Educational Inequality, Educational Expansion, and Intergenerational Income Persistence in the United States

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Abstract

The children of high-income parents often become high-income adults, while their low-income peers often become low-income adults. Education plays a central role in this intergenerational income persistence. Because education-based inequalities grew in recent decades, many scholars predicted that intergenerational income persistence would increase. However, previous research suggests that it remained stable across recent cohorts. We address this puzzle. Analyzing National Longitudinal Surveys of Youth data, we find that growing educational inequality by parental income, along with rising economic returns to education, increased intergenerational persistence, as scholars expected. However, two countervailing trends offset this increase. The expansion of higher education reduced persistence, because completing college helps low-income children become high-income adults. Yet, this reduction in persistence was far from enough to offset the increase in persistence associated with growing educational inequality and rising educational returns. Intergenerational persistence would have increased if not for another change: Within educational groups, parental income became less predictive of adult income. New methodological tools underlie these findings, tools which quantify, for the first time, education's full force in intergenerational income persistence. These findings suggest that to reduce intergenerational persistence, educational policies should focus less on how many people complete college but more on who completes it.

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The intergenerational persistence of socioeconomic (dis)advantages is a perennial concern in sociological research (e.g., Perrin 1904; Liu 2018). In closed societies, the children of high-income parents become high-income adults while the children of low-income parents become low-income adults. In open societies, by contrast, adults' incomes are less constrained by their parents' incomes. The study of intergenerational income persistence helps characterize the openness of a society by quantifying the association between parents' incomes and their children's incomes during adulthood. Higher "persistence" (more people remaining on their parents' rungs on the income ladder) means lower "mobility" (fewer people moving onto different rungs).[1]

Education plays a central role in intergenerational income persistence, via two important processes: educational inequality and educational returns (Blau and Duncan 1967; Featherman and Hauser 1978). First, parents' income shapes their children's education; high-income parents are more likely than low-income parents to raise highly educated children. We call this process "educational inequality." Second, children's education predicts their adult income; highly educated children typically enjoy higher incomes as adults than their less-educated peers. We call this process "educational returns."[2] Over recent decades in the United States, both educational inequality and educational returns have grown (Baum et al. 2013; Ziol-Guest and Lee 2016).

In light of these changes, researchers predicted that intergenerational income persistence would increase across cohorts (Haveman and Smeeding 2006; Duncan and Murnane 2011). Yet, surprisingly, the predicted increase "has not occurred" (Chetty et al. 2014a: 147). Instead, intergenerational income persistence has remained remarkably stable. Both survey data comparing people born between the mid-1950s and mid-1970s and administrative data comparing people born between the early 1970s and mid-1980s reveal little fluctuation in intergenerational income persistence (Hertz 2007; Lee and Solon 2009; Chetty et al. 2014a).[3]

How could intergenerational income persistence stay unchanged in the face of growing educational inequality and rising educational returns? In this study, we address this empirical

puzzle by investigating an additional trend in education: the increasing share of people completing college, often called "educational expansion." Completing college helps children from low-income and high-income families obtain similarly high incomes as adults, reducing intergenerational persistence (Hout 1988; Torche 2011). Consequently, when education expands and more people benefit from college, intergenerational persistence may weaken (Breen and Jonsson 2007; Breen 2010). Indeed, in recent decades, the share of college graduates has grown. Educational attainment rose more among high-income children than among low-income children, but college completion grew among children from all backgrounds (Bailey and Dynarski 2011). As the share of people completing college increased, so did the share completing advanced degrees, the share completing two-year degrees, and the share attending college but departing without degrees (National Center for Education Statistics 2017a). Like increasing college completion, some of these changes also may have reduced intergenerational income persistence.

We examine whether persistence remained unchanged because increases associated with educational inequality and educational returns were offset by reductions associated with educational expansion. No prior study has investigated how all of these trends shaped income persistence. Previous studies have shown that intergenerational income persistence is relatively weak among college graduates (Torche 2011; Chetty et al. 2017). However, educational expansion's potential to reduce income persistence has been ignored by prior investigations of how growing educational inequality and rising educational returns increased income persistence (Bloome and Western 2011; Blanden et al. 2014). We advance the literature by capturing the full force of education in income persistence trends.

Analyzing data from the National Longitudinal Surveys of Youth, 1979 and 1997 cohorts, we find that growing educational inequality by parental income, along with rising economic returns to education, increased intergenerational income persistence, as many scholars predicted. On the other hand, the expansion of higher education reduced persistence. That is, more people completing college led more people to move off their parents' rungs on the

income ladder. Yet, this reduction in intergenerational persistence was only one-third as large as the increase associated with growing educational inequality and rising educational returns, which pushed people back toward their parents' income rungs. Thus, persistence remained stable not because these educational trends fully offset one another. Persistence remained stable, instead, because educational expansion was joined by an additional, offsetting change: Within educational groups, parental income became less predictive of young-adult income. We speculate that this change reflects the lengthening transition to adulthood (Arnett 2000), increasing precarity of work (Kalleberg 2009), and rising income volatility (Western et al. 2012). In short, education both reproduces patterns of inequality across generations and upsets them, but recent trends in education tended toward reproduction. Thus, the legitimacy of the educational system may be at risk (Bowles and Gintis 2002).

To address our empirical puzzle, we introduce new descriptive tools that allow us to quantify, for the first time, the roles of educational inequality, educational returns, and educational expansion in intergenerational income persistence. Breen (2010) introduced an approach to distinguish these roles in occupational class persistence. Yet, despite rapidly growing interest in income persistence (e.g., Lee and Solon 2009; Torche 2011; Corak 2013; Chetty et al. 2014a, 2014b; Bloome 2015; Grusky et al. 2015), no comparable method exists in this endeavor. Consequently, researchers have yet to disentangle education's multiple roles in income persistence trends. We provide decomposition- and model-based methods to complete this task. Future scholars can also employ these methods to examine education's multiple roles in income persistence in other contexts.

Our findings have profound implications for policymakers committed to the ideal of equal opportunity. "College for all" reforms (aimed at expanding the share of people with post-secondary education) are unlikely to be sufficient to equalize opportunity. Our findings suggest that relatively advantaged children will avail themselves of such reforms before their less-advantaged peers do so, particularly because college completion is not yet universal even among children from the upper end of the income distribution. Instead, reforms must reverse

the trend toward rising educational inequality by promoting the education of low-income children. In other words, to reduce intergenerational persistence, policies should focus less on how many people complete college and more on who completes it.

In what follows, we first discuss trends in educational inequality, educational returns, educational expansion, and persistence within education groups. We next introduce our analytic approach and data. Finally, we detail our results and their implications for research and policy targeting intergenerational persistence.

The Roles of Educational Inequality and Returns in Income Persistence

Intergenerational income persistence should increase if either (a) educational inequality or (b) educational returns increase. Below, we discuss these two educational trends.

Educational Inequality

Educational inequality by parental income increased substantially across NLSY cohorts (Belley and Lochner 2007; Bailey and Dynarski 2011; Ziol-Guest and Lee 2016). In the NLSY79 cohort (born in the early 1960s and potentially attending college in the early 1980s), people from the lowest parental income quartile were about 31 percentage points less likely to complete college by age 32 than people from the highest quartile (Figure 1). In the NLSY97 cohort (potentially attending college 20 years later), the gap had grown to 47 percentage points.[4] This rising educational inequality reflects life-long educational trajectories. In fact, every step in the educational pipeline—including completing high school, entering post-secondary education, obtaining AA degrees, obtaining BA degrees, and obtaining advanced degrees—has become increasingly economically stratified (Appendix Table A1).[5,6]

Both economic and non-economic dynamics underlie these trends. As education became increasingly predictive of economic success, parents' incentives to invest in their children's education grew (Wrigley 1989; Reardon 2011). Higher-income parents can afford economic investments more easily than lower-income parents (Kaushal et al. 2011). Parents in the

top income decile increased their spending per child by approximately 132% between the early 1970s and mid-2000s, whereas parents in the bottom decile increased this spending by 24% (Kornrich and Furstenberg 2013). Parental spending matters both before and during college. Before college, high-income parents increasingly spend on preparatory activities such as tutoring and test preparation classes (Alon 2009). High-income parents also increasingly invest in their children's early education indirectly, by purchasing homes in districts with high-quality schools (Owens 2016). During college, families face tuitions and fees that have increased much faster than inflation (Roksa et al. 2007; College Board 2016). Financial aid has increased to cover these costs (Dynarski and Scott-Clayton 2013). Yet because sticker prices are relatively easy to find while financial aid is difficult to navigate, many low-income youths are discouraged from applying to college, particularly selective colleges (Scott-Clayton 2017). Moreover, following changes in federal regulations around student aid in 1992, loans became a substantial proportion of financial aid (College Board 2017). Partly in response to this development, increasing numbers of low-income college students combine school and work (Perna 2010). Because this combination often hurts academic performance (DeSimone 2008), the replacement of grants by loans may have exacerbated educational inequality.

Non-economic resources, such as time and parenting style, also shape children's educational attainment. All parents increased their time spent on children's developmental activities in recent decades, but the increase was greatest among college-educated parents (Altintas 2016). This divergence partly reflects changes in the family: Single parenthood increased fastest among less-educated people (McLanahan 2004), and single parents—who face severe time constraints when balancing work and family—report less time caregiving than partnered parents (Kalil et al. 2014). Parenting styles also differ across the socioeconomic spectrum. High-income parents engage in what Lareau (2011) calls "concerted cultivation," prioritizing parent-organized activities, while low-income parents favor "natural growth," prioritizing child-led organization of their own activities. The income gap in parenting styles may have grown together with the income gap in maternal age at birth, which contributed substantially

to rising educational inequality (Duncan et al. 2017).

In short, educational attainment has increased more among children from high-income backgrounds than among their low-income peers. The rise of educational inequality by parental income should have strengthened intergenerational income persistence.

Educational Returns

Like educational inequality, educational returns also increased in recent decades (Autor et al. 2008; Baum et al. 2013). In the NLSY79 cohort, college graduates' average adult income rank was about 2.6 times larger than high-school dropouts' (Figure 2). In the NLSY97 cohort, it was three times larger. In both cohorts, every step up the education ladder was associated with an increase in average income. Positive earnings returns accompany not only BAs and advanced degrees, but also AA degrees and post-secondary credits and certifications (Bahr 2014; Bahr et al. 2015; Belfield and Bailey 2017). Across cohorts, the returns to higher education increased, particularly for advanced-degree holders (Lemieux 2008).

A dominant explanation for these trends is the theory of "skill-biased technological change," which posits that changes like advances in automation and computing increased demand for highly educated workers (Autor et al. 2003). As the supply of these workers fell behind demand, labor-market returns to education increased (Goldin and Katz 2008). Other forces, including deunionization (Rosenfeld 2014), deindustrialization (Harrison and Bluestone 1988), and the growth of international trade (Feenstra and Hanson 1996), also boosted educational returns in the labor market. Educational returns in the family also rose. Highly educated people became more likely than less-educated people to marry, remain married, and have highly educated spouses, which expanded family income inequalities across education levels (Schwartz and Mare 2005; DiPrete and Buchmann 2006).[7]

Rising educational returns should have increased intergenerational income persistence, since highly educated people, who tend to have high-income parents, have increasingly high incomes themselves. Yet, one caveat is in order. Rising educational returns may reflect not

only increases in education's real payoff, but also increases in the influence of confounding factors, such as parental income. Once we account for the increased confounding of parental income, rising educational returns may do little to increase persistence, for two reasons. First, the increased confounding of parental income means that the children of high-income parents have become increasingly overrepresented among college students. These children may derive relatively little economic benefit from college, becoming high-income adults regardless of education (Brand and Xie 2010). This benefit might be particularly low among the new group of high-income students completing college, many of whom came from the bottom half of the test-score distribution and could be less ready to benefit from school (Belley and Lochner 2007). Second, as the mix of students changed, so did the mix of institutions they attended (Roksa et al. 2007). Rising shares of students entering less-selective, two-year institutions may have seen relatively small increases in their educational returns.

In sum, rising educational returns should have increased intergenerational income persistence, although the magnitude of the increase might be relatively small once we account for the advantages associated with parental income. Together with growing educational inequality, rising educational returns imply an increase in intergenerational persistence.

The Role of Educational Expansion in Income Persistence

While growing educational inequality and returns likely strengthened persistence, educational expansion should have reduced it. More people completing college has the potential to disrupt intergenerational persistence because persistence is weaker among college graduates than non-graduates. Below, we discuss how intergenerational persistence differs across educational groups and the implications for persistence trends.

