

Are They Still Worth It? The Long-Run Earnings Benefits of an Associate Degree, Vocational Diploma or Certificate, and Some College



CHANGHWAN KIM AND CHRISTOPHER R. TAMBORINI

Sub-baccalaureate education accounts for most of the expansion in higher education over the last century. Nevertheless, relatively few studies have examined the related long-term financial benefits. Exploiting a rich dataset linking the Survey of Income and Program Participation and administrative earnings records, this study investigates these benefits over a person's early and mid-career and the heterogeneity of these patterns by field of study. We find substantial payoffs, net of an extensive set of demographic covariates and variables indicating high school courses taken. At the same time, we find considerable variation across degree types and fields of study. Several vocational diplomas, certificates, and associate degrees are associated with higher earnings than bachelor's degrees in social science, liberal arts, and education. Implications of these findings are discussed.

Keywords: long-term earnings, community college, associate degree, vocational certificate, field of study

The financial payoffs associated with human capital investments in postsecondary education have received considerable attention in scholarly and policy arenas in recent decades (Davies and Guppy 1997; Hout 2012; Kim, Tamborini, and Sakamoto 2015; Oreopoulos and

Petronijevic 2013; Sandefur and Park 2007; Tamborini, Kim, and Sakamoto 2015). To date, researchers have largely focused on degrees from bachelor's and graduate programs when estimating the labor market benefits associated with postsecondary education. An appreciably

ChangHwan Kim is professor in the Department of Sociology at the University of Kansas. **Christopher R. Tamborini** is a senior researcher in the Office of Research, Evaluation, and Statistics at the U.S. Social Security Administration.

© 2019 Russell Sage Foundation. Kim, ChangHwan, and Christopher R. Tamborini. 2019. "Are They Still Worth It? The Long-Run Earnings Benefits of an Associate Degree, Vocational Diploma or Certificate, and Some College." *RSF: The Russell Sage Foundation Journal of the Social Sciences* 5(3): 64–85. DOI: 10.7758/RSF.2019.5.3.04. The views expressed in this article are those of the authors and do not represent the views of the Social Security Administration (SSA). Access to SSA data linked to Census Bureau survey data is subject to restrictions imposed by Title 13 of the U.S. Code. The data are accessible at a secured site and must undergo disclosure review before their release. For researchers with access to these data, our programs used in this analysis are available on request. Direct correspondence to: ChangHwan Kim at chkim@ku.edu, Department of Sociology, University of Kansas, 1415 Jayhawk Blvd., Room 716, Lawrence, KS 66045; and Christopher R. Tamborini at chris.tamborini@ssa.gov, Senior Researcher, Office of Research, Evaluation, and Statistics, U.S. Social Security Administration, 8th floor, 250 E. St., SW, Washington, D.C. 20254.

Open Access Policy: *RSF: The Russell Sage Foundation Journal of the Social Sciences* is an open access journal. This article is published under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

smaller body of work has focused on sub-baccalaureate programs, such as associate degrees and vocational certificates (Belfield and Bailey 2011; Dougherty 1987; Gill and Leigh 2003; Grubb 1993; Jepsen, Troske, and Coomes 2014; Marcotte et al. 2005; Monk-Turner 1990).

Despite receiving less attention in empirical work, sub-baccalaureate education has expanded substantially over recent decades. In 1963, 740,000 students were in public two-year institutions, accounting for 24 percent of public higher education (Baum, Kurose, and McPherson 2013). As of 2013, more than seven million students were, representing around 40 percent of all postsecondary students and around half of public college education (Kena et al. 2015). This growth raises questions about the financial benefits associated with sub-baccalaureate education over a person's work life and the heterogeneity of these patterns by field of study.

Systematic study of the financial payoffs associated with sub-baccalaureate education, particularly over the long run, has been hampered by a number of factors. One central factor is a lack of suitable data, particularly on fields of study. This is unfortunate given the vast diversity of programs and credentials at the sub-baccalaureate level, which are related with heterogeneous labor market outcomes (Grubb 1997; Jepsen, Troske, and Coomes 2014).

In this study, we investigate the long-term financial benefits associated with sub-baccalaureate degrees and certificates in the United States. To do so, we use nationally representative data that matches respondents from the 2004 and 2008 Survey of Income and Program Participation (SIPP) to restricted-use administrative files containing their longitudinal earnings from tax records. Specifically, the linked tax data allow us to follow the annual earnings of men and women finishing high school during the period between 1972 and 1993, for up to twenty years after graduation (on the advantage of the survey and administrative records linked data, see Grusky et al. 2019). In turn, SIPP's educational history module permits us to disaggregate between associate degree, vocational-technical diploma or certificate, and more important, by fields of study at the sub-baccalaureate level.

Our analysis explores three main lines of inquiry. The first examines how annual earnings unfold from early to mid-career across sub-baccalaureate groups using a twenty-year observational window starting from high school graduation. The second considers variation in the long-term benefits of sub-baccalaureate education across fields of study. Horizontal stratification by field of study is an important yet often overlooked dimension shaping the financial rewards to education (Kim, Tamborini, and Sakamoto 2015). A handful of studies reveal differential returns at the sub-baccalaureate level by field of study, but more work is needed (Dadgar and Trimble 2015; Grubb 1993, 1997; Kane and Rouse 1995; Liu, Belfield, and Trimble 2015). The third line of inquiry estimates the long-term financial benefits to sub-baccalaureate education by constructing a measure of twenty-year cumulative earnings starting from the year after high school graduation. Altogether, the long-term view presented in our analysis is critical, we argue, because standard accounts in the literature about the economic benefits of sub-baccalaureate education tend to rely on cross-sectional estimates or shorter-term observational windows.

Our results show that annual earnings, cumulative twenty-year earnings, and earnings growth of all sub-baccalaureate groups including vocational certificates and diploma are higher over early to mid-adulthood than comparable high school graduates. At the same time, we uncover important heterogeneity by fields of study at the sub-baccalaureate level. Some fields of study at the sub-baccalaureate level, we find, are associated with higher payoffs than others among bachelor's degree holders over the observational period. Although our aim is not to derive estimates of the causal effects of sub-baccalaureate education, we provide new insights into the shape of earnings trajectories from early to mid-career associated with different sub-baccalaureate groups and their fields of study by assembling novel data that links national survey data with longitudinal tax data. More generally, the article demonstrates one way in which survey data linked to administrative records can be used to better understand long-term economic patterns related to education over the life course.

BACKGROUND

The importance of education in determining the labor market experiences of workers has been widely discussed in economic and sociological research (Baum, Kurose, and McPherson 2013; Brand and Xie 2010; Hout 2012; Tamborini, Kim, and Sakamoto 2015). Despite a growing body of work on the financial returns to sub-baccalaureate education (Jepsen, Troske, and Coomes 2014), the bulk of the literature has focused on the financial rewards flowing from human capital investments in bachelor's degree programs (Rosenbaum, Ahearn, and Rosenbaum 2017). Most existing studies tend to calculate the financial rewards associated with the sub-baccalaureate level under the broad category of "some college" (Tamborini, Kim, and Sakamoto 2015).

A number of factors have complicated examination of the financial benefits related to sub-baccalaureate education. First, the institutions and programs offered at that level vary widely, and may include community colleges, vocational and technical institutes, and proprietary schools (Grubb 1993, 1997; Liu, Belfield, and Trimble 2015). Moreover, students attending such institutions are quite diverse in their goals and family backgrounds. Some attend with the intention of receiving a degree or certificate, whereas others may see a sub-baccalaureate degree as a stepping stone for a bachelor's degree program. Sub-baccalaureate institutions provide second chances for educational mobility, particularly among disadvantaged students. This diversity makes it challenging for researchers to estimate the associated benefits.

Second, as mentioned, the available data for sub-baccalaureate credentials are relatively limited (Belfield and Bailey 2011). Large national surveys such as the American Community Survey only provide cross-sectional information and do not contain detailed fields of study, especially at the sub-baccalaureate level. Panel surveys such as the National Longitudinal Survey of Youth include rich longitudinal information, but often do not have it on the field of study, and sample sizes are limited. Furthermore, these panel data have high sample attrition rates. Recently, administrative data on students enrolled in community colleges matched

with unemployment insurance information have been used to study the long-term economic return to sub-baccalaureate education (Dadgar and Trimble 2015; Jepsen, Troske, and Coomes 2014; Liu, Belfield, and Trimble 2015; Stevens, Kurlaender, and Grosz 2018). However, these studies are limited to one or two states and compare only between those who earn an award in a community college and those who enroll in a community college but do not earn any certificate, diploma, or degree. The relative benefits to sub-baccalaureate education relative to other levels of education such as high school graduates or four-year college degree holders are not estimated.

Is the Financial Benefit to Sub-Baccalaureate Education Substantive?

