prior scholarship offers evidence mostly consistent with the selectivity argument. Seminal work by Mare (1980) showed that the association between parents' resources and the probability of enrolling in a graduate program after graduating college is weaker than for earlier educational transitions, suggesting that disadvantaged youth who pursue a graduate degree might be strongly selected on factors such as ability or motivation. For example, Xie (1992) found that the association between social origins and the odds of being a scientist with at least 16 years of schooling (and thus likely to hold a graduate degree) is virtually null after educational attainment is accounted for. Research consistently finds a weak association between parents' education and entry into MA and MBA programs, although parental resources appear to matter more for entry into first professional and doctoral programs (Mullen, Goyette, and Soares 2003; Stolzenberg 1994). These findings suggest that intergenerational mobility should be higher—or at least *not lower*—among graduate degree holders than those with a terminal college degree.

The case for a strong meritocratic power of an advanced degree is not definitive, however, and there are plausible reasons for a stronger intergenerational persistence among the educational elite. Mullen et al.'s (2003) finding of a significant association between parents' socioeconomic status

(SES) and entry into a professional or doctoral program suggests that family resources may shape students' ability to access selective degrees. In the case of PhDs, many of which are tuition-free, non-monetary family resources, including the ability to forgo earnings and necessary knowledge to navigate a doctoral career and negotiate beneficial interactions with faculty advisors might be more relevant than money. Furthermore, even if labor markets for skilled workers are bureaucratized and formalized, it is possible that gatekeepers at elite workplaces still favor applicants from privileged backgrounds if they regard high-status connections and upper-class cultural capital important job requirements (Rivera 2015; Rivera and Tilcsik 2016). In an analysis of the British case, researchers found substantial earnings gaps based on social origins among those in higher professional and managerial occupations, many of whom have graduate degrees, which the authors aptly call a "class ceiling" (Laurison and Friedman 2016). The authors found that the class ceiling was not homogeneous, however. It was stronger for men than women, and it was reduced for occupations such as academics and scientists, which are the destinations of many PhD holders.

Unobserved selectivity of a different form could account for both high mobility among those with a terminal bachelor's degree and less mobility among advanced degree holders. Under this alternative pattern of selectivity, colleges could work as "sorting machines" that channel some individuals into graduate school based on their unobserved attributes (Stevens, Armstrong, and Arum 2008). Upper-class students who are low on unobserved attributes such as ability and motivation would conclude their educational career with a terminal bachelor's degree, while their more positively selected upper-class peers would go on to graduate education. This would induce negative selectivity of upper-class individuals who "only" attain a terminal BA, resulting in downward mobility. Additionally, upper-class students may opt to maximize their chances of entering graduate school by choosing specific undergraduate fields in the arts and sciences (Goyette and Mullen 2006). In contrast, students from less advantaged origins may favor vocational fields such as engineering, business, and education, which would maximize the economic returns of a terminal bachelor's degree (Davies and Guppy 1997; Ma 2009). It is plausible, then, that upper-class students who fail to enter graduate school

would have miscalculated, choosing less lucrative college fields of study (e.g., majors in English, history, or classics). This miscalculation may contribute to their downward economic mobility, whereas the optimal decisions of more disadvantaged students with a terminal BA would result in upward mobility. The overall outcome of these class-specific calculations could be a weak intergenerational association among those with a terminal BA, which does not necessarily translate to advanced degree holders.

MECHANISMS FOR MOBILITY AT THE TOP: THE HETEROGENEITY OF A GRADUATE DEGREE

Beyond meritocracy of the labor market for skilled workers and unobserved selectivity, a more basic factor may account for high intergenerational persistence at the top of the educational distribution. The strong intergenerational persistence among graduate degree holders found by Torche (2011) could result from the high heterogeneity within this educational level. What we call "graduate level" is a diverse collection of post-BA programs ranging from one-year master's degrees with nearly universal admission rates to selective professional and doctoral degrees. These programs vary widely in their admissions criteria, selectivity, and economic returns (Posselt and Grodsky 2017). A pronounced earnings gradient exists, with first professional degrees such as medicine and law at the top, followed by doctoral degrees and master's at a far distance (Day and Newburger 2002; Ma, Pender, and Welch 2016; Posselt and Grodsky 2017).

The heterogeneity in requirements and returns across graduate programs could provide an avenue for intergenerational persistence if individuals sort themselves into programs based on social origins. To date, no study exists that examines mobility across different types of graduate degrees. Torche's (2011) analysis of intergenerational mobility among advanced degree holders pooled together master's degrees, first professional degrees, and doctorates—a strategy necessitated by the small sample sizes of this group in population-representative surveys. A comprehensive analysis of mobility among the educational elite requires distinguishing across types of graduate programs. This study provides a step toward this goal by focusing on doctoral degrees. To the

extent that social origins sorting into different graduate programs accounts for the high intergenerational persistence found among advanced degree holders, focusing on one such program—the doctoral level, in this case—should account for this mechanism of intergenerational reproduction.

MECHANISMS FOR MOBILITY AT THE TOP: CHARACTERISTICS OF EDUCATIONAL INSTITUTIONS

Heterogeneity at the graduate level does not end with type of program. Social scientists have devoted increased attention to “horizontal educational differentiation” (Charles and Bradley 2002), that is, features of educational institutions such as institutional selectivity, field of study, and institutional control (public/private) and their role in stratification processes (Gerber and Cheung 2008). Prior research has found that horizontal educational differentiation does indeed play a role in the intergenerational transmission of advantage. A strong correlation has been found between social origins and both institutional selectivity and field of study at the undergraduate level (Carnevale and Rose 2004; Davies and Guppy 1997; Karen 2002). Research documents that graduates from selective institutions and specific fields receive higher occupational and economic returns (Brewer, Eide, and Ehrenberg 1999; Dale and Krueger 2002; Goyette and Mullen 2006; Kim, Tamborini, and Sakamoto 2015; Roksa and Levey 2010; Shamsuddin 2016; Thomas 2003; Thomas and Zhang 2005).

To date, research on horizontal stratification has focused on the undergraduate level. We know very little about the extent of horizontal stratification at the graduate level and its consequences for intergenerational persistence. This is an important limitation, particularly given the significant expansion of post-BA degrees in the United States. A recent exception is Kim et al. (2015), who show substantial variation in lifetime earnings by field of study across graduate degree holders. Unfortunately, given limited sample sizes, the authors were not able to disaggregate master’s, professional, and doctoral degrees.

MECHANISMS FOR MOBILITY AT THE TOP: OCCUPATIONAL PLACEMENT

The mechanisms for intergenerational persistence among advanced degree holders do not end with the educational system. After PhD holders complete their degrees, they enter the labor market and establish their careers in specific occupations and places of employment. Sorting by occupation and employment sector could provide an additional vehicle for the intergenerational persistence of inequality (Roksa 2005; Sewell and Hauser 1975). If, for example, upper-class PhD holders are overrepresented among more lucrative occupations in highly paid sectors such as private corporations while lower-class peers are more likely to choose low-pay occupations in less lucrative fields such as local government or nonprofit organizations, then occupational placement would provide a vehicle for intergenerational persistence. A comprehensive analysis of the mobility of the educational elite should then consider occupational and employment sector sorting as a potential vehicle for the transmission of advantage across generations.

This analysis assesses, for the first time, the extent of intergenerational mobility among PhD holders in the United States. We examine three questions.

Research Question 1: How much intergenerational mobility is there among the American educational elite?

Research Question 2: How does the intergenerational association among doctoral degree holders vary by gender and racial and ethnic background?

Research Question 3: What are the educational and labor market mechanisms for mobility among PhD holders?

