Broken Promise of College: New Educational Sorting Mechanisms for Intergenerational Association in the 21st Century

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Abstract

Previous studies have shown that intergenerational socioeconomic association becomes weaker as children's education level increases and is negligible among college graduates. A college degree is known as *the great equalizer* for intergenerational socioeconomic mobility. Recent studies, however, reported that the strong intergenerational association reemerges among advanced degree holders although it stays weak among BA-only holders. Despite the substantial theoretical importance and policy implications, the mechanisms behind the reemergence of the intergenerational association at the post-baccalaureate level have been less studied. In this paper, we examine the association between parents' education and children's earnings using the 2010, 2013, 2015, and 2017 National Survey of College Graduates data. Our results show that the strong intergenerational socioeconomic immobility among advanced degree holders is fully attributable to three educational sorting mechanisms: children from high-SES families (1) obtain expensive and financially rewarding advanced degrees, (2) attend selective institutions and major in hyper-lucrative fields of study such as law and medicine in graduate school, and (3) complete their education at a younger age and enjoy income growth over more years in the labor market. Implications of these findings are discussed.

Keywords: intergenerational social mobility, higher education, graduate education, vertical stratification, horizontal stratification

INTRODUCTION

Until the late twentieth century, studies of intergenerational social mobility suggested that the resemblance between parents' and children's socioeconomic status (SES) declines across children's educational levels and becomes virtually null among college graduates (Hout 1984, 1988). *The great equalizer* argument indicates that labor markets for college-educated workers are meritocratic (Breen and Jonsson 2007) and thus the expansion of higher education is expected to promote greater intergenerational social mobility. In her seminal study, however, Torche (2011) reported that intergenerational socioeconomic association (hereafter, intergenerational association) across children's schooling levels forms a U-shaped curve. The influence of family background on children's SES becomes weaker as level of education rises, reaches its weakest point at the BA level, but resurfaces at the graduate level.

The reemergence of intergenerational association among advanced degree holders has substantial theoretical importance and policy implications in the era of mass higher education. Nonetheless, the mechanisms behind the reemergence of intergenerational association at the post-baccalaureate level have been less studied. Horizontal stratification (i.e., distribution of institutional selectivity and field of study) among advanced degree holders, as well as labor market allocation and reward inequalities (i.e., occupational distribution and within-occupation inequality), are suggested as the likely processes (Torche 2011). Although descriptive evidence in her study seems to support these hypotheses, no prior study has examined whether these mechanisms actually account for the rise in intergenerational association at the graduate level net of other variables. Furthermore, even though these hypotheses provide invaluable insights, there remain two important questions. First, if upper-background children are able to apply horizontal stratification in their favor at graduate education, why do they not exploit the same strategy at the

undergraduate level? Second, why do labor market allocation and reward inequalities have effects only among advanced degree holders, not among those who have a BA only?

This paper is intended to fill this research gap and resolve the issues mentioned above. Relying on the rational choice framework (Breen and Goldthorpe 1997; Goldthorpe 2007), we hypothesized that strong intergenerational association reemerges because of educational choice strategies differentiated by family background. More specifically, the reemergence can be attributed to three educational sorting mechanisms: upper-background children are more likely than lower-background children to (1) obtain costly but financially rewarding advanced degrees (vertical selection), (2) major in less lucrative, yet culturally distinctive and enriching, fields of study such as the humanities and sciences while attending selective schools at the BA level, switching to hyper-lucrative fields such as law and medicine at the post-baccalaureate level (horizontal selection), and (3) complete their education at a younger age and thus benefit more from years of labor market experience after obtaining an advanced degree (early degree completion). Importantly, we do not assume dual processes between BA-only and graduate degree holders in educational choices and labor market allocations.

Using the 2010, 2013, 2015, and 2017 National Survey of College Graduate datasets, we examine the association between parents' education and children's earnings. Because the key issue is the reappearance of stronger intergenerational association at the graduate level, this study focuses on the differences between those who obtained a BA only and advanced degree holders. Our empirical results show that the three educational sorting mechanisms we posited fully account for the reemergence of the strong intergenerational association among advanced degree holders.

THEORETICAL REVIEWS

The stratification literature highlights the increasing importance of educational attainment in social stratification through industrialization and economic development (Blau and Duncan 1967; Featherman and Hauser 1978; Sewell and Hauser 1975; Treiman 1970). If children from low-SES families achieve a higher level of educational attainment, they can reach socioeconomic parity with children from high-SES families (Breen and Jonsson 2007; Hout 1984, 1988). Hout (1984, 1988) showed that the socioeconomic association between parents and children becomes weaker across children's schooling levels and is nonsignificant among those holding a college degree. The weak intergenerational association among more educated children is noticeable not only in the United States but also in other industrialized countries (Breen and Jonsson 2007; Breen and Luijkx 2007; Vallet 2004). Hout (1988) suggested that a college degree enables children from low-SES families to overcome their disadvantages. Because of these characteristics, a college degree is known to be *the great equalizer*. The expansion of higher education seems to promise equal opportunity for everyone.

The Puzzle: The U-shaped Pattern of Intergenerational Association

Despite the promise of a college degree, scholars have continued to investigate the possibility that postsecondary educational expansion/stratification increases educational inequality among college goers (Arum, Gamoran, and Shavit 2007; Boliver 2011; Charles and Bradley 2002; Davies and Guppy 1997; Gerber and Cheung 2008; Goyette and Mullen 2006; Posselt and Grodsky 2017). As organization theory suggests (Blau 1970), the expansion of the education system has been accompanied by institutional differentiation. Variations in the type of degree, field of study, and selectivity of institutions reflect the institutional differentiation in higher education (Arum et al. 2007; Baker 2014; Davies and Guppy 1997; Gerber and Cheung 2008). Within this differentiated education system, individual students experience differences in

educational quantity and quality after entering college (Andrade and Thomsen 2017; Sullivan et al. 2017).

Over the last century, the U.S. higher education system has undergone remarkable institutional expansion (Arum et al. 2007; Baker 2014; Cohen 2010; Goldin and Katz 2009; Posselt and Grodsky 2017). This expansion has not been limited to the bachelor's degree. The expansion of graduate education beyond the bachelor's degree implies further educational stratification, which could have led to a new mechanism of intergenerational association. Nevertheless, previous studies of intergenerational social mobility have aggregated BA and diverse advanced degree into a single category. This is in part because of the lack of large datasets having detailed information on graduate education.

By utilizing multiple datasets, Torche (2011) was able to disaggregate postsecondary educational degrees into BA-only and graduate levels and examined the pattern of intergenerational association between parents' and children's SES across children's educational levels. She reported that intergenerational association declined up to the baccalaureate level but, unexpectedly, reemerged at the post-baccalaureate level. That is, the intergenerational association pattern is U-shaped across children's schooling levels. Torche (2011, 2016) demonstrated that the U-shaped pattern appears with various measures of intergenerational association, including class mobility, occupational status mobility, hourly earnings mobility, and family income mobility. Falcon and Bataille (2018) replicated the U-shaped pattern of intergenerational association between family background and children's schooling level in France.