Educational Heterogeneity in Persistence

The relatively low persistence experienced by college graduates, compared to non-graduates, was first discovered by Hout (1984, 1988). He examined intergenerational class persistence

in the US in the 1970s–1980s. Since then, the same pattern has been documented across several decades and countries (Vallet 2004; Breen and Jonsson 2007; Breen and Luijkx 2007; Breen 2010; Pfeffer and Hertel 2015). Less is known about how intergenerational income persistence varies with education, but Torche (2011) finds that college graduates experience both the lowest class persistence and the lowest income persistence (see also Chetty et al. 2017; Eide and Showalter 1999). Parent-child income correlations are not zero among college graduates (Witteveen and Attewell 2017), but they are weaker in this education group than others. In other words, college graduates from low-income background tend to move up the economic ladder and enjoy incomes that are similar to those of their equally educated peers from high-income backgrounds. Non-graduates, in contrast, tend to stay closer to their parents' rungs on the income ladder, with low-income children becoming low-income adults and high-income children becoming high-income adults.[8]

However, persistence does not decline monotonically with education. Rather, it is higher among advanced-degree holders than among people with terminal BAs (Torche 2011). This U-shaped pattern of intergenerational persistence by education may reflect the stickiness of affluence; for example, children of high-income MDs who become physicians themselves are likely to maintain positions toward the top of the income distribution. Patterns at the sub-BA level are relatively underexplored. Persistence is higher among people who complete some college versus a BA, but we are unaware of studies comparing persistence among people who complete some college but do versus do not obtain an AA.

The weak intergenerational link evident among college graduates is often taken as evidence that college levels the playing field between people from different socioeconomic backgrounds (Hout 1988; Torche 2011). This interpretation is consistent with studies indicating that the causal effect of college on earnings is largest among the people least likely to complete college (Card 2001; Brand and Xie 2010).[9] Low-income children are less likely than high-income children to complete college, but they may benefit more (Eide and Showalter 1999). Compared with how they would have fared without college, low-income children may gain

more productivity-enhancing skills, network connections, and information on economically rewarded cultural orientations in college than high-income children. High-income children also may have lower returns to college than low-income children if they are less likely to major in lucrative subjects, more apt to prioritize socializing and partying, or more likely to benefit from class-biased hiring practices that help them become high-income adults regardless of educational achievements (Ma 2009; Armstrong and Hamilton 2013; Rivera 2015).

If college indeed yields larger returns among low-income students than high-income students, it should reduce intergenerational persistence, turning low-income children into high-income adults. Thus, helping more low-income children obtain BAs could further reduce persistence. However, college graduates' low intergenerational persistence may reflect not only heterogeneous returns to college by parental income but also selection effects. For example, high-income students might attend college whatever their skills or ambitions, while low-income students might decide whether to attend on the basis of their academic abilities and motivation (Breen et al. 2015; Zhou and Xie 2018). If so, college graduates' low persistence would reflect not only education's real payoffs but also the selectivity of low-income students into college. Even so, assuming that the mix of causal and spurious associations continues to generate lower persistence among college graduates than non-graduates, increasing the share of people completing college could reduce intergenerational persistence.[10]

Educational Expansion and Persistence Trends

Education expanded across the economic spectrum in recent decades. Among people from the bottom parental income quartile, the share completing college by age 32 rose about 56.6% between the NLSY79 and NLSY97 cohorts; among people from the top quartile, it rose 52.5% (Figure 1; Bailey and Dynarski 2011; Ziol-Guest and Lee 2016).[11] Because the baseline (NLSY79) share of college graduates was higher in the top parental income quartile, similar percentage changes in the top and bottom quartiles generated larger percentage point changes at the top, widening income differences in college completion. Yet children from all

parental backgrounds saw their chances of completing college rise. Education also expanded at the post-BA level (as more people completed MAs and other advanced degrees) and the sub-BA level (as more people completed AAs and even more completed some college but did not obtain degrees) (Horn and Skomsvold 2011; National Center for Education Statistics 2017a). However, since persistence is lowest among college graduates, expansion at these levels should have been less equalizing than expansion at the BA level.

In short, educational expansion should reduce persistence because more people should benefit from the low persistence experienced by college graduates (Hout 1988). To date, the methodological tools required to assess this hypothesis are available only for studying class persistence (Breen 2010). We introduce tools to assess this hypothesis in the context of income persistence (see Analytic Approach section).

The Role of Change within Education Groups

Growing educational inequality, rising educational returns, and educational expansion all alter persistence via differences *between* education groups (in terms of parental income, adult income, and population shares). What about changes *within* education groups?

There are two reasons to hypothesize that, within education groups, parental income became less predictive of young-adult income. First, changes in the life course may have delayed the age when incomes stabilize, making incomes less predictable at young ages. Second, changes in the labor market may have increased economic instability, making incomes less predictable at all life stages, not only at young ages.

Changes in the Young-Adult Life Course

Experiences historically associated with the transition to adulthood—departing the parental home, completing school, joining the labor force, marrying, and having children—have been increasingly delayed to older ages (Sironi and Furstenberg 2012). A life-course stage of "emerging adulthood" from the late teens to late twenties has developed since the 1970s

(Arnett 2000). This stage is characterized by exploration and instability in employment and relationships. While people born in the 1960s may have settled into enduring work and family situations reflective of their family backgrounds by their late twenties, people born in the 1980s may not have. Consequently, young-adult income may appear less predictable.[12]

Educational expansion contributed to the delayed transition to adulthood. Low-income children became increasingly likely to be in school as young adults, partly because they enter college at older ages (Bozick and DeLuca 2005) and partly because their time-to-BA increased (Bound et al. 2012) as they navigated transitions from two- to four-year institutions (Goldrick-Rab 2006) and combined work and school (DeSimone 2008). High-income children also increased their school enrollment at older ages, as they completed advanced degrees (Torche 2011). As a result, incomes likely peak and stabilize at older ages in more recent cohorts, especially among college graduates (including those with advanced degrees). Thus, young adults' incomes may have become less predictable from their parents' incomes, given their education. Older adults' incomes, however, may have remained as predictable as before.

Changes in the Labor Market

On the other hand, both young adults' and older adults' incomes may have become less predictable from their parents' incomes, given their own education, due to structural changes in the labor market. In recent decades, work has become increasingly "precarious" (Kalleberg 2009), not only for low-wage workers but also for professionals and managers. The share of workers engaged in nonstandard employment—including temporary help agency workers, on-call and contingent workers, and independent contractors—has grown since the 1970s (Kalleberg 2000; Katz and Krueger 2016). Job tenure has declined for private-sector men and never-married women, likely reflecting increased movement in and out of employment (Farber 2010; Hyatt and Spletzer 2013; Hollister and Smith 2014).[13] Year-to-year income volatility has increased since the 1970s and institutions supporting stable wages, like unions and public-sector employment, have declined (Western et al. 2012; Rosenfeld 2014). This

"precarious" turn in the labor market is evident in NLSY. Between ages 18-30, NLSY97 men were more likely than NLSY79 men to work part-time, work in services jobs, and go a year without wages, but less likely to work in unionized or government jobs (Maume and Wilson 2015). As labor-market experiences became more unstable, the incomes of adults with the same level of education also may have become less predictable from their parents' incomes.

In sum, changes in the young-adult life course and changes in the labor market may have reduced intergenerational income persistence within education groups. Below, we examine how these changes combined with growing educational inequality, rising educational returns, and educational expansion to shape persistence trends.

Analytic Approach

Intergenerational income persistence is typically measured as the slope coefficient from a regression of adult income on parental income,

$$Y_i^a = \alpha + \beta Y_i^p + \epsilon_i \tag{1}$$

where income is often adjusted for age, measurement error, and family size. β captures intergenerational persistence; its complement $(1 - \beta)$ captures mobility. Traditionally, researchers transformed incomes with logs, allowing β to be interpreted as an intergenerational income elasticity (Solon 1999). An elasticity captures both relative persistence (similarity in parents' and children's relative income positions) and differences in income inequality across generations.[14] More recently, researchers have begun transforming incomes into ranks (Chetty et al. 2014a, 2014b). By ranking parents' and children's incomes within their respective generation's distributions, β can be interpreted as an intergenerational rank correlation, capturing purely relative persistence. Sociologists have long prioritized understanding patterns in purely relative persistence when studying class persistence, explicitly conditioning on marginal class distributions (Breen 2004). To speak to this sociological concern with relative

persistence, we examine income ranks. Our key persistence parameter is the rank-rank slope.

To understand education's roles in income persistence trends, we introduce two methodological tools, or procedures, that other researchers can also employ. We first introduce a decomposition that offers an elegant mapping of education's multiple roles in income persistence. We then introduce a model-based approach that relaxes some assumptions embedded in the decomposition and provides further insights into education's multiple roles. Like the assessment of intergenerational income persistence itself, both of these tools are descriptive in nature, helping to fully characterize population processes (not only the causal effects of parental income or education but also non-causal patterns).

Decomposition

Our decomposition isolates changes in persistence associated with (a) educational expansion (expected to reduce persistence), (b) rising educational inequality and returns (expected to increase persistence), and (c) changing income predictability within education groups. We first partition persistence within each cohort into pieces reflecting each of these three components, and then examine changes in these components across cohorts.

Looking first within cohort, we write the rank-rank slope β as the weighted average of the "total associations" (described further below) between parents' and children's incomes within education groups (eq. 2.1). The weight, π_g, is the share of people within education group g (e.g., the share of people with BAs). B_g is the total association within group g. The larger a group's share, the larger the group's impact on the overall rank-rank slope β. With educational expansion, the group shares change. Later, we will use this change to isolate educational expansion's role in persistence trends.

$$\beta = \sum_g \pi_g B_g \tag{2.1}$$

$$= \sum_g \pi_g (B_g^b + B_g^w) \tag{2.2}$$

$$= \sum_g \pi_g \left(\frac{(\mu_{ga} - \mu_a)(\mu_{gp} - \mu_p)}{\sigma_p^2} + \beta_g \frac{\sigma_{gp}^2}{\sigma_p^2} \right) \tag{2.3}$$

To isolate the roles of income gaps between education groups and income predictability within education groups, we split the "total association" between parents' and children's incomes in education group g, B_g, into two pieces: the between-group association, B_g^b, and within-group association, B_g^w (eq. 2.2; see also Torche and Corvalan 2016).[15]

The between-group association B_g^b captures income gaps between education groups in childhood (reflecting educational inequality) and adulthood (reflecting educational returns). Formally, it consists of group g's contribution to the between-education covariance between parents' and children's income ranks, $(\mu_{ga} - \mu_a)(\mu_{gp} - \mu_p)$, scaled by the variance of parental income ranks, σ_p^2 (eq. 2.3, first term in parentheses). Substantively, the between-group association captures educational returns in the term $(\mu_{ga} - \mu_a)$, where μ_{ga} is the average adult income rank in education group g and μ_a is the overall average adult income rank. The larger the difference $(\mu_{ga} - \mu_a)$, the greater the returns to education. Further, the between-group association captures educational inequality via the term $(\mu_{gp} - \mu_p)$, where μ_{gp} is the average parental income rank in group g and μ_p is the overall average parental income rank. The larger the difference $(\mu_{gp} - \mu_p)$, the greater the educational inequality by parental income. In sum, larger between-group associations indicate more intergenerational income persistence due to gaps between education groups in both parental and adult incomes.

The within-group association B_g^w captures how strongly income persists across generations among people in education group g. If B_g^w is weaker among college graduates than non-graduates, educational expansion could reduce intergenerational income persistence. B_g^w

consists of the within-group slope, β_g (i.e., the slope coefficient from a regression like eq. 1, but calculated on a sample restricted to members of group g), scaled by the ratio of the variance of parents' income ranks within group g to the total variance of parents' income ranks, σ^2_{gp}/σ^2_p (eq. 2.3, second term in parentheses). The within-group slope β_g has been the focus of prior research on how income persistence differs by education. The scaling factor, σ^2_{gp}/σ^2_p, simply ensures that the weighted sum of the within- and between-group associations equals the overall rank-rank slope. Larger within-group associations indicate more intergenerational income predictability among people in education group g.

