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Education and Lifetime Earnings in the United States

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Abstract

Differences in lifetime earnings by educational attainment have been of great research and policy interest. Although a large literature examines earnings differences by educational attainment, research on lifetime earnings—which refers to total accumulated earnings from entry into the labor market until retirement—remains limited because of the paucity of adequate data. Using data that match respondents in the Survey of Income and Program Participation to their longitudinal tax earnings as recorded by the Social Security Administration, we estimate the 50-year work career effects of education on lifetime earnings for men and women. By overcoming the purely synthetic cohort approach, our results provide a more realistic appraisal of actual patterns of lifetime earnings. Detailed estimates are provided for gross lifetime earnings by education; net lifetime earnings after controlling for covariates associated with the probability of obtaining a bachelor's degree; and the net present 50-year lifetime value of education at age 20. In addition, we provide estimates that include individuals with zero earnings and disability. We also assess the adequacy of the purely synthetic cohort approach, which uses age differences in earnings observed in cross-sectional surveys to approximate lifetime earnings. Overall, our results confirm the persistent positive effects of higher education on earnings over different stages of the work career and over a lifetime, but also reveal notably smaller net effects on lifetime earnings compared with previously reported estimates. We discuss the implications of these and other findings.

Keywords

Lifetime earnings; Survey of Income and Program Participation; Economic returns to college; Semi-synthetic cohort estimation

Introduction

The financial returns to education have received much attention from scholars, policy analysts, and media commentators. A recurrent issue is the lifetime economic return of

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having a college degree. This concern is not surprising given the rising costs of college as well as the significance of lifetime earnings for wealth accumulation, retirement, health, and other important outcomes. Differences in lifetime earnings by education likely contribute to trends in inequality across households. Expectations about lifetime earnings also influence individuals' decisions about higher education, albeit often in the context of occupational aspirations (Carnevale et al. 2013; Smith and Powell 1990).

An expansive body of research has investigated the relationships between education and labor market outcomes, including various mediating mechanisms (e.g., Barrow and Rouse 2005; Brand and Halaby 2006; Brand and Xie 2010; Card 1999; Kim and Sakamoto 2008; Murphy and Welch 1993; Smith and Powell 1990). Although a large literature has examined cross-sectional earnings differences by educational attainment (Hout 2012), research on the accumulation of lifetime earnings remains limited because of the paucity of adequate data (Cooke 2003; Elder and Pavalko 1993). The social scientific literature's relatively scant attention to the lifetime returns to education is surprising (Hout 2012:387).

We begin to address the research gap by investigating how lifetime earnings vary by educational attainment among U.S. men and women. We use data from a nationally representative sample of respondents from the Survey of Income and Program Participation (SIPP) who are matched with their longitudinal earnings records based on administrative tax information from the Social Security Administration (SSA). Using quantile regression at the median, we estimate cohort-based 10-year and 20-year cumulative earnings from ages 20 to 69 for birth cohorts from the 1930s to the late 1960s over the years 1982 to 2008. We then estimate 50-year lifetime earnings by education after controlling for academic preparation and demographic covariates, using a semi-synthetic cohort approach.

The present study extends the literature in several ways. First, the linked administrative earnings data cover 20 years of a person's career. Second, unlike much previous research, which studied male workers only, this study provides estimates for both men and women. Third, by providing multiple estimates of lifetime earnings, some containing individuals with zero earnings, we advance our understanding of the total impact of education on lifetime earnings. Fourth, unlike commonly cited reports, our analysis accounts for a wide array of covariates, including a measure of academic preparation in high school. Finally, we offer insight into the adequacy of purely synthetic cohort methods, using age differences in cross-sectional earnings to estimate lifetime earnings.

Background

The growing college earnings premium over past decades has been widely documented (e.g., Brand and Halaby 2006; Brand and Xie 2010; Card 1999; Kim and Sakamoto 2008; Murphy and Welch 1993; Smith and Powell 1990). The bulk of current research has focused on differences in earnings over single years or across a few points in time. Although many important studies have examined long-term returns to education (e.g., Bhuller et al. 2014; Cooke 2003; Gouskova et al. 2010; Hauser and Daymont 1977; Johnson and Stafford 1974), we still know relatively little about the lifetime returns to education. Although "long-term earnings" usually refers to multiple years of earnings, "lifetime earnings" more specifically denotes the total earnings that an individual obtains over an entire work career from labor market entry until retirement. The research gap regarding lifetime earnings is unfortunate because variation in lifetime earnings is one of the most consequential sources of the socioeconomic stratification of well-being in modern societies (Weber [1922]1978). In a comprehensive study on the relation between education and stratification during twentieth century America, Fischer and Hout (2006:247) concluded that "the division between the less- and more-educated grew and emerged as a powerful determinant of life chances and lifestyles."

Moreover, lifetime earnings are related to various nonpecuniary benefits of higher education (Hout 2012; Oreopoulos and Salvanes 2011). These benefits include increased longevity (Mirowsky and Ross 2003), happier lives (Yang 2008), less divorce (Schwartz 2010), and greater participation in civil activities (Putnam 2001). Lifetime earnings are also a major source of variation in wealth and retirement income (Hendricks 2007; Ruel and Hauser 2013), including Social Security retirement benefits (Tamborini et al. 2009) and private retirement savings (Engen et al. 2005; O'Rand and Shuey 2007).

Several important studies have investigated lifetime earnings as they vary by educational level. Bhuller et al. (2014) used administrative data to analyze the labor market return to higher education and its variation across the life course in Norway. They reported that the internal rate of return to an additional year of schooling is around 10 % after taking into account taxes and pension entitlement. Haider and Solon (2006) estimated the 40-year lifetime earnings of U.S. workers, but their study focused more on life-cycle patterns in the differences between current earnings and lifetime earnings than on variation in lifetime earnings by education. Björklund (1993) took a similar approach.

Although informative, these studies are naturally based on specific target populations. Bhuller et al. (2014), Haider and Solon (2006), and Björklund (1993) studied only men. Bhuller et al. (2014) investigated Norwegian men born between 1948 and 1950. Haider and Solon (2006) studied American men born between 1931 and 1933. Björklund (1993) considered Swedish men born between 1924 and 1936. These studies are important examples of research using administrative data, but broader analyses are still needed.

Other studies have investigated long-term earnings, such as 10-year cumulative earnings (e.g., Cooke 2003; Gouskova et al. 2010; Hauser and Daymont 1977), whereas others have analyzed earnings data for a few years gleaned from available cases in various longitudinal surveys (Brand and Halaby 2006; Brand and Xie 2010; Flinn 2002). Although using more information than that contained in cross-sectional data, these studies did not reveal systematic evidence about lifetime earnings.