The first question assesses mobility among PhD holders and compares it with mobility for the general population. The analysis by gender and race/ethnicity addresses critical axes of stratification in U.S. society. Women receive, on average, lower earnings than men, and gender earnings disparities persist even among highly educated workers (Blau and Kahn 2017; Cha and Weeden

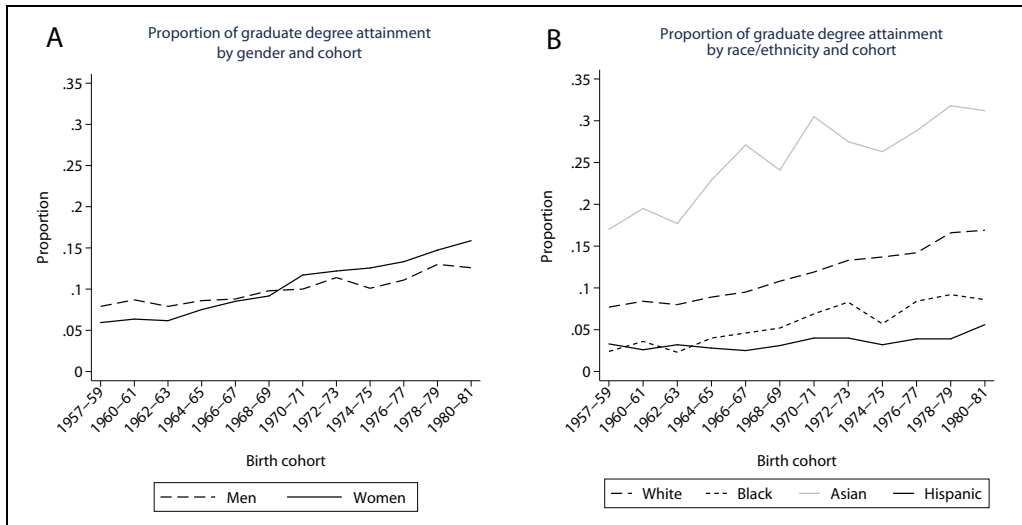


Figure 1. Proportion of graduate degree attainment by birth cohort (cohorts born 1957–1981).

Source: Current Population Survey Annual Socioeconomic Supplement 1992–2016.

Note: Graduate degree attainment includes master's, first professional, and doctoral degrees. Degree attainment measured at ages 34 to 36.

2014). Prior research suggests that women's earnings levels are less strongly related to their social origins than men's both in the general population (Jäntti et al. 2006) and among advanced degree holders (Laurison and Friedman 2016; Torche 2011). Weaker intergenerational earnings elasticities among women in the general population may be related to gender differences in labor supply and assortative mating (Raaum et al. 2007), but we expect gender differences in labor supply to be much narrower among doctoral degree holders than in the general population. Given that, it is possible that both earnings levels and intergenerational mobility are similar across gender among PhD holders.

Very little research exists on mobility patterns across different racial/ethnic groups in the United States, a deficiency partly due to small sample sizes of racial minorities in representative surveys. Furthermore, traditional measures of intergenerational mobility such as the intergenerational elasticity or the rank-rank correlation may provide a misleading picture of mobility for different racial groups if these groups have different mean levels of economic well-being (Johnson 2015; Mazumder 2014). Research consistently shows that chances of upward mobility are much more limited for black men than all other racial groups (Torche 2017; Chetty et al. 2018) and that

intergenerational persistence may have increased for both blacks and whites in the recent past (Bloome and Western 2011). As with gender differences, we will consider both the extent of intergenerational persistence and differences in earnings levels across racial and ethnic groups.

Our third question examines mechanisms for intergenerational persistence, with a focus on the educational system and labor market. Specifically, we examine whether horizontal sources of educational differentiation of the doctoral institution attended—including institutional selectivity, field of study, and private/public status—account for the intergenerational association among doctoral degree holders.² We also examine whether occupational and employment sector sorting account for the intergenerational association among PhD holders. Answers to these questions will elucidate the institutional pathways resulting in intergenerational persistence among the educational elite.

WHY STUDYING MOBILITY AMONG DOCTORAL DEGREE HOLDERS?

Before moving to the analysis, it is important to discuss the relevance of studying the small proportion of the US population that has earned a doctoral

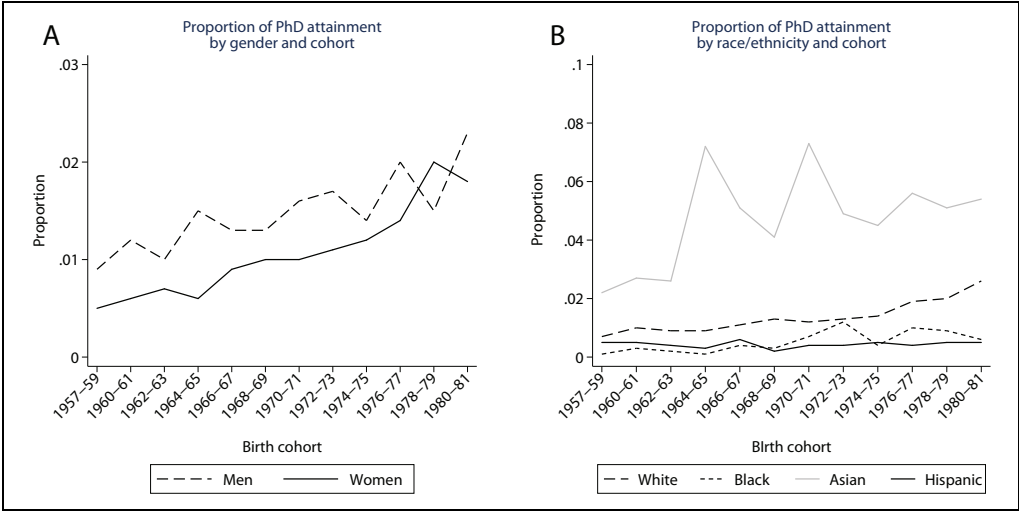


Figure 2. Proportion of PhD attainment by birth cohort (cohorts born 1957–1981).

Source: CPS Annual Socioeconomic Supplement 1992–2016.

Note: Degree attainment measured at ages 34 to 36. Note dissimilarity in y-axis scale between Figures 2A and 2B.

degree. In 2016, 10.7 percent of adults 30 to 65 years old held a graduate degree, and only 1.4 percent had a doctoral degree. Yet, the proportion of advanced degree holders has increased substantially across cohorts and is likely to continue to grow in the future. Figure 1 reports the share of men and women and different racial/ethnic groups with a graduate degree, including master’s, first professional, and PhD degrees, and Figure 2 reports the share of PhD holders for cohorts born between 1957 and 1981, based on the Current Population Survey (CPS) and measured when the cohort is 34 to 36 years of age.³

For men, there is an increase from 8 percent of graduate degree holders for those born between 1957 and 1959 to 13 percent for those born in 1980 to 1981 (Figure 1A). For women, this percentage surged from 6 percent for those born in the late 1950s to 16 percent for those born in the early 1980s, with women’s graduate degree attainment surpassing men’s among those born in the late 1960s. Marked differences exist across race and ethnicity (Figure 1B). While all racial groups have experienced gains across cohorts, both the starting point and the trends differ widely. Asians feature the highest rates of graduate degree attainment, at a far distance from other groups. Among Asians, graduate degree attainment increased from 17 percent for the cohorts born in 1957 to 1959 to

31 percent among those born in 1980 to 1981. Among whites, the proportion of the cohort that earned a graduate degree rose from 8 percent among those born in 1957 to 1959 to 17 percent among those born in 1980 to 1981. Advanced degree attainment is much smaller among racial and ethnic minorities. Both blacks and Hispanics display much lower levels of degree attainment among those born in the late 1950s—2.4 percent for blacks and 3.3 percent for Hispanics—and the percentage of advanced degree holders increased to 8.6 percent for blacks and 5.6 percent for Hispanics among cohorts born in the early 1980s. Even if small in absolute terms, these gains are substantial comparing with the starting point, particularly for blacks.

Trends across cohorts are similar for PhD attainment but at lower baseline levels (Figure 2). Men’s PhD attainment grew from .9 percent among those born in 1957 to 1959 to 2.3 percent for those born in 1980 to 1981, and women experienced gains from .5 percent to 1.8 percent across these cohorts. In contrast to lower educational levels, women haven’t yet reached parity with men at the doctoral level. As is the case for all graduate degrees, there are vast differences across racial/ethnic groups (Figure 2B). Asians are much more likely to have a PhD than other groups, and this advantage grew over time, with the

proportion of PhD holders rising from 2.2 percent for the 1957 to 1959 cohort to 5.4 percent for the 1980 to 1981 cohort. Whites experience an increase in PhD attainment from .7 percent to 2.6 percent across cohorts. Unrepresented minorities start at very low levels and experience less absolute upgrading, with increases from .1 percent to .6 percent across those born between the late 1950s and early 1980s for blacks and virtual stagnation across cohorts for Hispanics, with .5 percent PhD holders across the entire period considered.

Even if a small proportion of the US. population, the graduate degree holders in general and PhD holders in particular command substantial economic resources and influence. Socioeconomic and racial/ethnic stratification in the access to graduate degrees contributes to intergenerational persistence because a graduate degree yields large economic returns, and this economic premium has expanded over time in context of growing economic inequality (Ma et al. 2016). The study of growing inequality in the United States focuses of the “college premium” (Goldin and Katz 2008). However, since the mid-1980s, earnings returns to college have barely grown while returns to graduate degrees have skyrocketed, contributing to the concentration of income at the top (Autor 2014; Lemieux 2008; Posselt and Grodsky 2017; Valletta 2015). Not surprisingly, graduate degree holders are overrepresented among the upper income and wealth echelons in American society, and their wealth advantage has grown over time (Fisher et al. 2016; Keister 2014). Understanding mobility patterns of the educational elite is thus an important component of the understanding access to top positions in the occupational and economic structure and the persistence of advantage in the United States.