Together, the components of the rank-rank slope β shown in eq. 2.1–2.3 capture education's roles in intergenerational income persistence within each cohort (educational composition, π_g, income inequality between education groups, B^b_g, and income predictability within education groups, B^w_g). Changes in these components contribute to cohort change in persistence, $\beta^{97} - \beta^{79}$, as in eq. 3. (β^{97} and β^{79} are the rank-rank slopes in the NLSY97 and NLSY79.)

$$\beta^{97} - \beta^{79} = \underbrace{\sum_g \pi^{79}_g \left(\frac{(\mu^{97}_{ga} - \mu^{97}_a)(\mu^{97}_{gp} - \mu^{97}_p)}{\sigma^2_{p,97}} - \frac{(\mu^{79}_{ga} - \mu^{79}_a)(\mu^{79}_{gp} - \mu^{79}_p)}{\sigma^2_{p,79}} \right)}_{\text{Rising Income Gaps between Education Groups}} + \underbrace{\sum_g \pi^{79}_g \left(\beta^{97}_g \frac{\sigma^2_{gp,97}}{\sigma^2_{p,97}} - \beta^{79}_g \frac{\sigma^2_{gp,79}}{\sigma^2_{p,79}} \right)}_{\substack{\text{Changes in Intergenerational Predictability} \\ \text{within Educational Groups}}} + \underbrace{\sum_g B^{97}_g (\pi^{97}_g - \pi^{79}_g)}_{\text{Educational Expansion}} \tag{3}$$

The sums on the right-hand side of eq. 3 capture the contributions to changes in income persistence of, first, rising income gaps between education groups; second, changes in intergenerational predictability within education groups; and third, educational expansion. We generate point estimates for all population quantities from the NLSY79 and NLSY97 sample data (e.g., $\hat{\beta}_g$, $\hat{\pi}_g$, $\hat{\sigma}^2_{gp}$). Since the quantities of interest are nonlinear combinations of the component statistics, we assess sampling uncertainty via the nonparametric bootstrap.[16]

Model

We supplement our decomposition with a model-based approach. While the decomposition captures only the joint contribution to income persistence trends of (a) changing educational inequality and (b) changing educational returns, the model disentangles the two. Additionally, by simulating the status attainment process explicitly, the model relaxes some stringent assumptions implicit in the decomposition. For example, while the decomposition assumes that educational expansion does not shape incomes within education groups, the model allows changes in one aspect of persistence to influence others. Like our decomposition, our model-based approach is descriptive. This approach is necessary to address the descriptive puzzle motivating our paper, regarding the stability of intergenerational income persistence despite growing educational inequality and rising educational returns. For an alternative approach focused on identifying the causal effects of education on income persistence, and a discussion of the ignobility assumptions required for this identification, see Zhou (2018).

The model has two stages. First, we predict educational attainment using a generalized ordered logit model (Peterson and Harrel 1990; Williams 2006),

$$\text{logit}[P(E_i \geq g)] = \alpha_g + \lambda_g Y_i^p \tag{4}$$

where E is educational attainment, Y^p is parental income rank, and α_g and λ_g are the intercept and slope coefficients associated with attaining education level g. We recenter parental income rank at its population mean. Thus changes in α_g across cohorts capture educational expansion, and changes in λ_g capture rising educational inequality by parental income. This model is similar to the conventional ordered logit model but relaxes the proportional odds assumption by allowing λ_g to vary across educational categories.[17]

Using the education levels predicted from the first stage, the second stage of the model predicts adult income rank. Specifically, we first use a normal linear model to predict log income in adulthood, L^a, within each education group using parental income rank.

$$L_i^a \sim N(\gamma_g + \beta_g Y_i^p, \upsilon_g^2) \tag{5}$$

We then transform the simulated adult incomes into ranks. We again recenter parental income rank at its population mean. Cohort changes in γ_g capture changes in the conditional returns to education for people with median parental income; changes in β_g and υ_g^2 capture changes in the predictability of adult income from parental income within education groups.[18]

Improving on the decomposition, this model has distinct parameters to capture educational inequality (via λ_g) and educational returns (conditional on parental income)(via γ_g). Further, the model allows educational expansion (changes in α_g) to alter not only the shares of people in different education groups (π_g in eq. 2–3) but also other key quantities (e.g., the means and variances of parental incomes within education groups; μ_{gp} and σ_{gp}^2 in eq. 2–3). Similarly, changes in educational inequality (λ_g) can alter μ_{gp} and σ_{gp}^2. In a sense, the model uncovers the more structural processes underlying the inputs to the decomposition.

Our model follows in the footsteps of the status attainment model introduced by Blau and Duncan (1967). However, it relaxes the traditional assumptions of linearity and additivity—the implausibility of which partly explains the rise of log-linear analysis of class persistence since the 1980s. We relax the linearity assumption by modeling education as an ordered outcome (rather than a continuous variable like years of schooling). We relax the additivity assumption by allowing the full interaction effect of parental income and children's education on adult income (via separate β_g and υ_g^2 parameters in each education group).

To understand education's multiple roles in income persistence trends, we first estimate all parameters in eq. 4–5 ($\alpha_g, \lambda_g, \gamma_g, \beta_g, \upsilon_g^2$) for each cohort separately using NLSY79 and NLSY97 data. We then simulate data from these models, changing parameter values. For example, to investigate the role of changing educational returns, we simulate data for the NLSY97 cohort using all parameter estimates from the NLSY97 except γ_g, which we estimate from the NLSY79. With these simulated data, we calculate the rank-rank slope β^{97} and examine how intergenerational income persistence would have changed had everything changed across cohorts as observed, except educational returns. The counterfactual analysis is more nuanced for educational expansion. Instead of using the α_g estimated from the NLSY79, we find the

α_g values that predict the 1979 educational composition, π_g^{79}, when using the 1997 λ_g in eq. 4. Similarly, to assess the role of changing educational inequality, we find the α_g that predict the 1997 educational composition, π_g^{97}, while using the 1979 λ_g in eq. 4.

Data

We use National Longitudinal Survey of Youth data from the 1979 cohort (NLSY79, observed 1979–2014) and 1997 cohort (NLSY97, observed 1997–2015) to study education's roles in income persistence. NLSY cohorts have relatively large samples (compared to other panel surveys), which permit relatively precise inference on how persistence varies over time and across education groups. The NLSY79 and NLSY97 began with nationally representative samples of people age 14–22 in 1979 and age 12–18 in 1997, respectively. To ensure cross-cohort comparability and avoid over-representing late home-leavers, we limit our NLSY79 sample to people age 14–18 in 1979. NLSY79 and NLSY97 surveys were conducted annually through 1994 and 2011, respectively, and biennially thereafter.

We draw parental family income from the earliest five survey waves (1979–1983 and 1997–2001), capturing income years 1978–1982 for children age 13–17 in 1978 and income years 1996–2000 for children age 11–17 in 1996 for the NLSY79 and NLSY97, respectively. We average all years in which parents reported their income.[19] We measure adult family income by averaging values between age 27–32 (excluding respondents with fewer than two observations in either generation).[20] Averaging income observations reduces measurement error (Mazumder 2005). Several recent studies use a similar age range of 26–32 to study income persistence (Chetty et al. 2014a, 2014b). However, because age-income trajectories differ by education (with more highly educated people reaching stable income later in life), estimates of intergenerational persistence using income under age 30 are likely downwardly biased (Haider and Solon 2006; Chetty et al. 2017). We study age 27–32 to reflect economic attainment at comparable ages across cohorts, although these ages may not reflect permanent income. The youth of the NLSY97 sample limits what we can learn about long-term persistence.[21] But it

has the benefit of providing insights into education's roles in persistence in the contemporary US, during a period when college completion both expanded significantly and became more stratified by parental income. We further discuss the implications of our age limitations in the next sections.[22] Future analyses should follow these cohorts to reveal how education's roles in persistence change over the life course.

Family income sums husbands', wives' and other co-residential family members' annual incomes from a variety of sources, including wages and salary, farm and business, and several government programs. We add the estimated values of refundable tax credits from the Earned Income Tax Credit (EITC) and Child Tax Credit (CTC) to the NLSY-reported income sources, obtaining these values from the National Bureau of Economic Research's TAXSIM module (Feenberg and Coutts 1993).[23] We examine total family income to capture economic circumstances in a way that accounts for joint labor supply decisions among spouses and the increasing importance of women's employment and assortative mating.[24] To obtain consistent topcodes across survey years, we impute the top 3% of incomes from a Pareto distribution.[25] We transform income to constant dollars using the personal consumption expenditures index (PCE) and adjust income for need by dividing by the square root of family size.[26] We rank incomes separately within each generation and cohort, using mid-ranks for ties. We use custom survey weights to account for unequal selection probabilities and attrition. Our analytic sample sizes are 3,960 and 5,773 for the NLSY79 and NLSY97, respectively.

To assess education's multiple roles in intergenerational income persistence, we classify people into six education groups: less than high school, high school, some college with no degree, AA degree, BA degree, and advanced degree (i.e., MA degree or higher).[27] We focus on the most recent education observed between age 27–32.

We combine men and women in our main analyses because we find similar patterns of family income persistence across genders (see also Chadwick and Solon 2002; Mitnik et al. 2015). Appendix Tables A4 and A6 contain gender-stratified results. Women's educational attainment has increased faster than men's in recent decades (DiPrete and Buchmann 2006),

but we see qualitatively similar results across genders partly because both men and women experienced educational expansion across the NLSY cohorts. The share graduating college by age 32 increased 58% among women and 30% among men.

Results

Intergenerational income persistence remained remarkably stable between the NLSY79 and NLSY97 cohorts (Table 1). These cohorts reached age 30 about twenty years apart, in the early 1990s versus early 2010s. In these twenty years, correlations between parents' and children's rank incomes declined trivially (and statistically insignificantly), from .426 to .424. Similarly, log income correlations declined a substantively small and statistically insignificant amount, from .448 to .435. Intergenerational rank correlations around .42 indicate a moderate amount of income persistence and, on the flip side of the coin, a moderate amount of mobility.

The cross-cohort stability in intergenerational persistence characterizes the experiences of children from all parts of the parental income distribution (Figure 3). At the bottom, 75.5% of children from the lowest income quartile in the NLSY79 experienced upward rank mobility (gaining at least one income rank between childhood and young adulthood), versus 75.8% in the NLSY97. At the top of the distribution, 18.5% of children from the highest income quartile in the NLSY79 experienced upward rank mobility, versus 20.8% in the NLSY97. The share of people experiencing upward mobility declines with parental income due to ceiling effects; children from higher-income families simply have fewer possible ranks to enter that exceed their parents' ranks. However, many upward moves were not sufficiently large to boost low-income children out of the broad bottom of the income distribution. About 49.7% of children from the lowest quartile remained there as adults in the NLSY79 (Figure 3, middle panel); the most common transition out of the lowest quartile was to the second lowest quartile, and only 9.0% made it to the highest quartile in adulthood (Figure 3, right panel). Affluence is somewhat less sticky than poverty. About 41.4% of children from the highest income quartile remained there in adulthood in the NLSY79 (Figure 3, right panel), meaning

that although relatively few had the opportunity to increase their income rank compared to their parents (Figure 3, left panel), most remained at the broad top of the distribution. Only 9.4% fell down to the bottom quartile (Figure 3, middle panel). In short, adult income positions in the US can be predicted by childhood income positions, but not with complete accuracy because there is a non-trivial amount of income mobility. Nevertheless, this mobility tends not to dramatically alter families' economic positions across a generation; income is fairly persistent. Importantly for the current study, these patterns appear stable across cohorts. Across all measures captured in Figure 3 and Table 1, the two cohorts' experiences look extremely similar. Consistent with prior research using different data sources (Hertz 2007; Lee and Solon 2009; Chetty et al. 2014a), the NLSY79 and NLSY97 cohorts show little evidence of a shift in intergenerational income persistence in recent decades.

Stable persistence results from offsetting trends. While growing educational inequality and rising educational returns strengthened persistence, persistence was simultaneously reduced by educational expansion and declining intergenerational income predictability within education groups (Tables 2–4). Table 2 depicts each of these trends via the components of intergenerational income persistence for each cohort. (These components together compose the intergenerational rank correlation within each cohort, as in eq. 2.1–2.3; changes in these components describe changes in the intergenerational correlation, as in eq. 3.) Tables 3 and 4 contain our decomposition and model-based results.

The share of people completing at least some college rose substantially across cohorts (Table 2, column 1). Only about 47.4% did so in the NLSY79, versus 62.9% in the NLSY97. This educational expansion occurred at all levels above high school. Larger shares of people obtained some college education without any degree in the NLSY97 than in the NLSY79, but larger shares also obtained AA degrees, BA degrees, and MAs or other advanced degrees.[28] The share completing terminal BAs rose about 32%, from 17.9% to 23.5%. Among college graduates, intergenerational income persistence was relatively weak (Table 2, column 2). In the NLSY79, the rank-rank slope was .36 among high-school graduates but only .18 among

college graduates.[29] Because educational expansion shifted individuals out of the relatively high-persistence group of high-school graduates into the relatively low-persistence groups with higher education, it reduced persistence across cohorts. However, educational expansion may not have reduced persistence as much as expected, due to expansion above the BA level. Although a much smaller share of the population holds advanced degrees than BAs, this share increased dramatically across cohorts, from 5.2% to 9.8%. Moreover, intergenerational persistence is not as low among advanced-degree holders as among BA holders (at .26 versus .18 in the NLSY79, respectively). Likewise, expansion at the sub-BA level appears less equalizing than expansion at the BA level, since people with some college (both with and without AAs) are less mobile than people with college degrees. In short, educational expansion should have reduced persistence, because larger portions of the population came to enjoy the low persistence experienced by highly educated people; yet expansion at the sub- and post-BA levels may have dampened the equalizing effect of rising educational attainment.

As higher education expanded, rank-rank slopes declined within education groups. In the NLSY79, the slope among high-school graduates (advanced-degree holders) was .36 (.26), while in the 1997 cohort it was .33 (.20). Within-group declines are also evident once the intergenerational rank-rank slopes are scaled (by the ratio of the variances of parental income ranks within group and overall) in order to capture the within-group portion of the total intergenerational association (Table 2, column 3; see eq. 2.2–2.3). Declining income predictability within education groups suggests that other changes, in addition to educational expansion, may have reduced income persistence across cohorts.

