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Growing Wealth Gaps in Education

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Abstract Prior research on trends in educational inequality has focused chiefly on changing gaps in educational attainment by family income or parental occupation. In contrast, this contribution provides the first assessment of trends in educational attainment by family wealth and suggests that we should be at least as concerned about growing wealth gaps in education. Despite overall growth in educational attainment and some signs of decreasing wealth gaps in high school attainment and college access, I find a large and rapidly increasing wealth gap in college attainment between cohorts born in the 1970s and 1980s, respectively. This growing wealth gap in higher educational attainment co-occurred with a rise in inequality in children's wealth backgrounds, although the analyses also suggest that the latter does not fully account for the former. Nevertheless, the results reported here raise concerns about the distribution of educational opportunity among today's children who grow up in a context of particularly extreme wealth inequality.

Keywords Wealth · Education · Inequality · Cohort change

Introduction

Family wealth—measured as the net value of all financial and real assets a family owns—is much more unequally distributed than other indicators of families' economic well-being (Keister 2000). Research has documented that this already large inequality in family wealth in the United States has been increasing substantially over the last decades (Keister and Moller 2000; Piketty and Zucman 2014; Saez and Zucman 2014; Wolff 1995) and has been rising particularly strongly since the Great Recession (Pfeffer

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et al. 2013; Wolff 2016). One concern about growing wealth inequality is that it may also increase the rigidity of U.S. society, in particular by contributing to inequalities in educational opportunity. In fact, a growing body of research suggests that parental wealth plays an important role in the educational attainment of children in the United States and elsewhere (Belley and Lochner 2007; Conley 2001; Hällsten and Pfeffer 2017; Morgan and Kim 2006; Pfeffer 2011). Over the last decades, family wealth may have become even more important to support direct investments in educational opportunity—in the form of good neighborhoods, secondary schools, and colleges—and to insure against the risks entailed in these investments, for instance, when families rely on student loans to finance costly college careers. As families drift apart in their wealth holdings, so may their ability to use wealth for investment and insurance. Yet, to date, no empirical evidence speaks to whether and to what extent wealth gaps in education have grown.

This contribution provides the first empirical assessment of trends in wealth inequality in educational outcomes based on newly available data from the Panel Study of Income Dynamics (PSID). It also documents the extent to which these changes in wealth gaps in education can be accounted for solely by changes in the distribution of family wealth. Together, these analyses thus also speak to concerns about the potential long-term implications of the most recent and sharp increase in family wealth inequality for the future distribution of educational outcomes.

I begin by reviewing prior research on cohort trends in educational inequality. In the next section, I argue that this prior evidence, which is restricted to other socioeconomic indicators of family background, does not allow inferences about trends in wealth gaps: family wealth is empirically and conceptually distinct from more commonly used socioeconomic indicators, and it contributes unique predictive power to assessments of children's educational outcomes. After describing the data, measures, and methods, I estimate the association between family wealth and children's educational attainment, unconditional and conditional on other socioeconomic characteristics of families, and document how wealth-education associations have changed over cohorts born in the 1970s and in the 1980s. Finally, I apply a decomposition analysis to estimate the extent to which these changes can be accounted for by changes in the distribution of family wealth. Knowing whether trends in wealth inequality account for trends in children's educational outcomes is important because the wealth distribution has continued to grow even more unequal among today's children.

Background and Motivation

Prior Research on Trends in Educational Inequality

The study of cohort trends in socioeconomic inequality in education has been an active area of empirical investigation for several decades (e.g., Harding et al. 2004; Mare 1981; Shavit and Blossfeld 1993; Treiman 1970). Research in this area has investigated the changing relationship between educational attainment and a variety of indicators of socioeconomic background. One set of contributions has drawn on occupation-based measures of parents' social class, documenting remarkably stable class gaps in children's educational outcomes in the United States over much of the twentieth and early

twenty-first century (Hout et al. 1993; Pfeffer and Hertel 2015; Roksa et al. 2007). Other research has tracked the association between children's and their parents' highest educational status, finding largely stable levels of educational inequality tied to parental education (Bloome and Western 2011; Hout and Dohan 1996; Hout and Janus 2011; Mare 1981; Pfeffer 2008) as well as some signs of growing gaps for more-recent cohorts (Buchmann and DiPrete 2006; Hertz et al. 2007; Pfeffer and Hertel 2015; Roksa et al. 2007). The most notable and widely discussed changes in educational inequality, however, have been found in relation to family income: Reardon (2011) documented that the gaps in educational achievement (i.e., test scores) between children from high-income and low-income families has been growing steadily for at least 50 years. Similarly, income gaps in higher education have also grown: Belley and Lochner (2007) observed substantial increases in income inequality in college attendance, comparing a cohort born in the early 1960s with a cohort born in the early 1980s. Bailey and Dynarski (2011) showed that these trends extend to growing income gaps in college graduation among the same cohorts. While income gaps in college attendance have held stable for more-recent cohorts (Chetty et al. 2014; Ziol-Guest and Lee 2016), income gaps in college attainment have continued to increase (Duncan et al. 2017; Ziol-Guest and Lee 2016). The most recent estimates indicate that the difference in college graduation between children from the bottom and the top family income quintile approaches 50 percentage points (Ziol-Guest and Lee 2016).

Overall, then, cohort changes in the distribution of educational attainment are more pronounced in relation to parental income than in relation to parental education or parental occupations. It may thus be tempting to infer that rising income gaps in education should also manifest in rising gaps related to family wealth; after all, both are monetary dimensions of families' socioeconomic standing. However, as I will argue next, this direct inference is neither empirically nor conceptually valid: wealth is distinct from income, its association with education is distinct, and trends in that association may thus be distinct, too.

Wealth as an Independent Predictor of Educational Attainment

Some see conceptually few differences between wealth and income. In a strict model of neoclassical economics—that is, a world with perfect credit markets and with wealth accumulated from income rather than intergenerational transfers—wealth merely reflects different consumption patterns (see, e.g., the *Haig-Simons* income concept). Depending on their time preferences and levels of risk aversion, some individuals prefer to consume now, whereas others do not and instead accumulate wealth. Over the entire life course, income and wealth are thus seen as conceptually equivalent. This understanding of wealth, however, does not correspond well to empirical findings. Prior research on wealth has often noted that correlations between wealth and other background characteristics are far from perfect and that especially the correlation between income and wealth is lower than one may expect (Keister and Moller 2000; Oliver and Shapiro 2006). In the analytic sample used for this analysis, the correlation between family net worth ranks and five-year average of family income ranks is .70, which is higher than the correlation of .50 mentioned in the prior literature (Keister and Moller 2000; but see Killewald et al. 2017) but not high enough to discard one measure in favor of the other. One reason why wealth is not empirically equivalent to lifetime

income is the importance of intergenerational transfers, which account for more than half of all wealth in the United States (Gale and Scholz 1994). Conversely, Brady et al. (2017) showed that wealth captures only about one-quarter to one-third of fully observed lifetime income in the United States.

Prior wealth research shares the insight that wealth and income are distinct from each other and has found that, conditional on income and other observable characteristics, family wealth is related to a range of important outcomes, including children's education (for an overview, see Killewald et al. 2017). Researchers have documented independent associations between family net worth and children's early test scores (Orr 2003; Yeung and Conley 2008), total years of schooling completed (Axinn et al. 1997; Conley 2001; Pfeffer 2011), and each level of educational attainment (Belley and Lochner 2007; Conley 1999, 2001; Haveman and Wilson 2007; Morgan and Kim 2006). A related strand of research has focused on housing wealth as the largest wealth component in most families' asset portfolios. For instance, homeownership has been shown to affect both early cognitive development of children and later college access (e.g., Haurin et al. 2002; Hauser 1993). Lovenheim (2011) found that exogenous shocks to home values substantially increase children's rates of college attendance.[1] In this contribution, I therefore also separately document gaps in educational attainment as they relate to housing wealth as a select and important aspect of families' overall wealth position.

Why Wealth Gaps in Education May Be on the Rise

Prior research has also offered a range of potential explanations for the independent role of wealth in the educational attainment process. Families may draw on their wealth to invest in their children—in particular, through the purchase of educationally valuable goods (e.g., tutoring and test preparation, Buchmann et al. 2010). Moreover, family wealth may facilitate access to certain types of education: in the form of housing wealth (home values), family wealth provides access to high-quality public schools that—thanks to the reliance of public school budgets on local property taxes—are equipped with more resources than those in less-wealthy neighborhoods. Also, wealth may help reduce credit constraints for college access and persistence. Lastly, family wealth may serve an insurance function by providing important "real and psychological safety nets" (Shapiro 2004) against the risks inherent in human capital investment decisions. For instance, one risk entailed in going to college is the possibility of failing to attain a terminal degree that may be necessary to pay off accumulated student debt. Family wealth may insure against that risk because it provides the option to meet debt obligations via intergenerational transfers. The lack of family wealth, on the other hand, increases the risk of realizing these sunk costs and may therefore prevent children from enrolling in college in the first place or from taking on more student debt to remain there (Pfeffer and Hällsten 2012).

[1] Although it is not the aim of this contribution to assess whether the association between family wealth and children's education is causal, it is worth nothing that Lovenheim's evidence on the causal relationship between housing wealth and college entry is an important advance in the literature, especially in the context of continuing debates about the causal influences of family income (see, e.g., Cameron and Taber 2004; Mayer 1997).

Each of these pathways through which family wealth may translate into educational opportunity can be hypothesized to have increased in importance over recent decades. First, Kornrich and Furstenberg (2012) documented a steep rise in the amount of money parents spend on their children, in particular for their education. Most of that increase occurred between the mid-1970s and mid-1990s, which corresponds to the period in which the children analyzed here grew up. Although prior research has shown these transfers to be related to families' income (Kaushal et al. 2011; McGarry and Schoeni 1995; Schoeni and Ross 2005), Rauscher (2016) revealed that parental transfers are also and increasingly closely tied to parental wealth: the size of transfers for children's schooling by parents in the upper half of the wealth distribution exceeds those by parents in the lower half more than sevenfold.