DATA AND METHODS

The analysis is based on the Survey of Doctorate Recipients (SDR), a longitudinal survey of doctoral degree holders in the natural and social sciences, engineering, and health who earned their degrees from institutions in the United States, conducted since 1973. The doctoral fields included in the SDR represent approximately 66 percent of all doctorates granted in 1990 and approximately 73 percent of all doctorates granted in 2010.⁴ The survey includes information on demographic characteristics, education and training, occupational

experience, and earnings of PhD holders, and it provides the only comprehensive source on the careers of doctorate holders from US institutions.

The SDR sample is randomly selected from the Doctorate Records File (DRF), a record of all research doctorate recipients from US universities since 1920. The DRF is updated regularly based on data collected by the Survey of Earned Doctorates (SED), an annual census of all individuals receiving a research doctorate from a US institution each year since 1957, which collects information on the doctoral recipients’ demographic characteristics, educational trajectories, and post-graduation plans. The SDR was launched in 1973 and is repeated every two or three years since then. Individuals sampled into the SDR enter the survey on the year of the degree award and are followed until age 76. A small portion of PhD holders are added every year to the SDR to refresh the sample. As with original members, refresher observations are retained in the sample until age 76.

We use SDR waves of 2001, 2003, 2006, 2008, 2010, and 2013 (the last wave available to researchers)⁵ and link individuals across waves creating an individual-level panel. All SDR members included in the 2001 wave are included in our sample, as are refresher observations added in subsequent years. The SDR survey contains year-specific weights to account for unequal selection probabilities and unit nonresponse. The weights are intended to make the sample representative on a cross-sectional basis, and longitudinal weights are unavailable. Given that cross-sectional weights are highly correlated across years (average correlation between all pairs of years = .86), we use the first available cross-sectional weight for each observation in the sample. Sample sizes are about 30,000 each wave, ranging from 29,974 in 2008 and 31,462 in 2010. Some information about social origins is collected both in the SED census at the moment of graduation and the SDR panel surveys. In these cases, we use the data from the SED because these data are collected at the earliest possible time of observation for all respondents, and they therefore more accurately represent characteristics of the home environment when the respondent was growing up.

Variables and Analytical Strategy

We evaluate the strength of the association between parents’ socioeconomic position when

the children were growing up in the family and that of children when they are adults. We operationalize social origins based on parents' education. The variable measuring educational attainment is identical for father and mother and has five categories, as follows: less than a high school degree, high school graduate, some college education with no degree, college graduate, and graduate education (completed degree). Our measure of parental education combines father's and mother's education by taking the highest level of attainment of the two parents. In an alternative formulation, we take the lowest level of attainment of the two parents. Analysis using this alternative formulation yields similar substantive findings as those obtained with the highest level of education of the mother and father (results reported in Table A1 in the online appendix).

The use of parental education as a measure of social origins departs from the use of parental class, earnings, or income, which is more common in mobility research. The reasons to use parental education are substantive and data-driven. In terms of data, parents' education is the only measure of social background available in the data set. Substantively, parental education is likely to capture a broader range of parental inputs into children's development (Jerrim and Macmillan 2015), and it is highly correlated, if not identical, to other measures of socioeconomic advantage such as earnings or income (Björklund and Jäntti 2011; Pfeffer and Hertel 2015). Our analysis uses ancillary information to compare our findings using parents' education as a measure of social origins to those that use other measures of parental economic advantage, but we cannot conclusively claim that results would be identical if measures of income or class were used.

We capture the intergenerational socioeconomic association through a regression model predicting adult children's earnings by parents' education. Adult children's economic position is measured by the respondent's earnings from all sources of employment before deductions in the prior calendar year. Earnings are measured in all years the survey was conducted and are therefore available for 2000, 2002, 2005, 2007, 2009, and 2012. Respondent's earnings are adjusted for inflation, expressed in constant 2013 dollars, and averaged across all years of observation to provide a higher quality measure of permanent income purged from year-to-year variation and measurement error.⁶ We then take the natural logarithm

of the mean earnings over time. Measures of mobility using $\ln(\text{earnings})$ capture the predicted percentage change in adult children's earnings associated with different levels of parental education. For example, a difference of .10 between children of college graduates and children of high school graduates means that adult children with parents with a college degree have, on average, earnings approximately 10 percent higher than those with high school graduate parents.

In an alternative formulation of adult children's earnings, we use percentile earnings rank, obtained by ranking adult children's income and expressing it as the percentile relative to all sample members. In this formulation, the parameter estimate associated with parents' education can be interpreted as the change in child's earnings *percentile rank* associated with different levels of parental schooling. Although correlated, $\ln(\text{earnings})$ and earnings percentile ranks are not the same. One important difference is that the $\ln(\text{earnings})$ metric expresses mobility in percentage terms, and so it includes information about the dispersion of earnings. The rank-rank correlation metric expresses mobility in percentage points using only the ordinal information about the dependent variable, so it does not include information about the dispersion of children's earnings.

Several measurement issues emerge in the analysis of intergenerational mobility. A critical one is measurement error emerging from transitory shocks in earnings. Concerns about measurement error have traditionally focused on the independent rather than the dependent variable, which is not an issue in this case given that we use parental education rather than income and education is quite stable since early adulthood. Recent literature shows, however, that error in measures of the dependent variable—children's earnings—can also lead to bias emerging from age-related errors in variables and lifecycle bias (Björklund and Jäntti 2011; Black and Devereux 2011; Torche 2015). To address these potential sources of bias, all models include controls for mean-centered respondents' age and age squared averaged across the years of observation as well as interaction terms between parents' education and the age variables (Lee and Solon 2009).

We restrict the analytical sample to individuals between 28 and 70 years old in all sample waves⁷ who are US-born citizens. After these restrictions, the sample size includes 31,667 observations. We exclude noncitizens and naturalized citizens

because many of them experienced all or part of their formative years outside of the United States and thus their parents' level of education does not reflect their standing relative to others in the country. After excluding 13.5 percent of observations with missing data on any variables, the analytical sample size is 27,381. Our results are based on list-wise deletion of observations with missing cases. Alternatively, we implement multiple imputation with chained equations routine with 30 imputations (Allison 2012). Results from the two models are substantively identical, so we offer results based on list-wise deletion.

Models are estimated separately for men and women and different racial/ethnic groups within gender. Given sample size constraints, we distinguish the following groups: non-Hispanic whites, Asian, non-Hispanic blacks, and Hispanics and exclude the 1.8 percent of sample members that identify as members of other racial/ethnic groups. After examining the intergenerational mobility of PhD holders across gender and race/ethnicity, our second analytical step accounts for educational and occupational mediators of the intergenerational association. Educational factors include the following sources of horizontal differentiation at the doctoral level: selectivity of the doctoral institution, field of study, and institutional control (Ma and Savas 2014; Rumberger and Thomas 1993; Thomas and Zhang 2005; Zhang 2008). Institutional selectivity is measured by Barron's Profiles of American Colleges, which ranks institutions according to median SAT/ACT scores, high school class rank, average GPA, and percentage of applicants admitted into six categories, namely: noncompetitive, less competitive, competitive, very competitive, highly competitive, and most competitive. We also distinguish specialized programs, such as schools of nursing or the arts, for which requirements are not based on academic criteria. Barron's scores restricted-access data for 1982, 1992, 2004, and 2008 were obtained from NCES and merged to SDR data set by institutional IPEDS identifying code. Even though institutional quality at the doctoral level is a multidimensional construct difficult to capture with a single measure (Black and Smith 2006), Barron's scores are the most widely used measure of institutional selectivity in the literature (Thompson 2017).

Field of study distinguishes the following areas: computer and mathematical sciences; biology and environmental sciences; chemistry and

earth sciences; agricultural sciences; physics, astronomy, and other physical sciences; social sciences; psychology; engineering; agricultural and food sciences; and health sciences. These categories are aligned with those used in prior research (Ma and Savas 2014; Rumberger and Thomas 1993; Zhang 2008) and are adapted to the doctoral level. Institutional control distinguishes public and private institutions. Institutional control of PhD-granting institution and field of study do not vary after individuals complete their PhD, so the first available observation is used.