Persistence remained stable across cohorts because these equalizing changes were counterbalanced by growing educational inequality and rising educational returns. These trends are captured in the cross-cohort increase in between-group associations (Table 2, column 4; see eq. 2.3). Between-group associations are larger when differences between education groups are more extreme in their average parental and adult incomes. For example, high-school dropouts tend to come from (and create) lower-income families than their more-educated peers (Figures

1–2). Thus, their between-group association is quite high, since their typical income is far from the overall mean. The increased between-group associations among high-school dropouts and graduates (whose between-group associations grew from .55 and .04 to .89 and .15, respectively) illustrate how people without any college education have been increasingly left behind, falling further down the income ladder relative to their more-educated peers.

We formally decompose cross-cohort changes in persistence in Table 3, quantifying the roles of rising educational inequality and returns, changes within education groups, and educational expansion. The intergenerational rank correlation declined by .002 points across cohorts, dropping from .426 to .424. But if the only changes across cohorts were rising educational inequality and growing educational returns, we predict that the correlation would have increased .06 points on the correlation scale, or about 15% of the baseline persistence level of .42. Thus, these educational changes are strongly associated with an increase in the intergenerational persistence of income ranks. Yet, income persistence did not increase across cohorts due to two additional changes. Both declining intergenerational income predictability within education groups and educational expansion reduced income persistence. Despite large-scale educational expansion—increasing the share of people with at least some college by about 33% across cohorts—the associated reduction in persistence was insufficient to offset, by itself, the effects of rising educational inequality and growing educational returns. Given rising educational inequality and returns, as well as changes within education groups, educational expansion only reduced the correlation by .02 points, or about one-third as much as rising educational inequality and returns increased the correlation ($.02/.06 = 1/3$).

These patterns are evident when men and women are pooled (Table 3) and examined separately (Appendix Table A4). Neither can these patterns be explained by changes in family structure across cohorts. NLSY97 respondents were less likely than NLSY79 respondents to be married in young adulthood; they were also less likely to live with both parents as teens. Yet even when we limit the sample to individuals who were stably married as young adults, or to people who lived with both parents during the baseline survey wave, we see the same

patterns depicted in Table 3 (Appendix Table A4). Results are also robust regardless of how income is age- or family-size adjusted (Appendix Table A5) or whether income is restricted to include only core family members' wages and salaries (Appendix Table A5) or individuals' own adult wages and salaries (Appendix Table A6).

The model-based approach confirms the decomposition results, but also provides additional information (Table 4). The model allows us to distinguish rising educational inequality by parental income and growing educational returns. Further, it relaxes the assumption that educational expansion (changes in π_g) would leave other population quantities (e.g., μ_{gp}, μ_{ga}) unchanged. Table 4, first row shows that the rank income correlation declined by about .002 points across cohorts, repeating information shown in Tables 1 and 3. Table 4, second row confirms that simulated data from the two-stage model of educational attainment and income (eq. 4–5) accurately reproduce this estimate when using parameter values estimated from NLSY79 and NLSY97 data. (Appendix Tables A1 and A2 report these parameter estimates.) Table 4's remaining rows use simulated data from the two-stage model to investigate how persistence might have changed in different counterfactual scenarios. Two key findings emerge.

First, education-linked increases in intergenerational income persistence stem almost entirely from rising educational inequality (rather than rising educational returns). If educational inequality had remained where it was in the NLSY79 (rather than increasing over time) while everything else evolved as observed, we would expect income persistence to have declined significantly, with intergenerational rank correlations falling to about .396—a decline approximately 13 times larger than observed. This finding suggests that rising educational inequality strengthened intergenerational income persistence. Rising educational returns also strengthened intergenerational persistence, but only about one-fifth as much as rising educational inequality did. If educational returns had remained where they were in the NLSY79 while everything else evolved as observed, we would expect income persistence to have declined slightly to about .416. This small magnitude of change results, in part, from the fact that some of the rising returns to education reflects increased confounding by parental

income. When disentangling the sources of change in income persistence, this part of the rising returns is attributed to rising parental inequalities. The other part of the rising returns (which cannot be explained by parental income) is what, in Table 4, we see associated with a small increase in persistence across cohorts. Yet the small role of rising educational returns in persistence trends may also reflect the fact that the full returns to education may be reaped at increasingly older ages; in the NLSY97, the rewards to completing higher education may materialize later in life than in the NLSY79. We will return to this point.

Second, the model-based results confirm that educational expansion was insufficient to fully offset the effects of growing educational inequality and rising educational returns. If educational expansion had not occurred, we would expect income persistence to have increased slightly, by about .01 points. Since income persistence actually remained unchanged, educational expansion was indeed equalizing. Yet this decline in persistence was far smaller than the increase induced by growing educational inequality and rising educational returns. In fact, both the decomposition- and model-based approaches indicate that the role of educational expansion was only about one-third as large as the role of growing educational inequality and rising educational returns.[30] These results confirm that without other sources of change, income persistence would have intensified across cohorts.

The key additional change was the decline in intergenerational income predictability within education groups. Holding predictability at its NLSY79 level for all education groups, but allowing everything else to evolve as observed, we would expect the overall rank-rank slope to rise by about .025 points on the correlation scale (Table 4). The fact that, in reality, it did not rise (but rather remained stable) indicates that within-group changes put downward pressure on intergenerational income persistence. This downward pressure stems from all of the major education groups (Figure 4). Changes in predictability in all education groups together is associated with a .025 decline in the overall rank-rank slope (Table 4, bottom row, and Figure 4, top row), while changes in predictability in only the high-school educated group or only the BA-educated group are associated with declines of about .011 each (Figure 4, rows 3 and

6).[31] In short, income persistence remained stable across cohorts because, although rising educational inequality exerted substantial upward pressure on persistence (together with rising educational returns), two other forces—educational expansion and declining income predictability within education groups—pushed persistence downward.[32]

Will the upward pressure on persistence from growing educational inequality and rising education returns continue to be offset in the future by the combination of educational expansion and within-group change? There is reason to hypothesize that it will not and that, instead, persistence will increase as the more recent cohort ages. In particular, the downward pressure on persistence from declining income predictability within education groups may be specific to the young-adult life stage. Following other research on trends in intergenerational income persistence (e.g., Chetty et al. 2014a), we have compared persistence across people from different birth cohorts at similar ages. When, instead, we compare people at similar life stages as captured by marital status, our results are consistent.[33] However, conditioning on milestones like marriage introduces additional complications into the analysis, particularly in light of the fact that the two cohorts studied here may never be similar in terms of many milestones; for example, the share never marrying may always be higher in the NLSY97 cohort than the NLSY79 cohort (Ruggles 2016). Thus, we discuss below (and in the conclusion section) how our findings may differ once the NLSY97 cohort reaches middle age, and the resulting necessity to replicate our analyses in future years.

Generally, adult incomes are more predictable from parental incomes at older ages, when highly educated, high-income children have settled into their high-income adult careers and families (Haider and Solon 2006). If the ages at which adult incomes stabilize have increased across cohorts (and these ages vary with education), then as the cohorts get older, income persistence within education groups may rise faster in the NLSY97 cohort than in the NLSY79. This would lead persistence to increase across cohorts, since the upward pressure on persistence would come to outweigh the downward pressure. Future age-income profiles for the NLSY97 cohort are, of course, unknown. Researchers must follow respondents as

they age to describe how middle-age and young-adult persistence patterns differ. Yet the available data suggest that income will stabilize later in life in the NLSY97 cohort than it did in the NLSY79. During the adult ages observed for both cohorts, 27–32, income ranks evolved more rapidly in the NLSY97 cohort than in the NLSY79 (Figure 5). Age-income profiles were steeper, particularly for college graduates. Thus, the cross-cohort decline in income predictability within education groups might reflect the fact that in young adulthood, the highly educated members of the more recent cohort are further from their permanent incomes than the highly educated members of the earlier cohort were at the same ages.

These steeper age-income profiles in the more recent cohort result partly from rising ages at school completion. At age 27, only about 8% of NLSY79 respondents were enrolled in school, versus 13% of NLSY97 respondents (Table 5). As more people continue their educations later in life, incomes stabilize at older ages (since labor-force attachment is relatively weak during periods of school enrollment, and the eventual returns to higher education are not fully reflected in young-adult income even among people no longer enrolled). Given that parents' income predicts educational attainment, these enrollment trends suggest that persistence within education groups may increase as the NLSY97 cohort ages and more people from high-income backgrounds settle into their the eventual, high adult incomes.

Yet notably, educational enrollment at age 27 increased even more among people from low-income backgrounds than among people from high-income backgrounds, growing almost 6 percentage points among the former (from about 4.8% to 10.7%) versus 4.5 percentage points among the latter (from about 10.2% to 14.7%) (Table 5). People from high-income backgrounds have always been more likely to be enrolled during young adulthood, since they are more likely to obtain post-secondary degrees and, particularly, degrees beyond BAs. But increasing enrollment during young adulthood reflects trends among both the high-income (working on advanced degrees) and low-income (working on BAs, which they tend to complete at older ages).[34] This fact suggests that the story about persistence trends at older ages is not so simple. People from high-income families are not alone in taking longer to reach high

adult incomes; they have been joined by people from low-income families. Thus, we may see the effects of educational expansion increase as the more recent cohort ages, just as we may see the within-education group persistence increase.

Finally, delayed school completion across cohorts suggests that educational returns may be more understated in the later cohort than in the earlier cohort. At older ages, when people have had more time to reap the rewards of their educational attainment, we may see the role of rising educational returns increase. In short, rising age at school completion across the parental income distribution has three implications for persistence trends: if we reassess these trends in 15 years, when the more recent cohort has reached middle age, we may see (a) higher educational returns and (b) more within-group predictability (both changes would lead persistence to increase across cohorts in middle age, although it appears stable across cohorts in young adulthood) but also (c) a larger role of educational expansion (a change that would lead persistence to decline across cohorts). Changes (a) and (b) are likely stronger than (c), given that any additional reduction in persistence from educational expansion at the BA level may be dampened by expansion at the post-BA level (where persistence is not as low as it is at the BA level). This logic implies that the stable persistence observed across cohorts today reflects circumstances that are specific to the young-adult life stage, and, therefore, persistence may increase at older ages.

However, other changes beyond school completion may continue to offset persistence increases throughout the life course, at least partially. For example, members of the more recent cohort were 4.7 percentage points less likely to be out of school, but 6.9 percentage points less likely to be both out of school and earning (Table 5). Employment declines are evident even among those not enrolled in school, at both the top and bottom of the parental income distribution. These declines partly reflect the "precarious" (Kalleberg 2009) turn in employment, with increasing movement in and out of the labor force and rising reliance on temporary and contract work. Since these changes may persist into later life, parental income may remain less predictive of adult income within education groups.[35]

Moreover, delays in marriage may have driven up persistence during young adulthood, because intergenerational income persistence appears higher among single than married people due to imperfect assortative marriage (Chadwick and Solon 2002; Bloome 2017). In this regard, persistence may decline across cohorts as more people marry. In short, some, but not all, cohort differences in the transition to adulthood suggest an increase in income persistence across cohorts in later life. Ultimately, this is an empirical question to be answered in future years, when the more recent cohort reaches middle adulthood.

Discussion

Intergenerational income persistence has become the topic of substantial research in the past decade. One key finding from this research is that intergenerational income persistence has been remarkably stable across recent cohorts of young adults in the US. This finding contrasts sharply with evidence of growing educational inequality by parental income and rising educational returns in adulthood, evidence that suggests a stronger connection between parents' and children's incomes (Haveman and Smeeding 2006; Duncan and Murnane 2011). Why, then, has no increase in persistence materialized?

We hypothesized that the answer to this question might lie in offsetting educational trends. As educational inequality grew and educational returns rose (potentially increasing persistence), many more people completed college (potentially reducing persistence). Since Hout (1984, 1988) discovered that intergenerational class persistence is lowest among college graduates, scholars have recognized that expanding postsecondary education could reduce class persistence (since more people might benefit from the low persistence experienced by college graduates). Indeed, working-class youth see higher education as a way to escape their humble origins (Silva and Snellman 2018). Yet educational expansion has been largely overlooked in the scholarship on income persistence. Moreover, little is known about how the specific nature of educational expansion has shaped persistence. Not only have more people completed BAs (the educational shift of primary focus in prior research), but more people

have also entered college and left without degrees or with AAs, and more have obtained advanced degrees. Thus, in this article we investigated the extent to which expansion across all of these levels of education disrupted intergenerational persistence and whether these disruptions counterbalanced increases in persistence associated with growing educational inequality and rising educational returns, leading persistence to remain stable.