Perhaps partly because of the somewhat idiosyncratic nature of the samples and methods used in prior studies, commonly cited evidence on lifetime earnings in the United States in the contemporary media often relies on technical reports that tend to use cross-sectional data and synthetic cohort methods (e.g., Baum and Ma 2007; Carnevale et al. 2013; Day and Newburger 2002; Julian and Kominski 2011; Kantrowitz 2007). These reports typically extrapolate 5- or 10-year cumulative earnings from the annual earnings of full-time and full-year workers over a specified age range (e.g., 30–39, 40–49). These cumulative intervals are then aggregated to infer lifetime earnings. For example, using multiple years of the Current Population Survey (CPS), Day and Newburger (2002) reported that workers with a bachelor's degree earn around $900,000 more than high school graduates over a 40-year period between the ages of 25 and 64, while workers with a doctoral degree earn $1.3 million dollars more than those with a bachelor's degree. Kantrowitz (2007) argued that the payoff to college education over a lifetime is 10 times more than a family's investment in an undergraduate education.

Prior studies based on a synthetic cohort approach provide useful baseline estimates, but using only a single year or a few years of a person's earnings to infer lifetime earnings can generate biases (Gottschalk and Moffitt 1994; Haider and Solon 2006). One concern is the largely unrealistic assumption that workers would be employed full-time and full-year over their work lives. However, the less-educated are more likely to be unemployed than the highly educated for longer periods of time throughout their careers (Riddell and Song 2011), particularly during economic downturns (Sum and Khatiwada 2010; van der Wel et al. 2010). They may also retire earlier (Hayward et al. 1998).

Additionally, the association between current and lifetime earnings may vary in labor markets with high intragenerational mobility (Björklund 1993; Moffitt and Gottschalk 2011; Riddell and Song 2011). Estimates based on synthetic cohort methods often omit earnings from the early 20s. This approach can lead to overestimates of the lifetime returns of higher education because the less-educated often fully participate in labor markets during this life-course stage, while the highly educated are focused on schooling. On the other hand, assuming no earnings for the highly educated in their 20s may also be unrealistic. Bhuller et al. (2014) showed that the omission of earnings for the highly educated in their 20s understates the lifetime value of additional schooling. An additional drawback of technical reports is the lack of controls for covariates. Insofar as the omitted covariates are associated with lifetime earnings, commonly reported synthetic cohort estimates may substantially overestimate the net return to a college education.

The net return to a college education is relevant not only for individuals' enrollment decisions but also for policy analysis and social scientific theories. To further advance this area of research inquiry, this study makes use of rich longitudinal data that contain earnings information covering a large portion of an individual's work career. Adopting a semi-synthetic cohort method, we provide new evidence on the expected net lifetime earnings (i.e., 50 years of cumulative earnings from ages 20 to 69) by educational level.

Analytic Strategy

Data

We investigate data from the SIPP 2004 panel matched to the Detailed Earnings Record (DER) constructed by the SSA. Our base sample comes from Wave 2, which provides one-time topical modules that include retrospective educational histories. The linked DER file provides respondents' annual earnings based on W-2 tax records submitted to the Internal Revenue Service (IRS) for all jobs subject to federal income tax including wages, salaries, bonuses, commissions, tips, and self-employment income beginning in 1982. The central advantage of these administrative data is the provision of annual earnings covering a substantial portion of respondents' work life (20 years). The survey data, in turn, provide rich demographic detail, including respondents' retrospective educational history. We henceforth refer to this matched longitudinal data set as the "SIPP-IRS."

We begin tracking earnings in 1982 because that is the year in which the SSA started to collect full reliable information on earnings including from jobs not covered by Social Security and above the maximum amount taxable under the Federal Insurance Contributions Act (FICA) payroll tax. Using earnings from the 1980s onward yields estimates of lifetime earnings that are more relevant to the current market situation: the college premium in earnings began to rise in the early 1980s after a long decline (Goldin and Katz 2009). We limit our study of these earnings data to the year 2008 to minimize the possibly unique effects associated with the Great Recession (e.g., excessive unemployment, wage stagnation, financial depreciation). A number of studies have used Social Security earnings data (Couch et al. 2013a, b; Haas et al. 2011; Haider and Solon 2006; Kim and Tamborini 2012; Tamborini and Iams 2011), but our analysis is the first to use them to investigate differences in lifetime earnings by education. More-detailed descriptions of the SSA administrative records and survey matches may be found elsewhere (McNabb et al. 2009; Tamborini and Iams 2011).

As noted, the primary advantage of the linked administrative data is the provision of earnings information for the same individual covering long portions of his or her career. Moreover, these administrative data on earnings are not "top-coded" and are generally more accurate than survey data (Kim and Tamborini 2014). Another advantage is that the sample attrition problem is minimal because our main sample comes from Wave 2 of the SIPP in contrast to other longitudinal data sets, such as the National Longitudinal Survey of Youth (NLSY) or the Panel Survey of Income Dynamics (PSID). A possible drawback is that not all SIPP respondents were successfully matched with the administrative data. However, the match rate of the 2004 panel used is high, at around 80 %, and the match bias has been found to be quite small (Davis and Mazumder 2011). Even so, we apply a modified SIPP weight that adjusts for unsuccessful matching across key characteristics,[1] allowing us to maintain the national representativeness of the civilian noninstitutionalized U.S. population as of 2004.

Target Populations

Our analytic sample is restricted to men and women from four birth cohorts: 1962–1969 (Cohort 1), 1952–1959 (Cohort 2), 1942–1949 (Cohort 3), and 1932–1939 (Cohort 4). Table 1 shows detailed statistics about these cohorts. We selected these birth years to construct age-specific cohort-earnings streams reflecting different stages of the life course (ages 20 to 69). Specifically, we estimate cumulative 10-year earnings for individuals within the same birth cohort (but different birth years) for the same 20 years of life. For Cohort 1 (1962–

[1]Specifically, we estimated a logistic regression on the likelihood of an administrative match across a range of characteristics, including age, age-squared, education, race/ethnicity, family income, and marital history. Using the results of that regression, we multiply the inverse of the match probability given the characteristics by SIPP Wave 2 person weights.

1969), the two 10-year cumulative earnings blocks reflect the earnings of individuals in this group from ages 20 to 39 (20–29 and 30–39). Therein, for those born in 1962, these measures sum annual earnings from 1982 (age 20) to 2001 (age 39). For those born in 1963, annual earnings are summed from 1983 (age 20) to 2002 (age 39). For each subsequent birth year, we move the window forward one interval, repeating this method until reaching the final birth year of each cohort. For Cohort 2 (1952–1959), the two 10-year cumulative earnings blocks cover ages 30 to 49 (30–39, 40–49); for Cohort 3 (1942–1949), it covers ages 40 to 59 (40–49, 50–59); and for Cohort 4 (1932–1939), it covers ages 50 to 69 (50–59, 60–69).[2] When combined, these cohorts allow us to estimate lifetime earnings from age 20 to 69 by education.

Our analysis sample reflects additional selection rules. First, we exclude individuals who received a Social Security disability benefit before their final observation year (using SSA benefit records merged to our data set). Second, to remove individuals with extremely weak labor force attachment, we confine the analysis to persons who have at least two years of positive earnings in each 10-year age frame within their 20-year observation period.[3] These two restrictions reduce the total sample by 11.7 % for men and 21.3 % for women. Third, we limit our sample to the native-born to avoid the complication of assimilation processes and the number of eligible working years in the United States. Thus, our final sample includes both men and women who had at least two years of positive earnings within two 10-year age frames, did not receive a federal disability benefit, and were born in the United States. These selection criteria yield a total sample size of 11,824 men and 12,098 women.