These challenges aside, a number of key studies provide estimates of the labor market benefits associated with sub-baccalaureate education. One strand of work has explored college credits as well as degrees and certificates. In earlier work, Thomas Kane and Cecilia Rouse show net advantages to community college attendance even without finishing, finding around a 4 to 7 percent premium for a year of community college (1995). Norton Grubb, however, finds low economic benefits for those who fail to earn a credential or degree (1993, 1997). Steven Brint argues that community colleges tend to have low financial returns and may not be optimal for disadvantaged students by diverting them from four-year college (2003). Based on the notion of negative or zero returns of sub-baccalaureate higher education, the *cooling out* hypothesis argues that community colleges can discourage disadvantaged or underprepared students from achieving their desirable educational goals such as a bachelor's degree (Dougherty 1994; Rosenbaum et al. 2017).

Although mixed findings might be the story of a quarter century ago, more recent estimates suggest positive returns to different types of sub-baccalaureate education. According to James Rosenbaum, Caitlin Ahearn, and Janet Rosenbaum, the economic return to community college is positive for recent cohorts, though it was not significantly different from zero for older cohorts (2017). The extant litera-

ture since the 1990s confirms more substantial economic returns for those who are awarded an associate degree or vocational certificate, even as estimates of the magnitude of such returns vary sharply due to the different datasets and methodologies being used (Belfield and Bailey 2011). For example, Christopher Jepsen, Kenneth Troske, and Paul Coomes show that earnings rise substantially after receiving an associate degree or diploma for men, around 18 to 30 percent, and women, 40 percent, who entered community college in the early 2000s (2014). Stephanie Cellini and Latika Chaudhary document around a 15 percent gain in earnings associated with an associate degree among young adults age twenty-four to thirty in 2008 (2014). Using the 2000 follow-up of the National Education Longitudinal Survey, Dave Marcotte and his colleagues find substantial returns to an associate degree for cohorts who graduated in the 1990s, especially for women (2005). Looking at the median annual earnings of male full-time wage and salary workers age twenty-five and older, Sandy Baum, Charles Kurose, and Michael McPherson also find higher earnings among some college and associate degree holders, but relatively flat earnings for this group over recent decades (2013).

Although a consensus is developing on the positive payoff to an associate degree in recent decades, estimates of other sub-baccalaureate credentials are less established. For example, using a large administrative dataset reflecting information from the North Carolina Community College System, Vivian Liu, Clive Belfield, and Madeline Trimble report that the wage return to community college certificates are negative for both genders relative to those who enroll in a community college but do not earn any credentials (2015). Analyzing the longitudinal Youth Development Survey, Mike Vuolo, Jeylan Mortimer, and Jeremy Staff also find the negative return to certificates relative to the noncompleters (2016). Other studies, however, document higher earnings associated with certificates (Jepsen, Troske, and Coomes 2014). Clive Belfield and Thomas Bailey compute the average quarterly earnings return to certificates across studies that used state-specific administrative data, finding it is \$530 for men and \$740 for women (2017). Using administrative

data from the California Community Colleges system linked to earnings records, Ann Stevens, Michal Kurlaender, and Michel Grosz estimate individual fixed-effects models and find substantially higher earnings among individuals with technically oriented education offered in community college (2018).

Variation of Sub-Baccalaureate Education by Fields of Study

Parallel with discussions on the economic benefits, another important question is the extent to which labor market benefits vary across fields of study. Analysis of heterogeneity in labor market outcomes by field of study addresses broader issues related to horizontal stratification in higher education (Kim, Tamborini, and Sakamoto 2015). Most work in this area, however, has assessed variation of bachelor's and graduate degrees by fields of study rather than sub-baccalaureate level. Among the few studies on sub-baccalaureate degrees, Grubb reports positive returns to an associate degree among women in business and health-related fields but not in some fields such as education (1997). Other studies also reveal relatively higher returns for men and women with associate degrees in health (Jepsen, Troske, and Coomes 2014; Stevens, Kurlaender, and Grosz 2018). A review article argues that previous studies "uniformly show that field of study matters, with returns that are especially high for awards in health-related fields, high for directly vocational subjects, but negligible for academically focused associate degrees" (Belfield and Bailey 2017, 13).

One aspect that is not adequately addressed in previous studies is the value of various sub-baccalaureate fields relative to different fields of a bachelor's degree. For example, does an associate degree in health bring in a higher labor market benefit than a bachelor's degree in sociology? To our knowledge, no studies including recent research using state-level administrative data have provided such information.

Long-Term Financial Benefit to Sub-Baccalaureate Education

A dimension that has received surprisingly little attention in the study of sub-baccalaureate education relates to long-term labor market ben-

efits. Because the bulk of existing work uses cross-sectional earnings or average earnings over a period, analysis of the evolution of earnings or employment among sub-baccalaureate degree recipients over long stretches of their lives is rare. As a result, the earnings dynamics associated with sub-baccalaureate credits, degrees, or certificates over the life course are not well understood. One exception uses the Virginia Community College System data matched with unemployment insurance data (Jaggars and Xu 2016). Estimating multilevel growth curve models, Shanna Jaggars and Di Xu uncover substantial jumps in earnings after the completion of a credential. Both the immediate increase after completion and the subsequent earnings growth rates are highest for those who eventually earned a bachelor's degree, followed by associate degree holders and certificate holders. In addition, Liu and her colleagues estimate the return five, seven, and nine years after the first enrollment in a community college and find that the return rapidly increases in the first five years but slows thereafter (2015). In this article, we examine the earnings of individuals, following them for twenty years after high school graduation.

METHODS

We use wave-2 data from the SIPP 2004 and 2008 panels matched to the summary earnings record (SER) and the detailed earnings record (DER) files at the Social Security Administration (SSA). The SIPP data provide demographic and socioeconomic characteristics of a nationally representative sample. Critically, wave 2 includes a one-time topical module (educational history) that provides retrospective information about respondents' education. We use these data to measure field of study at the sub-baccalaureate level and to construct partial proxies for respondents' characteristics related to high school type and academic preparation. We pooled wave 2 of the 2004 and the 2008 SIPP panels to acquire adequate sample size to examine fields of study.

Linkages to the DER administrative file provide SIPP respondents' annual earnings from 1980 to 2014 based on their W-2 tax records. We also use the SER file to observe earnings in the relatively small proportion of years we examine prior to 1980. Both administrative files reflect respondents' tax-recorded earnings for all jobs in a year. One key difference is that the DER file contains respondents' full earnings information beyond the maximum taxable earnings and Social Security-covered employment, whereas the SER contains Social Security earnings that are capped at the taxable maximum under the Social Security program in a given year.¹ To mitigate potential concerns about this difference, we use the SER data only in observations prior to 1980 and switch to earnings from the DER thereafter. Also, the vast majority of workers do not reach the Social Security taxable maximum in any given year and work in covered employment—approximately 90 percent of all U.S. workers in the 1970s. We refer to this matched longitudinal dataset as the SIPP-IRS. More detailed descriptions of the SSA administrative records and survey matches may be found elsewhere (see McNabb et al. 2009; Tamborini, Kim, and Sakamoto 2015).

The central advantage of the SIPP-IRS data file is that it permits the construction of long-term earnings profiles over an age- and year-specific period. These data have several advantages over other longitudinal datasets. The National Longitudinal Survey of Youth is limited to particular birth cohorts, whereas the SIPP-IRS provides a larger range of cohorts and greater sample sizes. Although the Panel Survey of Income Dynamics is not limited to a particular birth cohort, the sample is based on households in 1968 with limited representativeness for more recent cohorts. Moreover, sample attrition is minimal in the SIPP-IRS data relative to other longitudinal datasets, and the linked annual earnings based on tax records are generally thought of as more reliable than self reports (Kim and Tamborini 2014).

A possible drawback of the SIPP-IRS is that

1. The earnings subject to Social Security taxes for a given year is limited by the taxable maximum. The vast majority of workers have earnings under this limit in any given year. In 2018, the taxable maximum was \$128,400. Social Security earnings also do not include labor income from a small segment of employment not covered under the Social Security program, such as some local and state government workers.

not all SIPP respondents were successfully matched with the administrative data. The match rate of the 2004 and 2008 panels, however, is high at around 80 to 90 percent. To maintain the national representation of the sample, our analyses use a SIPP weight that adjusts for unmatched respondents.

Target Population

Our main analysis sample consists of those who completed high school between 1972 and 1995. We selected these cohorts to construct twenty-year earnings since high school graduation using the 2004 and 2008 SIPP-IRS matched data. Our target population is those whose highest level of attainment is a vocational-technical diploma or certificate, an associate degree, or some college experience without earning a bachelor's degree (college dropouts) as of wave 2 of the SIPP panels. We compare the twenty-year earnings paths of these groups to high school graduates and individuals with a bachelor's degree of the same high school graduation cohort.