To facilitate this investigation, we introduced decomposition- and model-based tools that allowed us to evaluate, for the first time, education's multiple roles in intergenerational income persistence. The model-based approach, in particular, builds on the tradition of status attainment modeling dating back to the 1960s, when Blau and Duncan (1967) introduced path analysis into the study of social stratification. However, when the role of educational expansion was first explicated by Hout (1984, 1988), log-linear analysis of class persistence had supplanted the status attainment approach as the lingua franca in intergenerational research. Consequently, sociologists have examined education's multiple roles in persistence almost exclusively in the realm of class mobility (Breen and Jonsson 2007; Breen 2010). Yet, as income inequality has grown both between and within occupational classes (Weeden et al. 2007) and high-quality intergenerational income data have become increasingly available in the US and other countries (Corak 2013; Grusky et al. 2015), the study of income persistence has gathered substantial momentum. We introduced tools that quantify education's multiple roles in intergenerational income persistence, updating the status attainment approach by relaxing the the linear and additive assumptions of conventional path analysis and providing procedures that allow researchers to both decompose and model income persistence trends.

Using these methodological tools to analyze NLSY data, we found that educational expansion was indeed associated with declining intergenerational income persistence; as more people completed college, more people were able to move off their parents' rungs on the income ladder. However, this decline in persistence was only one-third as large as the increase in persistence associated with growing educational inequality and rising educational returns. In other words, even as educational expansion helped some people move off their parents'

income rungs, growing educational inequality and rising educational returns pushed even more people back toward their parents' rungs. The nature of educational expansion helps explain this finding. The shares of people with advanced degrees, with AA degrees, and with some college education but no degree rose. Yet these changes reduced persistence only slightly, since persistence was not as low among these groups as among BA holders.

Given that educational trends worked more to increase persistence than to disrupt it, why did income persistence remain stable across cohorts? The answer is that within education levels, parental income became less predictive of adult income. This change, together with educational expansion, offset the effects of growing educational inequality and rising educational returns, stabilizing persistence across cohorts. In other words, using terminology from the path analytic tradition of intergenerational research, we documented an increasing "indirect effect" of parental income on adult income via education (as evidenced by the fact that rising educational inequality and returns outweighed educational expansion), but a decreasing "direct effect" of parental income on adult income, via pathways other than education (as evidenced by the fact that within education groups, parental income became less predictive of adult income). This indirect/direct effect terminology is somewhat inaccurate, because the word "effect" typically implies causal relationships, whereas we focus on associations (which reflect both causal and spurious relationships). This terminology is also useful, however, because it clarifies how an intergenerational association could both strengthen (indirectly, in the pathway from origin to destination through education) and weaken (directly, in the residual pathway from origin to destination within education groups). Importantly, it is not the case that when indirect associations increase, direct associations must necessarily decrease. Theoretically, direct associations could have increased along with indirect associations. In that case, persistence would have increased across cohorts. We did not force direct and indirect changes to offset one another; rather, we observed that persistence remained stable across cohorts, and this stability resulted from offsetting changes.

A key question is whether these cohort changes are specific to the young-adult ages

studied here or will persist over the life course. We expect that educational expansion will put increasing downward pressure on persistence, as more people from low-income backgrounds complete college at older ages (Bound et al. 2012). But we also expect that rising educational returns will put increasing upward pressure on persistence. The full income returns to education will materialize later in life as people finish degrees at older ages, particularly advanced degrees, whose wage returns have increased even faster than wage returns to college alone (Lemieux 2008). Finally, we expect that within-group change's downward pressure on persistence will dissipate, at least partially. Higher within-group persistence among advanced-degree holders is likely on the horizon (Torche 2011). If these trends are not fully offset in middle age, persistence will increase across cohorts. Ultimately, this is an empirical question that must be answered later, when the NLSY97 cohort reaches middle age. If within-group change is still evident at middle age, then researchers might investigate our hypothesis that it reflects growing instability in employment experiences. An alternative hypothesis is that it reflects rising equality of opportunity among people with the same educational attainment; perhaps college graduates from high- and low-income backgrounds compete on an increasingly level playing field, despite growing educational inequality by parental income. These two hypotheses could be investigated when the NLSY97 cohort is older.

In addition to following these cohorts further into the life course, future research should investigate how the persistence trends documented here differ across social contexts (e.g., different countries or US regions). We have shown that our results are consistent across men and women (Appendix Tables A4 and A6). In additional analyses, we found that the results are also consistent across people with native-born and foreign-born parents and that they are similar across racial and ethnic groups, with some interesting differences linked to the economic fortunes of the least-educated Hispanic, non-Hispanic white, and non-Hispanic black Americans. Space constraints limit our ability to detail these differences.[36] An important task for future research is to understand whether and why higher education might differentially shape intergenerational income persistence in different social groups and social contexts.

For policymakers interested in reducing intergenerational income persistence and equalizing opportunity, our research has three implications. First, "college for all" policies, aimed at increasing the aggregate amount of post-secondary education attained, are likely to be less effective than policies aimed at increasing low-income children's educational attainment specifically. Of course, if all high-income children already completed college, then the only place to expand post-secondary education would be among low-income children; however, we have shown that college completion is not universal even among children from the upper end of the income distribution. We further documented that educational expansion was insufficient to offset rising educational inequality. For intergenerational persistence, it matters less how much education is attained than who attains the education.

"College for all" has become a rallying cry for policymakers (Carnevale 2008). It has also become a norm among young people, including those from disadvantaged backgrounds (Goyette 2008). Policies aimed at promoting college for all typically focus on reducing financial barriers for all (qualifying) prospective students, regardless of income (e.g., state subsidized tuition for all high-school graduates meeting GPA standards). The success of these policies could be evaluated by examining marginal distributions of education (i.e., the shares of young people with various degrees). Yet if primarily high-income children take advantage of "college for all" policies, these policies may do more to increase persistence than reduce it. Consistent with the maximally maintained inequality (MMI) hypothesis (Raftery and Hout 1993), we observed that advantaged children filled many more of the growing number of seats in post-secondary institutions across NLSY cohorts than their disadvantaged peers. Moreover, it is unlikely that the demand for college has been "saturated" (ibid: 57) among advantaged children, since in the NLSY97 only 58.5% of children from the top parental income quartile had completed BAs by age 32. Thus, we predict that "college for all" policies will be less effective in reducing intergenerational persistence than class-conscious policies.

Class-conscious policies might focus on reducing financial barriers for low-income children in particular (e.g., via state subsidized tuition combined with grants to cover living expenses

for prospective and returning students with family incomes below a low threshold), increasing outreach to high-school students in low-income areas, expanding student support services that help low-income college students graduate, and building bridges between two- and four-year colleges to improve transfer rates. The success of these policies could be evaluated by examining conditional distributions of education (i.e., the shares of young people with various degrees, given that they stem from low-income families). These policies should be particularly effective if they help low-income students complete BAs—and thus avoid the burdens associated with taking on debts without completing degrees (Nguyen 2012), burdens which are especially common among low-income students at for-profit colleges (Gelbgiser 2018). Since class-conscious policies could reduce educational inequality, they will likely be more effective at reducing intergenerational income persistence than "college for all" policies.

Class-conscious policies could also reduce intergenerational persistence among college graduates (in addition to reducing educational inequality). Because low-income children may experience greater returns to college than their high-income peers, increasing their representation among college graduates should reduce persistence, helping more college graduates escape low-income backgrounds. Increasing low-income representation in the most selective institutions of higher education—where instructional spending per student is relatively high (Hoxby and Avery 2013) and returns may be particularly large (Chetty et al. 2017)—could be especially impactful. There are many low-income, high-achieving students who are obvious targets for inclusion in these institutions (Hoxby and Avery 2013). Even students who normally would not be admitted to selective schools show high returns (Bowen and Bok 1998; Attewell and Lavin 2007). Thus, persistence among college graduates might be reduced both by targeting the highest-achieving students for selective institutions and by helping broad swaths of low-income students overcome barriers to college, like high sticker prices and limited individualized advising (Giancola and Kahlenberg 2016). In short, persistence is low among college graduates, but class-conscious policies could reduce it further.

A second policy implication of our research is that, if reducing persistence is a goal, then

reforms should address all stages of the educational pipeline: not only the transition into college, but also earlier transitions (e.g., graduating from high school) and later transitions (e.g., completing graduate degrees). Across NLSY cohorts, all transitions became more stratified by parental income (Appendix Table A1). At the bottom of the education distribution, the chance of transitioning from having no diploma to obtaining a high-school diploma (or equivalent) became substantially more unequal across children from low- versus high-income families. Policies focused on helping low-income children complete high school will be crucial for reducing intergenerational income persistence, for two reasons. First, because educational attainment is a multi-step process, helping the most disadvantaged students take the first step is the only way to ultimately help them experience college graduates' low intergenerational persistence. Second, because stratification by parental income is larger at this first educational transition than at later transitions (partly due to frequent parent-child interactions at young ages and partly due to selective attrition across transitions; Mare 1980, Muller and Karle 1993), reducing this stratification could substantially reduce income persistence.

Moving from the bottom of the education distribution to the top, the transition from obtaining a BA to obtaining an advanced degree has also become more stratified by parental income (Appendix Table A1). As education expands, the margin of intergenerational income reproduction may be rising to the MA level. Thus, policies to reduce persistence will be most effective when they focus on reducing the association between parental income and children's educational transitions, including all transitions from high school through graduate school. Focusing on the BA margin alone will likely be insufficient. To address all educational transitions, a multitude of policies will be necessary, requiring concerted effort among the K-12 system, public and private colleges, and federal, state, and local governments.

A third policy implication of our research is that to reduce persistence, programs could try targeting behavior within levels of education (not only, as discussed above, transitions between levels of education). Our work confirms that persistence is low among college graduates relative to non-graduates. But we might further reduce this persistence by shaping

the behaviors of students already enrolled in college, increasing low-income students' chances of leaving behind their disadvantaged backgrounds. In this paper, we have not empirically examined differences between low- and high-income students' behavior within college, although we have documented differences in persistence across levels of education (and changes in persistence within levels of education) that are suggestive of such behavioral differences (and changes in these differences). Thus, we cannot comment directly about the efficacy of potential programs, be they individual (e.g., tailored advising for low-income college students) or institutional (e.g., curricular reforms). Instead, we draw on insights from the effectively maintained inequality hypothesis (EMI), that class differentiation will occur in stratified educational systems not only vertically, in terms of transitions between levels of education (which is the focus of MMI), but also horizontally, within levels of education (Lucas 2001).

Consistent with EMI, college students from high-income families are much more likely to attend selective schools than their low-income peers (Reardon et al. 2012; Hoxby and Avery 2013; Giancola and Kahlenberg 2016). Policies could focus on shuffling the institutions from which different students obtain degrees, reducing persistence by shifting more low-income college students into selective schools. Less consistent with EMI, college students from high-income families are not more likely to major in fields that are associated with high earnings post-graduation; in fact, low-SES students appear more likely to choose fields that have clear labor-market rewards, like business and health (Goyette and Mullen 2006; Ma 2009; Quadlin 2017). These field-of-study choices could help explain the fact that within schools, children from low- and high-income backgrounds obtain similar adult incomes (Chetty et al. 2017). Yet in so far as recruiters for high-income jobs select candidates based on extra-curricular activities as well as academics (Rivera 2015), policies could reduce persistence by helping low-income students enter and excel in these activities as well. Moreover, while academic-field differentiation does not favor high-income students at the BA level, it does at the post-BA level (Torche 2011). Advanced-degree holders from high-income backgrounds are more likely than their low-income peers to obtain highly rewarded professional degrees, like medical and

law degrees. This horizontal stratification may help explain our finding that persistence is higher among advanced-degree holders than among BA holders. Policies could reduce persistence by helping low-income students obtain more lucrative advanced degrees (e.g., by providing targeted mentorship and resources to help navigate medical school entrance requirements). To identify effective EMI-inspired policies, an important task for future research is to better understand the processes that help college graduates from high-income backgrounds remain high income in adulthood (Armstrong and Hamilton 2013).

Of course, not all policies must focus on reforming students or educational institutions. There are also many policies that could reduce persistence by targeting other private or public entities. For example, we documented strong income persistence among advanced-degree holders. We might reduce this persistence by limiting advanced-degree holders' abilities to extract rents (Weeden 2002). Both physicians and lawyers, for instance, use professional organizations together with state restrictions to control the supply of labor and the type of work that different actors can complete (e.g., paralegals versus lawyers, nurses versus physicians). Policies could reduce opportunities for rent-seeking and thus reduce intergenerational persistence (if, for example, lawyers no longer earned so much more than teachers with MAs in education). As another example, we found that persistence is high among people who obtain no college education. One policy implication of this finding is that helping more people go to college could reduce persistence. But another policy implication is that persistence could be reduced via public or private investments in industries that provide high-school graduates with more opportunities to obtain high-paying jobs.