Estimation Strategy

In the descriptive analysis, we map out the lifetime earnings trajectory from age 20 to 69 for men and women by their highest educational attainments using median annual earnings for each single-year age interval of the 20-year observation period for the four cohorts. By contrast, our multivariate analysis uses regression to estimate the net effect of a college education on long-term earnings, controlling for important characteristics that affect both the likelihood of college degree attainment and earnings over the life course. We estimate gender-specific quantile regressions at the median using 10-year cumulative earnings as a dependent variable. Compared with ordinary least squares (OLS), median regression facilitates comparison of our results with commonly cited reports on lifetime earnings, which tend to use median earnings. Median earnings represent typical workers better than mean earnings, given that the distribution of long-term earnings is extremely skewed to the right for highly educated male workers. In the case of OLS, the conditional mean of log income is not the same as the log of conditional mean income. Estimates of lifetime earnings based on OLS results may therefore suffer from retransformation bias (Manning 1998) or may be sensitive to different assumptions involved when specifying such a retransformation. Unlike OLS, the estimates of the conditional quantiles based on logged earnings can be retransformed to actual dollars without any assumptions.

[2]Those born in 1960 and 1961, for example, are excluded from the sample because their age-20 earnings (i.e., earnings in year 1980 and 1981) go beyond the year for which data are available.

[3]To check whether our results are sensitive to this restriction, we varied the number of years of positive earnings to one, three, and four, finding basically the same results.

For this purpose, we use the following model:

$$y_{gi}=\sum \beta_g Edu_{gi}+\sum \gamma_{gj}\mathbf{X}_{gij}+\varepsilon_{gi}, \quad (1)$$

in which y_{gi} refers to log-transformed 10- or 20-year cumulative earnings for cohort g and individual i. All earnings are adjusted to 2009 dollars using the Consumer Price Index (i.e., series CPI-W). *Edu* refers to the level of education. **X** is a vector of J number of other control variables.

We use the estimates of the net 10- and 20-year cumulative earnings based on Eq. (1) to generate a measure of 50-year lifetime earnings. There are several ways of combining the cumulative earnings of the four cohorts to estimate 50-year lifetime earnings. For example, aggregating the 20-year earnings of Cohort 1 at ages 20 to 39 and Cohort 3 at ages 40 to 59 with the 10-year earnings of Cohort 4 at 60 to 69 covers the typical career lifespan. Alternatively, we could combine estimates of Cohort 1 at ages 20 to 29 with two 20-year earnings blocks from Cohort 3 (30 to 49) and Cohort 4 (50 to 69). In this article, we report the average of all possible combinations, noting that the discrepancies between the different combinations are minor. All the variations are within a 3.5 % margin of what we report here.

We refer to our results as being derived from a semi-synthetic cohort method. We acknowledge that this approach does not entirely overcome the problems of synthetic cohort methods because it requires three or four cohort groups to derive lifetime earnings. Nonetheless, it provides much more realistic estimates of lifetime earnings than the purely synthetic cohort methods because blocks of 20-year cumulative earnings represent substantial fractions of actual lifetime earnings outcomes.

The main independent variable, *Edu*, uses binary indicators to measure an individual's highest level of educational attainment: less than high school (LTHS); high school graduate (HSG); some college (SC); bachelor's degree only (BA); and graduate degree attainment (GRAD). We use the label (BA+) to refer to all college graduates, including those who obtained a graduate degree. The achieved level of education in our analyses reflects the person's highest level of attainment by 2004 (i.e., the year when SIPP Wave 2 was conducted). Therefore, the earnings of GRAD at age 20 do not reflect the earnings of graduate degree holders at age 20, but rather the earnings at age 20 of those who obtain a graduate degree later in their life.

Our models contain a rich set of controls. Sociodemographic controls include race and ethnicity (white, black, Hispanics, and other), never married (by 2004), birth year, whether the individual married young (< age 18), and total children (for women).[4] We additionally include a binary indicator of being born in the South, which helps to account for regional differences in background. Although the SIPP-IRS data set provides very limited information on respondents' family background and high school experience, the

[4]Some will argue that marriage and children are endogenous with earnings, so they should not be included as covariates. To address this concern, we additionally estimated the net 50-year lifetime earnings without controlling for the effects of marriage and children (results not shown). The difference between these estimates and the estimates reported in this article are small. This may be because the effects of marriage and childbearing are mostly associated with level of education rather than operating within the same level of education.

retrospective life history data in the SIPP allow us to include several covariates that proxy, partially, for background attributes and abilities. First, we control for private high school attendance because the attendance at a private high school is closely associated with family income (National Center for Education Statistics 1997). Second, we measure whether the respondent took college preparation courses or advanced mathematics and science courses in high school. Although our models may not be completely free from selection biases, controlling for Advanced Placement (AP) courses and college preparatory classes substantially reduces the extent of selection bias (which may also be interpreted as deriving from endogeneity bias) associated with family background and academic ability when compared with models without these controls.[5]

Supplemental Estimates

We provide supplementary analyses to our main results. In one set of models, we use a less-restrictive sample: namely, we lift the filters removing individuals who received a Social Security disability benefit and who failed to have at least two years of positive annual earnings in each 10-year block over their 20-year follow-up period. This approach not only reveals how these restrictions affect our main results but also can be viewed as providing more of a gross estimate of the association between education and lifetime earnings.

In another set of analyses, we estimate 50-year lifetime earnings using a synthetic cohort method based on self-reported earnings in the 2004 SIPP, comparing them with our main estimates based on longitudinal administrative data. This analysis illustrates differences in educational differences in lifetime earnings between estimates derived from a single snapshot of earnings using survey data and those derived from longitudinal administrative data covering much larger portions of an individual's work life. The difference between our estimates and those of synthetic cohort methods provides information about the direction and size of any bias in the previous estimates of lifetime earnings based on self-reported annual earnings.

Empirical Findings

Trajectories of Annual Earnings Over a Work Career by Education

Figure 1 shows the evolution of men's and women's earnings for the four cohorts over a work career from ages 20 to 69 by educational attainment. Recall that each educational subgroup reflects the highest degree held. Thus, in some instances, the individual did not actually hold the degree at the ages shown in the figure, such as those corresponding to the early 20s. As expected, median earnings show a curvilinear, inverted-U curve over the work career for men and women. Nevertheless, the form of this curve varies by education. The less-educated display relatively flat inverted-U curves, whereas the highly educated exhibit deep inverted-U curves. For example, the annual growth rate of male graduate degree holders for Cohort 1 in their 20s and 30s is four times steeper than that of male high school graduates (i.e., 4.2 % vs. 15.5 %).[6] Women's median earnings are lower than men's. The

[5]AP courses were not officially operational until 1955, but 62 % of men of the oldest cohort who attended college claim to have taken an AP course. Given that our analysis involves cohorts over several decades during which the educational system was evolving, various measurement issues may be associated with these control variables.

depth of the inverted-U curve for women is thus shallower than that for their male counterparts, although the basic form is similar.