We apply a number of sample restrictions to clarify our analysis. We exclude individuals who did not graduate from a high school and those who have a graduate degree. This helps focus our analysis on a comparison of the earnings trajectories of individuals with a sub-baccalaureate education to those of high school graduates and bachelor's degree holders over the same stage of life. We exclude graduate degree holders because the twenty-year cumulative earnings after high school may not reflect the value of their education accurately. Sensitivity analysis reported later examines the effect of including graduate degree holders in our sample of bachelor's degree holders. We limit our sample to those who acquired a high school diploma by age twenty to exclude nontraditional students who might have unique labor market and schooling experience. We also require that individuals with postsecondary education acquired their final degree within ten years after high school graduation. This restriction is desirable because the benefit to sub-baccalaureate education varies by the age of graduation (Jacobson, Lalonde, and Sullivan 2005). The benefit for nontraditional students may be lower than that for on-time graduates.

The tiny share of the sample who have zero tax earnings for twenty years after high school graduation are also dropped.

Analytical Strategy

We assess the earnings streams associated with sub-baccalaureate education in two ways. First, we assess three major subgroups: technical-vocational diploma and certificates, associate degree, and college dropouts, also referred to as some college no degree. Second, we disaggregate further by fields of study. In both instances, we carry out descriptive and multivariate analysis.

With regard to the descriptive work, we map out median annual earnings by age over a twenty-year period after high school graduation, limiting our sample in each year to those with positive earnings. We examine the pattern for the three major subgroups of sub-baccalaureate education and by fields of study. For comparative purposes, we include the earnings trajectories of high school graduates and bachelor's degree holders over the same stage of life.

Multivariate analysis examines the relationship between sub-baccalaureate education (three subgroups and fields of study) and twenty-year cumulative earnings starting with the year of high school graduation. Cumulative earnings is a summary measure that reflects a number of complex life-course processes that affect its value. The measure reflects transitions in and out of labor market over the observational period due to unemployment or withdrawal from the labor force. It is also influenced by differences in labor supply over time, wages, and wage growth. Consequently, observed differentials by education level or field of study could be driven by one or all of these factors. In our analysis, we do not systematically examine the factors that explain differences in cumulative earnings or earnings growth. Instead, our goal is to measure the total cumulative earnings associated with sub-baccalaureate education levels and fields of study and to identify the extent of differences across these subgroups. Equation 1 shows our model specification using ordinary least squares (OLS):

$$y_i = \alpha + \sum_j \sum_k \beta_{jk} Degree_{ijk} + \sum_l \gamma_l X_{il} + e_i, \quad (1)$$

where y_i is log-transformed twenty-year cumulative earnings for individual i . Because the cumulative earnings includes years in school and unemployment spells, our estimates uncover the total payoffs to education up to around mid-career. Some of these payoffs can be accounted for by the opportunity cost of going to college (the forgone earnings while in school), the change in employability associated with education, and the change in productivity.

$Degree_{ijk}$ refers to the educational attainment for individual i . More specifically, it refers to j level of education and k field for individual i . The five levels of education—high school graduates (HSG); vocational-technical diploma or certificate (Voca); associate degree (AA); college dropouts (ColDrop); and bachelor's degree (BA)—set high school graduate as a reference point. One limitation of our study is that the SIPP does not allow us to separate BA holders who transferred from a community college from those who enter a four-year institution without attending a community college. The earnings for BA holders who transferred from a community college tends to be lower than those who started at a four-year institution (Lockwood Reynolds 2012).

For the analysis on fields of study, we construct eight dummy variables for men who have a vocational-technical diploma or certificate and seven dummies for women with a vocational-technical diploma or certificate. In the case of AAs, fields of study for men are constituted by seven dummy variables. In the case of women with AAs, we used the same dummies as men except for the dummy of engineering and drafting due to a small sample size. For BAs, we use the same set of seven dummy variables. The dummy variables reflecting the fields of study for each educational level are presented in table 3. For some college but no degree, we cannot disaggregate by field of study because the SIPP does not provide information on their study subject in college. In total, we examine twenty-two fields of study for men and twenty-one for women in our model. Because the reference group is HSG, the estimated β_{jk} quantifies the relative (dis)advantage of $Degree_{ijk}$ in twenty-year cumulative earnings relative to HSG.

X_1 refers to the L number of control vari-

ables. We control for birth year, survey year, and race-ethnicity. We also introduce a number of educational history variables that are not commonly used. These include six dummy variables measuring whether the following high school courses were taken (yes or no): industry, shop, or home economics; business courses; vocational programs; other specialized programs; advanced math and science courses; and college preparation courses. In addition, we measure whether the respondent's high school diploma is GED, whether the respondent attended private high school, whether the respondents were born in the South, and age at the final degree (or age at the college dropout). Therefore, the estimated β_{jk} is the net effect of education after accounting for these control variables.

EMPIRICAL FINDINGS

Table 1 presents descriptive statistics of our sample. Median twenty-year cumulative earnings since high school graduation for men with some college no degree is \$664,248, which is 15 percent higher than high school graduates. For a typical man with a vocational diploma or certificate, it is \$624,340, which is 8 percent higher than HSG. AA holders have higher twenty-year cumulative earnings since high school graduation (\$710,133) than some college no degree and vocational degree holders, and is 24 percent higher than HSG. Bachelor's degree holders' twenty-year cumulative earnings are substantially higher than those of other degree holders, reflecting 48 percent higher earnings than HSG.

Women's twenty-year cumulative earnings since high school graduation is appreciably lower than men's. For example, AA women's median twenty-year cumulative earnings is 38 percent lower than that of equally educated men. In terms of the rank among the sub-baccalaureate degrees, female AA holders earn the highest, followed by some college and vocational degree holders. Thus, the rank order is the same between men and women.

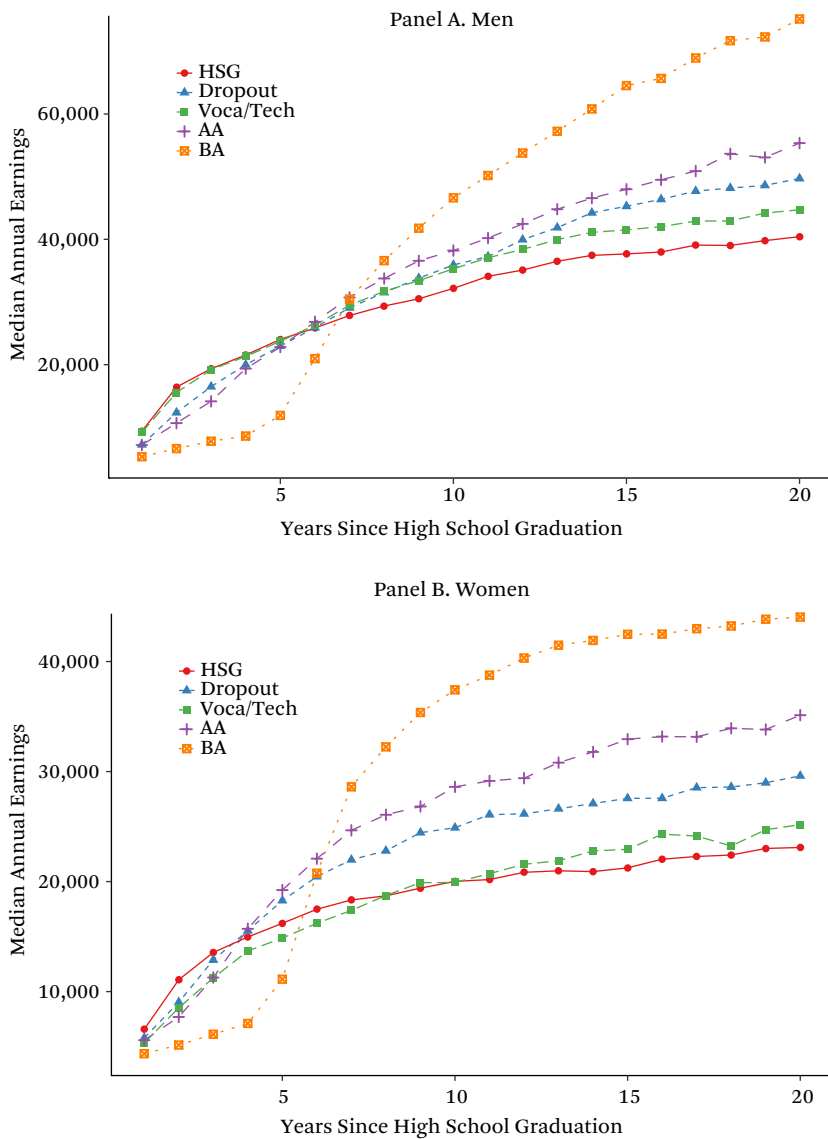
An interesting finding is that the cumulative earnings premium for college dropouts is notably higher than vocational degree holders. This result is consistent with studies showing that taking college credits without credentials