Second, the economic segregation of neighborhoods has increased since the 1970s (Fry and Taylor 2012; Reardon and Bischoff 2011) and, alongside it, so has the economic segregation of schools (Owens et al. 2016). Although these trends have been empirically established only using measures of income, similar trends may apply to wealth. For instance, Owens et al. (2016) have shown that the increasing income segregation of schools is primarily driven by those in the top 10 % of the income distribution—that is, those most likely to hold wealth (Keister and Moller 2000: 225; Oliver and Shapiro 2006:76). Furthermore, the link between rising inequality and segregation that has been established for income (Owens 2016; Watson 2009) may be even stronger for wealth because families' selection into housing markets directly determines both residential segregation *and* wealth inequality. In fact, as McCabe (2016) showed, homeowners often engage in decisively exclusionary politics to maximize the financial investment in their homes. Finally, because property tax–based school financing provides a tight link between school inputs and housing wealth, the extent to which residential segregation translates into differences in resources available to local schools should depend more on a neighborhood's wealth distribution than its income distribution. In sum, then, it seems reasonable to expect that growing wealth inequality has increased inequality in school contexts and resources, although this hypothesis urgently awaits empirical confirmation.

Third, one may expect credit constraints for college access and persistence to have increased as the cost to attend has risen dramatically over recent decades. The average, inflation-adjusted cost for in-state tuition and board at four-year colleges is more than 2.5 times higher today than in 1980 (Ma et al. 2015). Without a commensurate increase in financial aid,[2] these rising costs may have increased the importance of family wealth in alleviating students' credit constraints. Furthermore, this trend may have been compounded by changes in educational policy; specifically, the 1992 Higher Education Act excluded homeownership from the calculation of financial need and thereby increased the total amount of financing available to children from families with high home equity (Dynarski 2001).

Fourth, with increasing costs of attendance come increasing costs of failure. The prospect of leaving college with student debt but without a degree to make up for it may have increased the insurance function of family wealth. This function may also have

[2] The net cost of attending college (i.e., tuition/fees/board minus all financial aid and tax credits) has risen less steeply than sticker prices but still profoundly. In the 25 years between 1990 and 2015, the average net cost of attendance at public four-year colleges rose by 84 % (while the sticker price rose by 111 %); the corresponding increase at private four-year colleges was 39 % (sticker price rose by 78 %) (Ma et al. 2015).

become more consequential as job market insecurity and levels of life course risks (or the perception therefore) have increased while some public insurance schemes have deteriorated (Hacker 2007).

So far, I have offered reasons to expect a growing importance of family wealth in determining educational success in response to specific social and institutional changes—namely, the heightened private investment in children, the increased economic segregation of neighborhoods and schools, the rising costs of college attendance, and increasing insecurities facing children and young adults as they embark on their educational and labor market careers. However, in addition to family wealth becoming a more consequential resource for successful educational trajectories, increasing inequality in wealth *alone* may also translate into growing wealth gaps in education. That is, even if the way in which wealth is tied to educational success does not change, if children diverge more from each other in terms of their family wealth, they may also do so in terms of their educational outcomes. For example, as the amount of wealth available to families diverges, so should the amount of spending on investments in children (assuming a positive elasticity of consumption). Furthermore, such divergence can have multiplicative effects if increased investment at the top devalues investment at the bottom. For instance, concentration of advantage in wealthy neighborhoods and schools or concentration of investments in test preparation may skew the competition for access to selective colleges such that families of lower wealth are effectively priced out of the competition, creating a winner-take-all market (Frank and Cook 1996). As I will document later in this article, the distribution of wealth has indeed grown substantially more unequal among the children studied here, including but not limited to the period of the Great Recession (Pfeffer et al. 2013; for a detailed consideration of the potential implications of the Great Recession for the analyses reported here, see Appendix 2). Using decomposition analyses, I will assess the extent to which this growth in wealth inequality accounts for changing wealth gaps in educational outcomes.

Finally, like changes in educational inequality in general, trends in wealth gaps will also depend on the supply of education—namely, the stage and pace of educational expansion. First, inequality at a given level of education, such as high school attainment, necessarily decreases when expansion at that level continues in spite of saturation (i.e., close to 100 % completion rates) among the wealthy (Raftery and Hout 1993). This condition appears to be met for the cohorts analyzed here: high school graduation rates among the wealthiest are arguably saturated (as I will show), but national high school graduation rates have inched up another 5 percentage points over the period studied (NCES 2016a: table1). Second, trends in inequality at a given level, such as college access, can decrease or remain stable when that level expands faster than eligibility for it does (Arum et al. 2007). These conditions are also met over the observation period as enrollment in degree-granting postsecondary institutions increased by more than one-third, even when the growth in enrollment by foreign students is excluded (NCES 2016b: tables 303.70 and 310.20). In sum, for both high school graduation and college access, supply-side factors may serve to counter or even outweigh the factors described earlier.

Data, Measures, and Method

The Panel Study of Income Dynamics (PSID 2017) continually collects a rich set of longitudinally consistent indicators of the socioeconomic position of families, which

greatly facilitates the type of over-time comparisons reported here. It also collects information on the children born into a panel household and tracks them as they move out to establish their own households, making possible the assessment of their final educational outcomes. The PSID, which has been collecting detailed wealth information since 1984, is the only nationally representative survey that contains information on both family wealth and children's educational outcomes for a sufficiently wide range of different birth cohorts.

The analytic sample for this study consists of children who lived in PSID households at ages 10–14 in the first four waves in which family wealth was measured (1984, 1989, 1994, and 1999), which amounts to birth cohorts 1970 through 1989. That is, all trends in educational attainment assessed here occur over the span of the relatively brief time interval of just two decades. I will return to a discussion of potential longer-term trends in the Conclusion section. To track cohort changes in educational attainment, I compare children born in the 1970s with children born in the 1980s and assess whether, at age 20 ($N = 2{,}334$ and $N = 2{,}691$, respectively), they had graduated from high school and had gained any college experience, as well as whether, by age 25 ($N = 1{,}799$ and $N = 2{,}545$), they had completed a bachelor's degree.[3] The indicators of educational attainment available here record only whether a year of college has been completed and therefore do not allow the separate identification of students who enter college but drop out within the first year, nor do they allow distinguishing between different types of colleges attended.

Information on children's educational attainment was provided either by the children themselves if they had already established their own households—very few of them had done so by age 20—or by the origin household's respondent, typically a parent. The regression models described later control for the source of information on educational attainment.

The PSID collects wealth information based on a series of detailed questions on the ownership of assets and their value, covering home values, savings, stocks, many other financial assets, real estate, business assets, vehicles, mortgages, and other types of debt. As the main measure of wealth, this study uses total family net worth, which sums the value of all asset types minus debts.[4] In addition, I draw on the value of respondents' owner-occupied homes as a much simpler proxy indicator. If home values, as one of the

[3] The PSID has been conducted biannually since 1997, so I assess educational attainment at ages 20 and 25 if surveyed in that year but at adjacent ages (older, if available) otherwise. Online Resource 1, section 1, provides an overview of the different measurement years for each birth cohort. It also details how birth cohorts were differently affected by the 1997 PSID sample reduction but shows that the conclusions presented here do not appear to be substantially influenced by it.

[4] To best capture the economic conditions in which the child grows up, I define family wealth as a characteristic of the household in which the child resides at ages 10–14, irrespective of the household's structure. A different measurement approach would instead link children to the wealth reports of their parents, which, for nonintact families, can provide additional information on the wealth of nonresident parents (an alternative approach that could also be applied in studies focused on family income but typically is not). However, this information is available for only a selective set of cases in which the nonresident parent continues to be interviewed as a PSID respondent. In addition, it is debatable whether and how a nonresident parent's wealth *should* be taken into account. Including the wealth of a "truly absent" parent may induce as much measurement error as failing to include the wealth of a nonresident parent with continued parenting commitments (undivided by new parenting commitments to stepchildren). In other work on the intergenerational effects of wealth (Pfeffer and Killewald 2017), we tested the sensitivity of results to these two distinct measurement approaches and concluded that they do not yield substantively different findings.

major components of most households' wealth portfolio, approximate the wealth-education associations studied here well, data limitations that so far have hampered the widespread inclusion of wealth in analyses of educational attainment would be greatly relaxed: information on home values—without even considering remaining mortgage principals—is faster and easier to collect than full-fledged asset modules, feasibly even through linkage of existing surveys to external data, such as historical censuses or commercial real estate data. Wealth gaps based on other proxy measures—namely, home equity and financial wealth—are also discussed briefly and reported in Table 5 of Appendix 1.

The PSID wealth measures have been shown to have high validity, although they do not capture the very top (2 % to 3 %) of the wealth distribution well (Juster et al. 1999; Pfeffer et al. 2016). Because this study focuses on population associations between wealth and education rather than the educational pathways of children of a small wealth elite (for the latter, see, e.g., Khan 2012), this shortcoming is less problematic and likely results in a conservative estimate of the educational advantages among the top wealth group assessed here. In fact, the specification of wealth gaps reported here draws on wealth quintiles to capture nonlinearities in intergenerational associations throughout the distribution but not necessarily the very top. Quintiles are drawn within each cohort and based on the weighted analytic sample; analyses based on unweighted quintiles yield similar results (see Online Resource 1, section 2).

I also use a comprehensive set of indicators of the socioeconomic position of families beyond family wealth. As a measure of permanent income, I use total household income averaged across five income years (centered on the year at which wealth is measured; specified as weighted quintiles). Educational background is measured as the highest degree attained by either the household head or partner. Occupational background is measured as the highest socioeconomic index score (SEI) of either the head's or the partner's main occupation. Further controls for demographic characteristics include household size, the number of children in the household, whether the household head is married, mother's age, individuals' sex, and the source of information on their educational outcomes (self-reported or not). Each of these yearly measures is drawn from the same survey wave as the wealth measure (1984, 1989, 1994, or 1999). The main predictor studied here, family wealth, is provided in imputed form by the PSID, and so is family income; few missing values on all remaining predictors are imputed using Stata's *mi* procedures. A small share of cases (less than 1 %) with imputed values on the dependent variable are dropped (von Hippel 2007). Descriptive statistics for all variables included in this analysis are reported in Appendix 1, Table 4. All dollar values are inflation-adjusted to 2015.