Not surprisingly, in the very early stage of the work career, individuals with a college degree have lower median earnings than less-educated groups because the former group spends more time in school. Highly educated workers, however, have some earnings at this early stage of the work career. Our data indicate that around 90 % of eventual college degree holders participate in some labor market activities in their early 20s. By the 40s, all educational groups, except graduate degree holders, obtain their peak earnings and stay on this plateau for more than 10 years. By the early 50s, median earnings start to decline with the exception of graduate degree holders, who experience rising median earnings until their mid-50s. At later life (i.e., the 60s), we observe an age-leveling effect, likely driven by institutional settings, such as the eligibility ages for Social Security retirement benefits, which begin at 62. That said, the earnings-increasing effect of higher education does not disappear for men with graduate degrees in their 60s. For female workers, no differences are evident across education beyond approximately age 64.

Multivariate Results: 10-Year Cumulative Earnings Over a Work Career by Education

We examine the net value of college education on 10-year cumulative earnings reflecting different stages of the life course using gender-specific quantile regressions at the median. Tables 2 (men) and 3 (women) show these results.

For both men and women, a positive association between college attainment and 10-year cumulative log earnings is persistent during the prime-age years (i.e., 30s, 40s, and 50s). Compared with a high school diploma, the typical value of BA attainment on 10-year cumulative earnings during these age ranges is around 46 % to 54 % (i.e., $e^{.376} - 1$ to $e^{.432} - 1$) for men and around 50 % to 56 % (i.e., $e^{.405} - 1$ to $e^{.445} - 1$) for women, other things being equal. The estimated coefficients of graduate school completion show an even greater return to education.

The effect of GRAD becomes even higher in late life (age 60s) for men. This suggests that the earnings advantage of GRAD persists well into late life, even more than does BA. In contrast to men, the earnings advantage of GRAD for women is reduced in their 60s compared with their 50s. Research on whether this result is because men with a graduate degree stay longer in the labor force than equally educated women is warranted. Our gender-specific results demonstrate that although the absolute return to education is lower for women than for men, the relative return is higher for women.

50-Year Lifetime Earnings by Education

We investigate differences in 50-year lifetime earnings by educational attainment by combining the four cohorts used in our previous analysis. We assess lifetime earnings in three ways, as summarized in Fig. 2. First, we estimate 50-year earnings by education without any covariates. Second, we compute the net effect of education on 50-year earnings

[6]Earnings growth rates are estimated by regressing log annual earnings on time, separately by educational groups.

using the regression estimates presented in Tables 2 and 3. The net lifetime earnings refer to the expected earnings net of race/ethnicity, ever married, number of child births (for women), region of birth, and whether the respondents took college preparation and/or AP courses in high school.[7] Third, we compute the net present value of 50-year lifetime earnings by education at age 20 to account for the economic notion that future earnings are worth less than present earnings depending on time preference. How much individuals discount future earnings depends on their psychological disposition, and thus no universal standard exists. We apply a 4 % annual real discount rate, which is equal to the annual inflation rate for the last 100 years.

Panels A and B of Fig. 2 show the extent to which gross 50-year lifetime earnings vary by education by gender. The estimates indicate that men with a high school diploma earn around $1.54 million over a lifetime, whereas those with a bachelor's degree and a graduate degree earn $2.43 million and $3.05 million, respectively. Women's lifetime earnings are attenuated relative to men's, but substantial differences by education are also present; HSG, BA, and GRAD earn $811,000, $1.44 million, and $1.87 million respectively, over a lifetime. The 50-year lifetime earnings gap between HSG and BA is thus about $896,000 for men and around $630,000 for women. The value of graduate school compared with a bachelor's degree is about $612,000 for men and $429,000 for women. If we combine bachelor's degree only and graduate degree as college graduates in general (i.e., BA+), the gaps in lifetime earnings between HSG and BA+ become $1.13 million for men and $792,000 for women.

Because the lifetime returns to education can be influenced by demographic and socioeconomic characteristics, panels C and D of Fig. 2 present the net effect of education on lifetime earnings, using the coefficients from our previously estimated quantile regressions. We find that accounting for key covariates reduces the estimated lifetime earnings return to college education by approximately 30 %.[8] For example, the gap between HSG and BA decreases from $896,000 to $655,000 for men and from $630,000 to $445,000 for women. The return to GRAD compared with BA is reduced by around 20 % for men and about 12 % for women. These results reconfirm that the lifetime return to a college education is large.[9] At the same time, they show important reductions in the net lifetime value of college education relative to many prior studies using purely descriptive techniques. That is, the net lifetime value of a college education is substantially lower than the previously reported figure of $1 million (e.g., Carnevale et al. 2013; Day and Newburger 2002; Julian and Kominski 2011).

Panels E and F of Fig. 2 present the net present value of college education at age 20 for a hypothetical group whose lifetime earnings trajectories are equal to the regression estimates in Tables 2 and 3. Assuming a 4 % annual real discount rate, the net present lifetime value

[7]In computing net lifetime earnings, we set all covariates except education equal to the mean of the entire sample.

[8]For both genders, AP courses, college preparatory classes, and type of high schools explain the virtually all the reduction in the return to college education. For example, the 98 % of the reduction in the return to BA compared with HSG is attributable to these three variables. Other covariates cancel each other out more or less when included in addition to these three variables.

[9]We used propensity score matching techniques (PSM) to estimate cumulative earnings by education as a robustness check. We do not use PSM as our primary method because it yields results that are essentially the same as those based on median quantile regressions. When correctly specified, quantile regression is more efficient than PSM.

of BA compared with HSG at age 20 drops to about $259,000 for men and $180,000 for women. If all college graduates include graduate degree holders, the net present value of BA + is around $314,000 for men and $232,000 for women. Of course, using a different discount rate would alter these estimates, with lower discount rates leading to estimates that are closer to the estimates in Fig. 2 and higher discount rates leading to estimates that show lower lifetime returns to education. There is thus no single best measure of the value of a college education because there is no particular discount rate that can be said to be scientifically correct.

Relaxing the Sample Restrictions on Earnings and Disability

The estimates shown in Fig. 2 are based on the main analytic sample, which excludes (1) respondents who received a federal disability benefit before the end of their 20-year observational period, and (2) those with extremely weak attachment to the labor market (less than two years of positive earnings in each of their two 10-year blocks of observed earnings). Although these criteria help disentangle the net effect of education from work-limiting health and labor supply decisions (especially for women), a reviewer of this paper argued that estimating the total effect of education on lifetime earnings should not exclude disabled respondents or those who do not participate in the labor force because education has at least a partial impact on disability and labor force participation outcomes. To address this concern, we estimate the net 50-year lifetime earnings without these two sample restrictions applied in Table 4.

As might be expected, lifetime earnings using the less-restrictive sample are lower than those with the restrictions. Lifetime earnings for men are reduced proportionally, at around 10 % for all levels of education except LTHS. As a result, the premiums of higher education as measured against high school graduates are not much different between the main sample and the less restrictive one. For both BA and GRAD, the estimated relative premiums without restrictions are less than 8 % lower than those with restrictions (e.g., $775,000/$840,000 = .923).