Table 1. Descriptive Statistics

	High School Grad	Some College No Degree (Dropout)	Vocational Degree	Associate Degree	Bachelor's Degree
Panel A. Male					
Twenty-year cumulative earnings (from year of high school graduation)					
Mean (\$)	606,716	702,405	668,903	751,955	936,766
Median (\$)	576,415	664,248	624,340	710,133	851,174
Median: logged dollar	13.265	13.406	13.345	13.473	13.654
Racial composition					
Whites	75.6	75.1	72.9	81.2	87.0
Blacks	12.8	10.9	13.1	8.3	6.4
Hispanics	8.9	10.7	10.3	7.2	3.5
Other races	2.8	3.3	3.8	3.3	3.1
High school courses and characteristics					
College prep courses	11.8	33.7	14.3	35.9	63.9
Advanced math and science	49.8	68.3	57.5	70.5	86.3
Industrial arts, shop, or home economics	64.8	51.3	64.3	53.5	32.3
Business courses	16.4	24.2	18.5	24.3	24.3
Vocational program	8.7	4.3	15.7	6.1	0.7
Private high school	3.4	7.9	4.3	7.6	14.1
Years taken for degree after high school		3.72	3.24	4.31	5.22
Panel B. Female					
Twenty-year cumulative earnings (from year of high school graduation)					
Mean (\$)	313,471	410,686	340,940	470,633	581,544
Median (\$)	272,581	367,956	298,581	440,825	529,887
Median: logged dollar	12.516	12.816	12.607	12.996	13.180
Racial composition					
Whites	73.7	76.8	65.6	80.3	84.4
Blacks	14.4	12.7	20.2	10.6	7.8
Hispanics	8.7	7.2	9.9	6.7	4.4
Other races	3.3	3.4	4.3	2.4	3.4
High school courses and characteristics					
College prep courses	14.9	36.3	19.4	42.2	66.6
Advanced math and science	48.6	63.3	55.1	68.4	80.4
Industrial arts, shop, or home economics	46.4	40.3	44.9	39.8	24.8
Business courses	49.8	48.6	47.6	47.4	30.9
Vocational program	3.8	3.1	7.5	3.1	0.70
Private high school	4.6	7.9	4.8	8.1	14.5
Years taken for degree after high school		3.58	3.14	4.03	4.98

Source: Authors' calculations using the SIPP-IRS linked data.

Note: All earnings are adjusted to the 2014 dollars using CPI-U.

Figure 1. Median Annual Earnings Trajectory by Education Level

Source: Authors' calculations using the SIPP-IRS linked data.

Note: Samples are limited to those who reported positive earnings each year.

is associated with higher earnings (Belfield and Bailey 2011).

Courses taken during high school years for HSG and vocational degree holders are also different from those of other degree holders. Only 12 to 14 percent of male and 15 to 19 percent of female HSG and vocational degree holders took college prep courses, whereas more than one-third of AA or BA holders did. Table 1 presents other notable differences across levels of edu-

cation, including in terms of racial composition, the courses taken during high school, and age of degree completion.

Annual Earnings

Table 1 reveals substantial variation in twenty-year cumulative earnings after high school graduation. To address the life-course pattern of this variation over the early and mid-adulthood, we tracked men's and women's an-

nual earnings over the twenty years after high school graduation, limiting our sample to those with positive earnings in each year. Figure 1 plots the median annual earnings by degree types.

Organizing the data this way provides insights into the shape and speed of earnings growth across education groups by degree type since the year of high school graduation. For the first five years, individuals who end up earning a sub-baccalaureate (except vocational diploma or certificate) or bachelor's degree earn less than high school graduates among men. From the seventh year, however, median earnings for all postsecondary degree holders start to surpass high school graduates. From that point onward, the gaps in median annual earnings grow continuously across degree types.

Among men, the difference in the patterns of earnings growth between bachelor's degrees and all other degrees is noteworthy. For sub-baccalaureate education groups, median earnings are lower than those for HSG in the first several years after high school graduation because they spend their time in school. The earnings of all sub-baccalaureate education groups then start to surpass the HSG, not because of an observable jump or discontinuity in earnings around the period likely to surround degree acquisition, but rather because the earnings growth rates are consistently higher. By contrast, as shown in figure 1, the earnings growth rates for BA holders are almost flat in the first four years after high school, at which point median earnings jump rapidly. These patterns indicate that school-to-work transitions for BA holders is conceivably different those for sub-baccalaureate educations.

Women show a similar pattern as men but with a few important differences as well. The earnings growth rates for female workers seven or eight years since high school graduation become much flatter relative to men. The earnings gaps across levels of education are constant after ten years since high school graduation for women. Another notable gender difference is the trajectory of vocational-technical diploma or certificate. The advantage of vocational or technical diploma over high school graduation seems to be more evident for men than for women.

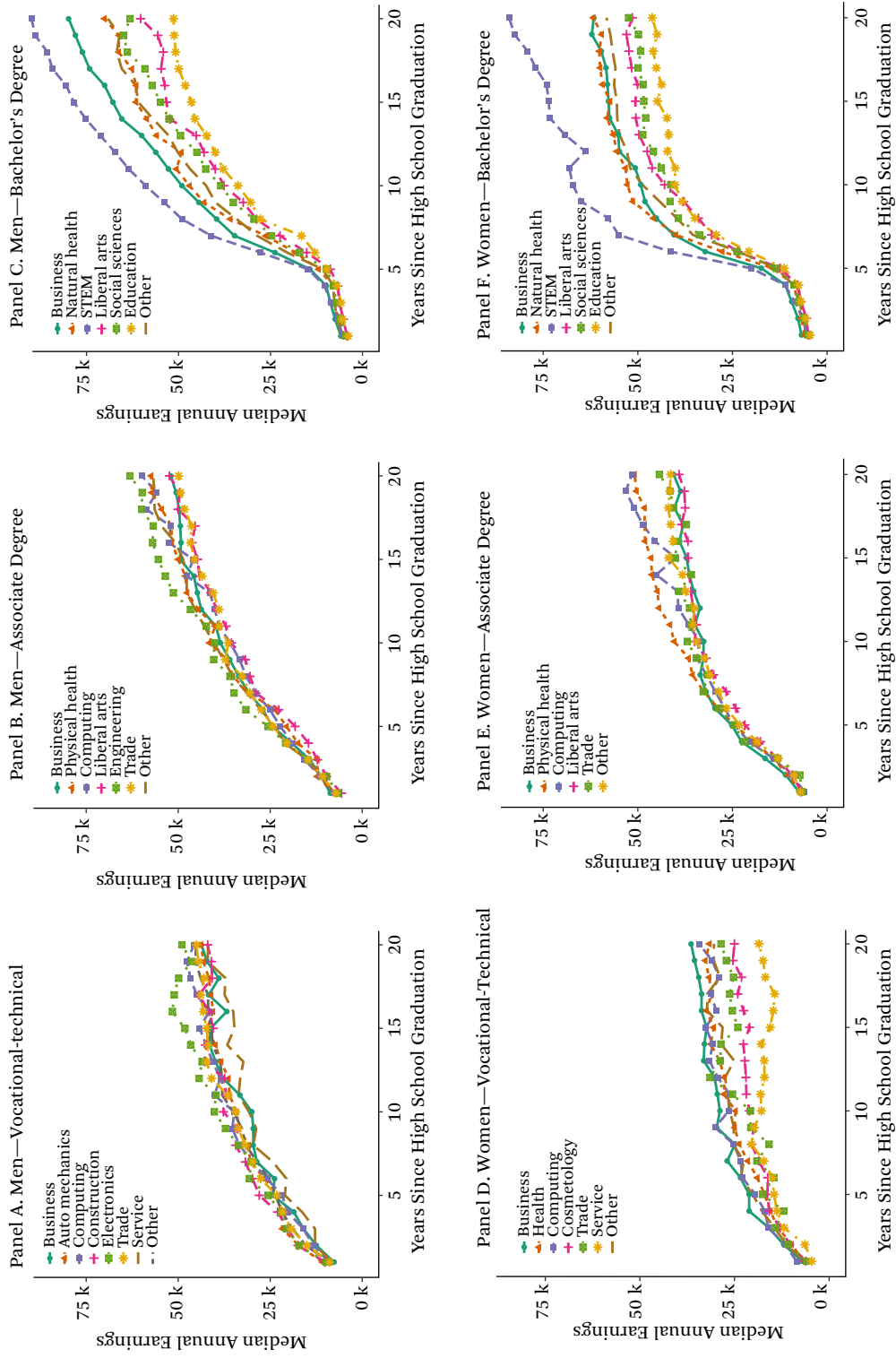
To what extent do the stylized earnings profiles observed in figure 1 represent most subfields in each degree type? Figure 2 addresses this question by tracing out the median annual earnings by fields of study within sub-baccalaureate and bachelor's degrees over twenty years. Several stylized patterns are noteworthy. First, we observe meaningful variation in the evolution of earnings from early to mid-adulthood by fields of study. Among men with vocational degrees or certificates, electronics and computing are associated with higher median earnings, particularly beginning at around ten years after high school graduation. Likewise, the highest median earnings among associate degree holders were associated with those studying engineering, computing, and physical health. Among women with vocational degrees or certificates, studying business and computing is associated with higher annual earnings than those with credentials in service and cosmetology fields. Among AAs, those with degrees in physical health and computing have higher median earnings than those with degrees in liberal arts, namely, toward the end of the observation window.