We also consider two measures of occupational allocation of PhD holders—occupational status and employment sector. The SDR survey measures occupation based on the Scientists and Engineers Statistical Data System (SESTAT) classification. We recoded SESTAT categories into 2010 occupational census codes and assigned socioeconomic status scores to each code using the codes created by Hout, Smith, and Mardsen (2015). Employment sector distinguishes seven categories, namely, four-year universities, two-year universities, for-profit business/industry, non-profit business/industry, self-employed, federal government, and state/local government. Prior research indicates employment sector is consequential for earnings among highly skilled workers (Roksa 2005). Occupational prestige and employment sector vary over time for some respondents. If variation exists, we use central tendency measures: mean occupational prestige and modal employment sector.

FINDINGS: INTERGENERATIONAL MOBILITY AMONG THE US EDUCATIONAL ELITE

Table 1 offers descriptive statistics for the entire sample of doctoral degree holders as well as by gender and race/ethnicity. There are marked differences in parental education across race and ethnicity, with Asians having the most advantaged origins and black and Hispanic PhD holders having comparatively disadvantaged origins. Women have slightly more advantaged educational origins than men, suggesting more pronounced stratification in the access to an advanced degree. Gender and racial differences in college selectivity are small, except for Asians, who are overrepresented in the most selective institutions. In contrast, substantial variation in PhD field of study emerges

Table 1. Descriptive Statistics: Social Background, Characteristics of Doctoral Institution Attended, and Socioeconomic Outcomes of PhD holders (All PhD Holders, by Gender and Race/Ethnicity).

	All	Men	Women	Asian	Black	Hispanic	White
Parents' education							
Less than high school	4.06	4.34	3.53	3.44	10.74	11.01	3.64
High school graduate	18.27	19.96	15	10.31	19.58	17.37	18.49
Some college	15.38	15.51	15.13	8.85	21.07	15.51	15.37
College graduate	22.40	22.26	22.67	15.16	15.58	18.73	22.95
Graduate degree	39.89	37.93	43.67	62.24	33.03	37.38	39.55
Institutional selectivity							
Most competitive	19.82	19.39	20.65	39.00	18.08	20.11	19.29
Highly competitive	19.13	19.22	18.96	25.18	20.48	22.09	18.77
Very competitive	28.01	27.82	28.39	19.71	22.29	26.90	28.46
Competitive	27.31	27.58	26.78	14.52	32.96	26.49	27.58
Less competitive	3.64	3.81	3.32	1.26	4.40	3.05	3.72
No competitive	2.02	2.14	1.79	.34	1.43	1.36	2.12
Special	.07	.04	.11	0	.36	0	.06
Field of study							
Computer science and math	5.84	7.24	3.12	6.06	3.81	5.03	5.94
Biology and environmental sciences	25.78	23.95	29.31	32.70	20.46	23.00	25.86
Chemistry, earth sciences	11.63	13.90	7.25	9.32	6.58	9.66	11.96
Physics	5.99	8.07	1.96	5.35	2.25	3.64	6.21
Social sciences	14.29	13.13	16.54	9.10	21.10	17.34	14.04
Psychology	18.71	12.79	30.16	12.42	29.34	26.02	18.30
Engineering	12.57	16.58	4.82	21.62	8.97	11.16	12.51
Health sciences	2.50	1.11	5.20	2.39	6.25	2.46	2.35
Agricultural sciences	2.68	3.21	1.64	1.05	1.25	1.68	2.82
Institutional control							
Private	30.34	29.70	31.59	39.25	32.02	29.07	28.89
Employment sector							
Four-year universities	45.74	43.55	49.96	40.93	56.23	53.00	45.26
Two-year colleges	4.17	3.32	5.81	3.45	6.50	5.27	4.08
Business for profit	29.24	34.09	19.87	38.00	18.09	22.53	29.68
Self-employed	5.27	4.14	7.46	1.51	3.27	4.13	5.50
Business nonprofit	5.70	4.83	7.38	6.54	4.63	4.70	5.70
Federal government	7.44	7.68	6.95	7.32	8.29	7.51	7.40
State local government	2.45	2.38	2.57	2.26	2.98	2.86	2.39
Occupational status	83.22	83.32	83.04	83.97	82.71	83.43	83.21
Earnings percentile rank	52.64	58.65	41.01	50.57	46.24	43.53	53.36
Earnings percentile men				57.57	53.36	51.03	59.13
Earnings percentile women				40.22	41.09	34.29	41.47

Note: Unweighted sample, restricted to US-born citizens aged 28 to 70 in all sample waves. Frequency distributions by race/ethnicity exclude other race (largely Native Americans) due to small sample sizes. Note that overall mean earnings percentile departs from approximately 50 because percentile rank calculations consider all respondents, including noncitizens and naturalized citizens.

across race/ethnicity and particularly between men and women. Consistent with prior research (Weeden, Thébaud, and Gelbgiser 2017), women are overrepresented in psychology, social sciences, and health-related fields, while men are

overrepresented in computer science and math, physics, and engineering. Field of study variation across racial/ethnic groups is less conspicuous, with the main discrepancy emerging between Asians—overrepresented in engineering,

computer science, and biology and underrepresented in the social sciences and psychology—and all other racial groups.

Very limited variation in occupational status exists, but there is indication of differential sorting into employment sector. Men are much more likely to be employed in for-profit businesses, while women are more likely to be in educational or non-profit institutions. Racial differences in employment sector are also pronounced, with Asians more likely to be in for-profit businesses and blacks more likely to be employed in educational institutions than any other group. Finally, substantial gender and racial differences earnings emerge. Men's earnings rank, on average, in the 59th percentile, while women's earnings rank in the 41st percentile. The racial earnings gradient also emerges for men. White and Asian men earn substantially more than blacks and Hispanics, while less pronounced racial differences in earnings exist among women.

We now move to the core of the analysis and examine the association between social origins and adult children's earnings among men and women. Table 2 presents models separately by gender, predicting earnings percentile rank (Model 2a) and logged earnings (Model 2b) of PhD holders. The analysis shows evidence of intergenerational socioeconomic persistence for men but not women. Male PhD holders whose parents have less than a high school diploma receive earnings that place them in the 54th percentile of the overall PhD earnings distribution (amounting to \$93,884 in 2013). The predicted earnings percentile rank increases as parents' education increases, signaling an association between social origins and economic rewards. Men with high school graduate parents receive, on average, earnings in the 57.5th percentile ($54 + 3.5$). Men whose parents have some college rank in the 56.6th earnings percentile ($54 + 2.6$), those with college graduate parents receive earnings in the 58.3rd percentile ($54 + 4.3$), and those with parents with a graduate degree rank in the 58.6th earnings percentile ($54 + 4.6$), which amounts to annual earnings of \$100,227 in 2013.

Figure 3 displays these earnings differences by social origins, along with 95 percent confidence intervals adjusted for group comparisons (Knol, Pestman, and Grobbee 2011) for men and women. The figure shows statistically significant earnings gaps between male PhD holders with the most disadvantaged social origins—parents with less than a high school diploma—and all other parental education levels (the difference with those with parents

with some college fails to reach significance at the conventional $p < .05$ level). At the same time, there are no significant differences in male PhDs' earnings across educational origins other than the most disadvantaged parents. The patterns of intergenerational persistence are quite similar if we use the son's log-transformed earnings measure instead of earnings rank. Model 1b in Table 1 indicates that compared to those whose parents had less than a high school education, those with high school graduate parents have, on average, 8 percent higher earnings, those with college graduate parents have 10 percent higher earnings, and those whose parents have a graduate degree receive, on average, 12 percent higher earnings.

In contrast to men, there is no association between parents' education and own earnings among women with a doctoral degree (Figure 3b). The variation in earnings across different social origins is substantively small and social origins differences consistently fail to reach statistical significance. The absence of intergenerational association indicates that women's earnings do not depend on their social origins if they attain a PhD.

How large is the intergenerational persistence found among male PhD holders compared to the intergenerational mobility for the entire US population? To benchmark our findings, we indexed parental educational categories using the estimated median earnings that incumbents of that educational category would receive, transformed into percentiles. Based on the 1970s US census as a rough proxy for the parental generation, we find that in 1970, individuals with less than a high school diploma received earnings that placed them in the 35th earnings percentile, high school graduates ranked in the 55th percentile, college graduates reach the 83rd percentile, and graduate degree holders reach the 87th percentile. Combining these data with our findings about intergenerational association among PhD holders, we obtain that the difference between parents who are high school dropouts and parents with a high school diploma reaches 20 percentile points (55th percentile to 35th percentile), but it results in earnings differences of only 3.5 earnings percentiles among their sons. Indeed, the widest difference in social origins, between high school dropout parents and parents with a graduate degree, reaches 47 earnings percentile points in the parental generation (87th percentile to 35th percentile), but it results in earnings difference of only 4.6 earnings percentiles among their sons. This

Table 2. Association between Parents' Education and Adult Children's Annual Earnings among Men and Women with a Doctoral Degree 2001–2012.