For women, however, using the less-restrictive sample shows more important differences relative to the main analytic sample. Overall, the lower the level of education, the larger is the relative reduction in lifetime earnings using the less-restrictive sample. For example, relative to our main estimates, the lifetime earnings using the less-restrictive sample are reduced by 30 % for HSB but by only 5 % for GRAD. As a result, the premium of higher education for women becomes substantially larger when the sample restrictions of disability benefit receipt and zero-earnings are lifted. Specifically, the premium rises from $445,000 to $508,000 for BA and from $822,000 to $991,000 for GRAD. Consequently, the gender gaps in the premium of higher education narrow. The premiums for women are around 70 % of those of men for both BA and GRAD in column (A), and they are 83 % (BA) to 94 % (GRAD) in column (B).

We caution that the substantial discrepancies between column (A) and column (B) for women are very likely to be associated with differences in labor supply across levels of education. Differential labor supply by education is complex and related to links between education, fertility, the timing of fertility, and marital status, among other factors. Most of the female respondents dropped from the main analytic sample had zero years of positive earnings over at least one 10-year block of their 20-year observational period. Reverse causal mechanisms—in which those who are not interested in labor markets are less educated—are likely to operate, at least partially.

Comparison With Synthetic Cohort Method Based on Current Earnings

To determine how educational differences in lifetime earnings may appear when long-term tax earnings data are not available, we estimated 50-year lifetime earnings using a synthetic cohort method based on self-reported earnings in the 2004 SIPP. Table 5 shows the results.

Lifetime earnings using SIPP earnings are computed as follows. First, we derive annual earnings as of 2004 by multiplying respondents' four-month earnings by 3 (Wave 2 of the SIPP provides respondents' earnings information for the previous four months). We then estimate 10-year cumulative earnings for five age groups (i.e., 20s, 30s, 40s, 50s, and 60s) by multiplying annual earnings for each member of an age group by 10. It is unrealistic to assume that 10-year cumulative earnings for the highly educated can be estimated by multiplying annual earnings by 10 because of their labor market inactivity in the early 20s. To account for this, 10-year cumulative earnings in the 20s are estimated by multiplying annual earnings by 8 for SC, 7 for BA, and 5 for GRAD. This estimate, then, represents earnings for that 10-year stage of the work life. Using the same set of covariates used in models shown in Tables 2 and 3, we estimate quantile regression at the median for the five age groups (i.e., 20s, 30s, 40s, 50s, and 60s). We then sum the net 10-year median earnings estimates to arrive at 50-year earnings by educational level. To facilitate comparison with previous studies, we derive 50-year lifetime earnings using a sample confined to full-time workers (i.e., 35+ hours a week) in column (C) of Table 5. We also provide estimates for a sample that does not screen out part-time workers (column (D)).

Compared with estimates based on the longitudinal tax data (panels C and D in Fig. 2), the synthetic cohort method using annual earnings of full-time workers overstates the earnings gains associated with a bachelor's degree by 23 % for men and 42 % for women. A less restrictive sample that includes those not working full-time alleviates the extent of overestimation but does not eliminate it. These results reveal that controlling for the same covariates does not eradicate the gap between our main estimates based on administrative tax data covering 20-years of a person's career and estimates based on self-reported SIPP earnings.

To consider how differences between the estimates based on long-term tax earnings data and self-reported earnings may be patterned by age, we examine the discrepancies at each 10-year age group. Figure 3 shows the results. If synthetic cohort methods overestimate the value of education proportionally over the whole work life, the slopes of all lines in Fig. 3 will be the same. Contrary to this expectation, Fig. 3 uncovers substantial variation by age. The largest magnitude of difference between the tax- and SIPP-based estimates occurs in the 20s and 60s. The extent of overestimation in age 20s is most substantial for the less-educated. Important discrepancies in the age 60s occur at all levels, particularly among the college-educated. These findings imply that measurement issues using synthetic cohort methods are concentrated at early and later stages of work careers.

To illustrate, we remove the 20s and 60s and examine whether focusing on prime working ages from 30 to 59 (30-year estimates) reduces the extent of overestimation (results not shown). Indeed, focusing on ages to 30 to 59 more closely approximates our estimate based on longitudinal earnings data for the same ages than using the 50-year lifetime earnings. However, the lifetime premium of a bachelor's degree in dollar terms is still overestimated by 20 % for both genders.

The good news is that the *relative* advantages of higher education are similar between column (A) of Table 4 and column (D) of Table 5 for both genders. College-educated workers (i.e., BA+) earn 53 % to 55 % more than HSG workers in the case of men, and 64 % to 67 % more in the case of women. Deriving lifetime earnings from annual self-reported earnings using the specification of column (D) is therefore likely to produce a fairly accurate estimate of the *relative* return to higher education.

Discussion and Conclusion

Using a rich data set that matches SIPP respondents with their longitudinal earnings from administrative tax records, this study investigates how education is related to lifetime earnings patterns over different stages of the life course in the United States. Accounting for important sociodemographic variables that influence both earnings and the probability of college completion, we provide estimates of men's and women's earnings by educational attainment over a lifetime.

Our results extend previous work showing the earnings-increasing effect of education in several ways. First, the analysis uses long-term earnings data for the same individual, which provides a better depiction of the relationship between educational attainment and lifetime earnings than estimates based on cross-sectional data and purely synthetic cohort methods. Second, our results show the importance of adjusting for socioeconomic and demographic characteristics to help disentangle the effect of education from other factors. Our regression-adjusted estimates reveal that taking into account other covariates significantly reduces the unadjusted lifetime earnings gains associated with college completion by around 30 %.

Our unadjusted estimates show that the lifetime earnings gap between high school and college graduates, including those with a graduate degree, is around $1.13 million for men and $792,000 for women. These estimates are only modestly lower than previous reports (Carnevale et al. 2013; Hout 2012). However, after we account for key covariates, the lifetime earnings return to college is clearly reduced. For bachelor's degree holders or higher (BA+), the 50-year estimate is about $840,000 for men and $587,000 for women, which is about 30 % to 45 % lower than what previous studies reported. Put differently, the lifetime earnings premium of a bachelor degree compared with a high school diploma is about 43 % for men and 51 % for women, which is substantially lower than an oft-cited prior estimate of 84 % (Carnevale et al. 2013).

The results also highlight the importance of sample restrictions in shaping our understanding of the returns to education. In supplementary analysis that used a less-restrictive sample, we found sharply higher lifetime returns for education among women, but not as much for men.

By comparing our estimates based on longitudinal tax data with those based on self-reported cross-sectional data, this article illustrates some of the consequences of using synthetic cohort methods as a basis for understanding the economic returns to education. According to our analysis, lifetime earnings estimates covering ages 20 to 69 derived from cross-sectional annual earnings appear to be overestimated by 23 % for men and 42 % for women. Limiting the sample to the prime working ages helps but does not eliminate the discrepancy. The discrepancy between our estimates of lifetime earnings based on linked longitudinal earnings data and estimates in other studies using cross-sectional data may be driven by many factors, including different covariates, different inclusion criteria for the sample, or different measurement of earnings.