Second, despite important variation in annual earnings by fields of study within sub-baccalaureate education groups, BA holders appear to show even more heterogeneity. Third, the advantage of BA over sub-baccalaureate education evident in figure 1 is not as clear when these groups are disaggregated by fields of study, particularly for men. Except for business and STEM majors, the earnings trajectories of AA majors appear to overlap with those of BA majors. This suggests that the clear advantage of BAs over AAs in figure 1 is driven by a small number of BA majors.

Finally, the stylized patterns described are more evident for men than for women. Diversity is higher in women's earnings trajectories across fields of study with the same sub-baccalaureate credential. Furthermore, despite clear overlap in earnings trajectories across education levels for men, overlap is much less evident for women.

Figures 1 and 2 are informative but do not account for spells out of the labor force. Consequently, estimates of the earnings gap between the less educated and the highly edu-

Figure 2. Median Annual Earnings Trajectory by Fields of Study



Source: Authors' calculations using the SIPP-IRS linked data.

cated might be downwardly biased over the long term because the less educated are more likely to be out of the labor force. At the same time, those who earned AAs or BAs are more likely to be out of the labor force in their early twenties. Thus, the earnings advantage of the less educated over the highly educated gap during the first five years after high school graduation could be larger on a cumulative basis. To address these concerns, we estimate a series of OLS models to explore the relationships between sub-baccalaureate degrees and fields of study with log twenty-year cumulative earnings after controlling for demographic and high school education covariates.

Regression Analysis by Sub-Baccalaureate Degree: Cumulative Twenty-Year Earnings

Table 2 summarizes the OLS results by level of education using gender-stratified models. The first model is the baseline specification that includes birth year. The second model adds controls for race, high school education, and age of degree acquisition covariates.

Relative to HSG, all three sub-baccalaureate education groups exhibit substantially higher twenty-year cumulative earnings even after controlling for the extensive set of high school education covariates. A vocational degree yields a 17 percent premium ($=e.158$) for men relative to HSG and a 20 percent premium for women when demographic and high school covariates are controlled for. The financial benefit for college dropouts (some college no degree) is also substantial for both genders. As discussed, studies that used cross-sectional survey data or state-level administrative data do not consistently show the positive earnings premium for all sub-baccalaureate education. However, our analyses with nationally representative data reveal substantial premiums for all sub-baccalaureate education including vocational certificates when demographic and high school covariates are taken into account. As expected, the benefits for sub-baccalaureate education are smaller than those for bachelor's degrees.

Thus far, our main results are interesting but not particularly surprising. We find that BAs earn more than AAs, and AAs earn more than vocational degrees or those with some college

but no degree. A growing interest is whether this stylized fact holds if we disaggregate educational attainment by fields of study. Thanks to recent studies using state-level administrative data, consensus is increasing that subjects matter (on data use, Jepsen, Troske, and Coomes 2014; Liu, Belfield, and Trimble 2015; Stevens, Kurlaender, and Grosz 2018; Xu and Trimble 2016; on consensus, Belfield and Bailey 2011, 2017). We contribute to this literature by examining the extent to which field of study in sub-baccalaureate education is associated with long-term earnings within the same sub-baccalaureate group and relative to fields of study among BA holders.

Regression Analysis by Field of Study

We estimate the net value of some college education on twenty-year long-term earnings from early to mid-adulthood across fields of study after controlling for demographic and high school-educated related covariates in table 3. Like table 2, the dependent variable is log-transformed twenty-year cumulative earnings after high school graduation. The reference group for the coefficients estimated in table 3 is HSG. To facilitate the comparison across educational levels and fields, we present the results of models 6 and 8 in figure 3.

Table 3 and figure 3 reveal a surprisingly high degree of variation within the same level of education when demographic and high school educated related covariates are controlled for. More important, men with an associate degree or even a vocational diploma in technical fields earn more in the first twenty years after high school graduation than what BAs in liberal arts or humanities earn over the same period. The latter finding corroborates that the financial benefits of sub-baccalaureate education is as high as bachelor's degrees, depending on majors.

For example, an AA in engineering has cumulative earnings that are 18 percent ($=\exp(.296.132)-1$) higher than a BA in liberal arts and humanities, and the gap is statistically significant. The estimated difference in the twenty-year cumulative earnings between a BA and an AA in liberal arts and humanities is tiny and statistically not different from zero. All seven

Table 2. OLS Regression of Education Level on Twenty-Year Cumulative Earnings After High School Graduation

	Male				Female			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Control variables								
Birth year	0		0		0		0	
Survey year	0		0		0		0	
Race			0				0	
High school courses ^a			0				0	
GED			0				0	
Private high school			0				0	
Born in the South			0				0	
Age of final degree			0				0	
(Reference = high school graduate)								
Some college no degree	0.185	(0.019)***	0.159	(0.020)***	0.392	(0.029)***	0.329	(0.032)***
Vocational diploma-certificate	0.141	(0.024)***	0.158	(0.024)***	0.193	(0.030)***	0.203	(0.032)***
Associate degree	0.297	(0.021)***	0.248	(0.025)***	0.578	(0.028)***	0.495	(0.032)***
Bachelor's degree	0.488	(0.015)***	0.401	(0.024)***	0.786	(0.022)***	0.664	(0.028)***
R ²	0.069		0.117		0.104		0.125	
N	15,418		15,418		16,351		16,351	

Source: Authors' calculations using the SIPP-IRS linked data.

Note: Adjusted weights are applied to reflect the complex survey design and varying match rates by groups.

^a High school courses include six dummy variables indicating whether the respondent took industrial, shop, or home economics courses; business courses; a vocational program; another program; Advanced Placement math or science courses; and college prep courses.

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

Table 3. OLS Regression of Education Level and Fields of Study on Twenty-Year Cumulative Earnings After High School Graduation

	Male				Female			
	Model 5		Model 6		Model 7		Model 8	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Control variables								
Birth year	0		0		0		0	
Survey year	0		0		0		0	
Race			0		0		0	
High school courses ^a			0		0		0	
GED			0		0		0	
Private high school			0		0		0	
Born in the South			0		0		0	
Age at final degree			0		0		0	
(Reference = high school graduate)								
Some college no degree	0.185	(0.019)***	0.160	(0.020)***	0.392	(0.029)***	0.335	(0.032)***
Vocational diploma or certificate								
Trade	0.189	(0.029)***	0.200	(0.032)***	0.183	(0.085)*	0.206	(0.087)*
Business, office manager	0.084	(0.087)	0.085	(0.087)	0.306	(0.048)***	0.309	(0.048)***
Communications, information services	0.122	(0.126)	0.141	(0.115)	0.273	(0.085)**	0.290	(0.085)**
Services	-0.203	(0.035)	-0.173	(0.119)	-0.234	(0.157)	-0.172	(0.149)
Construction trades	0.194	(0.055)***	0.216	(0.055)***	—		—	
Electronics	0.294	(0.056)***	0.286	(0.055)***	—		—	
Auto mechanics	0.129	(0.047)**	0.147	(0.049)**	—		—	
Cosmetology	—		—		0.055	(0.053)	0.061	(0.054)
Health care	—		—		0.226	(0.048)***	0.246	(0.052)***
Other	0.118	(0.035)***	0.142	(0.033)***	0.191	(0.052)***	0.211	(0.055)***

(continued)

Table 3. (continued)