	Men		Women	
	Model 1a Earnings Percentile	Model 1b Ln(earnings)	Model 2a Earnings Percentile	Model 2b Ln(earnings)
Less than high school (omitted)				
High school graduate	3.504* (1.551)	.081* (.034)	.988 (1.625)	.028 (.036)
Some college	2.588+ (1.558)	.057+ (.034)	2.171 (1.631)	.041 (.037)
College graduate	4.319** (1.533)	.097** (.034)	.397 (1.589)	-.003 (.036)
Advanced degree	4.622** (1.512)	.115*** (.034)	2.348 (1.555)	.040 (.035)
Age (centered)	6.794*** (1.272)	.145*** (.029)	4.248** (1.544)	.112** (.037)
Age ² (centered)	-.062*** (.012)	-.001*** (.000)	-.039* (.016)	-.001** (.000)
Constant	53.877*** (1.465)	11.437*** (.032)	40.998*** (1.454)	11.179*** (.032)
Observations	17,167	17,167	10,214	10,214

Note: Robust standard errors in parentheses. Sample restricted to US-born citizens aged 28 to 70 in all sample waves. Models include interactions between parents' education categories and age variables, not shown to conserve space. + $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

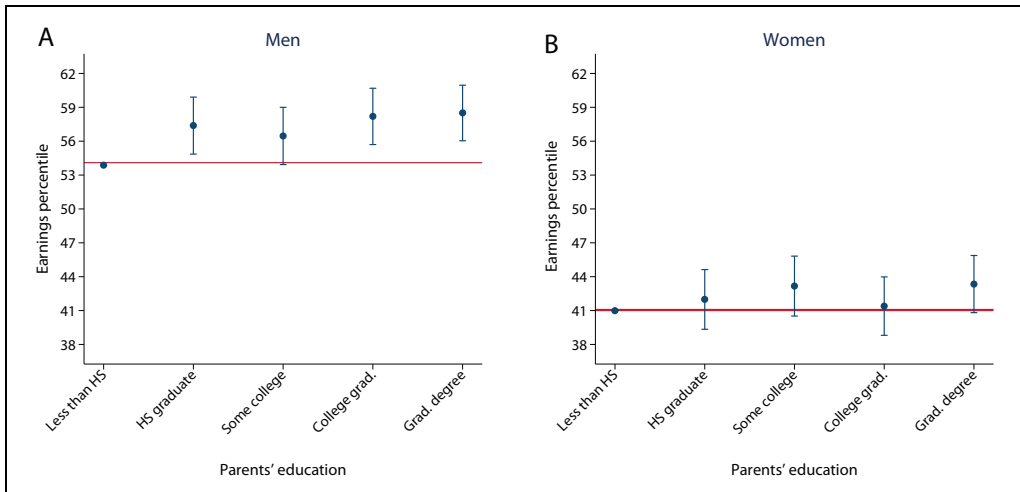


Figure 3. Association between parents' education and adult children earnings rank among men and women PhD holders.

Source: Table 2.

Note: Solid dots are parameter estimates, vertical lines are 95 percent confidence intervals. Parent's education = less than high school diploma omitted, used as baseline for comparison. Parameter estimates capture differences in mean annual earnings between each parental education category and the omitted category (less than high school diploma).

evidence suggests that the association between social origins and earnings among male doctoral holders is modest.

An alternative benchmarking strategy compares our findings with the overall intergenerational earnings elasticity in the United States. The intergenerational earnings elasticity for men has been calculated as approximately .47 (Corak 2013). This finding means that for a 10 percent increase in parents' earnings, adult son's earnings increase, on average, by roughly 4.7 percent. If we compare male doctoral degree holders whose parents had less than a high school diploma with those whose parents had a graduate degree, the latter receive 11.2 percent higher earnings than the former (Model 2b Table 2). However, the earnings gap between these two educational origins are much wider than a 10 percent gap in parents' earnings. Using the US census data, we obtain that in 1970, the difference in median earnings between individuals with less than high school diploma and individuals with a graduate degree reached 116 percent. In other words, among PhD holders, an earnings difference in the parental generation of approximately 116 percent results in an earnings gap in the children's generation of only 11.5 percent, suggesting an intergenerational earnings elasticity of approximately .10. Again, this suggests substantial intergenerational mobility among PhD holders compared with the general population.

An additional strategy to assess the magnitude of intergenerational persistence among male PhD holders is to compare earnings differences by social origins with earnings differences by gender. The difference in mean earnings between men and women PhD holders is 17.6 percentiles, with men receiving earnings that rank on the 59th percentile, while women's earnings rank in the 41st percentile, a gap of \$21,520 in 2013 dollars (Table 1). Compared to this gender gap, the widest earnings difference based on social origins—4.6 earnings percentiles between sons of high school dropouts and sons of graduate degree holders, amounting to \$6,343 in 2013 dollars—appears modest, and differences between intermediate educational origins are even narrower.

The intergenerational socioeconomic association among PhD holders is insignificant for women and small among men. Limited intergenerational persistence may conceal substantial variation across racial groups, however. We examine the association between social origins and adult earnings by race/ethnicity for men and women in Table 3 and Figure 4. Indeed, substantial variation

in intergenerational mobility by race emerges for men. Among Asian men with doctoral degrees, there is no significant earnings gains from having parents with higher levels of schooling. However, the social origins gradient reemerges for Hispanic, black, and white men. Among Hispanic men, there is a substantial gap between those who come from the most disadvantaged origins—parents with less than a high school diploma—and everyone else. Hispanic men whose parents did not graduate high school receive earnings that place them, on average, in the 45th earnings percentile. Those with high school graduate parents rise to the 52nd percentile, those with parents with some college education rank in the 56th percentile, sons of college graduates rank in the 51st percentile (difference not statistically significant at the $p < .05$ level), and those with parents with a graduate degree attain earnings in the 57th percentile. Of note, the strong intergenerational association among Hispanic men with a doctoral degree does not emerge from exceptionally high earnings among those with advantaged social origins but rather from exceptionally low earnings among those with low-education parents.

Among black and white men, some evidence of intergenerational persistence emerges, although the advantages associated with social origins are less pronounced than for Hispanics and follow a different pattern, with benefits emerging only from the most advantaged educational origins: parents with a graduate degree. Among whites, those with parents with an advanced degree have earnings in the 58th percentile compared with the 55th percentile for those with parents without a high school diploma. Among black men, sons of graduate degree holders receive earnings that place them in the 55th percentile compared to the 48th percentile among the sons of high school dropouts (Figure 4). Patterns of intergenerational persistence are similar if the measure of $\ln(\text{earnings})$ instead of earnings percentile is used, suggesting that differential dispersion of earnings does not alter conclusions about intergenerational persistence across racial groups.

In contrast to men, Table 3 shows no significant differences by race/ethnicity for women. Regardless of their social origins, women of all races/ethnicities receive similar levels of earnings. Given the substantial gender earnings gap, this means that all women with a PhD converge to a lower earnings level than men and suggests a trend of persistent gender inequality in earnings at the top of the educational distribution.

Table 3. Association between Parents' Education and Adult Children's Mean Earnings among PhD Holders by Gender and Race/Ethnicity.