Wealth gaps in high school attainment, college access, and bachelor's degree attainment are estimated via logistic regressions. To allow a more direct assessment of wealth gaps in college persistence, I also estimate models for bachelor's degree attainment conditional on college access. I begin by describing observed rates of educational attainment by family wealth quintiles. Next, I estimate adjusted rates based on models including the aforementioned control variables. I report predictive margins and, for the cohort comparison, discrete changes based on average marginal effects (see Hanmer and Ozan Kalkan 2013) using Stata's

margin commands (Long and Freese 2014).[5] The decomposition approach used to estimate the extent to which changes in the wealth distribution account for trends in wealth gaps in education is targeted at explaining a specific trend revealed in the preceding analyses and will therefore be described later. The regression results reported draw on longitudinal, individual weights that account for selective attrition, although unweighted analyses yield substantively equivalent results (see Online Resource 1, section 2). Reported standard errors are robust and adjusted for clustering by PSID lineages (original PSID households), adjusting for the presence of not only siblings but also cousins.

Findings

Wealth Gaps in Educational Attainment

I begin by reporting differences in educational attainment by family wealth. Figure 1 displays average rates of high school attainment, college attendance, and college degree completion across wealth quintiles (with 95 % confidence intervals), where wealth is measured as net worth (panel a) or home values (panel b) (see also Table 5 in Appendix 1). The wealth gradient in educational attainment is steep. In panel a, comparing the educational outcomes of children from the lowest net worth quintile with those from the highest quintile reveals a differences of 18.3 percentage points in high school graduation rates (72.8 % vs. 91.1 %), 32.1 percentage points for college access (21.4 % vs. 53.5 %) and 44.6 percentage points for college graduation (9.1 % vs. 53.7 %). The increase in rates across net worth quintiles is relatively linear for all levels of educational attainment, although the increase in high school graduation rates in the bottom half of the distribution is somewhat steeper, and the increase in college graduation in the top half of the distribution is steeper. Furthermore, whereas wealth gaps between the highest and the second highest net worth quintile are relatively low for college access (53.5 % vs. 48.9 %), they are more pronounced for college graduation (53.7 % vs. 36.4 %). In fact, among children from the highest net worth quintile, college access rates at age 20 and college graduation rates at age 25 are basically the same, suggesting a much higher level of college persistence among the top quintile (see also the last column of Table 5, Appendix 1).

Although the wealth gap in college graduation rates is enormous, it is, of course, not the case that every child from the wealthiest group assessed here graduates from college. Overall, only about half of the children from the top wealth quintile receive a bachelor's degree. That should not come as a surprise to those familiar with estimates of college graduation rates among recent U.S. cohorts, which closely resemble those estimated here.[6] With overall graduation rates at age 25 below 30 %, even if no child from the bottom half of the wealth distribution were to graduate from college, one would still expect college graduation rates of less than 60 % in the top half of the

[5] Stability analyses based on linear probability models are presented in Online Resource 1, section 3.

[6] Based on the Current Population Survey March Supplement, I estimate a college graduation rate for comparable individuals—specifically, individuals who are heads of households and age 25 in survey years 1995 through 2009—of 28 %, compared with 27.2 % in the analytic sample used here.

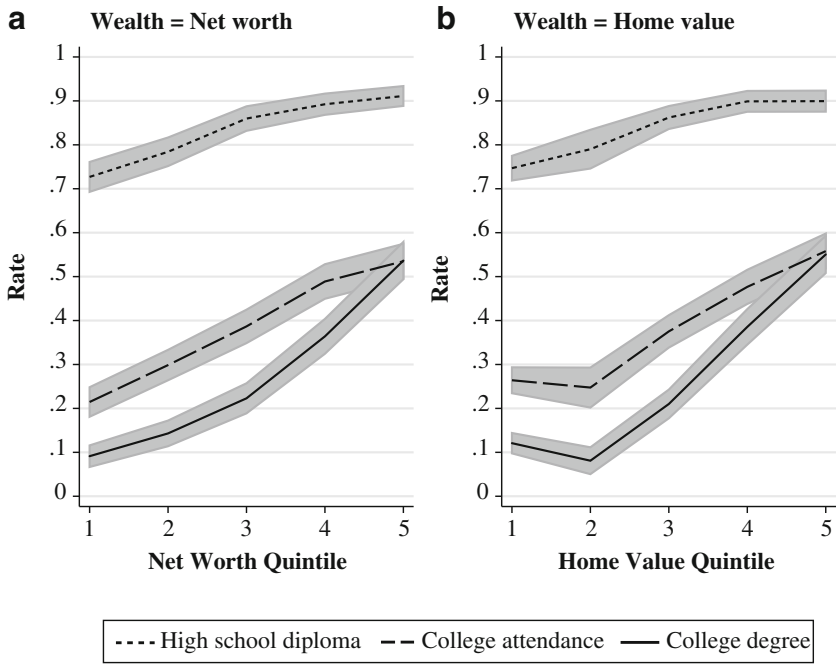

Fig. 1 Educational rates by wealth background: Wealth measured as net worth (panel a) and home value (panel b)

distribution. While it is thus a misperception that a great majority of children from wealthy households graduate college, it is certainly the case that many college graduates come from households with significant net worth. In this analytic sample, half of all college graduates come from a household with more than $190,000 in net worth, and a full one-fifth of them come from a household with a net worth of at least half a million dollars.

Panel b of Fig. 1 displays educational rates by home value quintiles.[7] The degree and pattern of inequality in educational attainment by families' home values closely approximate those by families' net worth (panel a). Although other wealth components, such as financial assets or home equity (home values minus mortgages), fare similarly well in approximating the reported net worth gaps (see Table 5 in Appendix 1), home values provide the most attractive proxy measure. Substantively, homeownership constitutes the main asset component in most families' wealth portfolio. From a measurement perspective, home values are the easiest to collect among all asset components and, as such, appear to be a promising candidate to help remedy the data shortage that so far has hampered work on the relationship between family wealth and educational outcomes.

[7] Here, the lowest group contains those whose parents do not own a home (home value of zero), about 30 % of the sample, while the second lowest group (about 10 % of the sample) consists of children from owned homes valued at most about $64,000 (see Table 4, Appendix 1). The remaining groups are standard quintiles (20 % each).

Wealth as an Independent Source of Educational Advantage

The large wealth gaps in educational outcomes shown in Fig. 1 can, of course, also arise from other correlated characteristics, not the least from family income. Accordingly, the observed wealth gaps in education—and again displayed in the "Uncontrolled" column of Table 1 (now also including the outcome of college completion among those who have gained access to support a more direct assessment of college persistence)—are lower after controls for observable characteristics of parents and children are added (see the aforementioned list of controls). Still, wealth gaps in education adjusted for these controls ("Controlled" column of Table 1) remain statistically and substantively significant: all else being equal, the gap in educational attainment between children from the bottom quintile and children from the top quintile of the net worth distribution still (statistically significantly) differs by 6.4 percentage points for high school graduation, 8.4 percentage points for college attendance, 10.5 percentage points for college graduation, and 10.7 percentage points for college persistence.

Note that the aim of these controlled models is not to provide a causal estimate of wealth effects (for recent evidence in this direction, see Hällsten and Pfeffer 2017). Doing so faces many challenges, including the possibility of remaining unobserved bias (e.g., when joint determinants of family wealth and educational outcomes are not controlled), of endogenous controls (e.g., when a control variable, such as marital status in this analysis, may be not only a determinant of wealth and education but also a consequence of wealth; see Schneider 2011), and of endogenous selection bias induced by conditioning on a collider (e.g., when marital status is a consequence of wealth and also related to further unobserved determinants of educational attainment; see Elwert and Winship 2014:44–45). Instead, I present estimates from these models mainly to compare educational gaps in wealth with those in income (the focus of most other research), underlining that something new can be learned from also taking into account wealth. Table 1 therefore reports wealth gaps in education next to gaps by family income.[8] For high school graduation, the observed gaps ("Uncontrolled" column) are of similar size, with a difference of 18.3 and 20.6 percentage points between the top and the bottom quintiles of wealth and income, respectively. This similarity in the size of raw wealth and raw income gaps extends to estimates based on controlled regressions ("Controlled" column). Everything else being equal, a change in family wealth from the bottom to the

[8] This comparative assessment could be influenced by differences in the measurement error present in the income and wealth measures. Although separate assessments of the quality of PSID's income and wealth measures do exist (with generally positive conclusions; see Gouskova and Schoeni 2007; Pfeffer et al. 2016), it is difficult to draw firm conclusions about the *relative* degree of measurement error in these two variables. However, most researchers would probably be ready to assume more measurement error in wealth than in income, submitting that it may be more difficult to capture (e.g., when held in complex financial products) and more difficult for the respondent to recall and estimate (e.g., paycheck information is recent, but home valuation may not be). If this assumption is correct, the estimated size of the wealth coefficients relative to that of the income coefficients would be underestimated, making for a conservative assessment of the relative importance of wealth.