Torche (2011) suggested that the reemergence of the intergenerational association for graduate-level education is a result of two mechanisms: horizontal stratification in education and occupational allocation and reward inequality in labor markets. She did not test these with

statistical models. Instead, she provided very informative, yet at best circumstantial, descriptive statistics. This might be because the datasets she utilized do not have enough information and the sample of advanced degree holders is not big enough for multivariable analyses. Torche demonstrated that there is horizontal stratification by family background among advanced degree holders, whereas there is no such stratification among BA-only holders. Upper-background children are more likely to choose lucrative majors in graduate school, such as business, law, and medicine, and they are more likely than their lower-background counterparts to attend a selective private institution. The pronounced horizontal stratification among advanced degree holders sounds like a plausible explanation. However, it raises the question of why upper-background families do not adopt the same strategy of horizontal stratification for undergraduate education. The second mechanism Torche suggested consists of two labor market processes: differentiated occupational allocation and the within-occupation earnings gap. She contended that "occupational allocation is strongly patterned by family origin, with upper-class background graduates much more likely to hold more lucrative managerial jobs than their less advantaged counterparts" (Torche 2011:799). As clearly noted in her paper, the labor market hypotheses are drawn from the literature of ascriptive labor market inequality.

Occupational distribution differentiated by family background among advanced degree holders is an informative finding. Nevertheless, there are two problems with the argument that this finding suggests. First, the reason why the labor market for advanced degree holders resembles ascriptive labor market inequality whereas the labor market for BA-only holders is meritocratic is unclear. Enhanced social capital among advanced degree holders is, in our view, a weak rationale for the segmented labor market argument. Second, there is the possibility that occupational allocation inequality is a simple reflection of differences in field of study. As is

well known, the occupational distribution is closely related to choice of major (Altonji, Blom, and Meghir 2012; Lemieux 2014; Morgan, Gelbgiser, and Weeden 2013; Robst 2007).

Three Mechanisms for the Right Side of the U-Curve

To address the concerns raised above, we suggest three potential educational mechanisms that can lead to the reemergence of strong intergenerational association beyond the undergraduate level. The broad premise of our argument is that parents and children adopt different educational strategies according to their social background (Breen and Goldthorpe 1997; Goldthorpe 2007). We assume that given differentiated resource constraints, upper-background children are more likely to choose longer-term, more ambitious, and more academically-focused courses whereas lower-background children are more sensitive to their chances of success in the labor market, and thus they are more likely to develop educational strategies that avert the risk associated with educational investment (Goldthorpe 2007).

Vertical Selection

Graduate education consists of different educational programs. Although it is not as stratified as the difference between the BA and graduate levels, there is vertical stratification across graduate educations. MA holders, on average, have lower earnings than other advanced degree holders, whereas MBA or other professional degree holders tend to enjoy higher returns from their education, often more than PhD holders (Day and Newburger 2002; Hersch 2014; Posselt and Grodsky 2017). We suspect that the vertical stratification in graduate education is related to the strong intergenerational association among advanced degree holders. The vertical stratification mechanism is relevant to the Maximally Maintained Inequality (MMI) theory (Raftery and Hout 1993). As the higher education system has expanded, high-SES families have strategically maintained the relative superiority of their children by expanding educational

quantity. However, the vertical stratification process is more complex than the simple expansion of upper-background children's education quantity.

Because educational decisions depend on the individual's evaluation of costs and benefits (Breen and Goldthorpe 1997), the likelihood of obtaining a more financially rewarding advanced degree varies by socioeconomic background. The post-baccalaureate transition to a more lucrative advanced degree requires more years of education (e.g., sociology PhD versus sociology MA), more expensive tuition (e.g., MBA versus MA in humanities), and more training after acquisition of the degree (e.g., MD versus business PhD).The tuition fees for profit-guaranteeing professional degree programs (e.g., law school and medical school) are high. High-SES families are able to financially support their children's postsecondary education (Rauscher 2016) but their peers from middle/low-SES families are more likely to need a loan or rely on other funding sources (Choy and Bradburn 2008; Houle 2014; Quadlin 2017). These high educational costs create a greater risk for students in need of a loan. As a result, children from high-SES families are more likely to choose a graduate program that is expensive and time-consuming but also financially rewarding (Mullen, Goyette, and Soares 2003), whereas students from low-SES families are more likely to choose two other types of program: a program that is less financially rewarding but comes with offers of financial aid such as a teaching or research assistantship, or a program requiring less training time so that compensation from the educational investment occurs relatively quickly. In any case, the variety in the type of graduate degree is associated with the U-shaped pattern. We call these processes vertical selection (Hypothesis 1: vertical selection).

Horizontal Selection

Agreeing with Torche (2011), we also hypothesized that two horizontal stratification processes, institutional selectivity and field of study, are important factors for the reemergence of

intergenerational association at the graduate level. Horizontal stratification as a strategy for maintaining the advantage of upper-background children is hypothesized by the Effectively Maintained Inequality (EMI) theory (Lucas 2001, Sullivan et al. 2017). Upper-background children benefit not only by expanding education quantity but also by improving educational quality.

Institutional selectivity is presumed to be relevant to the U-shaped curve because students from low-SES families are less likely than their counterparts from high-SES families to obtain their degree from a selective institution (Flint 1992; Gerber and Cheung 2008; Hoxby and Avery 2013; Posselt and Grodsky 2017). A problem is that stratification by institutional selectivity is not unique to graduate education. The selectivity of institutions at the undergraduate level is also sharply stratified by social origin (Hersch 2014). That is, institutional selectivity alone cannot explain why intergenerational association among bachelor's degree holders is negligible, whereas it is strong among graduate degree holders.

The next element of horizontal stratification is field of study. It is a well-known fact that the economic returns from higher education vary depending on field of study (Kim, Tamborini, and Sakamoto 2015; Rumberger and Thomas 1993). College graduates majoring in business, law, or medicine, as well as in science, technology, engineering, or mathematics (STEM), obtain better labor market outcomes on average than those holding degrees in arts/humanities, education, or social science (Gerber and Cheung 2008).

Unlike the case with institutional selectivity, there is an important twist with regard to horizontal stratification by field of study. Previous studies (Davies and Guppy 1997; Davis 1965; Goyette and Mullen 2006) reported a negative correlation between parental SES and the likelihood of choosing a vocational field of study at the baccalaureate level. Undergraduate students with a low-SES background tend to choose a more vocational field of study, which

helps them attain a high-paying job. In contrast, children of high-SES parents are more likely to choose a non-vocational field of study, such as arts and sciences, which increases their likelihood of advancing to graduate school (Goyette and Mullen 2006).

In fact, this twist is related to the first mechanism discussed above. Because students from low-SES families are less likely to pursue an advanced degree, they may regard their undergraduate major as their main instrument for socioeconomic success in the labor market (Davies and Guppy 1997; Davis 1965). Contrary to this, upper-background students may regard undergraduate education as a stepping stone toward post-baccalaureate education. Upper-background children tend to major in liberal arts or sciences, fields associated with high levels of academic knowledge and intellectual skills, thereby increasing their chances of entering graduate school (Goyette and Mullen 2006). This difference in the preference of field of study by family background might conceal the substantial intergenerational association at the baccalaureate level. We suspect that the intergenerational association at the baccalaureate level would emerge if field of study were controlled, because differentiated preferences function as a suppresser of intergenerational association at the BA level.

At the post-baccalaureate level, upper-background students may utilize their advantage by choosing an expensive but financially lucrative field of study (e.g., law or medicine). The high tuition costs and the lack of other financial support to study in these financially lucrative fields in graduate school discourage lower-background children from applying, whereas the same conditions work in favor of upper-background children. The second hypothesis of this study, thus, attributes the strong intergenerational association among advanced degree holders to different choices of field of study and institutional selectivity by family background. That is, upper-background children major in a non-vocational field of study at the BA level and a hyper-lucrative field of study at the post-baccalaureate level and attend selective institutions, whereas

children from lower backgrounds major in a vocational field of study at the BA level (Hypothesis 2: horizontal selection).