	Male			Female				
	Model 5		Model 6		Model 7		Model 8	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Associate degree								
Business, office manager	0.304	(0.039)***	0.243	(0.045)***	0.563	(0.046)***	0.483	(0.046)***
Physical sciences, health	0.323	(0.063)***	0.296	(0.067)***	0.792	(0.041)***	0.714	(0.044)***
Communications, information services	0.331	(0.058)***	0.313	(0.060)***	0.655	(0.107)***	0.569	(0.107)***
Liberal arts, humanities	0.167	(0.067)*	0.140	(0.066)*	0.452	(0.050)***	0.382	(0.054)***
Other vocation, trade	0.260	(0.034)***	0.198	(0.035)***	0.529	(0.080)***	0.453	(0.082)***
Engineering, drafting	0.382	(0.048)***	0.304	(0.051)***	—	—	—	—
Other	0.325	(0.039)***	0.282	(0.035)***	0.481	(0.048)***	0.415	(0.050)***
Bachelor's degree								
Business	0.591	(0.021)***	0.509	(0.030)***	0.920	(0.031)***	0.797	(0.035)***
STEM	0.713	(0.025)***	0.619	(0.030)***	1.156	(0.058)***	1.058	(0.060)***
Natural sciences, health	0.459	(0.041)***	0.375	(0.047)***	0.933	(0.035)***	0.817	(0.048)***
Social sciences, history, communications	0.386	(0.030)***	0.324	(0.034)***	0.690	(0.040)***	0.528	(0.041)***
Education	0.075	(0.076)	-0.004	(0.068)	0.499	(0.034)***	0.396	(0.038)***
Liberal arts, humanities	0.218	(0.048)***	0.132	(0.048)**	0.679	(0.032)***	0.562	(0.037)***
Other	0.416	(0.024)***	0.326	(0.027)***	0.827	(0.036)***	0.718	(0.039)***
R ²	0.086		0.132		0.114		0.135	
N	15,418		15,418		16,351		16,351	

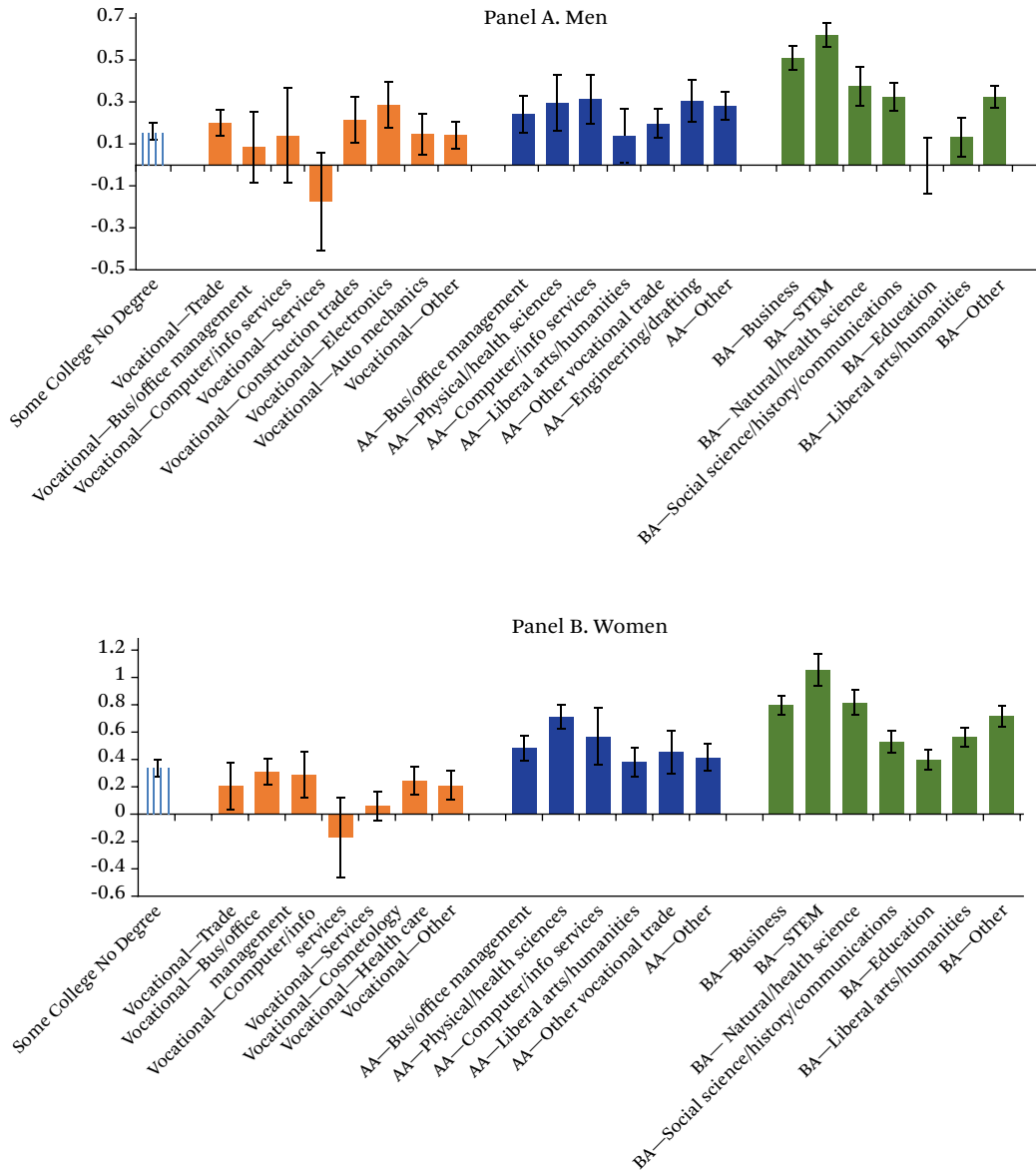
Source: Authors' calculations using the SIPP-IRS linked data.

Note: Adjusted weights are applied to reflect the complex survey design and varying match rates by groups.

^a High school courses include six dummy variables indicating whether the respondent took industrial, shop, home economics courses; business courses; vocational program, other program, Advanced Placement math or science courses, and college prep courses.

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

Figure 3. Relative Return to Higher Education in Twenty-Year Cumulative Log Earnings Relative to High School Graduates



Source: Authors' compilation based on table 3.

Note: Y-axis indicates the log earnings gap relative to high school graduation. The results are based on the estimates of models 6 and 8 of table 3.

majors of AA assessed in this study show higher average cumulative earnings than BAs in liberal arts and humanities (four are statistically significantly higher). This finding implies that the value of AAs is not limited to health-related majors and engineering. The coefficient of an AA

in liberal arts and humanities is not statistically different than that of a BA. That is, the value of a BA is not significantly higher than the value of an AA in regard to twenty-year cumulative earnings after high school graduation. Of the seven BA fields, only business and STEM majors

show statistically significantly higher cumulative earnings than all majors in AA or vocational diploma or certificates. Natural and health sciences show higher earnings than all majors in AA fields or vocational diploma or certificates. But the differences between BAs and AAs in the natural and health sciences are not always statistically significant.

Even among the eight vocational fields assessed in this study, none of the estimated coefficients are statistically significantly lower than that of the BA in the liberal arts and humanities except the vocational diploma in services. Comparing AA and vocational diplomas or certificates, AAs are worth more on average, but those who have a vocational diploma in electronics earn as much as any other AA majors, if not higher. The net earnings of some college without a degree are obviously higher than HSG and not lower than those who have a BA in the liberal arts and humanities.

Gender Differences in Financial Benefits Associated with Sub-Baccalaureate Education

Several gender differences are noteworthy. The value of higher education for women is more clearly hierarchical by level than it is for men. Relative to HSG, higher education is associated with a greater twenty-year cumulative earnings advantage for women than for men. The gap between HSG and AAs is almost twice as large for women (0.495) as it is for men (0.248), as shown in table 2. The only level of education that does not show a substantial gender difference is vocational-technical diploma or certificate. The result that the premium for women is higher than for men is consistent with other studies (Dadgar and Trimble 2015; Gill and Leigh 2003; Liu, Belfield, and Trimble 2015). These results do not mean that college-educated women earn more than equally educated men. However, the relative benefit of college education is almost twice as large for women as that for men. This large relative benefit for women might be a partial explanation on the rise of women in higher education (DiPrete and Buchmann 2013).

Unlike that for men, the clearly vertical hierarchy by educational level for women is evi-

dent again when disaggregated by fields of study. Among the six AA majors assessed in this study, two—physical and health services and computer and information services—exhibit a higher coefficient than that of BAs in the liberal arts and humanities, and only one—physical and health services—shows a statistically significant difference. The earnings advantages of health-related AA majors reported in previous studies is evident for women. Of the seven BA fields we examined, four—business, STEM, natural and health sciences, and other—seem to earn more on a twenty-year cumulative basis than all other AA or vocational training fields on average, although some of differences are not statistically significant. The value of associate degrees for women looks higher than vocational training regardless of field. Put simply, horizontal stratification by fields of study seems to be more important for men than for women in regard to long-term earnings covering early to middle career. Conversely, vertical stratification seems to be more important for women than for men. These findings warrant further investigation.

Yet we hasten to add caveats on the interpretation of our findings. Our models do not include hours worked due to limitations in the linked tax data. To be sure, many of the trends observed for women are influenced by the timing of marriage and motherhood and its attendant impacts on labor supply. As noted, one aim of this article was to document the earnings patterns among female workers by education level rather than to disentangle the causal impact of degree types and field of study that may be comingled with selection processes related to fertility, education investments, and work patterns.