Our research has not proven that these policies effectively reduce persistence. Rather, it suggests that they could be effective, given the associations that we observe among parental income, educational attainment, and adult income. To test the efficacy of any proposed policy, a different type of research is required, ideally including evaluations of randomized interventions to establish causality (e.g., randomly assigning some colleges to provide specialized advising to low-income students and others not to).[37]

More broadly, our research has not established causal relationships. The study of intergenerational income persistence, by definition, concerns the extent to which parental income inequalities are reproduced in adulthood, rather than the causal effect of parental income on adult income. We thus follow in the descriptive tradition of intergenerational research and document how changes in population compositions and distributions are associated with changes in persistence (e.g., Hout 1988; Breen and Jonsson 2007). We have shown empirically that demographic changes, such as the growing share of college graduates, are related to changes in intergenerational income persistence. Future research could focus on teasing out the causal and non-causal portions of these relationships (e.g., the extent to which educational expansion is associated with declining persistence because college causally weakens persistence versus because low-income students select into college based on their future high incomes). If, for example, none of the decline in persistence associated with educational expansion is causal, then education's potential to temper intergenerational inequality is even more limited than presented here. If, instead, none of the growth in educational inequality reflects the causal effect of parental income on children's education, then education's tendency to replicate incomes across generations is not as strong as presented here.

Yet in this paper, we have resolved the puzzle of why intergenerational income persistence remained stable while education-based inequalities increased across recent cohorts of young adults. Stability resulted from offsetting trends. Growing educational inequality and rising educational returns exerted strong upward pressure on persistence, but the expansion of post-secondary education together with changes within education groups counterbalanced this upward pressure. These finding reveal the complexity of intergenerational persistence, which reflects opportunities for hoarding educational privileges (Reeves 2017), opportunities for advancement via education (Chetty et al. 2017), and vulnerabilities to risk and uncertainty regardless of education (Silva 2013), among other processes. Our findings suggest that the legitimacy of the educational system may be at risk, since recent trends in higher education have done more to replicate patterns of inequality across generations than to promote mobility.

Endnotes

[1] For clarity, we use "persistence" throughout this article. We discuss persistence because it corresponds directly to what we measure, i.e., the association between parents' and children's incomes. Mobility is the complement of this association; mathematically, mobility = 1 − persistence.

[2] We use "educational returns" to describe the association between education and adult income, not the causal effect of education on adult income.

[3] Occupational status persistence also appears trendless (Hout 2018). Studies of income persistence using survey data leave some uncertainty about trends (Fertig 2003; Mayer and Lopoo 2005; Aaronson and Mazumder 2008). However, studies of income persistence using administrative data (which contain relatively little measurement error) suggest that the finding of temporal stability across recent birth cohorts is likely accurate (Torche 2015: 54). Some evidence of increasing persistence appears across earlier cohorts, born between the 1940s and early 1960s (Bloome and Western 2011; Davis and Mazumder 2017).

[4] These estimates echo Bailey and Dynarski's (2011). Focusing on college completion by age 25, they report gaps between the lowest and highest parental income quartiles of 31 versus 45 percentage points in the NLSY79 versus NLSY97.

[5] We use "college completion" and "BA" to indicate four-year degrees; we discuss "AA" or two-year degrees separately.

[6] See Analytic Approach section for the model underlying these results.

[7] Educational returns are often measured via individuals' own earnings; but because education predicts both own and spousal earnings, family income better captures education's full economic returns (Kim and Sakamoto 2017).

[8] Whether one considers low or high persistence desirable, from a normative perspective, partly depends on how strongly one values equality of opportunity versus family autonomy (including parents' ability to use their resources to shape their children's life chances) (Fishkin 1988). High-income parents might find high persistence desirable, hoping their children avoid falling down the income ladder, while low-income parents might find low persistence desirable, hoping their children climb up the rungs.

[9] The interaction between education and parental income in predicting adult income can be interpreted as capturing differential income persistence by education, or, equivalently, differential returns to education by parental income.

[10] As we discuss further below, persistence reflects the association between parental and adult income, not the causal effect of parental income. Consequently, demographic shifts (like college graduates' increasing prevalence) can alter persistence even if the associations underlying these patterns are not completely causal.

[11] Comparing NLSY79 and NLSY97 cohorts at age 25, Bailey and Dynarski (2011) report

that college completion increased 80% versus 50% among people from the bottom versus top parental income quartile. Ziol-Guest and Lee (2016) report that it increased 32.3% versus 42.2% among people from the bottom versus top parental income quintile.

12 Not all delays in the transition to adulthood necessarily reduce persistence. For example, since income persistence is lower among unmarried than married individuals (Chadwick and Solon 2002; Bloome 2017), fewer young people marrying could increase persistence.

13 Hyatt and Spletzer (2013: 13) document increasing flows in and out of employment. Evidence is mixed regarding whether tenure declined also via year-to-year occupational switching among employed people (Jarvis and Song 2017; Molloy et al. 2017).

14 β is the product of the intergenerational correlation of log incomes and the ratio of the standard deviations of log incomes in the children's versus parents' generations. When inequality rises across generations, β rises even if the correlation remains stable.

15 The between-group association is necessary because, when we run separate regressions within education groups, our slopes reflect regression to group-specific means; because these means differ, these slopes will not capture all inequalities that contribute to the intergenerational income correlation in the full population.

16 We resample with replacement to obtain 10,000 bootstrap samples, and, for each of the bootstrap samples, calculate our income ranks and quantities of interest. We take the 2.5^{th} and 97.5^{th} percentiles of the resampling distribution to estimate 95% intervals.

17 An alternative approach to modeling educational attainment is Mare's (1980) sequential logit model, which uses binary logit regressions to model educational transitions for "at-risk" populations (e.g., modeling the probability of transitioning from high-school graduation to college entrance among high-school graduates). Coefficient estimates from sequential logit models, however, are difficult to interpret because they reflect both the influence of social background and the sample selection process (Cameron and Heckman 1998).

18 This predictability depends on both the slope of the regression line connecting parental and adult income and the residual variation of adult income around that line. These two parameters can be separately identified, but their relative sizes depend heavily on function form assumptions. This functional form dependence is a less extreme example of the well-known fact that functional form assumptions are required to separately identify categorical variables' means and variances (Mood 2010: 74). Because of this functional form dependence, together with our uncertainty about the true functional form, we report counterfactuals that combine slope and residual variance effects.

19 When respondents were young and many lived in their parents' households, parents provided income reports on a special survey version.

20 Biases from nonrandom attrition appear inconsequential in weighted analyses (MaCurdy et al. 1998). NLSY79 has high retention and low income nonresponse compared to other surveys (Pergamit et al. 2001).

21 In the most recent survey wave, NLSY97 respondents were age 30–36. Incomes reflect the previous calendar year, meaning 29–35 are the oldest ages when income is observed. We restrict income observations to age 27–32 to ensure cross-cohort comparability. When we extend to age 35, the age distribution skews substantially older in the NLSY79 than NLSY97.

22 Our discussion of age-income profiles focuses on adult children, not their parents, because mean parental age at income measurement exceeds 40 in both cohorts (suggesting that neither cohort suffers from lifecycle bias). However, we also report results adjusted for age-income profiles among both adult children and their parents (Appendix Table A5). To handle different patterns of age missingness, we adjust for a quintic in adult age and categorical parental age measures (missing, <30, 30-39, 40-49, 50-59, and 60+). For the age-adjusted analyses, we first regress each annual income observation on age and then save the residuals to create average age-adjusted income measures for persistence analyses. This approach accounts for cohort differences in average age-income profiles; but, as we discuss later, cohort differences in age-income profiles within education levels could still contribute to persistence differences across cohorts.

23 We also include only wage/salary income as a robustness check (Appendix Table A5).

24 We also examine individuals' own wage and salary income in adulthood (Appendix Table A6). Individual wage/salary income reflects labor-market experiences. Yet, it is not independent of family experiences, since labor-force attachment depends on current and expected spousal income. Individual wage/salary income also can only be measured among employed people. Nevertheless, we examine this income to confirm that our findings do not derive only from how incomes are combined within families or redistributed by the state.

25 Our results are insensitive to different treatments of tax/transfer income and topcodes.

26 Adjusting for size helps capture resource availability (e.g., compared to married people with equal family incomes, singles have more resources available for saving/consumption above subsistence). However, adjusting for size also mixes economic and demographic differences (e.g., differences in fertility, union formation, and union dissolution). Results are consistent whether or not we adjust for size (Appendix Table A5).

27 We do not distinguish people who attended for-profit versus non-profit post-secondary institutions. Although the former increased across cohorts, it remained quite low in both. In 1980 versus 2000 (when the NLSY79 versus NLSY97 cohorts were college age), 1% versus 3% of people enrolled in undergraduate post-secondary institutions were enrolled in for-profits (National Center for Education Statistics 2017b).

28 The smallest increase appears at the AA level. This small increase aligns with other reports. In 1995, 8.3% of 25–29 year olds held an AA as their highest degree (corresponding well to the NLSY79's 8.3%; Table 2), compared to 9.4% in 2010 (slightly higher than the NLSY97's 8.7%, but well within the 95% interval from 7.9% to 9.6%; Table 2) (National Center for Education Statistics 2017a).

29 Wald tests confirm that intergenerational rank income correlations vary significantly

with education ($p = .0003$ and $p = .0002$ in the NLSY79 and NLSY97).

30 From Table 4, .011/(.026+.005) = .35; from Table 3, .018/.059 = .31.

31 Adult income predictability within education groups depends on both the parent-child income correlations within education groups and the residual income variances (ρ and ν^2 in Appendix Table A2). Within-group correlations declined in three of the six groups (similarly, within-group slopes declined in three of the six groups; Table 2). Within-group residual variances rose in five of the six groups. Thus, predictability declined in all groups except the AA group, which is relatively small and whose cohort change is estimated imprecisely.

32 This conclusion rests on models that hold constant one set of parameters at a time (parameters associated with educational inequality; educational returns; educational expansion; and within-group predictability). Yet the conclusion remains unchanged when holding constant two sets of parameters at once, allowing for interactions (e.g., interactions between educational expansion and returns). We created counterfactual rank-rank slopes in the NLSY97 cohort using the two-stage model, then predicted these slopes in an ANOVA framework with indicators for the parameters held constant. We found these interactions to be generally statistically insignificant and too small in magnitude to warrant additional complications to our model (Appendix Table A3).

33 Appendix Table A4 shows that among ever-married people, persistence remained stable because increases associated with growing educational inequality and rising educational returns were offset by reductions associated with educational expansion and change within education groups.

34 Among 27 year-olds enrolled in school, about 55% from the top parental quartile were working on post-BA degrees, versus about 15% from the bottom quartile, who were, instead, primarily working toward two- and four-year degrees.

35 Employment declines also reflect the poor labor market conditions around the 2007–2009 recession. Young-adult outcomes of the NLSY79 cohort also reflect changes around a recession, but the recession of 1990–1991 was not as severe as the 2007–2009 recession.

36 Further discussion of gender/immigrant/racial/ethnic differences available on request.

37 Evaluations of randomized interventions are only one type of valuable policy research; other types include assessments of implementation and costs.

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Table (1) Intergenerational income persistence by cohort. Total family income, including taxes and transfers, adjusted for family size. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	1979 Cohort	1997 Cohort	Δ 1997-1979
Rank-rank slope	.426	.424	-.002
	(.395, .453)	(.400, .446)	(-.042, .039)
Elasticity (standardized)	.448	.435	-.013
	(.415, .480)	(.404, .453)	(-.060, .022)

Note: The standardized elasticity is the slope from a regression of adult log income on parental log income in which both log incomes have been standardized relative to the respective generation's distribution to a mean of zero and a standard deviation of one. Thus, this elasticity can be interpreted as a correlation (in logs), just as the rank-rank slope can be interpreted as a correlation (in ranks).

Table (2) Components of intergenerational income persistence by educational attainment and cohort. Bootstrapped 95% intervals in parentheses (Panel B). NLSY79 and 97 data.