Table 1 Wealth and income gaps in education

	Change in Probability Compared With Lowest Quintile (SE)			
	Uncontrolled		Controlled	
High School Graduation				
Wealth quintile				
2nd	0.0553*	(0.0259)	–0.0053	(0.0228)
3rd	0.1315***	(0.0246)	0.0456†	(0.0240)
4th	0.1640***	(0.0239)	0.0574*	(0.0264)
Highest	0.1830***	(0.0237)	0.0643*	(0.0302)
Income quintile				
2nd	0.0960***	(0.0266)	0.0358	(0.0234)
3rd	0.1509***	(0.0251)	0.0456†	(0.0260)
4th	0.1934***	(0.0236)	0.0783**	(0.0277)
Highest	0.2063***	(0.0239)	0.0715*	(0.0317)
College Attendance				
Wealth quintile				
2nd	0.0871***	(0.0261)	0.0321	(0.0307)
3rd	0.1729***	(0.0279)	0.0626†	(0.0324)
4th	0.2749***	(0.0276)	0.1011**	(0.0357)
Highest	0.3214***	(0.0283)	0.0839*	(0.0380)
Income quintile				
2nd	0.1124***	(0.0265)	0.0684*	(0.0320)
3rd	0.2192***	(0.0261)	0.1186***	(0.0333)
4th	0.2663***	(0.0268)	0.1139**	(0.0360)
Highest	0.4083***	(0.0259)	0.1996***	(0.0413)
College Degree				
Wealth quintile				
2nd	0.0499*	(0.0213)	0.0042	(0.0293)
3rd	0.1323***	(0.0233)	0.0153	(0.0298)
4th	0.2730***	(0.0262)	0.0606†	(0.0315)
Highest	0.4460***	(0.0287)	0.1048**	(0.0347)
Income quintile				
2nd	0.0642***	(0.0173)	0.0378	(0.0295)
3rd	0.1621***	(0.0224)	0.0826*	(0.0325)
4th	0.3194***	(0.0260)	0.1295***	(0.0345)
Highest	0.4979***	(0.0265)	0.1659***	(0.0386)
College Degree Conditional on Attendance				
Wealth quintile				
2nd	0.0695†	(0.0403)	–0.0101	(0.0444)
3rd	0.1430***	(0.0395)	–0.0148	(0.0474)
4th	0.2664***	(0.0393)	0.0505	(0.0475)
Highest	0.4263***	(0.0380)	0.1071*	(0.0517)

Table 1 (continued)

	Change in Probability Compared With Lowest Quintile (SE)			
	Uncontrolled		Controlled	
Income Quintile				
2nd	0.0796*	(0.0363)	0.0325	(0.0485)
3rd	0.1802***	(0.0395)	0.0775	(0.0531)
4th	0.3493***	(0.0396)	0.1410*	(0.0560)
Highest	0.4640***	(0.0377)	0.1583**	(0.0579)

Notes: Standard errors, shown in parentheses, are robust and clustered by PSID family lineage. Controlled = average marginal effects with controls for individuals' family background (family wealth, family income, parental occupational status, parental education, household size, number of children in the household, whether household head is married, and mother's age), gender, and whether they have established their own household by age 20/25 (see also Table 4 in Appendix 1).

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

top quintile is associated with an increase in the probability of high school graduation by 6.4 percentage points; the same change in terms of family income, everything else being equal, is associated with an additional increase by 7.2 percentage points. That is, family wealth and family income have independent and roughly equivalent predictive power for the attainment of a high school degree. In terms of college attainment, income gaps are larger than wealth gaps (both uncontrolled and controlled). Family income appears to be more than twice as important as family wealth for the likelihood of a student gaining some college experience (controlled). Despite this dominating role of income in predicting college access, the overall difference in the relative importance of income and wealth is less pronounced for the attainment of a bachelor's degree. While a move from the bottom to the top family income quintile entails, everything else being equal, an increase in bachelor's graduation rates by 16.6 percentage points, the same move in terms of family wealth still entails an additional 10.5 percentage point advantage (similar for college persistence)—large enough to conclude that the overall extent of educational inequality is captured incompletely when we neglect family wealth as an independent factor in educational attainment and, in particular, college graduation.

Trends in Wealth Gaps in Educational Attainment

The central question addressed here is whether the wealth gaps in education described so far (in Fig. 1) have changed across an observation window of two decades. For this assessment, I compare the educational outcomes of children born in the 1970s (1970–1979) to children born in the 1980s (1980–1989). Figure 2 (see also Table 6, Appendix 1) displays rates of high school graduation, college access, college completion, and college persistence (completion

among those who report some college experience) by family net worth quintiles for each of the two cohorts. The upper panel reports cohort-specific graduation rates. The lower panel displays the same information in a slightly different format—namely, as the cohort difference in graduation rates, with the earlier born cohort serving as the reference (and consequently, with positive slopes indicating growing wealth gaps) and 95 % confidence intervals to allow the assessment of statistical significance of cohort differences.[9]

Starting with high school graduation, I find that average graduation rates have increased among students from the bottom three wealth quintiles. For instance, children in the more recent cohort who grew up in the middle fifth of the wealth distribution have a graduation rate of 89.2 %, which is 7.0 percentage points (and statistically significantly) above that of students from the middle fifth of the wealth distribution born a decade earlier. High school graduation rates of students from the top two wealth quintiles, in contrast, did not change in this time frame—a potential sign of saturation of this educational level among wealthier households. Overall, then, with the bottom 60 % increasing their high school graduation rate and the top 40 % remaining largely stable, wealth inequality in high school attainment has decreased.

Also evident are some signs of equalization in terms of college access: college attendance rates have tended to improve between these two cohorts across the distribution, most notably (and statistically significantly) for children from the middle wealth quintile, who experienced an increase of 11.5 percentage points (from 32.4 % to 43.9 %). In contrast, college attendance rates among children from the top wealth quintile expanded less rapidly, with a statistically insignificant increase of 5.6 percentage points. As explained earlier, this may reflect the fact that college education has expanded faster than eligibility for it.

Trends in wealth gaps in college attainment are different and stark. Children from the bottom 60 % of the wealth distribution were not able to make much progress over the decade studied here, with statistically insignificant increases of 5 percentage points or less, while children from the next 20 % of the wealth distribution increased their college completion rates by 8.4 percentage points. The most marked increase, however, was experienced by children from the top 20 % of the distribution. With a statistically significant increase in the college graduation rate of 14.1 percentage points in the span of just a decade, the wealthiest children have pulled away from others in terms of college degree attainment. That is, despite some decreases in wealth gaps in high school graduation and college access, the clearest and largest change in the distribution of educational opportunity lies in the rising gap between those from the top 20 % of the wealth distribution and everyone else. As a result, whereas college graduation rates between those from the top and the bottom quintile of the wealth distribution differed by 39.5 percentage points among children who were born in the 1970s, they differed by a full 48.9 percentage points for children born a decade later; these figures translate to a 9.4 percentage point increase the wealth gap in college degree attainment in just a decade.

[9] For an explanation of why statistical significance tests should be based on estimates of discrete change, see Long and Freese (2014:297).

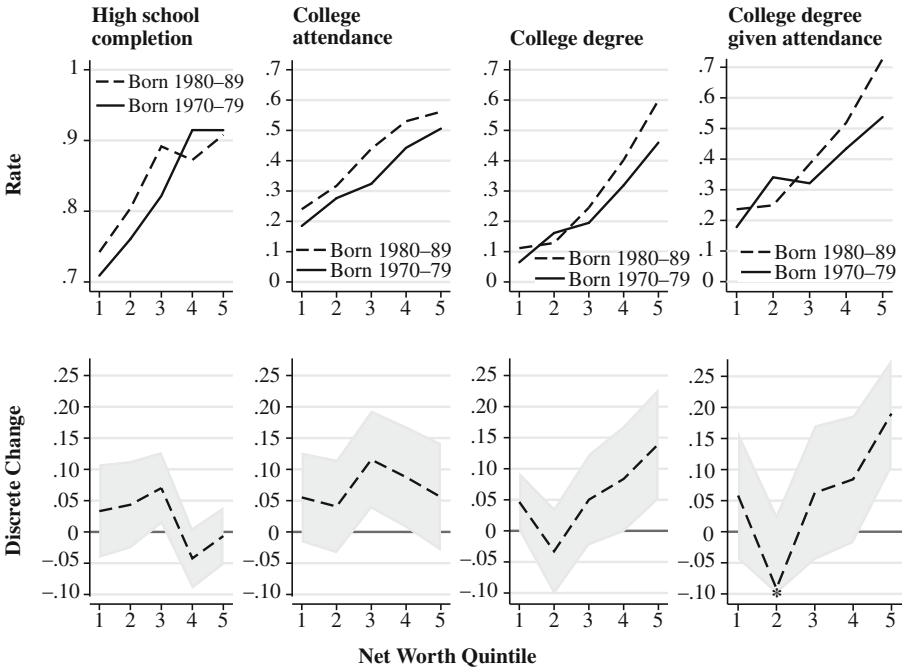

Fig. 2 Cohort trends in wealth gaps in education. *Display of lower bound of one confidence interval (second quintile, college degree given college attendance) truncated to maintain the same *y*-axis scale across outcomes

An increasing wealth gap in college graduation alongside some equalization of college access implies an exposed role of changing wealth differences in college persistence. The last column of Fig. 2 illustrates this point: The takeoff in college graduation rates among students from the top wealth quintile is driven by a tremendous improvement in their college persistence rates, increasing from 53.7 % to 72.9 % (a full 19.1 percentage points) within a decade. The advantage in college persistence among the wealthiest fifth of students compared with even those from the middle of the wealth distribution has grown by 12.7 percentage points.[10]

Finally, some readers may also be interested in cohort changes in the *independent* role of wealth—that is, the potential growth of *controlled* wealth associations. The aforementioned cautions against a causal interpretation of controlled wealth associations—because of the potential partial endogeneity of some controls and the potential presence of endogenous selection bias—also apply to the assessment of trends in controlled associations: to the extent that some controls are (also) endogenous, trends in their relationship with both wealth and educational outcomes can bias conclusions about trends in the effects of wealth. For instance, if marital status were to be increasingly determined by wealth or increasingly important for children's educational success, controlling for marital status may also control away some of the increasing effects of wealth. With these concerns in mind, I refer the interested reader to Fig. 3 (see also Table 7 in Appendix 1), which provides the same type of trend assessment as that

[10] Stability analyses reported in Online Resource 1, section 4, further reinforce the contrast between stagnating college persistence rates among the bottom three quintiles and sharply increasing rates among the top quintile.