Robustness Checks

Some may wonder whether the relative earnings of BAs are underestimated in our models, given that graduate degree holders are excluded from the primary analyses. It is debatable whether BAs-only or BAs or higher should be a comparison group in assessing the relative value of AAs. Nevertheless, we conducted a series of sensitivity tests that reestimate models of tables 2 and 3 with a sample including grad-

uate degree holders to address the concern of underestimation.² As expected, the value of a BA or higher is a bit larger in the new estimation, but the increase is small. For example, when we estimate the same model with model 1 of table 2, the coefficients of BA+ become 0.522 for male and 0.861 for female, which are only 0.034 and 0.075 higher respectively than what we report in table 2. When other covariates such as race and high school performances are controlled for (the same model specification with model 2 of table 2), the estimated coefficient of BA+ for men (0.378) becomes smaller than that of BA-only (0.401 in table 2).

The estimations including fields of study also are not substantively different either when we include graduate degree holders in the sample of BAs. Net of demographic and high school performance covariates, none of the seven undergraduate majors among bachelor's or higher degree holders become more significant than reported in table 3. For some majors, the coefficients become smaller as graduate degree holders are added in our analyses. This counterintuitive result is partially because many graduate degree holders are out of the labor force in their twenties and even their early thirties, and thus have a relatively shorter span to accumulate labor income over the twenty-year observational period beginning after high school graduation.

One noteworthy change when graduate degree holders are included in our analyses is the increase in the value of an education major. When we include graduate degree holders, the coefficient of education major among men becomes highly significant (0.218) without controlling for race and high school performance. However, when race and high school performance are controlled for, the coefficient becomes substantially lower (0.059), which is statistically not different from zero.

CONCLUSIONS

In this study, we use data from the SIPP and matched administrative tax information to examine the long-term labor market benefits associated with sub-baccalaureate degrees and

certificates. Following men and women for twenty years after high school graduation, we provide new estimates of the cumulative earnings associated with awards to various programs within the sub-baccalaureate level and field of study. We also add to the growing, yet still small, body of literature on the labor market outcomes associated with sub-BA education by documenting how earnings unfold from early to mid-career by educational level and fields of study therein.

Several notable findings emerge from our analysis. Our estimates showing higher annual and cumulative twenty-year earnings up to mid-adulthood among individuals with sub-baccalaureate education at all levels (associate degree, vocational diploma or certificate, and college dropout) relative to high school graduates are consistent with the notion that sub-baccalaureate education has long-term economic benefits. We shed related new light on some important gender differences. Consistent with earlier work, the value of an AA over vocational training is higher for women than for men (Dougherty 2005). We also provide strong evidence of substantial variation by fields of study. The sub-baccalaureate field with the highest long-term, twenty-year cumulative earnings net of control variables were in fields associated with health, technical, or craft skills, which is consistent with research (Jepsen, Troske, and Coomes 2014). For vocational diplomas or certificates, we find relatively higher payoffs for men with awards in construction, electronics, and auto mechanics.

A somewhat surprising finding is that the earnings of some sub-baccalaureate majors are high relative to some types of bachelor's degrees over early to mid-adulthood. For example, the cumulative twenty-year earnings from high school graduation for individuals with associate degrees in physical and health sciences, computer and information services, and engineering and drafting is equal to or higher than those BA fields except business and STEM. Consider also that the earnings levels associated with vocational training in electronics and construction trades for men is higher than those

2. Results are not shown here but can be obtained from the authors on request.

with BAs in liberal arts and the humanities. These patterns suggest that a bachelor's degree is not necessarily associated with a higher financial benefit to the investment in education than an associate degree, at least considering the twenty years from high school graduation that incorporate years before and after degree acquisition. This pattern is driven, in part, by substantially greater heterogeneity in earnings by fields of study within bachelor's degree holders, especially among men. The cumulative earnings gap between BA STEM majors and BA liberal arts or humanities majors is 63 percent among men, whereas that between AA engineering or drafting majors and AA liberal arts and humanities majors is 17 percent.

Our results speak to broader themes related to human capital investments in postsecondary education. Education has become an increasingly key determinant of a person's life chances (Fischer and Hout 2006). Horizontal stratification within higher education (fields of study) has received relatively less attention than vertical stratification (levels of education) as a mechanism of economic stratification (Gerber and Cheung 2008). This study's results are consistent with a growing body of studies showing the importance of horizontal stratification (Kim, Tamborini, and Sakamoto 2015; Ma and Savas 2014; Torche 2018). In light of recent technological changes and economic trends, some students who studied engineering or health services may benefit more from community college programs than from studying nontechnical BA majors (Oreopoulos and Petronijevic 2013). Kim, Tamborini, and Sakamoto present strong evidence that horizontal stratification in higher education (BA, graduate degree) is a stronger determinant than vertical stratification in terms of forty-year lifetime earnings (2015). In this context, recent reports that the proportion of students who major in humanities and social sciences has decreased, whereas the proportion of STEM majors has increased after the Great Recession might reflect a response to the growing importance of horizontal stratification (Blom, Cadena, and Keys 2015).

Our findings also are relevant to the cooling out hypothesis. Kevin Dougherty labels community college as the contradictory college because it appears to structure both aspirations

and failure (1994). Contrary to this argument, our results show that except for a small number of subfields, almost all sub-baccalaureate education brings in substantial financial benefits relative to high school graduates. Given these findings, it is hard to say that sub-baccalaureate education is an institutional process that structures and legitimates failure.

We note several important caveats throughout this article, but several points are worth underscoring. To begin with, our results should not be interpreted as evidence indicating that the total value of a bachelor's degree is low. The financial benefits to a bachelor's degree tend to be larger at the advanced mid-career and later stage of work life, which were not examined in this study (Kim, Tamborini, and Sakamoto 2015; Tamborini, Kim, and Sakamoto 2015). Moreover, other financial compensations such as pensions, health insurance, and longer vacation times are tied to higher education (Kristal, Cohen, and Mundlak 2011; Tamborini and Kim 2017; Zajacova, Montez, and Herd 2014). Furthermore, the total benefit of education is not restricted to direct monetary compensations (Hout 2012; Oreopoulos and Salvanes 2011).

One concern might be whether the relatively high value of sub-BA education in our estimations is driven by the inclusion of older cohorts in our sample (1970s graduates) such that the value of sub-BA could be lower in recent cohorts. The number of community colleges in the 1970s was small and concentrated in a small number of states but expanded rapidly after that (Dougherty 1988). To address this concern, we disaggregated our sample into two cohorts (those who completed high school between 1972 and 1984 and those who completed between 1985 and 1995) and estimated the same models contained in tables 2 and 3. The results (available on request) are almost identical between the two cohorts. Nevertheless, we cannot rule out the possibility that those who obtained a sub-baccalaureate degree in the twenty-first century have different experiences than previous generations. Future research on this topic is warranted.

Another concern relates to the effects of unobserved heterogeneity. Selection into four-year institutions is more likely to be positive than

selection into sub-baccalaureate education. Therefore, the actual gap between BA and sub-BA net of uncontrolled heterogeneity might be smaller than our estimates. On the flip side, selection into sub-baccalaureate education is more likely to be positive than among those who stop formal education at high school graduation. Thus, our estimates showing the earnings advantages of sub-baccalaureate education relative to HSG could be upwardly biased.³ Our estimated coefficients in this study should not be interpreted as causal.

Altogether, our study illustrates one way that linking survey and administrative data can enable researchers to tackle new questions and produce estimates that would be otherwise unfeasible by making use of information provided by both data sources. Survey data linked to the IRS or SSA earnings information provide ample opportunity to study individuals' long-term earnings histories and to track the changes in annual earnings for the same individuals over long stretches of their lives. Federal statistical research data centers are one place researchers can access such data linkages.⁴