Early Degree Completion and More Work Experience

In addition to horizontal stratification in education, two labor market processes, allocative inequality and within-occupation reward inequality, have been proposed as potential mechanisms behind the strong intergenerational association among advanced degree holders. An important question here is how these labor market processes can result in stronger intergenerational association among advanced degree holders, whereas it does not have the same consequence for BA-only holders.

Occupational allocation is closely associated with choice of field of study. Unless field of study is controlled, occupational allocative inequality could be a reflection of educational stratification rather than of a labor market process. As for within-occupation reward inequality, we pay attention to variation in the timing of degree completion. The age at which the highest educational degree is conferred is highly correlated with the age at entering the labor market. Those who complete their degree at a younger age accumulate more years of labor market experience, which leads to a higher earnings premium at the same age (Taniguchi 2005). We suspect that the benefit from early degree completion is greater for advanced degree holders, because age of completing graduate education varies more than that of completing undergraduate education, and the annual income growth rates for advanced degree holders are steeper than those for BA-only holders (Day and Newburger 2002; Tamborini, Kim, and Sakamoto 2015).

Although the number of older college students has increased, the majority of college graduates begin their undergraduate education right after high school graduation and obtain a bachelor's degree before age 25 (Jacobs and King 2002; Taniguchi and Kaufman 2005). Contrary to this, the time needed to earn an advanced degree varies depending on socioeconomic

family background (Goldrick-Rab 2006). Students from low-SES families are more likely to work after BA completion, save money for further education, and go back to school to obtain a graduate degree, rather than advance to a graduate program right after college. In contrast, students from high-SES families advance to graduate school without the gap years. Thus, they complete their education at a younger age, and they have more years of post-graduate-degree work experience than their lower-background counterparts of the same age.

Thus, our last hypothesis attributes the strong intergenerational association among advanced degree holders to early degree completion by children from high-SES families (Hypothesis 3: more years of work experience after degree completion). On the surface, this looks like a labor market process (i.e., within-occupation reward) but it is in fact part of the educational stratification process.

ANALYTIC STRATEGY

To examine the three hypotheses, we utilize data from the 2010, 2013, 2015, and 2017 National Survey of College Graduates (NSCG). The NSCG, a nationally representative survey of individuals who attained at least a bachelor's degree, provides information on both parents' education, specific degree type in post-baccalaureate education, type of institution, field of study, and earnings. No other available datasets provide such extensive information on graduate education from large enough samples to test our hypotheses.

We limit our sample to respondents between 35 to 54 years of age to encompass the primary working ages after completion of graduate education.[1] Only positive earners are selected. A small number of cases for which parents' education information is not available are dropped. The

[1] The average age of degree completion for an MA is around 31 years, and for a PhD it is about 33. A sensitivity analysis using samples of ages 30 to 59 yield very similar results.

final sample sizes for the combined multi-year NSCGs are 54,567 for men and 45,056 for women. Among these, 23,327 men and 23,338 women have an advanced degree.

Main Dependent and Independent Variables

For our measure of children's outcomes we focus on earnings because that is the most reliable socioeconomic measure that the NSCG datasets offer. Cross-sectional earnings have greater predictive power of lifetime earnings than any other socioeconomic variable (Brady et al. 2018; Kim, Tamborini, and Sakamoto 2018). Detailed occupation might also be a good proxy for lifetime earnings (Erikson, Goldthorpe, and Portocarero 1979; Featherman and Hauser 1978; Hauser and Warren 1997; Weeden and Grusky 2005), but the occupational measures of the NSCG are uniquely coded and hardly comparable with those used in other research.

The lack of earnings information about parents in many datasets can be a methodological problem for studies on intergenerational social mobility (Jerrim, Choi, and Simancas 2016). However, the U-shaped pattern of intergenerational association has been studied using a variety of measures. Torche (2011, 2016) examined intergenerational association using personal earnings, family income, wealth, and occupational standing. Falcon and Bataille (2018) and Wakeling and Laurison (2017) studied intergenerational association using parents' social class (measured by the Erikson-Goldthorpe-Portocarero (EGP) or a modified EGP classification) and children's educational achievement. Although not frequently used, the intergenerational association between parents' education and children's socioeconomic status has been studied as well (e.g., Pfeffer and Hertel 2015).

The NSCG does not provide information on family income when the respondents were young, but it does provide parents' schooling levels. In this study, we examine intergenerational inheritance using the association between parents' education and children's earnings. Given that we assume rational yet differentiated educational choices by family background, parents'

education is a good, if not better than family income, measure of family background. Parents' education shapes their children's educational aspirations and choices (Breen and Goldthorpe 1997; Lareau 1989; Mullen et al. 2003), probably more so than parents' income. Furthermore, parents' education might be a better measure of their child's long-term earnings (or implicitly the socioeconomic status of the respondents' families when they were young) than single digit occupation, EGP classification, or average years of education by detailed occupation (Kim, Tamborini, and Sakamoto 2018).

We use the highest number of years of schooling completed by either parent as the main independent variable.[2] We check the sensitivity of our results by estimating our models using each parent's schooling. As an additional sensitivity check, we test our models using predicted family income at age 13, applying the two-sample two-stage least square (TS2SLS) technique, as we discuss later.

Statistical Models

We start from a base model that does not control for the variables related with the three mechanisms and move to the full model to estimate the effect of each mechanism by adding relevant covariates on top of the base model. Equation (1) shows our base model:

$$lnY = \alpha + \beta P + X'\delta + \varepsilon, \quad (1)$$

where lnY is an indicator of the log-transformed, inflation-adjusted, annual earnings of the child. P refers to parents' schooling years. Thus, β quantifies the expected change in the log-transformed child's earnings as parents' schooling year increases by one year. X is a vector of demographic variables and survey-year dummies. The demographic variables are age, age-squared, race/ethnicity (white, black, Hispanic, Asian, other), marital status (currently married,

[2] The seven educational categories of the NSCG were recoded into schooling years as follows: less than high school = 9, high school diploma = 12, some college = 14, BA = 16, MA = 18, professional degree = 20, and PhD = 22. Slight changes in the recoding procedure do not alter our results.

not married), and having children. We estimate our models separately for BA-only and advanced degree holders to fully account for the different impacts of control variables on the two groups.[3] Thus, if the right side of the U-shaped pattern is replicated, β for bachelor's degree holders (hereafter, β_{BA}) is statistically zero whereas β for advanced degree holders (hereafter, β_{Ad}) is statistically significantly positive.

Next, we evaluate the three hypothetical mechanisms by estimating how much the βs are changed by adding the relevant covariates (V, H, and C) to the right side of Equation (1), as follows:

$$lnY = \alpha + \beta P + X'\delta + (V'\zeta) + (H'\eta) + (C'\theta) + \varepsilon, \quad (2)$$

where V refers to a vector of dummy variables for type of advanced degree: MA, MBA, PhD, or other professional degree. One thing we hasten to add before discussing our models further is that we do not aim to demonstrate causality here. Instead, we focus on how much intergenerational association remains net of potential mechanisms. If vertical selection is responsible for the strong intergenerational association among advanced degree holders (Hypothesis 1), β_{Ad} should be substantially decreased by adding V. For the models for bachelor's degree holders, we omit V because there are not multiple degree types, by definition.

To evaluate the horizontal selection mechanism, H, a vector indicating field of study and institutional selectivity, is added. Field of study is measured by the ten majors: art/humanities, social science (= reference), business, law, science, engineering, math, computer science, medicine, and other.[4] Institutional selectivity is classified as five tiers: private/research I and II,

[3] When we estimated models using a sample combining BA-only and advanced degree holders, the results are almost identical with what we report here.