The findings presented here also speak to broader debates about the financial value of college education. Although including covariates reduces the estimated financial return of educational attainment, the net return of higher education is likely to be greater than the net cost. The average price of tuition and required fees of a four-year college per year was about $12,967 in 2010 before factoring in scholarships (National Center for Education Statistics 2012).[10] For four years, the total cost was $52,000. Although our unadjusted estimates are consistent with previous estimates often cited in the academic literature (e.g., Hout 2012), the regression-adjusted estimates that control for the probability of college completion and other characteristics related to earnings reveal more modest, yet clearly substantial, positive effects of higher education on lifetime earnings relative to the net cost of education.

Yet, some may prefer to gauge the lifetime financial return to schooling using a discounted present dollar value. When a 4 % real discount rate is applied, the net present value of college education (BA and GRAD combined) at age 20 is around $314,000 for men and around $232,000 for women. From this view, the net present lifetime value of college education at age 20 for those who have similar likelihood of obtaining a bachelor's degree is 6 times greater than the total cost of college education for men, and 4.5 times greater for women. Such results corroborate that a college education yields substantially more financial rewards than it costs for the typical man and woman. At the same time, the net present value, some may argue, underestimates the value of higher education. In terms of life-course patterns, our results show higher growth rates in median earnings over the work career among college graduates relative to high school graduates. This indicates greater intragenerational mobility of college graduates relative to high school graduates. Insofar as higher earnings at the late stage of work career improves retirement income security more than the earnings at the early stage of work career, the positive effect of education at the late stage of work career should be emphasized rather than discounted.

The results also provide insight into gender differences. Men clearly earn more over a lifetime than women at all educational levels: the absolute return to higher education is 43 % higher for men than that for women. However, our regression-adjusted estimates show that the relative return to post-baccalaureate education is higher for women than for men during their prime working ages. Moreover, supplementary estimates using a less restrictive sample

[10]We omit room and board from this calculation because persons who do not attend college also need to pay those costs.

showed higher relative total return of education for women relative to our main estimates, resulting in a narrowing of the gender difference in absolute return.

Another notable gender difference is that the relative return from education in the 20s is substantially large for women, whereas it is statistically zero for men, mainly because the earnings of less-educated young women are much lower than correspondingly less-educated men. The latter is likely driven, in part, by childbearing and the weak labor force attachment of less-educated women in their 20s. This pattern may, in turn, lower the perceived opportunity cost for women in going to college.

In addition, our findings have public policy relevance. One area of significance relates to student loan programs. Insofar as education increases earnings over the life span, it provides economic rationale for various student loan programs and other policies targeting improved educational outcomes (Avery and Turner 2012). The expectation of a lifetime earnings advantage for college attainment could also influence demand for higher education and decisions about loans.

The strong association between education and lifetime earnings also has implications for retirement and aging. The long-term earnings boost resulting from higher education constitutes a key mechanism linking education with retirement outcomes, such as Social Security benefit levels (Iams et al. 2010), work-related pensions (Poterba et al. 2007), retirement savings (Munnell and Sundén 2004; O'Rand et al. 2009), and health and mortality outcomes (Cristia 2009). The observed positive association between graduate degree attainment and cumulative earnings in the 60s for men may be of particular importance. Moreover, given the rise toward retirement savings vehicles that require more active participation by individuals (e.g., defined-contribution pensions), education may be becoming a more salient aspect of retirement planning (O'Rand 2011).

The analysis is not without limitations. First, we recognize that due a limited number of control variables, our results are not definitive and should not be unquestionably accepted as being causal. Unobserved individual heterogeneity (e.g., reflecting variation in such traits as ambition, intelligence, creativity, differences in preferences for income versus leisure, or intrinsic job rewards) may contribute to the education–earnings relationship observed here. Second, we do not measure the entire lifetime earnings of one birth cohort because the longitudinal earnings data do not extend further back than 1982. Estimates of real-cohort lifetime earnings may vary from those based on the semi-synthetic cohort method used here.

Third, lifetime earnings differences by education might ultimately differ for future cohorts. Given increasing earnings dispersion by education among recent cohorts, differences in lifetime earnings by education may become more pronounced. The Great Recession, moreover, could accentuate these gaps, insofar as less-educated groups were more affected by the economic downturn than higher-educated groups (Sum and Khatiwada 2010), and unemployment or underemployment can have long-lasting negative effects on earnings (Couch et al. 2013b). Finally, this study focuses on median earnings, but there is likely to be substantial variability at different points of the distribution across the work career. Earnings, moreover, reflect only one dimension of the relationship between education and socioeconomic well-being.

Our findings suggest a number of directions for additional study. Future research is needed in regard to the decomposition of the total earnings effect of education into components reflecting time employed versus hourly wage rates. More work is warranted to improve our understanding of the variation in lifetime returns to a college degree by field of study. A more systematic analysis of gender is necessary as are differences by race/ethnicity. The complex nexus of interactions between higher education, family formation patterns, and earnings paths warrant more attention (Brand and Davis 2011). An assessment of volatility in how earnings accumulate over a worker's career, including later life, would be fruitful. A more detailed investigation of the economic opportunity costs of going to college would furthermore be a useful contribution.

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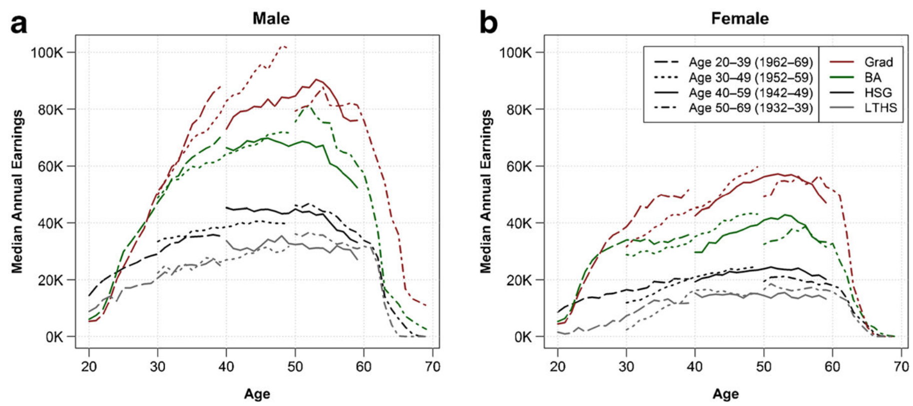