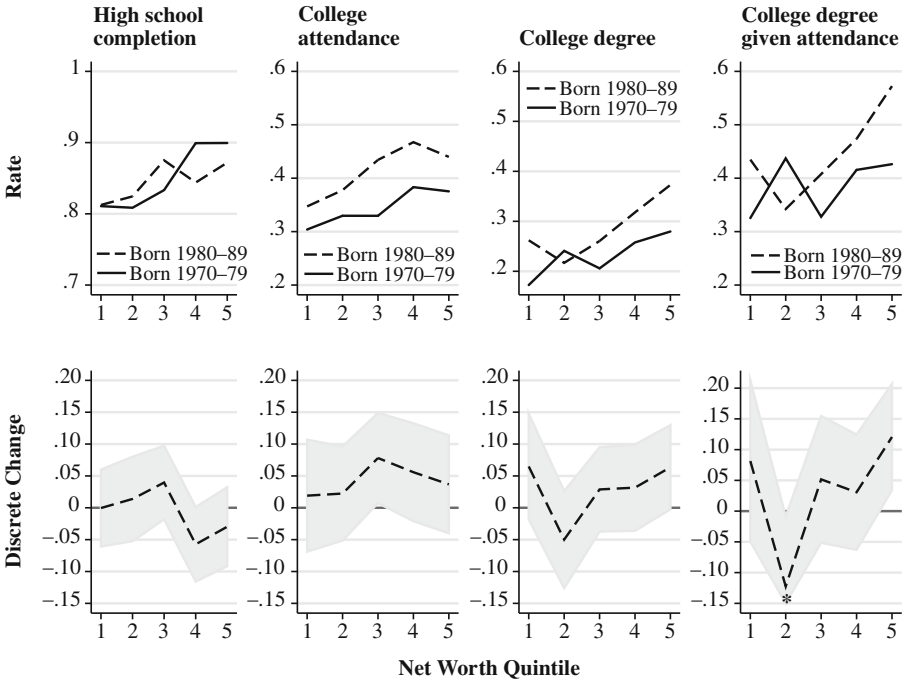

Fig. 3 Cohort trends in controlled wealth gaps in education. Based on models including all control variables listed in Table 1, fully interacted by cohort. *Display of lower bound of one confidence interval (second quintile, college degree given college attendance) truncated to maintain the same *y*-axis scale across outcomes

presented in Fig. 2 but based on regression models with the full set of controls (interacted by cohort to also allow for trends in the associations between each control and the outcomes). Although the cohort trends in controlled wealth-education associations are, as expected, smaller than those in the uncontrolled wealth-education associations, the general conclusion from these results is that the cohort trends follow very similar patterns.[11] The most pervasive trend continues to be the surge in college degree attainment of college-going children from the top wealth quintile, reinforcing the earlier conclusion about the role of increased college persistence of the wealthiest students.

Growing Wealth Gaps in College Graduation in the Context of Rising Wealth Inequality

In the remainder of this section, I will focus on the growing wealth gap in college completion—as the most concerning finding yielded by the analyses so far—and assess the degree to which it is related to the growth in wealth inequality. As argued earlier, although wealth may have become a more influential factor in determining college success, solely the fact that those at the top of the distribution have increasingly more wealth at their

[11] Stability analyses based on linear probability models (see Online Resource 1, section 3) reveal only one notable difference: an even more pronounced increase in the growth of college attainment among children from the top wealth quintile; the main conclusion about growing wealth gaps in higher educational attainment based on average marginal effects from logistic regression models, as presented here, thus appears to be conservative.

disposal than everyone else may also account for some of the growth in wealth gaps in education. I begin by describing the growth of wealth inequality among the children of the two cohorts studied here and also report on levels of wealth inequality among today's children (aged 10–14 in the latest available survey wave of 2015). I then describe the decomposition approach used to estimate the degree to which the observed rise in wealth inequality contributes to the documented increase in the wealth gap in college attainment.

Table 2 reports the median wealth among three groups of children: those growing up in the bottom 80 % of the family wealth distribution, the next 10 %, and the top 10 %. The differences in family wealth between these three groups are already high for the first cohort studied here: the median family net worth of children in the bottom four quintiles is $57,055 (in 2015 $), more than six times higher among those in the next 10 % ($361,406), and nearly 14 times higher among those in the top 10 % ($788,728). A decade later, the family wealth of children in the top quintile increased further—much more strongly among the top 10 % than the next 10 %—but decreased substantially for the remaining 80 % of children. As a result, in the second cohort, median wealth among children in the top 10 % is now 22 times higher than among those in the bottom 80 % (and still 9 times higher among the next 10 % compared with those below). Another substantial shift occurred at the very bottom of the wealth distribution: less than 1 in 10 children of the earlier cohort come from families without any net worth (i.e., zero or negative net worth), but that share rose to 13.7 % of children in the later cohort. The rise in wealth inequality between these two cohorts is also reflected in the Gini coefficient, which increased from 0.72 to 0.80. The rise of asset nonownership and indebtedness (zero and negative net worth) is an important driver of this increase, as indicated by the fact that the Gini coefficient among those with positive wealth rose slower than the Gini coefficient across the entire distribution.[12]

Using a decomposition analysis, I seek to relate this increase in wealth inequality to the documented growth in the wealth gap in college attainment (for a similar type of analysis of family income gaps, see Duncan et al. 2017). Perhaps the most concerning outcome of such analysis would be to find that all the increase in the wealth gap in college attainment can be traced to the growth of wealth inequality given that, as also shown in Table 2, wealth inequality is even greater among today's children. Among children observed in the latest available PSID wave of 2015, wealth is even more heavily concentrated at the top: children in the top 10 % of the distribution now typically grow up with about $1.2 million in net worth, which is about 57 times the wealth of the bottom 80 % of children, whose typical family wealth is just $21,000. Perhaps even more concerning, the share of children from households with zero or negative net worth has jumped by 10 percentage points to nearly one-quarter of all children. The Gini coefficient has also risen to 0.88, again more rapidly when including the full distribution, indicating the importance of the growth of no asset holding and indebtedness.[13] At the backdrop of such extreme wealth inequality among today's children, the growth in wealth inequality between earlier cohorts perhaps appears relatively low. Still, knowing whether this growth can be traced to the college outcomes of these children may inform our expectations about the fate of today's children.

[12] Note that distributions that include negative values, as is the case for wealth, can produce a Gini coefficient above 1.0.

[13] Additional analyses reported in Online Resource 1, section 5, reveal that the Gini coefficient of nonhousing net worth (net worth excluding home equity) followed a similarly sharp increase, now reaching an astounding level of 0.98 (but see also the previous footnote).

Table 2 Trends in wealth inequality among children

	Cohort		
	Earlier: Aged 10–14 in 1980s	Later: Aged 10–14 in 1990s	Current: Aged 10–14 in 2015
Median Net Worth			
Top 10 %	788,728	893,577	1,198,000
Next 10 %	361,406	374,908	396,000
Bottom 80 %	57,055	39,977	21,000
Ratios			
Top 10 %/Next 10 %	2.2	2.4	3.0
Top 10 %/Bottom 80 %	13.8	22.4	57.0
Next 10 %/Bottom 80 %	6.3	9.4	18.9
Share With Zero/Negative Net Worth	0.097	0.137	0.231
Gini Coefficient	0.719	0.797	0.879
Gini Coefficient (positive wealth)	0.678	0.740	0.767

The decomposition analysis relies on a piecewise spline regression model to predict the probability of college attainment (conditional and unconditional on college access):

$$\begin{aligned} \ln\left(\frac{p_i}{1-p_i}\right) &= \beta_0 + \beta_1 X_i && X_i \le a \\ &= \beta_0 + \beta_1 X_i + \beta_2 (X_i - a) && a < X_i \le b \\ &= \beta_0 + \beta_1 X_i + \beta_2 (X_i - a) + \beta_3 (X_i - b) && b < X_i, \end{aligned}$$

where X_i is an absolute measure of net worth, and the spline knots (a and b) are set at specific absolute net worth values (to be described further shortly). The use of an absolute measure of wealth for this predictive model—instead of a relative measure, such as quintiles—is crucial to allow for the assessment of shifts in the wealth distribution. Here, the net worth variable (X_i) is transformed using the inverse hyperbolic sine (IHS) function (see Burbidge et al. 1988), which approximates the logarithmic function but allows the inclusion of cases with zero or negative net worth. The spline knots are set at net worth values representing the 80th and 90th percentiles of the unweighted wealth distribution among the earlier cohort and the full sample at age 25 (nontransformed net worth of $200,863 and $378,160, respectively).[14] In a first step, I ascertain that this parsimonious specification of the relationship between family wealth and college attainment provides an acceptable approximation to the observed outcome of interest: the increased college graduation rates of children from the top wealth quintile. The top panel of Table 3 reports the probabilities of college attainment for children

[14] The specific model used here has been calibrated to provide the best empirical fit (discussed further below; see also Online Resource 1, section 6).

Table 3 Decomposition analysis: Percentages

	Probability of College Degree		Probability of College Degree | Attendance	
	Observed	Predicted	Observed	Predicted
(1) Cohort Born in 1970s				
(1.1) Lowest four wealth quintiles	18.8	17.6	34.2	33.5
(1.2) Highest wealth quintile	46.0	45.2	53.7	53.0
(1.3) Gap (1.2 – 1.1)	27.2	27.5	19.5	19.5
(2) Cohort Born in 1980s				
(2.1) Lowest four wealth quintiles	22.1	17.0	36.8	32.4
(2.2) Highest wealth quintile	60.1	46.0	72.7	53.5
(2.3) Gap (2.2 – 2.1)	38.0	29.0	35.9	21.1
(3) Cohort Difference in Gap (2.3 – 1.3)	10.8	1.4	16.4	1.6
(4) Growth in Gap Accounted for		13.1		9.5

from the bottom four quintiles and children from the top quintile in the earlier birth cohort. The predicted probabilities are derived from the regression model just described and approximate the observed probabilities quite well. The predicted college graduation rate among all children from the bottom four quintiles is 17.6 %, compared with the observed 18.8 % (33.5 % vs. 34.2 % among those who have gained college access). Similarly, 45.2 % of children from the top quintile are predicted to attain a college degree, compared with the observed college graduation rate of 46.0 % (53.0 % vs. 53.7 % among those who have gained college access). The predicted and observed graduation gaps between these two groups are thus very similar—27.5 and 27.2 percentage points, respectively (and equivalent at 19.5 percentage points among those accessing college)—validating the choice of parametric form of the model applied here (see also Online Resource 1, section 6).