[4] To check whether the degree of disaggregation of field of study matters, we did sensitivity analyses using 31 and 144 fields of study. These analyses yielded basically the same results as those we report here.

private/liberal arts I, public/research I, other four-year universities (= reference), and specialized institutions (cf. Hersch 2014). For advanced degree holders, institutional tiers at both the undergraduate and graduate levels are included in our models.

If the stronger intergenerational association among advanced degree holders is attributable to upper-background students majoring in a hyper-lucrative field of study at the graduate level (Hypothesis 2), β_{Ad} should decrease by controlling for field of study. Contrary to this, β_{BA} should increase with control of field of study, because students from low-SES families major in a vocational field at the undergraduate level, whereas students from high-SES families major in less-lucrative fields for the BA.

In Equation (2), C refers to age at degree completion. Because age and age-squared at the time of the survey are controlled for, the coefficient of age of degree completion is indistinguishable from the effect of potential years of work experience, which is defined as the difference between the year of the highest degree completion and the survey year. We expect that age at degree completion would account for part of the intergenerational association (Hypothesis 3).

If the three mechanisms fully account for the reemergence of strong intergenerational association at the post-baccalaureate level, both β_{Ad} and β_{BA} should become non-significant in our full model. Throughout our analyses, we test the statistical significance of the differences in βs between the base model and the additional models, applying the KHB-method (Karlson, Holm, and Breen 2012).[5] Person weights are applied to adjust for differences in the probabilities of sample selection. We estimate all the models separately for men and women.

[5] The KHB method was developed mainly to compare the estimated coefficients between two nested non-linear probability models. However, it can be easily applied to linear models (Breen, Karlson, and Holm 2013; Karlson et al. 2012).

EMPIRICAL FINDINGS

Educational Stratification and Earnings Disparities by Family Background

Tables 1 and 2 show how children's educational achievement and labor market earnings vary by parents' education for men and women respectively. Children of highly educated parents are more likely than children of less educated parents to obtain a lucrative graduate degree at an upper-tier institution and more likely to earn a degree at a younger age. Children of highly educated parents are also more likely to choose a liberal arts major and less likely to choose a business major for their undergraduate degree. Interestingly, when they advance to graduate school, the children of highly educated parents are not more likely than the children of less educated parents to concentrate in arts/humanities or social science. Instead, the proportion of arts/humanities or social science majors is higher among the children of less educated parents. In graduate school, the children of highly educated parents are more likely than the children of less educated parents to choose professional fields such as law and medicine. As for labor market earnings, the children of highly educated parents earn more than the children of less educated parents. The higher earnings of the children of highly educated parents are more conspicuous among advanced degree holders than among BA-only holders. These tendencies are evident for both men and women.

[Table 1 and 2 around here]

What Mechanisms Explain the Puzzle of the Right Side of the U-curve?

We start our multivariable analyses by examining whether the upswing of the intergenerational association among advanced degree holders compared to BA-only holders that Torche (2011) reported is replicated with our datasets. As shown in Table 3, for Model 1, which controls only for demographic variables and survey year dummies, the coefficients of parents'

education are for both genders statistically zero for BA-only holders, whereas they are positive and statistically significant for advanced degree holders. Among advanced degree holders, for each 1-year increase in parents' schooling, earnings rise by 2.4% for sons and 1.2% for daughters. This upswing, the right side of the U-curve, is steeper for men than for women. As this upswing is so apparent in our data, we now examine whether the three hypothetical educational mechanisms can explain the upswing.

[Table 3 about here]

Model 2 tests the vertical selection hypothesis by controlling for degree type. Compared to Model 1, the coefficient for male advanced degree holders declines from 0.023 to 0.012, a 47% reduction, although the coefficient for parents' years of schooling is still statistically significant. The coefficient for female advanced degree holders declines just as substantially, from 0.012 to 0.002, an 85% decline. The coefficient for female advanced degree holders becomes non-significant when holding type of advanced degree constant. The strong intergenerational association among advanced degree holders is, thus, at least partially accounted for by the greater likelihood that the upper-background children obtained an expensive and financially rewarding advanced degree. These results support Hypothesis 1 (vertical selection).

Models 3 (field of study) and 4 (selectivity of institution) estimate the explanatory power of horizontal stratification. After controlling for field of study in Model 3, compared to Model 1, the coefficient of parents' education increases considerably (88.5%) for BA-only men and becomes statistically significant. This suggests that the weak intergenerational association among BA-only holders is due to the negative correlation between family background and the likelihood of selecting a financially lucrative undergraduate major. The difference in intergenerational association between BA-only and graduate degree holders is negligible in Model 3. Net of field

of study, the extent to which parents' education and children's earnings are associated is not different between BA-only and graduate degree holders.

Unlike the effect of field of study, the control of institutional selectivity in Model 4 reduces the coefficient of the parents' education among BA-only holders. That is, the two educational horizontal stratification mechanisms drive the intergenerational association among BA-only holders, but in opposite directions. The effects of field of study and institutional selectivity seem to cancel each other out at the undergraduate level. The trade-off between the two horizontal stratification mechanisms accounts for the weak intergenerational association among BA-only holders.

In contrast to bachelor's degree holders, for advance degree holders both field of study and institutional selectivity attenuate the association between parents' education and children's earnings. The explanatory power of institutional selectivity is particularly strong. It accounts for 63% of the coefficient of the parents' education for male advanced degree holders and 65% for the females. Overall, these results are consistent with Hypothesis 2 (horizontal selection).

Next, we examine whether age at degree completion mediate the association between parents' education and children's earnings. Age at degree completion reduces the coefficients of parents' education, not only for graduate degree holders but also for BA-only holders. This result partially supports Hypothesis 3 (early degree completion and longer work experience). This result provides a partial explanation for the relation between the within-occupational earnings gap and family background that Torche (2011) suggested.

Finally, when all three mechanisms are added together in Model 6, the coefficients of the parents' education are neither substantially nor statistically significant for any of the educational groups, regardless of gender. The coefficients of parents' education in Model 6 are almost identical for both levels of education and for both genders. The three mechanisms fully account

for the strong intergenerational association among graduate degree holders. It is worth noting that control of the first two mechanisms, vertical selection and horizontal selection, does not fully account for the influence of parents' education (results not shown here). Only when all three mechanisms are added simultaneously does the difference in the coefficients of parents' education between the two educational levels disappear. As marked by dagger signs in Table 3, the differences between Model 1 and Model 6 in the coefficients of parents' education for graduate degree holders are statistically significant for both genders.

Intergenerational Association by Type of Advanced Degree

Table 3 shows that in Model 2 the type of advanced degree explains a substantial portion of the strong intergenerational association among graduate degree holders. We now turn our attention to the differences in intergenerational association by graduate degree type. Table 4 shows the results before and after controlling for field of study, institutional selectivity, and age of degree completion for each degree type.

[Table 4 about here]

The coefficients of parents' education are statistically significant for male MA, PhD, and professional degree holders, but not for MBA holders. Intergenerational association is particularly strong for male professional degree holders. Net of horizontal selection and age of degree completion, the coefficient of parents' education is still significantly positive for male professional degree holders whereas those for MA and PhD are virtually zero. To investigate whether occupational allocation can explain this, we test models (not shown here) controlling for occupation in addition to the covariates of Model 2. There are no meaningful changes.[6] For

[6] Probably because the occupational coding of the NSCG is closely linked to field of study, controlling occupation may not have reduced the coefficients of intergenerational association. Besides occupation, we also control for employment sector, size, new business in the previous 5 years, and linear/quadratic tenure, finding that these additional control variables did not change the results.

women, the coefficient of parents' education is significant only for professional degree holders in Model 1. When horizontal selection and age of degree completion are controlled for, no degree types exhibit a positive association between parents' education and children's earnings.