Fig. 1.
Earnings trajectories over the lifetime by education and by gender

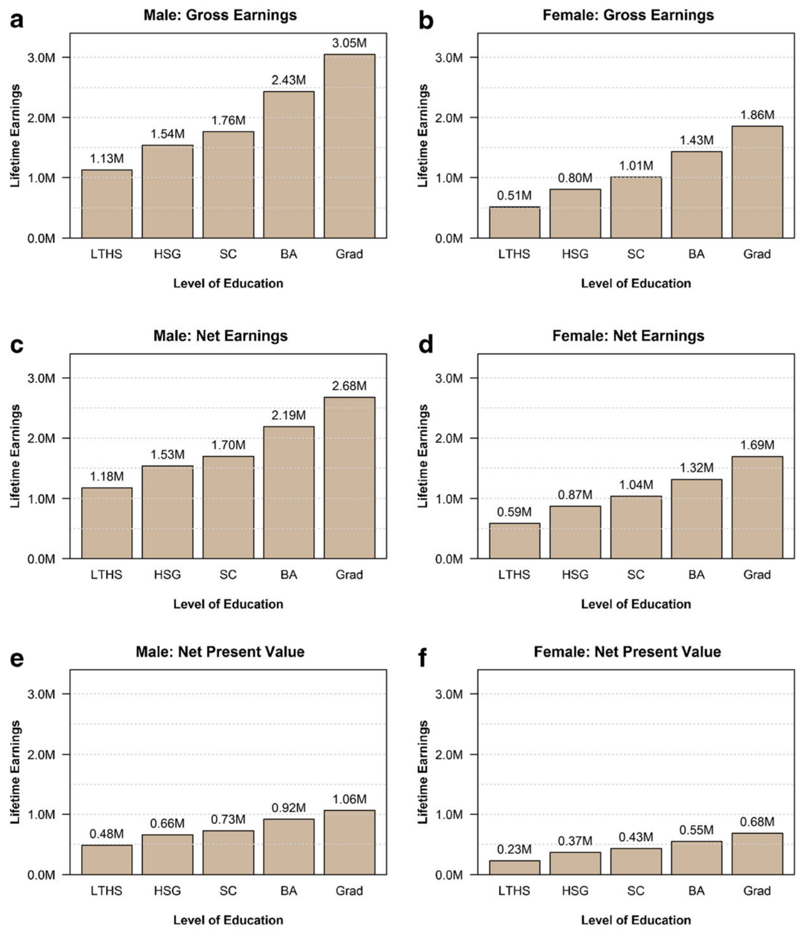

Fig. 2.

Fifty-year (age 20 to 69) median lifetime earnings by education, gross and net. A semi-synthetic cohort method is used to estimate lifetime earnings. Gross earnings are based on descriptive statistics without controlling for any covariates. For the estimates of net lifetime earnings and its present value, race/ethnicity, marital history, number of children, birth place, high school type, college preparation courses, and math and science AP courses are taken into account in median regression models. The present value is calculated at age 20 using a discount rate of 4 %

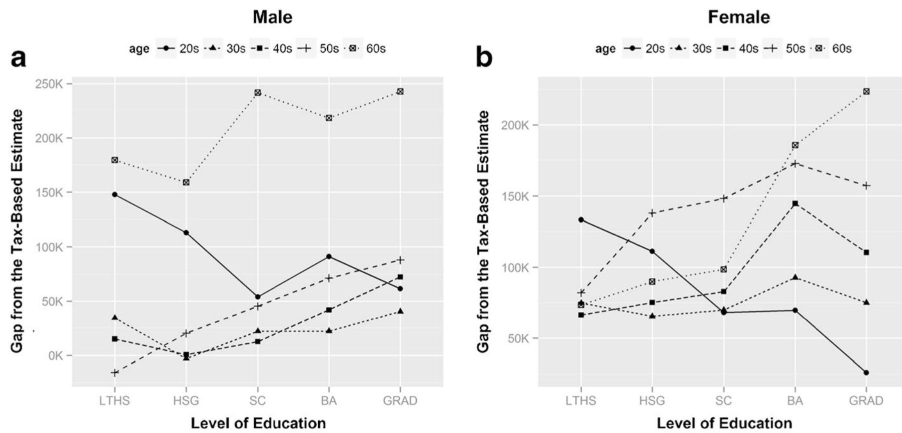

Fig. 3.

Comparison of 10-year cumulative earnings estimates using self-reported earnings (a synthetic cohort method) and longitudinal administrative tax earnings records for the same individuals (a semi-synthetic cohort method), by level of education and by gender

Table 1

Sample characteristics by birth cohort

	Total	Cohort 1	Cohort 2	Cohort 3	Cohort 4
Birth Years	1932–1969	1962–1969	1952–1959	1942–1949	1932–1939
Age Range	20–69	20–39	30–49	40–59	50–69
Starting Year	1982 to 1989	1982 (age 20 for 1962 cohort) to 1989 (age 20 for 1969 cohort)	1982 (age 30 for 1952 cohort) to 1989 (age 30 for 1959 cohort)	1982 (age 40 for 1942 cohort) to 1989 (age 40 for 1949 cohort)	1982 (age 50 for 1932 cohort) to 1989 (age 50 for 1939 cohort)
Ending Year	2001 to 2008	2001 (age 39 for 1962 cohort) to 2008 (age 39 for 1969 cohort)	2001 (age 49 for 1952 cohort) to 2008 (age 49 for 1959 cohort)	2001 (age 59 for 1942 cohort) to 2008 (age 59 for 1949 cohort)	2001 (age 69 for 1932 cohort) to 2008 (age 69 for 1939 cohort)
Age in Year 2004	35–72	35–42	45–52	55–62	65–72
Male Sample Size	11,824	3,830	3,953	2,680	1,361
Female Sample Size	12,098	4,003	4,072	2,710	1,313

Table 2

Median regressions of 10-year cumulative earnings for men by life-course stage

	Age 20–29 (Cohort 1)	Age 30–39 (Cohorts 1 and 2)	Age 40–49 (Cohorts 2 and 3)	Age 50–59 (Cohorts 3 and 4)	Age 60–69 (Cohort 4)
Education (ref. = HSG)					
LTHS	−.454*** (.050)	−.333*** (.040)	−.280*** (.042)	−.168*** (.046)	−.141 (.121)
SC	.056* (.026)	.119*** (.021)	.115*** (.022)	.097** (.030)	.071 (.092)
BA	.048 (.032)	.432*** (.026)	.399*** (.028)	.376*** (.038)	.308* (.125)
GRAD	−.072 (.043)	.578*** (.033)	.588*** (.033)	.595*** (.040)	.791*** (.131)
Race (ref. = white)					
Black	−.300*** (.035)	−.285*** (.028)	−.215*** (.032)	−.132** (.043)	−.143 (.129)
Hispanic	−.153*** (.038)	−.142*** (.032)	−.155*** (.041)	−.205** (.060)	−.258 (.225)
Other	−.150* (.058)	−.148** (.048)	−.155** (.053)	−.104 (.067)	−.381 (.221)
Never Married	−.260*** (.028)	−.321*** (.023)	−.379*** (.031)	−.350*** (.056)	−.177 (.207)
Married Before Age 18	.012 (.099)	−.085 (.074)	−.264*** (.074)	−.341*** (.097)	−.388 (.316)
Birth Year	.018*** (.005)	−.005** (.002)	.001 (.002)	.011*** (.002)	−.012 (.016)
Born in the South	−.030 (.024)	−.081*** (.019)	−.069** (.020)	−.042 (.026)	−.054 (.081)
Private High School	.040 (.038)	.060* (.030)	.026 (.032)	−.015 (.041)	−.177 (.129)
College Prep	.056* (.027)	.104*** (.020)	.138*** (.022)	.115*** (.028)	.230* (.098)
Math and Science AP	.050* (.024)	.065*** (.019)	.058** (.020)	.077** (.026)	.226** (.080)
Constant	11.685*** (.179)	13.019*** (.069)	12.944*** (.089)	12.280*** (.136)	12.783*** (1.068)
Sample Size	3,830	7,783	6,633	4,041	1,361
Pseudo-R^2	.105	.123	.115	.096	.053

Note: Numbers within parentheses are standard errors.