REFERENCES

- Baum, Sandy, Charles Kurose, and Michael McPherson. 2013. "An Overview of American Higher Education." *The Future of Children* 23(1): 17–39.
- Belfield, Clive R., and Thomas Bailey. 2011. "The Benefits of Attending Community College: A Review of the Evidence." *Community College Review* 39(1): 46–68.
- . 2017. "The Labor Market Returns to Sub-Baccalaureate College: A Review." CAPSEE working paper. New York: Teachers College, Columbia University. Accessed November 6, 2018. <https://ccrc.tc.columbia.edu/media/k2/attachments/labor-market-returns-sub-baccalaureate-college-review.pdf>.
- Blom, Erica, Briand C. Cadena, and Benjamin J. Keys. 2015. "Investment over the Business Cycle: Insights from College Major Choice." IZA discussion paper no. 9167. Bonn: Institute of Labor Economics.
- Brand, Jennie E., and Yu Xie. 2010. "Who Benefits Most from College? Evidence for Negative Selection in Heterogeneous Economic Returns to Higher Education." *American Sociological Review* 75(2): 273–302.
- Brint, Steven. 2003. "Few Remaining Dreams: Community Colleges Since 1985." *Annals of the American Academy of Political and Social Science* 586(1): 16–37.
- Cellini, Stephanie Riegg, and Latika Chaudhary. 2014. "The Labor Market Returns to a for-Profit College Education." *Economics of Education Review* 43: 125–40.
- Dadgar, Mina, and Madeline Joy Trimble. 2015. "Labor Market Returns to Sub-Baccalaureate Credentials: How Much Does a Community College Degree or Certificate Pay?" *Educational Evaluation and Policy Analysis* 37(4): 399–418.
- Davies, Scott, and Neil Guppy. 1997. "Fields of Study, College Selectivity, and Student Inequalities in Higher Education." *Social Forces* 75(4): 1417–38.
- DiPrete, Thomas A., and Claudia Buchmann. 2013. *The Rise of Women: The Growing Gender Gap in Education and What It Means for American Schools*. New York: Russell Sage Foundation.
- Dougherty, Christopher. 2005. "Why Are the Returns to Schooling Higher for Women than for Men?" *Journal of Human Resources* XL(4): 969–88.
- Dougherty, Kevin J. 1987. "The Effects of Community Colleges: Aid or Hindrance to Socioeconomic Attainment?" *Sociology of Education* 60(2): 86–103.
- . 1988. "The Politics of Community College Expansion: Beyond the Functionalist and Class-Reproduction Explanations." *American Journal of Education* 96(3): 351–93.
- . 1994. *The Contradictory College: The Conflicting Origins, Impacts, and Futures of the Community College*. Albany: State University of New York Press.
- Fischer, Claude S., and Michael Hout. 2006. *Century of Difference: How America Changed in the Last One Hundred Years*. New York: Russell Sage Foundation.
- Gerber, Theodore P., and Sin Yi Cheung. 2008. "Horizontal Stratification in Postsecondary Education:

3. To address this concern, we estimate annual earnings growth rates after controlling for individual fixed effects. The average earnings growth rates after degree completion are twice as high for AAs as they are for HSGs.

4. See "Federal Statistical Research Data Centers," U.S. Census Bureau, <https://www.census.gov/fsrdc> (accessed November 7, 2018).

- Forms, Explanations, and Implications." *Annual Review of Sociology* 34(1): 299–318.
- Gill, Andrew M., and Duane E. Leigh. 2003. "Do the Returns to Community Colleges Differ Between Academic and Vocational Programs?" *Journal of Human Resources* 38(1): 134–55.
- Grubb, W. Norton. 1993. "The Varied Economic Returns to Postsecondary Education: New Evidence from the Class of 1972." *Journal of Human Resources* 28(2): 365–82.
- . 1997. "The Returns to Education in the Sub-Baccalaureate Labor Market, 1984–1990." *Economics of Education Review* 16(3): 231–45.
- Grusky, David B., Michael Hout, Timothy M. Smeeding, and C. Matthew Snipp. 2019. "The American Opportunity Study: A New Infrastructure for Monitoring Outcomes, Evaluating Policy, and Advancing Basic Science." *RSF: The Russell Sage Foundation Journal of the Social Sciences* 5(2): 20–39. DOI: 10.7758/RSF.2019.5.2.02.
- Hout, Michael. 2012. "Social and Economic Returns to College Education in the United States." *Annual Review of Sociology* 38(1): 379–400.
- Jacobson, Louis, Robert J. Lalonde, and Daniel Sullivan. 2005. "The Impact of Community College Retraining on Older Displaced Workers: Should We Teach Old Dogs New Tricks?" *ILR Review* 58(3): 398–415.
- Jaggars, Shanna Smith, and Di Xu. 2016. "Examining the Earnings Trajectories of Community College Students Using a Piecewise Growth Curve Modeling Approach." *Journal of Research on Educational Effectiveness* 9(3): 445–71.
- Jepsen, Christopher, Kenneth Troske, and Paul Coomes. 2014. "The Labor-Market Returns to Community College Degrees, Diplomas, and Certificates." *Journal of Labor Economics* 32(1): 95–121.
- Kane, Thomas, and Cecilia Rouse. 1995. "Labor Market Returns to Two- and Four-Year Colleges: Is a Credit a Credit and Do Degrees Matter?" *American Economic Review* 85(3): 600–14.
- Kena, Grace, Lauren Musu-Gillette, Jennifer Robinson, Xiaolei Wang, Amy Rathbun, Jijun Zhang, Sidney Wilkinson-Flicker, Amy Barmer, and Erin Dunlop Velez. 2015. *The Condition of Education 2015*. Washington: National Center for Education Statistics.
- Kim, ChangHwan, and Christopher R. Tamborini. 2014. "Response Error in Earnings: An Analysis of the Survey of Income and Program Participation Matched With Administrative Data." *Sociological Methods & Research* 43(1): 39–72.
- Kim, ChangHwan, Christopher R. Tamborini, and Arthur Sakamoto. 2015. "Field of Study in College and Lifetime Earnings in the United States." *Sociology of Education* 88(4): 320–39.
- Kristal, Tali, Yinon Cohen, and Guy Mundlak. 2011. "Fringe Benefits and Income Inequality." *Research in Social Stratification and Mobility* 29(4): 351–69.
- Liu, Vivian Y. T., Clive R. Belfield, and Madeline J. Trimble. 2015. "The Medium-Term Labor Market Returns to Community College Awards: Evidence from North Carolina." *Economics of Education Review* 44 (February): 42–55.
- Lockwood Reynolds, C. 2012. "Where to Attend? Estimating the Effects of Beginning College at a Two-Year Institution." *Economics of Education Review* 31(4): 345–62.
- Ma, Yingyi, and Gokhan Savas. 2014. "Which Is More Consequential for Income Disparity: Fields of Study or Institutional Selectivity?" *Review of Higher Education* 37(2): 221–47.
- Marcotte, Dave E., Thomas Bailey, Carey Borkoski, and Greg S. Kienzl. 2005. "The Returns of a Community College Education: Evidence From the National Education Longitudinal Survey." *Educational Evaluation and Policy Analysis* 27(2): 157–75.
- McNabb, Jennifer, David Timmons, Jae Song, and Carolyn Puckett. 2009. "Uses of Administrative Data at the Social Security Administration." *Social Security Bulletin* 69(1): 75–84.
- Monk-Turner, Elizabeth. 1990. "The Occupational Achievements of Community and Four-Year College Entrants." *American Sociological Review* 55(5): 719–25.
- Oreopoulos, Philip, and Uros Petronijevic. 2013. "Making College Worth It: A Review of the Returns to Higher Education." *The Future of Children* 23(1): 41–65.
- Oreopoulos, Philip, and Kjell G. Salvanes. 2011. "Priceless: The Nonpecuniary Benefits of Schooling." *Journal of Economic Perspectives* 25(1): 159–84.
- Rosenbaum, James E., Caitlin E. Ahearn, and Janet E. Rosenbaum. 2017. *Bridging the Gaps: College Pathways to Career Success*. New York: Russell Sage Foundation.
- Sandefur, Gary D., and Hyunjoon Park. 2007. "Educational Expansion and Changes in Occupational

- Returns to Education in Korea." *Research in Social Stratification and Mobility* 25(4): 306–22.
- Stevens, Ann Huff, Michal Kurlaender, and Michel Grosz. 2018. "Career Technical Education and Labor Market Outcomes: Evidence From California Community College." *Journal of Human Resources*. Published online April 4, 2018. DOI:10.3368/jhr.54.4.1015.7449R2.
- Tamborini, Christopher R., and ChangHwan Kim. 2017. "Education and Contributory Pensions at Work: Disadvantages of the Less Educated." *Social Forces* 95(4): 1577–606.
- Tamborini, Christopher R., ChangHwan Kim, and Arthur Sakamoto. 2015. "Education and Lifetime Earnings in the United States." *Demography* 52(4): 1383–407.
- Torche, Florencia. 2018. "Intergenerational Mobility at the Top of the Educational Distribution." *Sociology of Education* 91(4): 266–89.
- Vuolo, Mike, Jeylan T. Mortimer, and Jeremy Staff. 2016. "The Value of Educational Degrees in Turbulent Economic Times: Evidence from the Youth Development Study." *Social Science Research* 57 (May): 233–52.
- Xu, Di Xu, and Madeline Trimble. 2016. "What About Certificates? Evidence on the Labor Market Returns to Nondegree Community College Awards in Two States." *Educational Evaluation and Policy Analysis* 38(2): 272–92.
- Zajacova, Anna, Jennifer Karas Montez, and Pamela Herd. 2014. "Socioeconomic Disparities in Health Among Older Adults and the Implications for the Retirement Age Debate: A Brief Report." *Journals of Gerontology: Series B* 69(6): 973–78.