Interestingly, the coefficients of parents' education become negative for male MBA and female PhD holders in Model 2. Occupational allocation does not help in accounting for these cases. The negative coefficient for male MBA holders could be because of the positive selection of the lower-background children into MBA programs. MBA programs are relatively short in duration and are often financially supported by employers if the employee exhibits great managerial potential and commitment. This makes the financial barrier faced by lower-background children lower for MBA programs than for other graduate programs. In any case, our results pose new puzzles regarding the variation in intergenerational association across degree types. Further research in this line of study is warranted.

Robustness Checks

[Table 5 about here]

We use the highest year of schooling completed by either parent as our main independent variable. To check whether our results are sensitive to how we measure parents' education and family background, we reestimate the models of Table 3 using father's years of schooling, mother's years of schooling, a dummy indicating that at least one parent has a BA degree, and predicted family income at age 13[7]. As shown in Table 5, the results are remarkably similar to

[7] For this analysis, we apply the two-sample two-stage least squares technique. First we estimate predicted family income based on six characteristics: father's years of schooling, mother's years of schooling, children's birth year, gender, race/ethnicity, and high school region, using the 1970, 1980, and 1990 Census datasets. Second, we imputed the match of the log-predicted family income to the NSCG data with respect to these six characteristics, and then we assess the association between family income at age 13 and children's earnings. The issue of smaller standard errors related to the generated regressor is addressed by applying the Murphy-Topel method (Murphy and Topel 1985).

what we report in Table 3. The association between parents' SES and children's earnings is null among BA-only holders whereas it is statistically significantly positive among graduate degree holders. When type of advanced degree, field of study, institutional selectivity, and age at degree completion are taken into account, the strong intergenerational association among advanced degree holders disappears. In addition, we reestimate our models by age group. The results for the two age groups (not shown here, but available upon request) are similar. The intergenerational association is stronger among graduate degree holders, but it becomes zero net of all three mechanisms.

DISCUSSION

College has been thought to be *the great equalizer*, attenuating the association between parents' and children's SES (Hout 1984, 1988). Once children from a lower family background advance to college, family socioeconomic background does not appear to affect their socioeconomic status (Breen and Jonsson 2007; Hout 1984, 1988; Mare 1980; Raftery and Hout 1993). Recent studies (Falcon and Bataille 2018; Posselt and Grodsky 2017; Torche 2011, 2018; Wakeling and Daniel Laurison 2017), however, have found that a strong intergenerational association reemerged at the graduate level. In this study, we examined the mechanisms that account for the upswing in intergenerational association at the graduate level.

Our empirical results show that the reemergence of intergenerational association between parents' education and children's earnings at the post-baccalaureate level can be fully accounted for by three educational sorting mechanisms: children of highly educated parents (1) obtain an expensive and financially rewarding advanced degree such as a PhD or other professional degree (vertical selection), (2) major in a hyper-lucrative post-baccalaureate field of study such as law or medicine while a attending a selective institution (horizontal selection), and (3) complete their

education at a younger age and enjoy earnings growth over more years of labor market experience (early degree completion and greater work experience).

These results shed new light on the educational stratification theories. Consistent with the MMI theory (Raftery and Hout 1993), because of the first mechanism (i.e., vertical selection) students raised in high-SES families (measured by parents' education in this study) enjoy an advantage in post-baccalaureate educational transitions. Because the decision to make an educational transition depends on the individual's evaluation of the costs and benefits (Becker 2003; Breen and Goldthorpe 1997), high-SES families have a greater financial capacity to support their children's graduate education. Graduate students supported by their family are more likely to obtain an expensive but lucrative advanced degree.

As the EMI theory implies (Lucas 2001), educational expansion enhances horizontal stratification in higher education (Arum et al. 2007; Gerber and Cheung 2008). However, horizontal stratification does not linearly evolve to the benefit of upper-background children. One of the unique contributions of this paper is to show that horizontal stratification functions differently at the undergraduate and graduate levels. At both educational levels, students from high-SES families are more likely to earn a diploma offered by a selective institution, which leads to better economic returns (Gerber and Cheung 2008; Posselt and Grodsky 2017). At the undergraduate level, however, students from low-SES families tend to select a vocational field of study (Davies and Guppy 1997; Davis 1965; Goyette and Mullen 2006). Because they are less likely to pursue an advanced degree, students from low-SES families may regard their undergraduate major as a crucial instrument for upward mobility in the labor market (Davies and Guppy 1997; Davis 1965). The selection of a vocational field of study by students from low-SES families offsets the effects of institutional selectivity at the baccalaureate level. Meanwhile, students raised in high-SES families strategically choose non-vocational fields of study, such as

arts/humanities and science, for their undergraduate education, which increases their chances of entering graduate school (Goyette and Mullen 2006). When they enter graduate school, they are more likely to major in an expensive but lucrative field of study, such as law or medicine.

This difference in horizontal stratification between undergraduate and graduate school implies that horizontal stratification is entwined with vertical stratification in higher education. Both upper- and lower-background students seem to make educational choices strategically to maximize the benefits. Given the gap in available resources as a function of family background, these seemingly rational choices lead to the reemergence of intergenerational association at the graduate level. Thus, the U-curve pattern is a result of rational and adaptive educational strategies differentiated by family background.

To check whether the differentiated strategic choices discussed above are empirically evident further, we classify fields of study into less lucrative and more lucrative based on average earnings, and college types into less selective and more selective. Then we track the choice patterns across undergraduate and graduate education. Table 6 shows the results. Among BA-only holders, children of less educated parents are more likely to choose more lucrative majors than less lucrative majors (58% vs. 42%), whereas children of highly educated parents are more likely to choose less lucrative majors than more lucrative majors (52% vs. 48%). A similar choice pattern is evident for women. For the children of less educated parents, the most common pattern is to choose a lucrative (or vocational) undergraduate major and enter the labor market without any graduate major.

Among male advanced degree holders, the children of less educated parents are more likely to stay in a less lucrative field in graduate school if they choose a less lucrative major for the BA. Contrary to this, the children of highly educated parents tend to switch to a more lucrative field in a graduate school even though they have majored in a less lucrative field for the BA. Among

female advanced degree holders, the choice of a less lucrative BA major followed by a less lucrative graduate major is the most common pattern, regardless of family background. Nonetheless, the switch from a less lucrative BA major to a more lucrative graduate major is more frequent among children of highly educated parents than among children of less educated parents.

[Table 6 around here]

We argue that the weak intergenerational association for BA-only holders and the strong intergenerational association for advanced degree holders are not the results of two different processes, but they are the flip side of the same process, sequences of strategic choices differentiated by family background. A key determinant is available resources. Given their limited resources, lower-background students attempt to obtain a stable and solid-income job by choosing for the BA a vocational field of study that confers occupationally oriented concrete skills (Goyette and Mullen 2006). On the other hand, upper-background students aim to not only gain occupational skills but also enhance their cultural capital through their undergraduate education. Less lucrative but entertaining and enriching undergraduate majors are affordable mainly for upper-background children. Students at institutions requiring a large proportion of courses in arts and science fields tend to acquire greater academic knowledge and better intellectual skills, such as critical thinking and writing (Dressel and Mayhew 1954; Forrest 1982). These enable them to proceed to graduate school, earn a higher-level advanced degree such as a law or medical degree, and eventually get a hyper-lucrative professional job. Since upper-background children are more likely to be non-first-generation college students (Pascarella et al. 2004; Terenzini et al. 1996), their college-educated parents help them navigate the strategic practices in higher education “in the form of familiarity with high culture, sophisticated use of

verbal and written language, and confidence in their broad knowledge of history, culture, and politics" (Goyette and Mullen 2006:525–26).