	% Share	β	Association Within	Association Between	Association Total	Contribution
Panel A: Point estimates						
1979 cohort						
<HS	9.93	.28	.23	.55	.78	.08
HS	42.71	.36	.33	.04	.37	.16
Some College	15.98	.26	.25	.00	.25	.04
AA	8.29	.29	.26	.01	.27	.02
BA	17.85	.18	.14	.36	.49	.09
MA+	5.24	.26	.21	.54	.75	.04
1997 cohort						
<HS	6.83	.26	.14	.89	1.03	.07
HS	30.28	.33	.26	.15	.41	.12
Some College	20.82	.27	.25	.00	.25	.05
AA	8.72	.32	.28	.00	.28	.03
BA	23.52	.18	.14	.27	.40	.09
MA+	9.84	.20	.15	.45	.60	.06
Panel B: 95% Intervals						
1979 cohort						
<HS	(8.90, 10.98)	(.18, .40)	(.14, .32)	(.44, .66)	(.67, .90)	(.07, .09)
HS	(40.84, 44.43)	(.31, .41)	(.28, .38)	(.03, .06)	(.32, .42)	(.14, .18)
Some College	(14.68, 17.44)	(.18, .35)	(.17, .34)	(-.00, .01)	(.17, .34)	(.03, .06)
AA	(7.23, 9.41)	(.18, .39)	(.16, .35)	(-.00, .03)	(.17, .37)	(.01, .03)
BA	(16.43, 19.30)	(.10, .25)	(.07, .19)	(.30, .42)	(.41, .58)	(.07, .10)
MA+	(4.38, 6.12)	(.11, .40)	(.09, .33)	(.39, .73)	(.57, .93)	(.03, .05)
1997 cohort						
<HS	(6.20, 7.49)	(.16, .38)	(.09, .19)	(.79, 1.00)	(.92, 1.14)	(.06, .08)
HS	(29.04, 31.57)	(.28, .38)	(.22, .29)	(.13, .18)	(.36, .45)	(.11, .14)
Some College	(19.60, 21.92)	(.22, .32)	(.20, .30)	(-.00, .01)	(.20, .30)	(.04, .06)
AA	(7.88, 9.60)	(.23, .40)	(.20, .36)	(-.00, .02)	(.20, .37)	(.02, .03)
BA	(22.34, 24.71)	(.12, .23)	(.10, .18)	(.23, .30)	(.35, .46)	(.08, .11)
MA+	(8.97, 10.77)	(.12, .28)	(.09, .21)	(.38, .53)	(.51, .70)	(.05, .07)

Note: The "association total" is the sum of the "association between" and the "association within." The "association within" is a scaled version of the rank-rank slope coefficient β (where the scaling factor is the ratio of the standard deviation of parental income ranks within the education group to the overall standard deviation of parental income ranks). The "contribution" is the product of the share and the "association total." The sum of the contributions (across the education groups, within cohort) equals the cohort-specific intergenerational rank-rank slope.

Table (3) Decomposition of cohort change in intergenerational income persistence. Bootstrapped 95% intervals in parentheses (second column). NLSY79 and 97 data.

	Δ Point Estimate	Δ 95% Interval
Due to Δ educational composition	-.018	(-.031, -.006)
Due to Δ between-education inequalities	+.059	(.033, .088)
Due to Δ within-education predictability	-.043	(-.077, -.010)
Total	-.002	(-.041, .037)

Table (4) Observed and counterfactual change in intergenerational income persistence across cohorts. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	β 1979	β 1997	Δ 1997-1979	Δ^c 1997 Obs. - 1997 Countfact.	Δ^c % of Δ 1997-1979
Observed Parameters					
Observed data	.426	.424	-.002		
	(.395, .456)	(.399, .446)	(-.043, .035)		
Simulated data	.424	.422	-.002		
	(.395, .453)	(.399, .445)	(-.040, .034)		
Counterfactual Parameters					
1979 Educational composition		.433	.009	-.011	550
		(.411, .454)	(-.028, .045)	(-.022, -.001)	
1979 Educational inequality		.396	-.028	.026	-1300
		(.370, .419)	(-.064, .006)	(.011, .040)	
1979 Educational returns (conditional)		.416	-.008	.005	-250
		(.390, .442)	(-.050, .032)	(-.007, .019)	
1979 Within-group predictability		.449	.025	-.027	1350
		(.419, .479)	(.006, .043)	(-.064, .008)	

Note: The components of change in these model-based counterfactuals are not additive and thus cannot be summed together to find the total observed change (unlike the components of change in the decomposition results shown in Table 3, which are additive and do sum to the total observed change).

Table (5) Percentage of 27 year olds experiencing events traditionally associated with the transition to adulthood, by cohort and parental income quartile. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	All		Parental Income Q1		Parental Income Q4	
	1979 Cohort	1997 Cohort	1979 Cohort	1997 Cohort	1979 Cohort	1997 Cohort
Not enrolled in school	91.73	87.07	95.17	89.27	89.79	85.28
	(87.8, 95.95)	(83.82, 90.18)	(87.8, 95.95)	(83.82, 90.18)	(87.8, 95.95)	(83.82, 90.18)
+ Earning	78.76	71.89	74.05	63.68	81.91	75.68
	(72.35, 83.69)	(62.04, 77.56)	(72.35, 83.69)	(62.04, 77.56)	(72.35, 83.69)	(62.04, 77.56)
+ Not living with parents	66.34	53.01	59.88	43.53	71.04	60.20
	(57.96, 73.19)	(41.76, 62.04)	(57.96, 73.19)	(41.76, 62.04)	(57.96, 73.19)	(41.76, 62.04)
+ Married	40.00	24.03	31.94	16.39	42.35	29.39
	(30.08, 46.35)	(15.25, 31.42)	(30.08, 46.35)	(15.25, 31.42)	(30.08, 46.35)	(15.25, 31.42)
+ Living with own child	24.78	15.03	24.38	12.94	23.99	14.44
	(20.9, 29.48)	(11.81, 18.81)	(20.9, 29.48)	(11.81, 18.81)	(20.9, 29.48)	(11.81, 18.81)

Note: Respondents are classified as earning if they report non-zero income from wages, salary, commissions, or tips in the previous calendar year. They are classified as not living with parents if they do not reside with biological, adoptive, step, or foster parents, guardians, or parents-in-law. They are classified as living with their own child if they reside with a biological, adoptive, or step child. All outcomes are measured at age 27, with two exceptions (due to the lack of survey in 2012): for respondents who were age 13 in 1997, earnings status is measured at age 28; and for respondents who were age 12 in 1997, all outcomes except earnings status are measured at age 28.

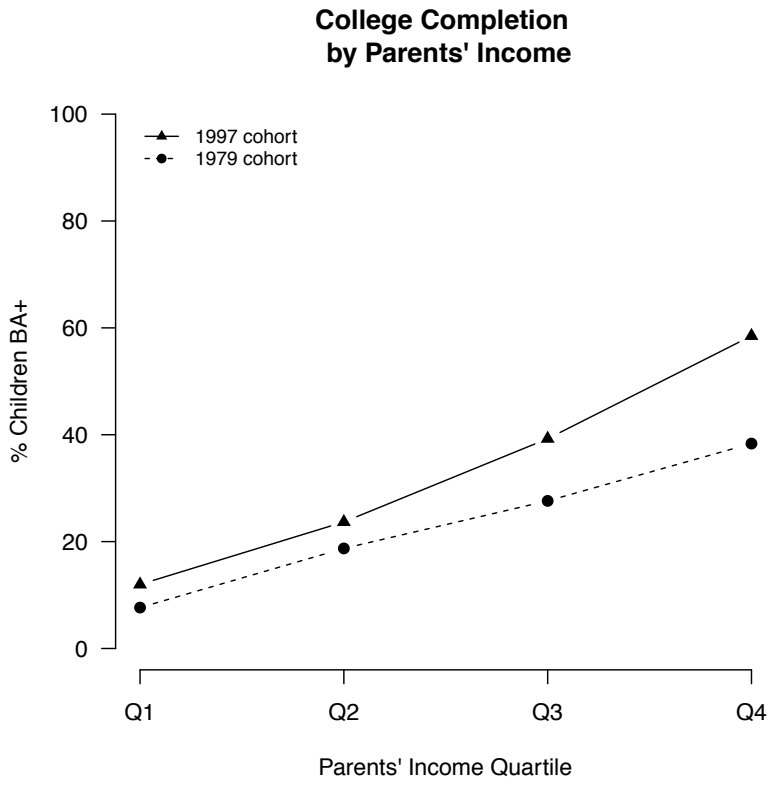

Figure (1) College completion by age 32 across parental income quartiles and cohorts. NLSY79 and 97 data.

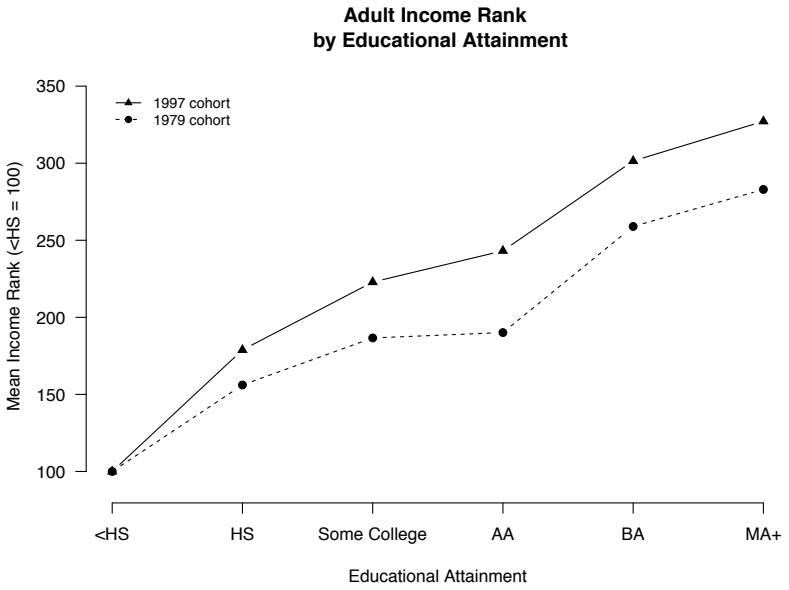

Figure (2) Average adult income rank, relative to people with less than a high school education, by educational attainment and cohort. NLSY79 and 97 data.

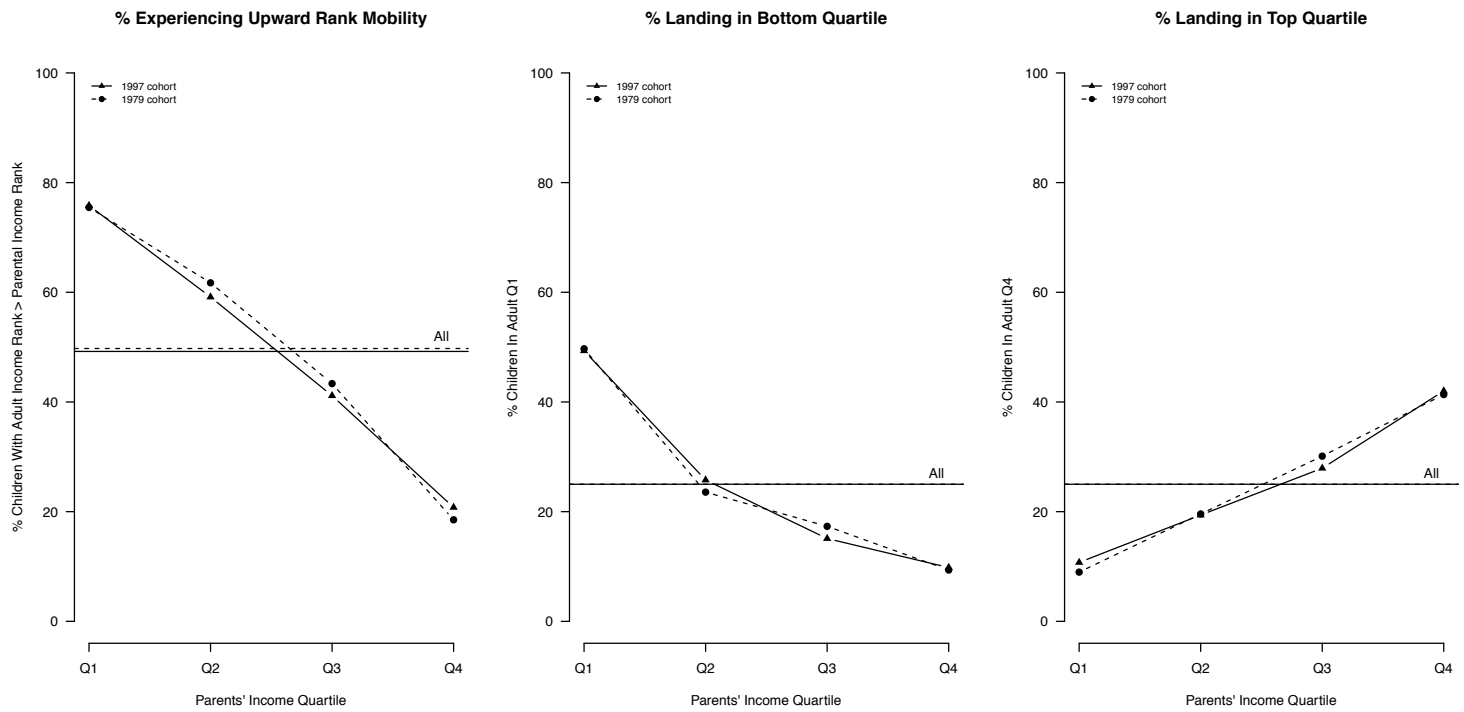

Figure (3) Percent of children experiencing upward rank income mobility (left panel), ending up in lowest adult income quartile (middle panel), and ending up in highest adult income quartile (right panel), by cohort and parental income quartile. Information for full sample, including all quartiles, shown in horizontal lines (cohort differences in full sample are so small that almost no differences are visible; the two horizontal lines in each graph lie on top of one another). NLSY79 and 97 data.