* $p < .05$;

** $p < .01$;

*** $p < .001$ (two-tailed tests)

Table 3

Median regression of 10-year cumulative earnings for women by life-course stage

	Age 20–29 (Cohort 1)	Age 30–39 (Cohorts 1 and 2)	Age 40–49 (Cohorts 2 and 3)	Age 50–59 (Cohorts 3 and 4)	Age 60–69 (Cohort 4)
Education (ref. = HSG)					
LTHS	−.883*** (.083)	−.489*** (.067)	−.365*** (.057)	−.292*** (.063)	−.197 (.116)
SC	.113** (.039)	.167*** (.031)	.179*** (.027)	.157*** (.036)	.263** (.081)
BA	.331*** (.048)	.423*** (.039)	.405*** (.035)	.445*** (.051)	.417** (.119)
GRAD	.290*** (.062)	.706*** (.047)	.710*** (.040)	.748*** (.055)	.598*** (.131)
Race (ref. = white)					
Black	−.096* (.046)	.123** (.039)	.097* (.036)	.227*** (.051)	.284* (.110)
Hispanic	−.137* (.059)	.022 (.052)	−.041 (.051)	−.085 (.074)	.033 (.183)
Other	−.173* (.086)	.026 (.072)	−.047 (.066)	−.096 (.091)	.092 (.197)
Total Number of Children	−.145*** (.014)	−.216*** (.011)	−.123*** (.010)	−.035** (.013)	−.012 (.028)
Never Married	−.275*** (.046)	−.029 (.041)	.101** (.042)	.155* (.071)	.045 (.190)
Married Before Age 18	−.532*** (.078)	−.006 (.056)	.063 (.043)	−.034 (.055)	−.049 (.119)
Birth Year	.017** (.006)	−.009*** (.002)	−.006** (.002)	−.004 (.003)	−.032* (.014)
Born in the South	−.054 (.034)	−.013 (.028)	−.080*** (.025)	−.114** (.034)	.016 (.075)
Private High School	.053 (.054)	.017 (.045)	.049 (.038)	.016 (.050)	.128 (.118)
College Prep	.125*** (.036)	.120*** (.029)	.118*** (.026)	.115** (.037)	.140 (.085)
Math and Science AP	.110** (.033)	.066* (.027)	.035 (.023)	.029 (.032)	.175* (.071)
Constant	11.411*** (.255)	12.785*** (.107)	12.807*** (.109)	12.597*** (.178)	13.403*** (.986)
Sample Size	4,003	8,075	6,782	4,023	1,313
Pseudo-R^2	.105	.109	.091	.086	.049

Note: Numbers within parentheses are standard errors.

* $p < .05$;

** $p < .01$;

*** $p < .001$ (two-tailed tests)

Table 4

Net 50-year lifetime earnings with and without the sample restrictions of disability and positive earnings[a]

		(A)[b] Sample Restrictions: − 2+ Years of Positive Earnings - No Work Disability		(B)[c] Sample Restrictions: - No Earnings Restriction - Includes the Disabled, Except Those Disabled Before Age 20		
		Net 50-Year Lifetime Earnings	Gap From HSG	Net 50-Year Lifetime Earnings	Gap From HSG	(B)/(A)
Male[d]	LTHS	1,178,000	(−357,000)	795,000	(−564,000)	.675
	HSG	1,535,000	—	1,359,000	—	.885
	SC	1,696,000	(161,000)	1,508,000	(149,000)	.889
	BA	2,190,000	(655,000)	1,965,000	(605,000)	.897
	GRAD	2,678,000	(1,143,000)	2,412,000	(1,053,000)	.901
	[BA+GRAD]	2,375,000	(840,000)	2,134,000	(775,000)	.899
Female[d]	LTHS	586,000	(−285,000)	186,000	(−428,000)	.317
	HSG	871,000	—	614,000	—	.704
	SC	1,036,000	(165,000)	858,000	(244,000)	.828
	BA	1,317,000	(445,000)	1,122,000	(508,000)	.852
	GRAD	1,693,000	(822,000)	1,605,000	(991,000)	.948
	[BA+GRAD]	1,458,000	(587,000)	1,303,000	(690,000)	.894

[a]All estimates control for race/ethnicity, marital history, number of children, birth place, high school type, college preparation courses, and math and science AP courses. The same mean values for all covariates are applied to all estimates.

[b]These estimates are the same as those shown in Fig. 2.

[c]Zero cumulative earnings is converted to $1 before taking log-transformation.

[d]The total numbers of respondents to compute lifetime earnings (A) are 11,824 for men and 12,098 for women. The total numbers of respondents to compute (B) are 13,386 for men and 15,375 for women.

Table 5

Net lifetime earnings, estimates using self-reported annual earnings[a]

		(C)[b,d] Sample Restrictions: - Positive Earnings in 2004 - Full-time Workers Only			(D)[b,d] Sample Restriction: - Positive Earnings in 2004		
		Net 50-Year Lifetime Earnings	Gap From HSG	(C)/(A)[c]	Net 50-Year Lifetime Earnings	Gap From HSG	(D)/(A)[c]
Male	LTHS	1,539,000	(−286,000)	1.306	1,377,000	(−316,000)	1.169
	HSG	1,825,000	—	1.189	1,693,000	—	1.103
	SC	2,072,000	(246,000)	1.222	1,894,000	(201,000)	1.117
	BA	2,635,000	(810,000)	1.203	2,486,000	(793,000)	1.135
	GRAD	3,183,000	(1,358,000)	1.189	2,971,000	(1,278,000)	1.109
	[BA+GRAD]	2,843,000	(1,018,000)	1.197	2,669,000	(976,000)	1.124
Female	LTHS	1,016,000	(−335,000)	1.734	948,000	(−291,000)	1.618
	HSG	1,351,000	—	1.551	1,239,000	—	1.423
	SC	1,504,000	(153,000)	1.452	1,399,000	(159,000)	1.350
	BA	1,982,000	(631,000)	1.506	1,846,000	(607,000)	1.402
	GRAD	2,286,000	(935,000)	1.350	2,325,000	(1,086,000)	1.373
	[BA+GRAD]	2,096,000	(841,000)	1.438	2,026,000	(787,000)	1.390

[a] All estimates control for race/ethnicity, marital history, number of children, birth place, high school type, college preparation courses, and math and science AP courses. The same mean values for all covariates are applied to all estimates.

[b] Annual earnings is estimated by multiplying three to the four-month SIPP earnings. To compute 10-year earnings, annual earnings is multiplied by 10, and then log-transformed. To account for low earnings in the early 20s for highly educated workers, earnings in their 20s is discounted by 20 % for SC, 30 % for BA, and 50 % for GRAD.

[c] (A) are the estimates of lifetime earnings reported in column (A) of Table 4.

[d] The total numbers of respondents to compute lifetime earnings (C) are 18,251 for men and 14,724 for women. The total numbers of respondents to compute (D) are 20,359 for men and 19,730 for women.