Then, why has the difference in the sequence of strategic choices as a function of family background become more prominent recently? We suspect that privatization in higher education plays a role. Since the 1980s, massive private funding has fueled postsecondary education expansion (Arum et al. 2007; Baker 2014; Cohen 2010; Ehrenberg 2005; Levine 2001; Lyall and Sell 2006). On the one hand, the inflow of large amounts of private capital might widen access to higher education, although children from low-SES families should hardly benefit from educational expansion (Arum et al. 2007; Raftery and Hout 1993). On the other hand, privatization induces stratification in the higher education system, resulting in a hierarchical differentiation between selective institutions that retain substantial private funding and their counterparts that need financial support. Higher education institutions are competing to raise private funding and attract students for the purpose of organizational survival (Baker 2014; Goldin and Katz 2009). The rapid growth in MBA programs and the spread of vocational curricula in diverse fields of study reflect the capitalistic transformation of higher education (Baker 2014; Chandler 1977; Cohen 2010).

The for-profit competition among postsecondary educational institutions has been accompanied by a rise in tuition fees (College Board 2017; Goldin and Katz 2009). During the past three decades, college tuition and fees have increased 2.3 times for private institutions and 3.5 times for public institutions, while the costs of attending private institutions have been more than three times higher than those for public institutions (College Board 2017). The increasing educational costs create higher financial barriers for children from low-SES families. Whereas high-SES families can afford to support their children's higher education financially, students

from low-SES families are more likely to depend on loans or need other financial aid to afford tuition (Choy and Bradburn 2008; Houle 2014; Quadlin 2017; Rauscher 2016).

These soaring educational costs may have greater impacts on graduate students than undergraduate students. The tuition fees needed to obtain a financially rewarding advanced degree such as an MBA or other professional degree and to major in a hyper-lucrative post-baccalaureate field of study such as law or medicine are extremely high. Thus, undergraduate students major in vocational fields of study, which do not require additional large educational expenses. As a result, children from low-SES families can reach parity with their counterparts from high-SES families at the baccalaureate level, but they are less likely to do so at the post-baccalaureate level. Because a larger fraction of college degree holders obtain only a BA, not an advanced degree, a strong intergenerational association might not appear on the surface in studies aggregating BA and advanced degree holders into a single category.

Overall, our findings cast serious doubt on the notion that expansion of higher education can boost equal opportunity regardless of family background. Expansion of the higher education system has evolved along with institutional differentiation in higher education, increasing inequality among college goers (Arum et al. 2007; Gerber and Cheung 2008; Posselt and Grodsky 2017). As higher education becomes more complex and costlier, parents and children adjust their educational choice strategies taking into account the available resources and perceived opportunity costs. Upper-background families find a way to exploit the potential of this institutional differentiation to their favor.

Our research has several limitations. Because of data limitations, the empirical analyses do not identify precisely when the three mechanisms of strong intergenerational earnings immobility emerged. An examination in future research of change (or stability) over a longer period is warranted. To measure the selectivity of institutions, we divided higher educational

institutions into five tiers, following Hersch (2014). Detailed information about educational institutions is publicly unavailable due to confidentiality issues. Previous research warns that the effects of institutional selectivity on labor market outcomes vary depending on how it is measured (Black and Smith 2004; Gerber and Cheung 2008). Our relatively crude five-tier classification may have underestimated the effects of institutional selectivity.[8] The strong intergenerational association among MBA and other professional degree holders should be addressed in future research as well. Gender differences in intergenerational association among the college-educated are another future research topic. For all levels of higher education, intergenerational association is weaker among women than among men. The current study does not uncover the factors related to these gender differences.

CONCLUSION

This study has shed new light on the puzzle of why intergenerational association is stronger among advanced degree holders than among bachelor's degree holders. We show that the reemergence of intergenerational association at the post-baccalaureate level is a result of the sequence of strategic choices differentiated by family background. Our results also raise the possibility that the notion of college as *the great equalizer* is a short-lived hope, resulting from the lack of detailed information on vertical and horizontal stratification in higher education. At a minimum, we have demonstrated that the stratification within higher education is closely associated with the change in intergenerational mobility. Future research needs to inquire into which areas and by what mechanisms upper-background children maximize the human and social capital they acquire through higher education.

[8] The use of the Carnegie classification did not improve model fitness or explanatory power with respect to intergenerational association.

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Table 1. Socioeconomic Stratification among Sons by Parents' Education

	Total	Parents' Education		
		Less than BA	BA or higher	Difference
Types of degrees				
BA	0.664	0.719	0.617	-0.102***
MA	0.149	0.142	0.156	0.014*
MBA	0.088	0.078	0.097	0.019**
Professional	0.068	0.041	0.091	0.049***
Ph.D.	0.030	0.020	0.039	0.019***
Institutional Selectivity				
Undergraduate level				
Tier 1	0.067	0.037	0.092	0.054***
Tier 2	0.043	0.022	0.061	0.039***
Tier 3	0.234	0.192	0.269	0.077***
Tier 4	0.608	0.697	0.532	-0.165***
Tier 5	0.049	0.051	0.046	-0.005
Graduate level [a.]				
Tier 1	0.161	0.108	0.194	0.087***
Tier 2	0.006	0.006	0.007	0.001
Tier 3	0.230	0.189	0.257	0.068***
Tier 4	0.480	0.555	0.433	-0.122***
Tier 5	0.123	0.143	0.110	-0.034**
Fields of study				
Undergraduate level				
Art/Humanities	0.101	0.078	0.121	0.043***
Social science	0.169	0.144	0.191	0.048***
Business	0.251	0.292	0.215	-0.077***
STEM	0.309	0.294	0.322	0.028***
Medicine	0.027	0.029	0.025	-0.004
Education	0.062	0.067	0.058	-0.009
Other	0.081	0.096	0.068	-0.028***
Graduate level [a.]				
Art/Humanities	0.046	0.044	0.048	0.004
Social science	0.071	0.080	0.065	-0.015*
Business	0.266	0.281	0.256	-0.025
Law	0.115	0.083	0.135	0.053***
STEM	0.185	0.176	0.191	0.015
Medicine	0.124	0.108	0.135	0.027**
Education	0.120	0.151	0.100	-0.051***
Other	0.073	0.078	0.070	-0.008
Mean age of degree completion				
Bachelor's degree holders [b.]	24.9	25.7	24.1	-1.5***
Advanced degree holders [a.]	30.4	31.4	29.8	-1.6***
Mean annual earnings ($ in 2017)				
Bachelor's degree holders [b.]	115,880	110,235	121,539	11,304*
Advanced degree holders [a.]	161,843	140,368	175,423	35,055***
N	54,567	24,607	29,960	

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017.
Note: Person weights are applied. [a.] $N = 23{,}327$. [b.] $N = 31{,}240$.