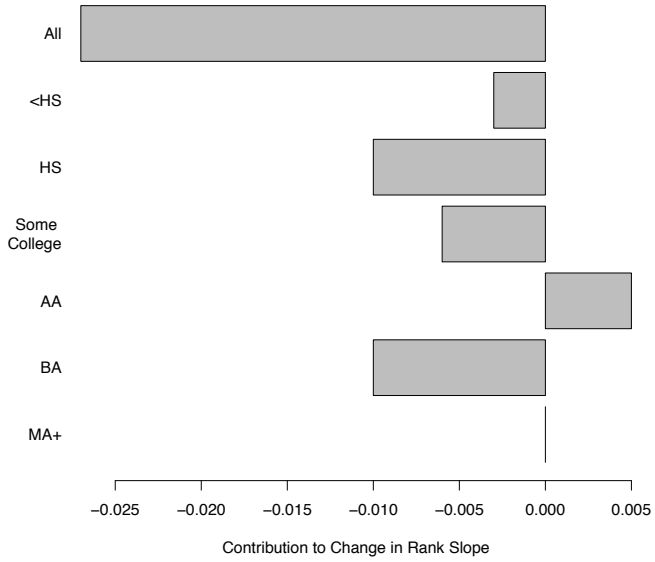

Figure (4) Change in intergenerational income persistence across cohorts associated with change within all education groups (top bar) and with change within each level of education. NLSY79 and 97 data.

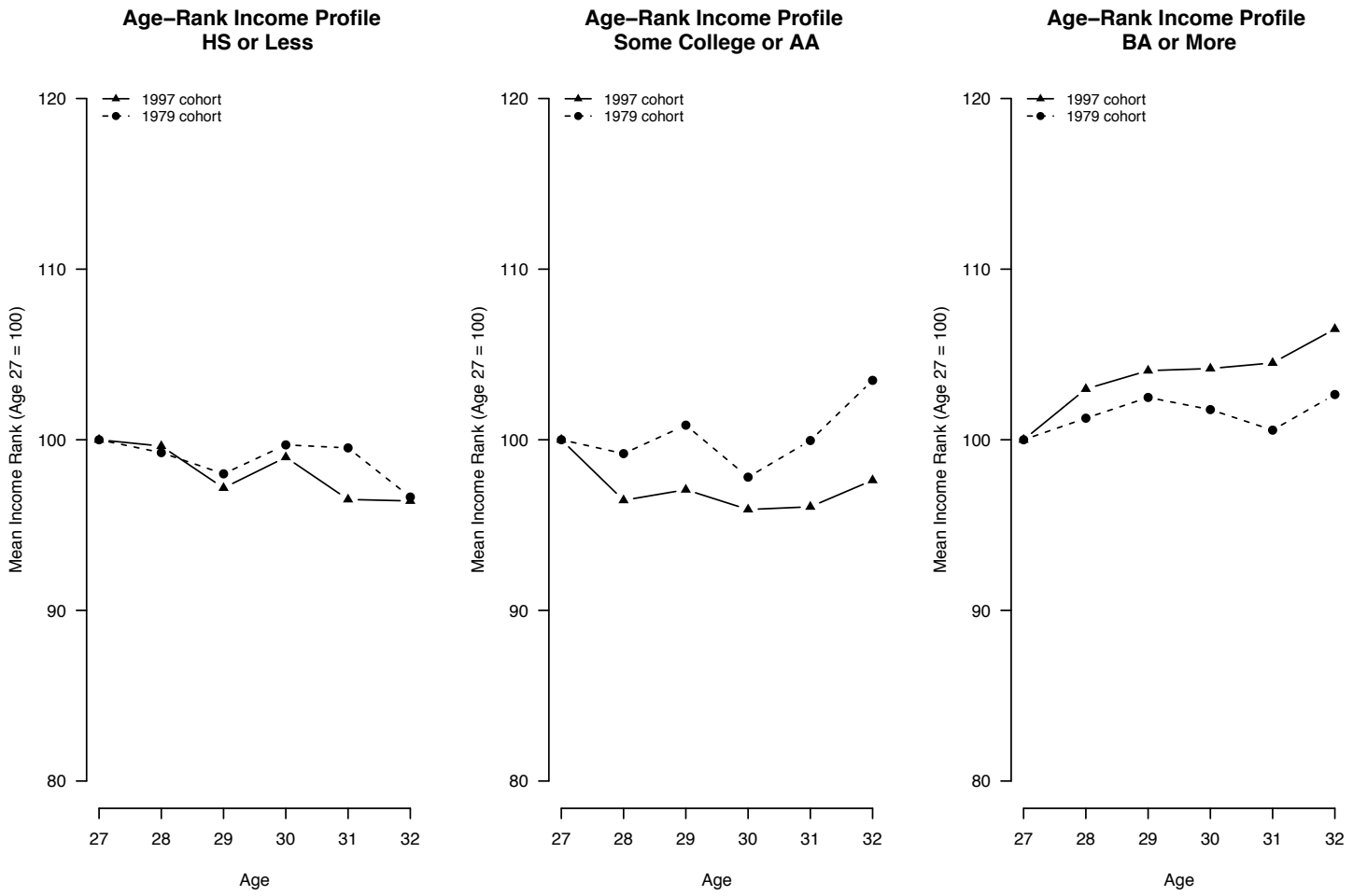

Figure (5) Age-rank income profile in age 27–32 range by educational attainment and cohort. Average rank by age normalized by average rank at age 27. NLSY79 and 97 data.

Appendix Table (A1) Generalized ordered logistic regression coefficients predicting educational transitions with parental income rank. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	1979 Cohort		1997 Cohort	
	Composition Parameter α	Inequality Parameter λ	Composition Parameter α	Inequality Parameter λ
$\geq$ HS	.991	2.999	1.076	4.211
	(.819, 1.170)	(2.533, 3.556)	(.917, 1.247)	(3.698, 4.758)
$\geq$ Some College	-1.098	1.969	-.821	2.870
	(-1.253, -.951)	(1.694, 2.261)	(-.927, -.708)	(2.643, 3.078)
$\geq$ AA	-1.973	2.231	-1.799	2.854
	(-2.164, -1.802)	(1.948, 2.562)	(-1.935, -1.675)	(2.640, 3.079)
$\geq$ BA	-2.608	2.533	-2.387	3.126
	(-2.844, -2.395)	(2.221, 2.888)	(-2.532, -2.241)	(2.889, 3.364)
$\geq$ MA+	-4.215	2.272	-3.754	2.630
	(-4.744, -3.773)	(1.637, 3.046)	(-4.041, -3.509)	(2.267, 3.016)

Appendix Table (A2) Coefficients and residual standard deviation from OLS regressions predicting adult log income with parental income rank. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	1979 Cohort				1997 Cohort			
	Returns Parameter γ	Slope Parameter β	Residual SD Parameter υ	Correlation Parameter ρ	Returns Parameter γ	Slope Parameter β	Residual SD Parameter υ	Correlation Parameter ρ
$<$ HS	9.828	1.164	.893	.825	9.799	1.385	1.063	.836
	(9.714, 9.944)	(.879, 1.498)	(.782, 1.004)	(.610, 1.000)	(9.644, 9.970)	(.934, 1.883)	(.981, 1.141)	(.569, 1.000)
HS	10.174	1.088	.724	.838	10.216	1.317	.919	.818
	(10.136, 10.211)	(.955, 1.216)	(.664, .787)	(.736, .941)	(10.173, 10.260)	(1.152, 1.477)	(.856, .981)	(.729, .902)
Some College	10.350	.676	.613	.610	10.414	.826	.797	.570
	(10.300, 10.395)	(.522, .822)	(.573, .652)	(.478, .735)	(10.367, 10.459)	(.669, .998)	(.716, .889)	(.438, .703)
AA	10.356	.730	.715	.558	10.538	.825	.637	.680
	(10.278, 10.433)	(.460, .981)	(.583, .844)	(.360, .731)	(10.479, 10.598)	(.609, 1.038)	(.580, .696)	(.514, .837)
BA	10.693	.549	.529	.499	10.779	.508	.610	.395
	(10.643, 10.741)	(.370, .727)	(.479, .583)	(.347, .641)	(10.742, 10.816)	(.376, .634)	(.577, .641)	(.294, .487)
MA+	10.885	.342	.473	.344	10.912	.490	.604	.369
	(10.798, 10.968)	(.065, .625)	(.404, .546)	(.059, .615)	(10.854, 10.976)	(.284, .702)	(.546, .662)	(.214, .529)

Appendix Table (A3) ANOVA analysis, predicting counterfactual intergenerational income persistence with educational composition, inequality, returns, and within-group predictability. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	β	Sum of Squares as % of Total Sum of Squares
1979 Educational composition	.009	8.952
	(.002, .016)	(.110, 33.326)
1979 Educational inequality	-.026	49.106
	(-.039, -.013)	(15.932, 82.135)
1979 Educational returns (conditional)	-.006	6.901
	(-.016, .004)	(.026, 19.461)
1979 Within-group predictability	.024	32.368
	(-.010, .061)	(.339, 71.149)
Incremental F test for two-way interactions		
(average p-value)	.214	
(share of p-values $>$ .05)	.727	

Appendix Table (A4) Decomposition of cohort change in intergenerational income persistence separately by gender and both adult family structure and childhood family structure. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	Men Δ	Women Δ
Full Sample		
Total	-.019	.015
	(-.073, .031)	(-.039, .072)
Due to Δ educational composition	-.026	-.015
	(-.043, -.009)	(-.037, .006)
Due to Δ between-education inequalities	.038	.092
	(.002, .077)	(.053, .134)
Due to Δ within-education predictability	-.032	-.061
	(-.081, .015)	(-.111, -.006)
Ever Married		
Total	-.031	-.011
	(-.100, .037)	(-.081, .057)
Due to Δ educational composition	-.022	-.045
	(-.049, .004)	(-.081, -.017)
Due to Δ between-education inequalities	.038	.102
	(-.008, .088)	(.052, .155)
Due to Δ within-education predictability	-.048	-.069
	(-.117, .014)	(-.131, -.004)
Living with Both Parents at Baseline		
Total	-.046	-.055
	(-.117, .023)	(-.136, .024)
Due to Δ educational composition	-.105	-.132
	(-.147, -.068)	(-.187, -.087)
Due to Δ between-education inequalities	.087	.174
	(.032, .147)	(.103, .247)
Due to Δ within-education predictability	-.027	-.097
	(-.098, .043)	(-.168, -.023)

Appendix Table (A5) Decomposition of cohort change in intergenerational income persistence, varying income measurement choices. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	Adjustment in Adulthood Only Δ	Adjustment in Both Generations Δ
Income Is Age Adjusted		
Total	-.027	-.066
	(-.067, .014)	(-.109, -.025)
Due to Δ educational composition	-.029	-.024
	(-.044, -.015)	(-.040, -.011)
Due to Δ between-education inequalities	.049	.021
	(.020, .074)	(-.009, .049)
Due to Δ within-education predictability	-.047	-.064
	(-.087, -.006)	(-.103, -.025)
Income Is Not Family Size Adjusted		
Total	-.040	-.026
	(-.080, .005)	(-.067, .014)
Due to Δ educational composition	-.030	-.025
	(-.044, -.016)	(-.040, -.011)
Due to Δ between-education inequalities	.039	.043
	(.013, .064)	(.018, .069)
Due to Δ within-education predictability	-.049	-.044
	(-.088, -.009)	(-.083, -.003)
Income Includes Only Wages and Salaries		
Total	-.012	-.024
	(-.052, .029)	(-.064, .017)
Due to Δ educational composition	-.021	-.019
	(-.036, -.008)	(-.034, -.006)
Due to Δ between-education inequalities	.064	.056
	(.035, .091)	(.026, .084)
Due to Δ within-education predictability	-.055	-.061
	(-.093, -.015)	(-.100, -.022)

Appendix Table (A6) Decomposition of cohort change in intergenerational income persistence, measuring only own individual wages and salary in adulthood. Excluding individuals with zero average earnings or fewer than two observations, ages 27–32. Bootstrapped 95% intervals in parentheses. NLSY79 and 97 data.

	Δ
Full Sample	
Total	.001
	(-.047, .044)
Due to Δ educational composition	-.025
	(-.040, -.011)
Due to Δ between-education inequalities	.058
	(.032, .085)
Due to Δ within-education predictability	-.032
	(-.074, .008)
Men	
Total	-.024
	(-.080, .032)
Due to Δ educational composition	-.029
	(-.048, -.013)
Due to Δ between-education inequalities	.040
	(.005, .076)
Due to Δ within-education predictability	-.035
	(-.086, .016)
Women	
Total	.045
	(-.017, .108)
Due to Δ educational composition	-.027
	(-.052, -.003)
Due to Δ between-education inequalities	.107
	(.068, .145)
Due to Δ within-education predictability	-.036
	(-.089, .018)