Next, I apply the same predictive model to the later cohort of children while constraining the parameter estimates to equal those estimated for the first cohort. That is, I now predict graduation rates for the later cohort based on their individual (IHS-transformed) net worth but use the coefficients estimated based on the earlier cohort. In effect, this model assumes that the relationship between wealth and college outcomes observed in the earlier cohort remains constant but allows for changes in the wealth distribution between the two cohorts.[15] The extent to which the predicted college graduation rates produced by this model replicate the observed graduation rates for the later cohort indicates the extent to which changes in the wealth distribution—namely, increases in wealth inequality—account for changes in wealth gaps in college attainment. If changing wealth gaps in college attainment were entirely driven by the change in wealth inequality between these two cohorts,

[15] Furthermore, in the context of the specific model applied here, I also need to assume that the parameterization of the model remains equally valid—that is, the absolute thresholds chosen for the spline knots that were drawn based on the earlier cohort remain equally useful for the later cohort.

the predicted and the observed wealth gaps for the second cohort would be the same. However, as shown in the second panel of Table 3, the predicted and observed wealth gaps in college graduation diverge from each other, mostly because applying the wealth effects estimated in the earlier cohort to the wealth distribution of the later cohort underestimates the college degree attainment of the top quintile (46.0 % vs. 60.1 % among all; 53.5 % vs. 72.7 % among those accessing college); that is, it misses most of the surge in college degree attainment and persistence at the top established in the prior section. As a result, the predicted wealth gap in college degree attainment is much smaller than observed (29.0 vs. 38.0 percentage points among all; 21.1 vs. 35.9 percentage points among those accessing college). Whereas the wealth gap in college degree attainment between the top quintile and everyone else rose by 10.8 percentage points between these two cohorts (by 16.4 percentage points for those attending college), the rise predicted by assuming a stable association between wealth and college degree attainment is only 1.4 percentage points (1.6 percentage points for those attending college).

Overall, then, the conclusion is that the rise in wealth inequality alone explains only a limited share of the growth in the gap in college degree attainment between the wealthiest 20 % of students and the rest—less than one-sixth (13.1 %) among all and less than one-tenth (9.5 %) among those attending college. Although a decomposition of the wealth gap in education *controlled* for other observed characteristics (reported in Online Resource 1, section 7) reveals a potentially larger contribution of growing wealth inequality to the growth of *controlled* associations between parental wealth and college attainment (explaining about one-third of the growth in the wealth gap in college degree attainment among all and about one-quarter among those attending college), the main conclusion is that the increase in wealth inequality between these two cohorts is far from fully reflected in the increase in wealth gaps in their later college degree attainment. This may qualify as good news at the backdrop of the extreme level of wealth inequality among today's children. Given this result, it also does not seem reasonable to interpolate from the gaps in college degree attainment observed here to gaps in the future college degree attainment of today's children based on the level of wealth inequality they currently experience. Such interpolation may also be inadmissible for another reason: as described in detail in Appendix 2, the parental wealth of many members of the second cohort included here was likely subject to significant fluctuation in the run-up to and during the Great Recession. The possibility that such period effects underlie the trends established here prohibits inferring a broader, secular trend toward growing wealth gaps that extends to current cohorts.

Still, the possibility that the growing inequality in college degree attainment stems primarily from changes in the importance of wealth for college success (rather than from changes in the distribution of wealth) should embolden policy efforts geared at reducing the inequitable effects of wealth on higher educational attainment. Short of such changes, today's children can at the very least be expected to continue to encounter a remarkably high level of wealth inequality in their college opportunities.

Conclusion

This article describes gaps in educational attainment by family wealth and their change over two recent cohorts, born in the 1970s and 1980s, respectively. In line with prior research (e.g., Conley 2001), substantial gaps in educational attainment by family net worth can be observed across all educational levels—namely, high school attainment, college attendance, and college graduation—and the role of family wealth in predicting these educational outcomes is independent of that of other socioeconomic characteristics of families, including family income. Most pressingly, however, this article provides the first evidence (to my knowledge) that wealth inequality in college graduation has been rising further over recent cohorts, with the college graduation rates of children from higher wealth backgrounds surging while children from lower wealth levels are left behind. The extent of this surge in wealth inequality in college degree attainment is profound: for children born between 1970 and 1979, the college graduation rate among those who grew up in the top 20 % of the wealth distribution was 39.5 percentage points higher than among those who grew up in the bottom 20 %. However, for children born only a decade later, that wealth gap in college attainment has grown to 48.9 percentage points. This rapid increase in wealth inequality in college degree attainment is especially concerning because the stakes of college completion have also been rising, both at the individual and the societal level. Not only do individuals' opportunities to attain comfortable earnings increasingly depend on the completion of a bachelor's degree, but the country's international competitiveness and economic growth are widely seen as depending heavily on a highly educated workforce (Goldin and Katz 2008).

The documented increase in wealth inequality in college degree attainment is also particularly notable as wealth gaps at lower levels of educational attainment show signs of decrease. In terms of high school attainment, the least-wealthy students have made further inroads, but this level of educational attainment had already been largely saturated among students from higher-wealth backgrounds. Also, I document advances in college access among children from the middle of the wealth distribution relative to others. As a consequence, the documented growth in the wealth gap in college attainment must be driven by growing inequality in college persistence. I accordingly also document a surge in college persistence among the wealthiest children: just above one-half (53.7 %) of the wealthiest children born in the 1970s who had gained access to college also attained a bachelor's degree, compared with 72.9 % of those born in the 1980s—an increase in college persistence rates at the top of the wealth distribution by more than 19 percentage points in just a decade. In sum, then, the findings reported here suggest that efforts to equalize educational opportunities as they relate to family wealth need to go beyond the expansion of college access for children from lower-wealth backgrounds and put particular emphasis on also leading these students toward college graduation (for an equivalent argument related to parental income, see Bailey and Dynarski 2011).

Furthermore, I find that the documented growth in wealth inequality in college attainment occurs in the context of rising inequality in the wealth origins of the children studied here. This widening distance in their wealth origins, however, is far from fully reflected in the rising wealth gap in their college graduation rates. That is, the growth in educational inequality between these two cohorts is not primarily driven by widening wealth *inequality* itself and may instead arise from the increasing *importance* of family wealth. The contrary finding—rising wealth inequality fully accounting for rising wealth gaps in education—would have made predictions about the fate of today's children particularly bleak given that the level of wealth inequality they experience substantially exceeds that observed in the cohorts studied here and can only be described as extreme (e.g., with a Gini coefficient of 0.88).

Independent of this takeoff in wealth inequality, the results reported here raise concerns about the increasing association between family wealth and college attainment. Efforts to reduce this association should, as already mentioned, also focus on the ways in which family wealth facilitates college persistence. Although this contribution does not seek to establish causality and much less the causal pathways through which family wealth affects educational outcomes, the theoretical arguments provided may guide future research in explaining the increasing role of wealth for college persistence. Rising direct financial transfers from wealthy parents to their offspring (Rauscher 2016) may increasingly be geared at supporting college students in staying on track or getting back on track rather than transferring to other institutions or stopping out as they face academic challenges (Goldrick-Rab and Pfeffer 2009). Furthermore, wealth inequality in college persistence and attainment is likely also established in children's earlier educational experiences—for instance, as children from wealthier households attend high schools that leave them academically better prepared for college and thereby also facilitate access to colleges with higher retention rates, such as highly competitive and prestigious four-year schools (Bastedo and Jaquette 2011).

This last observation also points to one of the limitations of this contribution and opportunities for future research. This study does not investigate "horizontal" differences in education, such as wealth gaps by institution type and selectivity (but see Jez 2014). Yet, as children from the wealthiest families have reached saturation of educational participation at the secondary level and more children from wealth backgrounds below the top are accessing higher education (as documented here), the wealthiest households may increasingly exploit these types of horizontal differences in the educational system to effectively maintain inequality (Gerber and Cheung 2008; Lucas 2001). In this sense, the growth of wealth inequality in college attainment shown here may still provide a conservative estimate. Furthermore, the growth of college enrollment among those from the middle of the wealth distribution may be a less hopeful sign of progress to the extent that it may be driven by enrollment in subpar and predatory for-profit colleges that does not translate into a bachelor's degree (McMillan Cottom 2017). Future research may draw on new data—including restricted-use PSID data available for a subset of the individuals included here—to identify the type

of college attended, distinguishing four-year and two-year, public and private, profit and not-for-profit, as well as selective and nonselective colleges. Doing so holds promise for the explanation of the documented large and growing wealth gaps in college persistence: the assessment of different institutional types of colleges may reveal that the wealthiest students have increased their advantage in college attainment chiefly by attending the types of postsecondary institutions that have the highest retention rates.

Another way in which the presented analyses may underestimate the degree of wealth inequality in education is in its exclusive focus on the *immediate* family. Advantages arising from family wealth may extend beyond the parent-child dyad, with the wealth of grandparents or even wealth in extended-family networks potentially also facilitating educational success (Hällsten and Pfeffer 2017; Prix and Pfeffer 2017; Roksa and Potter 2011). Revealingly, many college campuses around the country have begun to complement their family visit day with a portion dedicated to grandparents (e.g., Feiler 2014).