Table 2. Socioeconomic Stratification among Daughters by Parents' Education

	Total	Parents' Education		
		Less than BA	BA or higher	Difference
Types of degrees				
BA	0.638	0.695	0.579	-0.117***
MA	0.245	0.223	0.268	0.045***
MBA	0.044	0.037	0.051	0.014**
Professional	0.050	0.030	0.072	0.042***
Ph.D.	0.023	0.015	0.031	0.017***
Institutional Selectivity				
Undergraduate level				
Tier 1	0.053	0.029	0.079	0.051***
Tier 2	0.054	0.032	0.077	0.045***
Tier 3	0.198	0.157	0.240	0.083***
Tier 4	0.651	0.725	0.574	-0.151***
Tier 5	0.044	0.057	0.030	-0.027***
Graduate level [a.]				
Tier 1	0.095	0.060	0.122	0.062***
Tier 2	0.017	0.021	0.014	-0.006
Tier 3	0.202	0.153	0.239	0.086***
Tier 4	0.599	0.676	0.541	-0.135***
Tier 5	0.086	0.090	0.083	-0.007
Fields of study				
Undergraduate level				
Art/Humanities	0.119	0.102	0.135	0.033***
Social science	0.215	0.192	0.239	0.047***
Business	0.210	0.235	0.183	-0.051***
STEM	0.133	0.112	0.155	0.043***
Medicine	0.092	0.106	0.078	-0.028***
Education	0.147	0.158	0.136	-0.023**
Other	0.084	0.094	0.073	-0.021**
Graduate level [a.]				
Art/Humanities	0.053	0.039	0.064	0.025***
Social science	0.101	0.099	0.102	0.002
Business	0.122	0.123	0.121	-0.003
Law	0.082	0.062	0.098	0.036***
STEM	0.067	0.059	0.073	0.015**
Medicine	0.160	0.154	0.166	0.012
Education	0.319	0.360	0.289	-0.071***
Other	0.095	0.105	0.088	-0.017
Mean age of degree completion				
Bachelor's degree holders [b.]	25.484	26.534	24.172	-2.362***
Advanced degree holders [a.]	31.095	32.300	30.188	-2.112***
Mean annual earnings ($ in 2017)				
Bachelor's degree holders [b.]	63,562	58,727	69,606	10,879***
Advanced degree holders [a.]	87,917	81,194	92,975	11,781*
N	45,056	21,576	23,480	

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017.
Note: Person weights are applied. [a.] $N = 23,338$. [b.] $N = 21,718$.

Table 3. Intergenerational Associations between Parents' Education and Children's Earnings

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Demographic variables	Y	Y	Y	Y	Y	Y
	Survey year	Y	Y	Y	Y	Y	Y
	Vertical selection (Types of advanced degrees)		Y				Y
	Horizontal selection 1 (Fields of study)			Y			Y
	Horizontal selection 2 (Selectivity of institution)				Y		Y
	Age of degree completion					Y	Y
Men	BA-only Holders						
	Parents' years of schooling	0.005	n.a.	0.010*	0.001	-0.001	0.001
		(0.004)	n.a.	(0.004)	(0.004)	(0.004)	(0.004)
	Adjusted R^2	0.071	n.a.	0.111	0.085	0.098	0.144
	N			31,240			
	Graduate Degree Holders						
	Parents' years of schooling	0.023***	0.012***	0.014***	0.009*	0.017 ***	0.001††
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
	Adjusted R^2	0.058	0.166	0.207	0.122	0.106	0.269
	N			23,327			
Women	BA-only Holders						
	Parents' years of schooling	0.003	n.a.	0.005	0.000	0.001	-0.001
		(0.005)	n.a.	(0.005)	(0.005)	(0.005)	(0.005)
	Adjusted R^2	0.017	n.a.	0.053	0.020	0.019	0.059
	N			21,718			
	Graduate Degree Holders						
	Parents' years of schooling	0.012*	0.002	0.009	0.004	0.009	-0.002††
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	Adjusted R^2	0.007	0.073	0.063	0.020	0.014	0.095
	N			23,338			

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017

Note: Control variables are age up to quadratic, race/ethnicity, marital status, having children, and survey year. Person weights are applied.

* p < .05; **p < .01; ***p < .001 (two-tailed tests)

† p < .05; †† p < .01 (KHB test on the difference between the coefficient of Model and the coefficients of other models, two-tailed test)

Table 4. Intergenerational Associations between Parents' Education and Children's Earnings by Advanced Degree Type

	Men		Women	
	Model 1	Model 2	Model 1	Model 2
Demographic variables	Y	Y	Y	Y
Survey year	Y	Y	Y	Y
Horizontal selection 1 (Fields of study)		Y		Y
Horizontal selection 2 (Selectivity of institution)		Y		Y
Age of degree completion		Y		Y
MA				
Parents' years of schooling	0.011*	-0.002	-0.005	-0.002
	(0.005)	(0.004)	(0.006)	(0.004)
Adjusted R^2	0.061	0.226	0.006	0.226
N	12,887		15,851	
MBA				
Parents' years of schooling	0.001	-0.020*	0.028	0.017
	(0.010)	(0.009)	(0.017)	(0.017)
Adjusted R^2	0.057	0.154	0.029	0.052
N	4,467		2,396	
Professional				
Parents' years of schooling	0.031***	0.031***	0.020*	0.007
	(0.009)	(0.008)	(0.010)	(0.009)
Adjusted R^2	0.078	0.157	0.029	0.107
N	2,666		2,293	
Ph.D.				
Parents' years of schooling	0.018**	-0.001	-0.012	-0.021*
	(0.006)	(0.005)	(0.008)	(0.008)
Adjusted R^2	0.061	0.261	0.028	0.099
N	3,307		2,798	

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017
Note: Control variables are age up to quadratic, race/ethnicity, marital status, having children, and survey year. Person weights are applied.
*p < .05; **p < .01; ***p < .001 (two-tailed tests)

Table 5. Sensitivity Analysis: Intergenerational Associations between Parents' Socioeconomic Status and Children's Earnings

	Men		Women	
	Model 1	Model 2	Model 1	Model 2
Demographic variables	Y	Y	Y	Y
Survey year	Y	Y	Y	Y
Vertical selection (Types of advanced degrees)		Y		Y
Horizontal selection 1 (Fields of study)		Y		Y
Horizontal selection 2 (Selectivity of institution)		Y		Y
Age of degree completion		Y		Y
BA-only Holders				
Father's years of schooling	0.003	-0.001	0.010	0.005
Adjusted R^2	0.071	0.144	0.017	0.06
N	31,029		21,465	
Mother's years of schooling	0.008	0.003	0.004	0.000
Adjusted R^2	0.071	0.144	0.017	0.059
N	31,180		21,687	
Parents' education: BA or higher	0.054*	0.036	0.016	-0.009
Adjusted R^2	0.071	0.144	0.017	0.059
N	31,240		21,718	
Predicted family income at age 13	0.015	0.006††	0.009	-0.004†
Adjusted R^2	0.071	0.144	0.017	0.059
N	31,240		21,718	
Graduate Degree Holders				
Father's years of schooling	0.026***	0.006††	0.012**	-0.001†
Adjusted R^2	0.062	0.269	0.008	0.095
N	23,189		23,137	
Mother's years of schooling	0.023***	0.002††	0.016**	0.004†
Adjusted R^2	0.058	0.271	0.008	0.096
N	23,294		23,324	
Parents' education: BA or higher	0.127***	-0.005	0.041	-0.028
Adjusted R^2	0.056	0.269	0.006	0.096
N	23,327		23,338	
Predicted family income at age 13	0.055***	-0.002††	0.034**	0.001††
Adjusted R^2	0.056	0.269	0.007	0.095
N	23,327		23,338	

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017
Note: Control variables are age up to quadratic, race/ethnicity, marital status, having children, and survey year. Person weights are applied.
*p < .05; **p < .01; ***p < .001 (two-tailed tests)
† p < .05; †† p < .01 (KHB test on the difference between the coefficient of Model and the coefficients of other models, two-tailed test)