	Women															
	Men						Women									
	Asian		Black		Hispanic		White		Asian		Black		Hispanic		White	
Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	Earnings Percentile	Ln (earnings)	
Less than high school High school graduate	-0.22 (.108)	.048 (.089)	3.792 (4.006)	.048 (.089)	7.500* (3.798)	.193* (.087)	2.577 (2.028)	.073 (.045)	-4.743 (8.571)	-2.13 (.185)	-6.17 (3.327)	.004 (.081)	3.611 (3.353)	.064 (.076)	-1.310 (2.679)	-0.13 (.057)
Some college	.074 (5.627)	.065 (3.982)	4.422 (3.982)	.065 (3.982)	11.510** (3.924)	.208* (.090)	1.624 (2.032)	.049 (.045)	-7.251 (8.532)	-1.74 (.175)	3.599 (3.448)	.110 (.088)	5.876 (3.703)	.122 (.076)	-1.147 (2.678)	-.003 (.057)
College graduate	2.989 (4.796)	.084 (4.241)	1.11 (4.241)	.02 (4.292)	6.388 (4.292)	.140 (.096)	3.215 (2.008)	.084+ (.044)	-.320 (8.822)	-.082 (.185)	1.353 (3.586)	.026 (.082)	6.011 (4.173)	.101 (.102)	-2.248 (2.642)	-.049 (.056)
Advanced degree	1.368 (5.222)	.097 (3.776)	7.768* (3.776)	.185* (.091)	12.211** (1.991)	.245* (.098)	3.402+ (1.566)	.100* (.044)	2.034 (8.318)	-.119 (.187)	4.118 (3.366)	.113 (.077)	1.241 (3.640)	-.026 (.091)	-3.340 (2.619)	-.007 (.056)
Age (centered)	4.549 (2.900)	.068 (.054)	9.595*** (2.555)	.189** (.059)	10.206** (3.733)	.302* (.120)	6.514*** (1.566)	.139*** (.033)	-2.369 (6.561)	-.135 (.156)	5.417* (2.724)	.109+ (.064)	6.014* (2.412)	.187* (.076)	2.899 (2.424)	.084 (.055)
Age ² (centered)	-0.37 (.031)	-0.01 (.001)	-0.85*** (.025)	-0.02** (.038)	-100** (.038)	-0.03* (.001)	-0.60*** (.015)	-0.01*** (.000)	.037 (.078)	.002 (.002)	-.048+ (.029)	-.001 (.001)	-.062* (.026)	-.002* (.001)	-.027 (.024)	-.001 (.001)
Constant	59.344*** (4.235)	11.524*** (.085)	47.694*** (3.216)	11.346*** (.072)	44.586*** (3.221)	11.250*** (.078)	55.090*** (1.952)	11.452*** (.043)	46.675*** (7.843)	11.365*** (.166)	40.723*** (2.642)	11.179*** (.066)	33.257*** (2.450)	11.045*** (.060)	43.642*** (2.553)	11.226*** (.054)
Observations	947	892	892	892	1,069	1,069	13,917	13,917	832	832	1,038	1,038	897	897	7,075	7,075

Note: Robust standard errors in parentheses. Sample restricted to US-born citizens aged 28 to 70 in all sample waves. Models include interactions between parents' education categories and age variables, not shown to conserve space. Model excludes respondents who identify with "other" race/ethnicity (see text for details). + $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

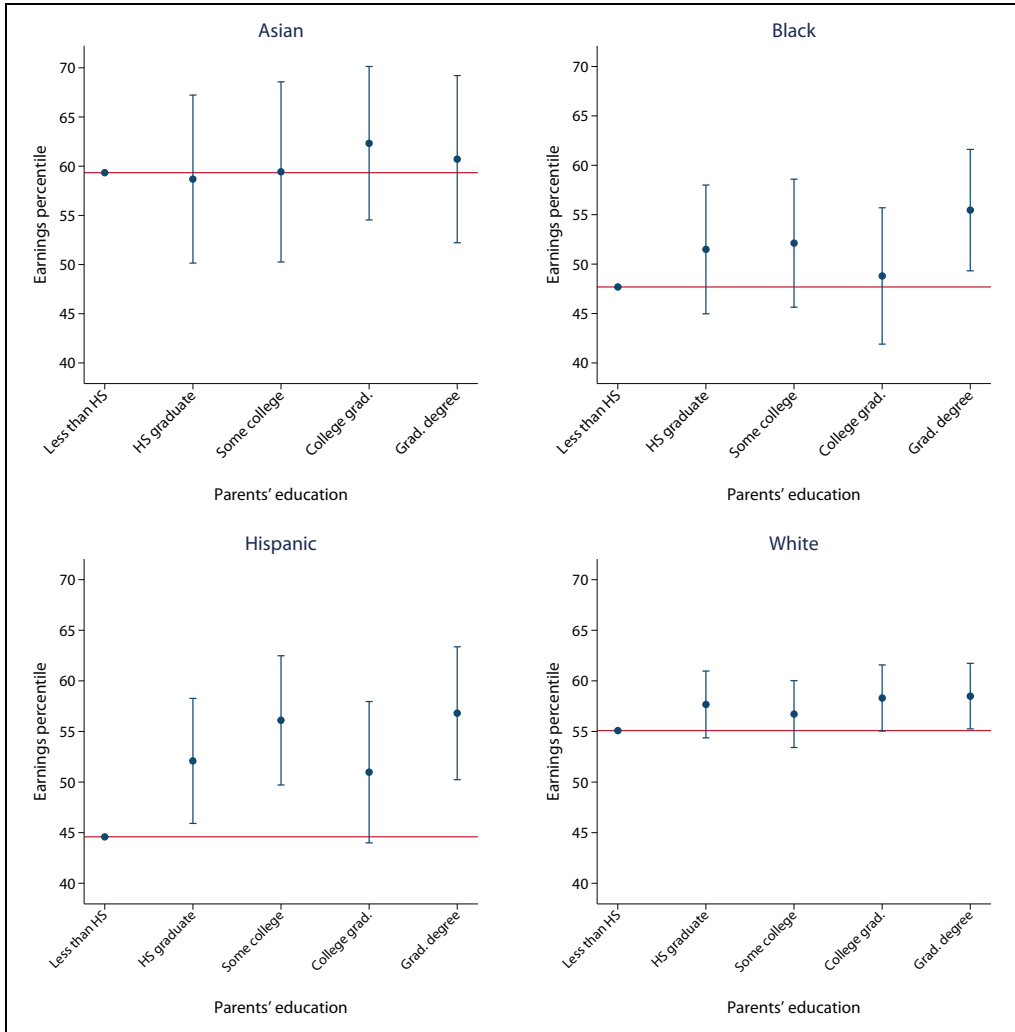


Figure 4. Association between parents' education and adult children earnings rank among male PhD holders by race/ethnicity.

Source: Table 3.

Note: Solid dots are parameter estimates, and vertical lines are 95 percent confidence intervals. Parent's education = less than high school diploma omitted, used as baseline for comparison. Parameter estimates capture differences in mean earnings percentile between each parental education category and the omitted category (parents with less than high school diploma).

In sum, our analysis reveals limited intergenerational persistence among PhD holders in the United States. Among women, we find no association between parents' education and adult children's earnings. Among men, evidence of intergenerational persistence exists for black, white, and Hispanic men, but the magnitude of persistence is modest, with the exception of Hispanics.

MECHANISMS FOR INTERGENERATIONAL PERSISTENCE

We now examine educational and labor market factors as potential mediators for intergenerational persistence among PhD holders. Given that there is no evidence of intergenerational persistence

for women, we restrict this analysis to men. If these institutional factors account for the transmission of advantage across generations, we should expect the intergenerational association to decline when these factors are controlled for. It is important to mention that this mediation analysis cannot be given a causal interpretation because the characteristics of the doctoral institution attended and field of study are not randomly allocated, violating the sequential ignorability assumption (Imai et al. 2011). For example, higher-ability students may be more likely to be admitted into more selective institutions, and it may be their higher ability rather than the characteristics of the institution they attended that accounts for the observed intergenerational association (Gerber and Cheung 2008). This is not a critical issue for this analysis given that we are not focused on the causal process driving intergenerational persistence of the US educational elite. Rather, we want to ascertain whether the characteristics of the educational institution attended and the occupational position provide a vehicle—causal or otherwise—for the intergenerational persistence we observe among the educational elite.

The models in Table 4 capture the association between parents' education and sons' earnings controlling for the selectivity of the PhD-granting educational institution attended, field of study, and institutional control as well as employment sector and occupational status. Figure 5 compares the parameter estimates after adding these institutional factors with the parameter estimates obtained from Table 3, when we only controlled for age, to gauge the extent to which these factors mediate the association between social origins and adult earnings (to ease comparison, the parameter estimates in Figure 5 are centered around zero instead of centering around the value of the reference category of parental education).

For Asian men, the intergenerational association was insignificant even without accounting for these institutional factors, and it remains so after controlling for them. Among black and white men, the small amount of intergenerational association observed in Table 3 disappears after institutional factors are controlled for. Detailed analysis of the mediation process suggests that white and black men from the most advantaged educational origins are more likely to attend selective educational institutions and work in for-profit businesses and the federal government, which pay off more in terms of earnings, accounting for the observed intergenerational persistence (not shown, available from the author on request).

The case is different for Hispanic men. Accounting for the characteristics of the doctoral institution attended and characteristics of their post-PhD occupation does not explain their observed intergenerational persistence. After these factors are accounted for, significant earnings gaps remain across different educational origins, reaching 10 earnings percentiles between Hispanic men with the most disadvantaged and most advantaged educational origins. We return to this unanticipated finding in the conclusion.