Finally, the finding that home values serve as a powerful proxy measure of wealth gaps in education may be particularly important to help expand the research base and facilitate future research. Home value indicators are more easily collected than full-fledged asset survey modules and are often readily accessible through administrative or linked external data. For instance, drawing on home values to approximate wealth gaps in education may allow historical assessments of wealth inequality in education (e.g., based on the housing values reported on the publicly available 1940 U.S. Census), longer-term assessments of additional cohorts (e.g., based on the housing information consistently observed in the PSID since 1968), or detailed analyses of wealth gaps in college pathways based on administrative data held by colleges and states that also include the addresses of students' pre-college residence (for which external real estate data yield estimates of home values).

The documented role of home values in approximating wealth gaps in education, however, also goes beyond a measurement issue. It asks to what extent wealth effects on education are in fact asset effects, effects of housing quality (e.g., Lopoo and London 2016), and effects of the neighborhoods in which highly valued houses are located (Durlauf 2004; Sampson et al. 2002). The broad but largely separate literatures on each of these potential channels that link housing wealth to educational success urgently await integration.

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Appendix 1

Additional Tables

Table 4 Descriptive statistics

	Sample at Age 20			Sample at Age 25		
	All	Born in 1970s	Born in 1980s	All	Born in 1970s	Born in 1980s
Outcomes						
High school graduation	0.835	0.826	0.843			
	(0.371)	(0.379)	(0.364)			
College access	0.385	0.349	0.417			
	(0.487)	(0.477)	(0.493)			
College graduation				0.272	0.242	0.296
				(0.445)	(0.429)	(0.456)
Wealth						
Net worth (in 1,000s)	230.244	224.685	235.054	237.733	219.323	252.546
	(811.717)	(772.203)	(844.525)	(1010.358)	(718.188)	(1194.595)
Home value (in 1,000s)	139.352	134.739	143.343	140.311	136.857	143.09
	(182.387)	(183.552)	(181.312)	(178.012)	(170.352)	(183.933)
Home equity (in 1,000s)	75.973	84.267	68.797	75.807	83.599	69.538
	(136.089)	(143.552)	(128.882)	(128.888)	(121.996)	(133.873)
Financial assets (in 1,000s)	68.591	50.925	83.876	81.148	56.169	101.248
	(559.163)	(531.662)	(581.573)	(731.093)	(579.647)	(832.776)
Median wealth (by quintiles)						
Net Worth (in 1,000s)						

Table 4 (continued)

	Sample at Age 20			Sample at Age 25		
	All	Born in 1970s	Born in 1980s	All	Born in 1970s	Born in 1980s
Lowest quintile	0	0	0	0	0	0
	[–1277.9, 4.8]	[–932.3, 6.8]	[–1277.9, 4.3]	[–1277.9, 5.0]	[–932.3, 8.4]	[–1277.9, 3.3]
2nd quintile	21.3	25.6	18.4	22.9	29.7	16.8
	[4.9, 45.5]	[6.9, 47.9]	[4.3, 41.6]	[5.0, 46.1]	[8.5, 53.5]	[3.4, 40.0]
3rd quintile	73.3	76.5	71.4	75.8	79.9	69.7
	[45.6, 107.0]	[48.0, 103.8]	[41.7, 111.9]	[46.1, 110.7]	[53.6, 110.7]	[40.2, 108.1]
4th quintile	164.7	156.6	176.4	170.7	164.8	173
	[107.1, 269.6]	[105.0, 246.0]	[112.3, 284.6]	[110.9, 273.4]	[110.9, 269.9]	[109.6, 279.8]
Highest quintile	503.4	498.7	505.3	508.6	520.3	501.3
	[269.9, 26127.2]	[246.7, 20811.4]	[287.2, 26127.2]	[273.4, 26127.2]	[270.4, 20811.4]	[282.4, 26127.2]
Overall	75.1	78.3	70.4	76.8	84.6	67.2
Home Value (in 1,000s)						
Lowest quintile	0	0	0	0	0	0
	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]
2nd quintile	36.3	34.4	36.8	36.8	45.6	35.2
	[0.0, 64.0]	[1.4, 63.9]	[0.0, 64.0]	[0.0, 64.0]	[1.4, 72.7]	[0.0, 59.8]
3rd quintile	95.9	95.6	103.7	99.6	98.5	99.6
	[64.0, 128.1]	[64.0, 124.3]	[64.0, 142.3]	[64.1, 133.9]	[73.0, 125.5]	[60.8, 142.3]
4th quintile	170.7	159.8	185	172.1	162.5	185
	[129.5, 219.1]	[125.5, 194.0]	[143.7, 239.9]	[134.3, 223.9]	[127.8, 198.6]	[143.7, 239.9]
Highest quintile	320.1	306	343.8	334.6	306	351.8
	[219.9, 1912.2]	[195.0, 1912.2]	[241.9, 1912.2]	[225.6, 1565.1]	[199.7, 1242.9]	[241.9, 1565.1]
Overall	95.9	95.6	99.6	99.6	98.5	99.6

Table 4 (continued)

	Sample at Age 20			Sample at Age 25		
	All	Born in 1970s	Born in 1980s	All	Born in 1970s	Born in 1980s
Other SES						
Income (in 1,000s)	92.126	83.486	99.600	92.669	85.506	98.433
	(92.126)	(64.639)	(109.989)	(89.901)	(66.319)	(104.761)
Occupational status	485.380	469.368	499.232	488.751	480.698	495.231
	(233.664)	(234.642)	(231.968)	(233.896)	(232.850)	(234.583)
Parental education						
Less than high school	0.106	0.14	0.077	0.101	0.124	0.082
	(0.308)	(0.347)	(0.267)	(0.301)	(0.330)	(0.275)
High school	0.312	0.359	0.272	0.305	0.347	0.271
	(0.463)	(0.480)	(0.445)	(0.460)	(0.476)	(0.444)
Some college	0.295	0.258	0.327	0.297	0.262	0.325
	(0.456)	(0.438)	(0.469)	(0.457)	(0.440)	(0.469)
Bachelor's degree	0.286	0.243	0.324	0.297	0.267	0.322
	(0.452)	(0.429)	(0.468)	(0.457)	(0.443)	(0.467)
Demographics						
Female	0.491	0.482	0.499	0.486	0.475	0.495
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Family size	4.409	4.461	4.364	4.394	4.431	4.365
	(1.245)	(1.250)	(1.239)	(1.239)	(1.235)	(1.241)
Number of children in family	2.466	2.458	2.472	2.455	2.426	2.478
	(1.065)	(1.070)	(1.060)	(1.063)	(1.060)	(1.065)
Household head married	0.766	0.798	0.738	0.765	0.806	0.732
	(0.423)	(0.401)	(0.440)	(0.424)	(0.396)	(0.443)

Table 4 (continued)

	Sample at Age 20			Sample at Age 25		
	All	Born in 1970s	Born in 1980s	All	Born in 1970s	Born in 1980s
Mother's age	37.571	36.762	38.272	37.798	37.089	38.368
	(5.588)	(5.497)	(5.572)	(5.648)	(5.581)	(5.639)
Own household, age 20	0.213	0.205	0.220			
	(0.410)	(0.404)	(0.415)			
Own household, age 25				0.756	0.771	0.744
				(0.430)	(0.420)	(0.437)
N	5,025	2,334	2,691	4,344	1,799	2,545

Notes: Weighted using individual weights at age 20/25. Standard errors are shown in parentheses; quintile boundaries are shown in brackets.

Table 5 Wealth gaps in education: Rates and 95 % confidence intervals (CI)

	High School Graduation		College Attendance		College Degree		College Degree | Attendance	
	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI
Net Worth Quintile								
Lowest	0.7283	(0.6947, 0.7620)	0.2138	(0.1805, 0.2471)	0.0912	(0.0667, 0.1157)	0.2144	(0.1603, 0.2685)
2nd	0.7836	(0.7508, 0.8165)	0.3009	(0.2660, 0.3359)	0.1411	(0.1122, 0.1701)	0.2839	(0.2316, 0.3363)
3rd	0.8598	(0.8319, 0.8876)	0.3867	(0.3486, 0.4247)	0.2235	(0.1892, 0.2578)	0.3574	(0.3077, 0.4072)
4th	0.8923	(0.8682, 0.9165)	0.4887	(0.4494, 0.5280)	0.3643	(0.3246, 0.4039)	0.4808	(0.4334, 0.5282)
Highest	0.9113	(0.8887, 0.9338)	0.5352	(0.4956, 0.5748)	0.5372	(0.4948 0.5796)	0.6408	(0.5960 0.6856)
Home Value Quintile								
Lowest	0.7479	(0.7199, 0.7759)	0.2644	(0.2349, 0.2939)	0.1210	(0.0978, 0.1442)	0.2532	(0.2083, 0.2980)
2nd	0.7840	(0.7395, 0.8286)	0.2394	(0.1946, 0.2842)	0.0805	(0.0503, 0.1107)	0.1987	(0.1293, 0.2680)
3rd	0.8623	(0.8362, 0.8884)	0.3750	(0.3381, 0.4118)	0.2103	(0.1776, 0.2430)	0.3439	(0.2955, 0.3923)
4th	0.9004	(0.8769, 0.9239)	0.4783	(0.4394, 0.5172)	0.3861	(0.3456, 0.4266)	0.5021	(0.4550, 0.5493)
Highest	0.8993	(0.8754, 0.9233)	0.5605	(0.5206, 0.6003)	0.5505	(0.5080, 0.5929)	0.6436	(0.5990, 0.6883)
Home Equity Quintile								
Lowest	0.7561	(0.7297, 0.7825)	0.2728	(0.2444, 0.3012)	0.1275	(0.1050, 0.1499)	0.2620	(0.2194, 0.3046)
2nd	0.8383	(0.7943, 0.8824)	0.3135	(0.2558, 0.3712)	0.1654	(0.1157, 0.2151)	0.3379	(0.2484, 0.4274)
3rd	0.8464	(0.8183, 0.8744)	0.3765	(0.3394, 0.4135)	0.2122	(0.1793, 0.2451)	0.3460	(0.2976, 0.3944)
4th	0.8915	(0.8673, 0.9157)	0.4514	(0.4132, 0.4895)	0.3592	(0.3200, 0.3985)	0.4915	(0.4438, 0.5391)
Highest	0.8937	(0.8688, 0.9186)	0.5375	(0.4971, 0.5780)	0.5203	(0.4773, 0.5633)	0.6271	(0.5810, 0.6732)
Financial Assets Quintile								
Lowest	0.7094	(0.6745, 0.7444)	0.1901	(0.1599, 0.2203)	0.0726	(0.0517, 0.0934)	0.2037	(0.1490, 0.2584)
2nd	0.7875	(0.7553, 0.8196)	0.3129	(0.2773, 0.3484)	0.1447	(0.1153, 0.1742)	0.2722	(0.2215, 0.3229)
3rd	0.8618	(0.8349, 0.8887)	0.3957	(0.3567, 0.4347)	0.2597	(0.2225, 0.2968)	0.3655	(0.3168, 0.4142)
4th	0.9132	(0.8910, 0.9355)	0.5058	(0.4664, 0.5452)	0.3820	(0.3416, 0.4225)	0.5064	(0.4587 0.5541)
Highest	0.9080	(0.8855, 0.9304)	0.5258	(0.4865, 0.5651)	0.5085	(0.4664, 0.5507)	0.6270	(0.5814, 0.6726)