Table 6. Horizontal Stratification by Family Background

	Men				Women			
	Total	Parents' education			Total	Parents' education		
		<BA	BA+	Difference		<BA	BA+	Difference
BA-only holders								
Fields of study								
Less lucrative	0.472	0.424	0.519	0.095***	0.583	0.560	0.612	0.053***
More lucrative	0.528	0.576	0.481	-0.095***	0.417	0.440	0.388	-0.053***
Total	1.000	1.000	1.000		1.000	1.000	1.000	
Institutional selectivity								
Less selective	0.711	0.771	0.652	-0.119***	0.734	0.805	0.646	-0.159***
More selective	0.289	0.229	0.348	0.119***	0.266	0.195	0.354	0.159***
Total	1.000	1.000	1.000		1.000	1.000	1.000	
N	31,240	15,591	15,649		21,718	11,995	9,723	
Graduate degree holders								
Fields of study								
Less lucrative BA/less lucrative Grad.	0.295	0.328	0.275	-0.053***	0.513	0.539	0.493	-0.046***
Less lucrative BA/more lucrative Grad.	0.285	0.243	0.312	0.069***	0.211	0.162	0.248	0.086***
More lucrative BA/less lucrative Grad.	0.073	0.076	0.070	-0.006	0.089	0.091	0.087	-0.004
More lucrative BA/more lucrative Grad.	0.347	0.353	0.343	-0.010	0.187	0.207	0.172	-0.036
Total	1.000	1.000	1.000		1.000	1.000	1.000	
Institutional selectivity								
Less selective BA/less selective Grad.	0.423	0.554	0.340	-0.215***	0.508	0.617	0.427	-0.190***
Less selective BA/more selective Grad.	0.125	0.136	0.119	-0.017***	0.116	0.113	0.118	0.006***
More selective BA/less selective Grad.	0.180	0.143	0.202	0.059***	0.177	0.150	0.198	0.048***
More selective BA/more selective Grad.	0.272	0.166	0.339	0.173***	0.199	0.121	0.257	0.136***
Total	1.000	1.000	1.000		1.000	1.000	1.000	
N	23,327	9,016	14,311		23,338	9,581	13,757	

Source: National Survey of College Graduates 2010, 2013, 2015, and 2017.
Note: More selective institutions are private research I/II, private liberal art I, and public research I. Less selective institutions are other four-year universities and specialized institutions. More lucrative fields are business, law, engineering, math, computer science, and medicine. Less lucrative fields are art/humanities, education, social science, science, social work and others. Person weights are applied.
*p < .05; **p < .01; ***p < .001 (two-tailed tests)

Appendix Table A. Intergenerational Associations between Parents' Education and Children's Earnings (Model 6 in Table 3)

	Men				Women			
	BA-only Holders		Graduate Degree Holders		BA-only Holders		Graduate Degree Holders	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Parents' education	0.001	(0.004)	0.001	(0.004)	-0.001	(0.005)	-0.002	(0.005)
Types of degrees (Reference = MA)								
MBA	n.a		0.003	(0.078)	n.a		0.091	(0.155)
Professional	n.a		0.448	(0.048)***	n.a		0.714	(0.047)***
Ph.D.	n.a		0.234	(0.032)***	n.a		0.320	(0.036)***
Selectivity of institution								
Undergraduate institution (Reference = Tier 4)								
Tier 1	0.287	(0.047)***	0.196	(0.039)***	0.251	(0.077)**	0.060	(0.050)
Tier 2	0.279	(0.065)***	-0.039	(0.048)	0.277	(0.072)***	0.064	(0.044)
Tier 3	0.132	(0.025)***	0.129	(0.028)***	0.004	(0.040)	-0.003	(0.042)
Tier 5	-0.090	(0.046)*	-0.043	(0.067)	-0.042	(0.061)	0.074	(0.110)
Graduate institution (Reference = Tier 4)								
Tier 1	n.a		0.257	(0.035)***	n.a		0.125	(0.045)**
Tier 2	n.a		-0.120	(0.139)	n.a		-0.033	(0.102)
Tier 3	n.a		0.067	(0.030)*	n.a		-0.002	(0.044)
Tier 5	n.a		-0.038	(0.037)	n.a		-0.046	(0.046)
Fields of study (Reference = Social science)								
Art/Humanities	-0.253	(0.053)***	-0.410	(0.054)***	-0.218	(0.057)***	-0.252	(0.067)***
Business	0.194	(0.033)***	0.413	(0.073)***	0.196	(0.046)***	0.260	(0.148)
Law	0.144	(0.104)	-0.067	(0.068)	0.294	(0.207)	-0.188	(0.073)*
Science	-0.019	(0.037)	-0.084	(0.031)**	0.086	(0.044)	0.039	(0.063)
Engineering	0.266	(0.026)***	0.251	(0.030)***	0.423	(0.072)***	0.289	(0.119)*
Math	0.034	(0.061)	0.013	(0.055)	0.105	(0.091)	0.053	(0.174)
Computer science	0.227	(0.030)***	0.218	(0.052)***	0.391	(0.059)***	0.298	(0.148)*
Medicine	0.130	(0.057)*	0.285	(0.041)***	0.288	(0.041)***	0.221	(0.045)***
Other	-0.154	(0.039)***	-0.227	(0.037)***	-0.259	(0.051)***	0.022	(0.044)
Age of degree completion	-0.023	(0.003)***	-0.020	(0.002)***	-0.007	(0.003)**	-0.007	(0.002)**
Age								
Linear	0.112	(0.034)***	0.127	(0.034)***	-0.029	(0.044)	0.035	(0.037)
Quadratic	-0.001	0.000**	-0.001	0.000**	0.000	0.000	0.000	0.000

Appendix Table A. *(Continued)*

	Men				Women			
	BA-only Holders		Graduate Degree Holders		BA-only Holders		Graduate Degree Holders	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Race (Reference = White)								
Black	-0.047	(0.053)	-0.201	(0.061)**	-0.117	(0.061)	0.062	(0.043)
Hispanic	-0.186	(0.037)***	-0.084	(0.043)*	0.050	(0.052)	-0.045	(0.050)
Asian	-0.040	(0.044)	-0.128	(0.040)**	0.254	(0.049)***	0.002	(0.060)
Others	-0.066	(0.056)	-0.047	(0.052)	0.148	(0.068)*	0.061	(0.082)
Marital status (Reference = Married)								
Not married	-0.257	(0.034)***	-0.208	(0.037)***	0.087	(0.032)**	-0.001	(0.030)
Children (Reference = One or more)								
None	-0.209	(0.028)***	-0.128	(0.029)***	0.186	(0.030)***	0.130	(0.027)***
Survey year (Reference = 2017)								
2010	-0.065	(0.031)*	-0.018	(0.033)	-0.137	(0.044)**	-0.028	(0.037)
2013	-0.080	(0.030)**	-0.019	(0.031)	-0.072	(0.036)*	-0.029	(0.035)
2015	-0.031	(0.031)	-0.015	(0.032)	-0.086	(0.039)*	-0.039	(0.037)
Intercept	9.180	(0.740)***	8.790	(0.742)***	11.266	(0.959)***	10.259	(0.805)***
Adjusted R^2	0.144		0.269		0.059		0.095	
N	31,240		23,327		21,718		23,338	

Source: National Survey of College Graduates 2010, 2013, and 2015
Note: Person weights are applied.
*p < .05; **p < .01; ***p < .001 (two-tailed tests)