CONCLUSION

Prior research has shown that the association between social origins and adult children's economic status is weak among college graduates, but it intensifies among graduate degree holders (Torche 2011), questioning the meritocratic power of higher education. We examine a simple but important factor potentially accounting for limited mobility among graduate degree holders: the wide heterogeneity of programs comprised within the nominal "graduate level," including master's, first professional, and doctoral degrees, which have vastly different durations, admission criteria, and selectivity. Given that these programs differ in terms of their economic rewards, if individuals sort into these programs based on their social origins, then heterogeneity at the graduate level may provide a vehicle for the intergenerational transmission of advantage.

To test this hypothesis, we focus on intergenerational mobility among PhD holders. Drawing on a large panel survey of doctoral recipients, we find that for those with a PhD, the association between parents' education and adult children's earnings is null among women and modest among men—much less than the overall intergenerational economic association found for the entire US population and much less than the gender earnings gap among doctoral degree holders. This finding naturally does not mean the elimination of social inequality in access to doctoral training and its economic rewards. Access to a PhD degree is still strongly dependent on social origins via the cumulative influence of parental resources on the probability of making earlier educational transitions (Mare 1980; Mullen et al. 2003). Access also varies sharply across racial and ethnic groups and is particularly low for blacks and Hispanics due to wide socioeconomic gaps across groups as well as institutional factors (Alon, Domina,

Table 4. Association between Parents' Education and Adult Children's Earnings Percentile among Male PhD Holders, Including Educational Institutional and Occupational Characteristics.

	All	Asian	Black	Hispanic	White
Less than high school (omitted)					
High school graduate	1.036 (1.449)	-.583 (4.466)	2.131 (4.232)	7.036* (3.332)	-.530 (1.845)
Some college	.216 (1.454)	.915 (5.140)	2.710 (4.051)	9.519** (3.627)	-1.413 (1.848)
College graduate	.978 (1.433)	.755 (4.418)	.864 (4.377)	2.515 (3.918)	-.655 (1.827)
Advanced degree	1.506 (1.417)	-1.727 (4.535)	4.750 (3.803)	9.835** (3.600)	-.197 (1.814)
Age (centered)	7.725*** (1.222)	7.049** (2.439)	7.976** (2.459)	12.045*** (3.026)	6.879*** (1.473)
Age ²	-.071*** (.012)	-.059* (.025)	-.068** (.024)	-.118*** (.031)	-.064*** (.014)
Selectivity: Most competitive	1.396+ (.725)	3.542 (2.572)	-.226 (3.291)	4.043 (3.072)	1.228 (.773)
Selectivity: Highly competitive (omitted)					
Selectivity: Very competitive	-1.184* (.590)	-4.315+ (2.405)	.729 (2.736)	-1.061 (2.617)	-1.146+ (.624)
Selectivity: Competitive	-1.870** (.605)	-4.549 (2.948)	-1.241 (2.465)	-2.407 (2.414)	-1.904** (.642)
Selectivity: Less competitive	-2.714* (1.158)	-.162 (7.514)	-.626 (3.825)	-4.498 (3.808)	-2.709* (1.210)
Selectivity: Not competitive	-2.345+ (1.417)	.076 (11.920)	-17.033+ (9.831)	-5.165 (4.968)	-2.020 (1.466)
Selectivity: Special	18.679*** (4.897)		-9.878** (3.556)		22.356*** (4.671)
Computer and math sciences	4.664*** (.950)	15.927*** (4.079)	7.170 (4.974)	5.082 (4.101)	4.230*** (1.004)
Biology and environmental sciences	-.345 (.739)	.343 (3.613)	-3.393 (3.347)	-2.327 (3.009)	-.298 (.782)
Chemistry and earth sciences	.923 (.789)	5.084 (3.967)	-.947 (3.941)	2.828 (3.531)	.734 (.830)
Physics, other physical sciences	1.761* (.892)	6.161 (4.296)	1.920 (3.964)	3.312 (3.566)	1.558+ (.937)
Social sciences	.775 (.877)	4.997 (4.728)	1.574 (3.253)	-4.442 (3.875)	.781 (.930)
Psychology (omitted)					
Engineering	8.481*** (.777)	9.946** (3.761)	6.637* (3.295)	7.790* (3.082)	8.393*** (.822)
Health sciences	2.823 (1.791)	7.423 (5.843)	-7.950 (6.985)	6.997 (5.664)	2.926 (1.939)
Agricultural sciences	.393 (1.186)	-1.305 (5.241)	2.924 (4.892)	-4.419 (4.589)	.397 (1.236)
Private institution	3.976*** (.612)	.966 (2.361)	7.075** (2.420)	-.330 (2.810)	4.084*** (.649)
Occupational status	.407*** (.042)	.515*** (.141)	.056 (.193)	.157 (.212)	.419*** (.044)
Four-year university (omitted)					
Two-year college	-13.616*** (1.144)	-8.351* (3.760)	-6.699 (4.138)	-6.973 (6.423)	-14.239*** (1.210)

(continued)

Table 4.
(Continued)

	All	Asian	Black	Hispanic	White
For-profit business	19.170*** (.469)	24.290*** (1.991)	21.677*** (2.517)	20.135*** (2.343)	18.972*** (.492)
Self-employed	1.130 (1.375)	1.007 (9.798)	-6.205 (6.968)	3.667 (8.168)	1.208 (1.419)
Nonprofit business	7.937*** (.955)	10.779** (3.794)	9.429+ (5.306)	3.260 (4.913)	7.891*** (1.004)
Federal government	10.993*** (.605)	9.823** (3.441)	14.107*** (2.487)	8.771*** (2.342)	11.006*** (.640)
Local and state government	-6.966*** (1.218)	-2.706 (6.109)	4.304 (7.007)	.911 (4.955)	-7.595*** (1.277)
Constant	13.073*** (3.895)	1.479 (13.298)	37.009* (16.926)	26.881 (18.618)	13.944** (4.242)
Observations	16,825	947	892	1,069	13,917

Note: Robust standard errors in parentheses. Sample restricted to US-born citizens aged 28 to 70 in all sample waves. Models include interactions between parents' education categories and age variables, not shown to conserve space. Model exclude respondents who identify with "other" race/ethnicity. See text for details.

+ $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

and Tienda 2010; Hsin and Xie 2014; Kao and Thompson 2003; Lee and Zhou 2015). This finding indicates, however, that for those who attain a PhD, their economic standing is only weakly connected to their educational background.

Even if PhD holders are a small proportion of the American population, understanding their mobility patterns is important because of the large economic rewards and social influence they command. The mobility of doctoral degree holders is also relevant for theoretical reasons: They offer a litmus test of meritocratic ideals in American society. If there is a segment of the population for whom specialized skills and credentials attained over many years of intensive training should trump *any* influence of class-based social and cultural capital, it should be among those with doctoral degrees. From this perspective, the association between parents' education and adult children's earnings we found for men with a doctoral degree, as modest as it is, poses a challenge to the meritocratic potential of higher education.

The finding of modest intergenerational association among men with a doctoral degree also invites the question about mechanisms for intergenerational persistence of this select group. As scholars have argued, the extent to which measures of mobility capture equality of opportunity

and provide policy-relevant information depends on the mechanisms accounting for such association (Jencks and Tach 2006; Swift 2004). If intergenerational persistence emerges from barriers to human capital investment or use of nepotistic networks, this suggests unmeritocratic criteria and calls for policy intervention. If, in contrast, intergenerational persistence emerges from genetic transmission or taste socialization—as small a role as these factors would play—a more limited role for policy is suggested (Black and Devereux 2011). In practice, it is difficult to isolate meritocratic and nonmeritocratic sources for social mobility, but our analysis of mechanisms provides some clues to understand the main pathways and barriers for mobility among the educational elite. We found that among black and white men, intergenerational persistence is entirely driven by the association between advantaged social origins and entry into more selective educational institutions and more lucrative employment sectors. These findings invite research on the factors driving differential educational and employment sorting by social origins among the educational elite.