Table 6 Cohort changes in wealth gaps in education: Rates and 95 % confidence intervals (CI)

Net Worth Quintile	High School Graduation		College Attendance		College Degree		College Degree | Attendance	
	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI
Cohort Born 1970–1979								
Lowest	0.7090	(0.6525, 0.7654)	0.1848	(0.1342, 0.2353)	0.0649	(0.0342, 0.0957)	0.1780	(0.0983, 0.2577)
2nd	0.7606	(0.7054, 0.8157)	0.2766	(0.2221, 0.3310)	0.1616	(0.1063, 0.2168)	0.3407	(0.2444, 0.4370)
3rd	0.8216	(0.7756, 0.8676)	0.3237	(0.2649, 0.3826)	0.1951	(0.1401, 0.2501)	0.3211	(0.2365, 0.4058)
4th	0.9147	(0.8806, 0.9489)	0.4427	(0.3850, 0.5004)	0.3189	(0.2572, 0.3807)	0.4339	(0.3583, 0.5095)
Highest	0.9146	(0.8796, 0.9497)	0.5058	(0.4427, 0.5689)	0.4597	(0.3911, 0.5282)	0.5374	(0.4663, 0.6085)
Cohort Born 1980–1989								
Lowest	0.7443	(0.6904, 0.7982)	0.2377	(0.1887, 0.2868)	0.1115	(0.0728, 0.1502)	0.2362	(0.1643, 0.3081)
2nd	0.8036	(0.7598, 0.8474)	0.3220	(0.2704, 0.3736)	0.1253	(0.0820, 0.1687)	0.2434	(0.1700, 0.3168)
3rd	0.8917	(0.8578, 0.9256)	0.4393	(0.3820, 0.4966)	0.2463	(0.1957, 0.2970)	0.3851	(0.3159, 0.4543)
4th	0.8722	(0.8376, 0.9069)	0.5300	(0.4732, 0.5868)	0.4031	(0.3418, 0.4643)	0.5188	(0.4468, 0.5907)
Highest	0.9082	(0.8785, 0.9380)	0.5617	(0.5039, 0.6195)	0.6006	(0.5378, 0.6634)	0.7285	(0.6734, 0.7835)

Table 7 Cohort changes in controlled wealth gaps in education: Rates and 95 % confidence intervals (CI)

	High School Graduation		College Attendance		College Degree		College Degree | Attendance	
Net Worth Quintile	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI	Rate	95 % CI
Cohort Born 1970–1979								
Lowest	0.8260	(0.7720, 0.8799)	0.2965	(0.2215, 0.3716)	0.1574	(0.0929, 0.2219)	0.3018	(0.1800, 0.4237)
2nd	0.8172	(0.7677, 0.8668)	0.3242	(0.2667, 0.3818)	0.2221	(0.1595, 0.2847)	0.4046	(0.3076, 0.5015)
3rd	0.8342	(0.7894, 0.8790)	0.3297	(0.2732, 0.3862)	0.2005	(0.1498, 0.2511)	0.3262	(0.2467, 0.4056)
4th	0.8935	(0.8468, 0.9401)	0.3874	(0.3328, 0.4420)	0.2578	(0.2068, 0.3087)	0.4112	(0.3412, 0.4813)
Highest	0.8824	(0.8231, 0.9418)	0.3811	(0.3192, 0.4430)	0.3024	(0.2440, 0.3608)	0.4533	(0.3784, 0.5282)
Cohort Born 1980–1989								
Lowest	0.8059	(0.7532, 0.8586)	0.3496	(0.2802, 0.4191)	0.2778	(0.2107, 0.3448)	0.4477	(0.3534, 0.5420)
2nd	0.8078	(0.7626, 0.8531)	0.3858	(0.3291, 0.4425)	0.2270	(0.1675, 0.2865)	0.3482	(0.2640, 0.4324)
3rd	0.8788	(0.8407, 0.9169)	0.4370	(0.3843, 0.4898)	0.2721	(0.2256, 0.3186)	0.4242	(0.3602, 0.4883)
4th	0.8522	(0.8092, 0.8951)	0.4566	(0.3983, 0.5149)	0.3075	(0.2563, 0.3588)	0.4680	(0.4010, 0.5350)
Highest	0.8832	(0.8345, 0.9319)	0.4386	(0.3765, 0.5006)	0.3575	(0.3032, 0.4119)	0.5556	(0.4857, 0.6255)

Appendix 2

Effects of the Great Recession

Here I discuss how the vast changes in families' wealth during the Great Recession may have contributed to the changing wealth gaps in education presented here. Of course, the potential effect of the Great Recession on inequality in educational outcomes does not alter the description of trends provided here, but understanding whether these trends may be driven by a period effect rather than reflect a broader secular trend is of interest.

I first summarize findings on how the wealth distribution shifted during the last decades and then locate the two birth cohorts studied here within this timeline. I then hypothesize the ways in which the pre- and post-recession periods may have affected the observed trends.

Last, I note the results of a stability analysis that partly responds to a measurement concern related to wealth fluctuation around the Great Recession.

The Great Recession and Wealth

Pfeffer and Schoeni (2016) documented that wealth inequality has been rising for decades, particularly since the early 2000s and in the run-up to the Great Recession: relative increases at higher points in the distribution outpaced increases at lower points. Beginning with the crash of the housing market in late 2007, the Great Recession exerted a tremendous and lasting impact on the wealth distribution among U.S. households. Wealth grew even more unequal as lower points in the distribution incurred larger relative losses that were also more sustained through at least 2013. With that, the Great Recession's effects on wealth inequality extended far beyond its official end date of June 2009 (as set by the National Bureau of Economic Research).

The Great Recession intersects with the birth cohorts assessed here. For Cohort 1, born in the 1970s, educational attainment was assessed before the recession (given that they turned 25 between 1994 and 2004). In contrast, substantial macroeconomic fluctuation coincided with the educational career of some members of Cohort 2, born in the 1980s, who graduated from high school and, in most cases, made their college enrollment decision before the recession (having turned age 18 between 1998 and 2007), but some of those who ended up going to college or entertained the decision at a later point did so during the recession (having turned age 25 between 2005 and 2014).

Potential Effects of the Great Recession on Wealth Gaps in College Outcomes

Given this timing, the Great Recession's effects should be concentrated on the college outcomes of the second birth cohort, possibly in two ways.

First, the run-up period to the recession positively affected their college-going as the emerging housing bubble reduced credit constraints for college access (see Lovenheim 2011). This influx of home equity would have been most consequential for the homeowning middle class, whose wealth is chiefly concentrated in their homes, pushing toward a reduction of wealth gaps in college access compared with the earlier cohort. Conversely, the same students who enrolled in college thanks to an influx in

home equity were negatively affected by the bursting of the housing market bubble and the ensuing loss of available finances to sustain their further college careers (Johnson 2012), implying that decreasing gaps in college access may not have translated into decreasing gaps in attainment. At the same time, wealthier households were less affected by the recession because their wealth is typically less concentrated in housing and instead also includes significant financial wealth. After a period of substantial fluctuation, however, the stock market rebounded much more quickly than the housing market did, translating into less pronounced and less prolonged wealth losses at the top. These trends may have preserved the advantage of the wealthiest students in terms of college persistence and attainment.

Second, as is typical in any recession (Leslie and Brinkman 1987), the Great Recession may have driven more students into college to avoid weak labor markets (Long 2014), potentially contributing to smaller gaps in college access. However, to the extent that students who were induced to enroll in college only by a recession are less prepared for college or less motivated, corresponding increases in persistence and attainment may not follow.

In sum, broad economic forces at work before and during the Great Recession may have helped narrow the wealth gap in college access between the two cohorts studied here while maintaining or even increasing gaps in persistence. This possible direction of influence, of course, is very much in line with the actual trends documented earlier.

Stability Analyses

The tremendous fluctuation in parental wealth before and during the recession may also be considered a measurement challenge (and opportunity for further research) when studying wealth gaps in educational outcomes. In line with my analytical aims, I use a stability analysis that accounts for the fact that the wealth position of children during childhood (ages 10–14, as measured here) may differ from family wealth assessed closer to children's college enrollment decision.

Reanalyses of all presented models of college access and graduation based on wealth measures at age 18[16] produce substantively equivalent results (see Online Resource 1, section 4). As a reminder, wealth measures at age 18 were assessed before the Great Recession for all included individuals, so this stability analysis captures wealth fluctuation induced by the run-up to the recession.

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[16] Later ages would introduce endogeneity concerns because college attendance is expected to affect family wealth.

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