While institutional mediators account for intergenerational persistence among black and white men, this is not the case for Hispanic men. For this group, growing up in a household where

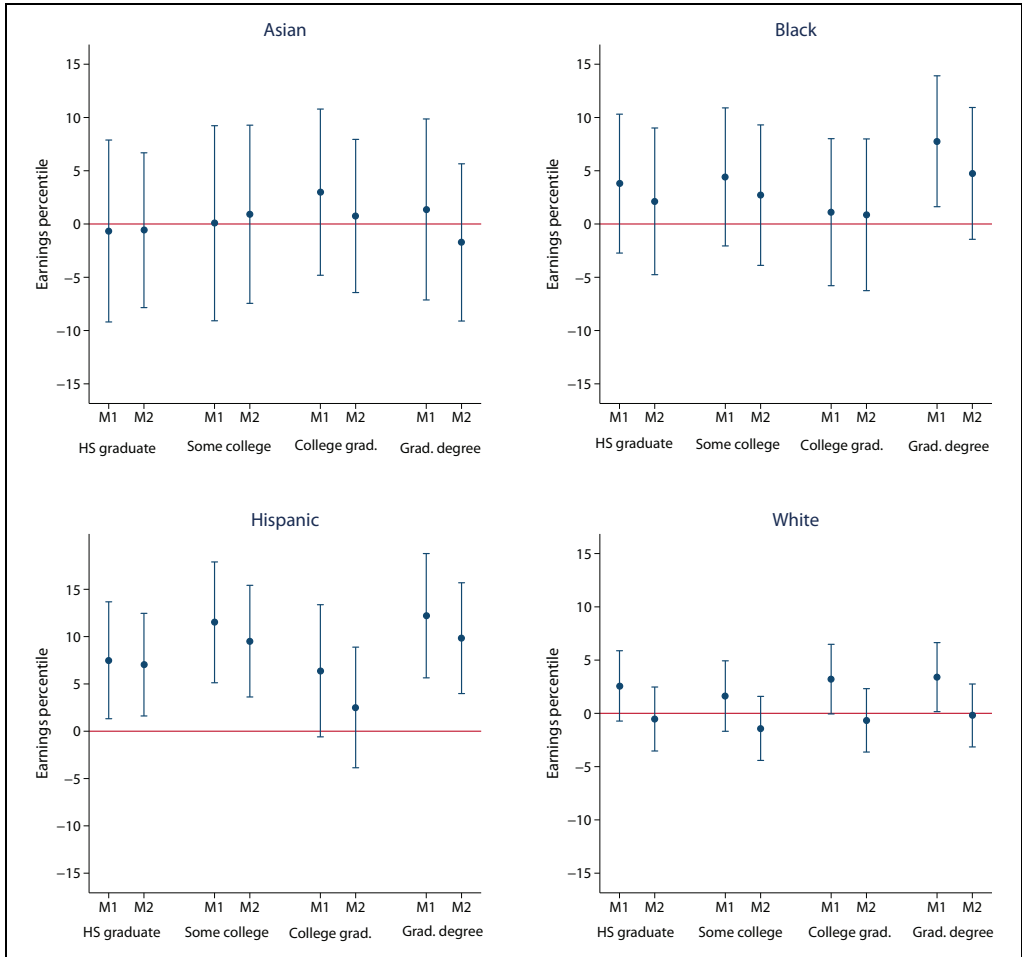


Figure 5. Association between parents' education and adult children annual earnings among male PhD holders by race/ethnicity, accounting for institutional mediators (institutional selectivity, control, and field of study) and occupational mediators (occupational status and employment sector).

Source: Table 4.

Note: Solid dots are parameter estimates, and vertical lines are 95 percent confidence intervals. Parameter estimates capture difference in adult children's mean earning between parents with less than high school attainment (omitted category) and each level of parental education. To ease comparison, the parameter estimates are centered around zero instead of centering around the value of the reference category of parental education. Two models are estimated for each educational category: Model 1 = baseline, no controls included except for respondents' age and age squared (obtained from Table 3). Model 2 = adds controls for selectivity of doctoral institution, public/private control, field of study, occupational status, and employment sector.

parents have very low levels of educational attainment incurs a substantial earnings penalty net of the selectivity of the institution attended, field of study, sector of employment, and status of the occupation selected. This finding points to particular barriers that Hispanic men who grew up in

households with very little educational capital face even if they attain doctoral degrees. Investigating these barriers is beyond the scope allowed by the data available, and at the moment, we can only speculate that heterogeneity in terms of country of origin, parental immigration status, and

pregraduate educational trajectories could play an important role (Alon et al. 2010; Arbona and Nora 2007).

The null intergenerational persistence among women with doctoral degrees should be interpreted along with the substantial gender differences in earnings among the educational elite: Women with a PhD receive, on average, earnings that place them in 41.0st percentile while men rank in the 58.7th percentile. Combined, these findings indicate that women homogeneously converge to a lower level of earnings than men across generations, a phenomenon that can be described as “perverse openness” (Hout 1984). Several mechanisms could contribute to the substantial gender earnings gap among the American educational elite, including gendered preferences, horizontal stratification at the doctoral level, occupational placement, gendered intra-household division of labor, parenthood status, and employers’ discrimination.

We restricted the sample to US-born individuals to ensure that they experienced their formative years in the United States and that the educational attainment of their parents could be meaningfully compared across families of origin. This decision, while necessary to investigate intergenerational mobility, excludes a substantial portion of PhD holders working in the United States who are non-citizens or naturalized citizens. In ancillary analysis (Table A2 in the online appendix), we examine mobility for this group and find a higher level of intergenerational persistence than among US-born citizens. The sample of noncitizens and naturalized citizens is highly heterogeneous in terms of country of origin, time of arrival to the United States, and circumstances while growing up, challenging the interpretation of this finding. We expect that further research will examine the mobility trajectories among the growing number of international PhD holders in the United States and other advanced industrial countries (Posselt and Grodsky 2017).

Importantly, the modest intergenerational persistence among PhD holders is not inconsistent with strong intergenerational persistence among all advanced degree holders. First, it is possible that the sorting into graduate programs strongly depends on social origins, with upper-class advanced degree holders overrepresented among lucrative first professional degrees and their lower-class peers overrepresented among less lucrative MA programs. Furthermore, intergenerational persistence could be stronger among those with master’s and first professional degrees. In

fact, Torche’s (2011) results of a strong overall intergenerational persistence among all advanced degree holders suggests that mobility is more limited among those with master’s or first professional degrees. Furthermore, prior literature suggests that these programs may provide a more fertile ground than PhDs for the effect of social origins, in the form of cultural and social capital, on occupational placement and earnings. For example, in her study of recruitment by investment banks, management consulting firms, and corporate law firms among a pool of MBAs and law graduates, Rivera (2015) shows that high-status extracurricular activities and polished interactional styles cultivated by upper-class families are critical components of “fit” for these elite employers. Rivera and Tilcsik (2016) further show a substantial payoff of class of origins for law school male (but not female) graduates. Laurison and Friedman (2016) found that the pay gap based on social origins is much more pronounced among recipients of professional degrees such as doctors, lawyers, and professionals in finance than scientists and academics, who are more likely to have a doctoral degree. This suggests that the promise of the meritocratic power of higher education is far from being achieved even among those with the highest human capital in the nation and invites detailed analysis on intergenerational stratification among the growing proportion of Americans with educational attainment beyond a college degree.

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NOTES

1. A similar pattern of weaker intergenerational association at higher levels of schooling has been found in other advanced industrial countries such as France, Sweden, and Germany (Breen and Jonsson 2007; Breen and Luijckx 2007; Vallet 2004).

2. Ideally, we would also consider characteristics of the parents' educational experience, including type of institution attended and field of study. Such information is not included in the available data.
3. The fifth birth cohort considered is those born in 1957 because the Current Population Survey started including information about graduate degree attainment only in 1992. The analytical sample includes all residents within the age range without selecting based on citizenship or nativity because information on citizenship and nativity is only available in the CPS since 1994.
4. Calculations by the author based on the Survey of Earned Doctorates, <https://www.nsf.gov/statistics/2017/nsf17306/datatables/tab-14.htm>. The fields not included in the Survey of Doctorate Recipients are most doctoral degrees in education and the humanities and arts.
5. We did not include earlier survey waves to reduce the impact of period and cohort changes that would emerge if an extended period of time were considered. Starting in 2010, the Survey of Doctorate Recipients includes an international component consisting of non-US citizens from 2001 or later cohorts who reported plans to emigrate and non-US citizen panel members who obtained their doctoral degrees in the United States but are found outside the United States for two consecutive cycles. We do not include the international component because our focus is on social origins of those growing up and living in the United States.
6. Observations with one or more valid measures of earnings were included in the analysis. In sensitivity testing, we restricted the sample to observations with at least two, three, and four valid earnings measures. Results are unaltered.
7. Sensitivity analysis with a narrow age range from 30 to 65 years old do not alter the findings.

SUPPLEMENTAL MATERIAL

The Appendices are available in the online version of the article.

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