# The Long and Winding Road: Heterogeneity in the Form and Timing of Postsecondary Education

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**Abstract**

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Postsecondary education in the United States has undergone profound changes in recent decades. Reflecting the strong and growing labor market premiums for college degrees, college enrollment rates have risen dramatically. And while racial and socioeconomic gaps have not completely closed, those traditionally left out of higher education—including women, nonwhite, lower-income, and older students—have increased both their enrollment in and completion of college degree programs. Further, the number of institutions has expanded to meet this growing demand. The roughly 21 million college students today attend over 4,500 two-year and four-year, public and private colleges and universities.

At the same time, today's college students travel increasingly heterogeneous pathways through their postsecondary education by delaying the transition from high school to college, enrolling later in life, attending part-time, whether exclusively or intermittently, and enrolling in multiple institutions. This dissertation examines three key dimensions of this heterogeneity. In Chapter 2, I describe trends over the past three and a half decades in older adults' decision to return to school. Changes in rates of enrollment among older adults—particularly in the case of black women—have occurred in the context of rising levels of educational attainment among more traditionally-aged individuals and changes in the labor

market that have recast employment as increasingly precarious. Chapter 3 capitalizes on detailed postsecondary transcript data to infer developmental trajectories of students' college credit completion over the first ten years since leaving high school. These trajectories allow us to take more fully into account the timing, sequencing, and duration of students' part– and full-time status as they progress through postsecondary education than prior work on the subject. I then relate students' trajectories to their sociodemographic background and to their likelihood of eventually completing a college degree. Finally, in Chapter 4, I compare the post-schooling wages of students who attended for-profit colleges to those of students who either did not attend college at all or attended public or private, nonprofit colleges.

Taken together, the analyses presented in this dissertation advance our current understanding of the ways in which higher education remains stratified along both its vertical and horizontal dimensions. Despite the expansion of access to higher education, getting in and through degree programs (the vertical dimension), as well as when, how, and where students choose to enroll (the horizontal dimension), continue to be patterned along racial and socioeconomic lines.

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# Chapter 1

# Introduction

> In a global economy where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity—it is a pre-requisite. Right now, three-quarters of the fastest-growing occupations require more than a high school diploma. And yet, just over half of our citizens have that level of education.... And half of the students who begin college never finish.... That is why we will provide the support necessary for you to complete college and meet a new goal: by 2020, America will once again have the highest proportion of college graduates in the world.
>
> *President Barack Obama, 2009*[1]

The image of an eighteen-year-old arriving on a college campus for the first time and receiving his or her diploma four years later is an increasingly outdated and inaccurate portrayal of the contemporary American postsecondary student. Indeed, today's postsecondary students are not only drawn from a wider swath of the general population, they also vary widely in when, how, and where they enroll. President Obama's words capture the current "college-for-all" environment, wherein college has come to be seen as a norm not only for those who are academically adept or socially elite, but also for everyone regardless of academic or social background (Goyette 2008; Rosenbaum 2001). This expansion has impacted not only who enrolls, but also how they do so.

While less than half of high school sophomores in 1980 expected to attain a bachelor's degree, nearly 85% did so in 2002 (Goyette 2008). The expectation gap between more and

[1]Obama, Barack. 24 February 2009. "Remarks of President Barack Obama: Address to Joint Session of Congress." Washington, DC: The White House Press Office. Available at: http://whitehouse.gov/the_press_office/remarks-of-president-barack-obama-address-to-joint-session-of-congress/.

less advantaged students (that is, those whose parents do and do not have at least a bachelor's degree themselves) has narrowed over time, from 34.4 percentage points in 1980 to 12.8 percentage points in 2002 (Goyette 2008). Beyond just wanting to go to college, college enrollment and completion rates have risen among groups that had historically been left behind by higher education, including women, nonwhite, lower-income, first-generation, and older students (Baker and Velez 1996; Buchmann and DiPrete 2006; DiPrete and Buchmann 2006; Jacobs and Stoner-Eby 1998; McDaniel et al. 2011). This does not mean that the opportunity to access higher education is no longer unequal (substantial inequalities indeed persist; see, for instance, Kao and Thompson 2003), but it does signal large-scale demographic changes in the make-up of today's college student population.

Part of these shifts in individuals' higher education expectations and enrollment has been driven by the growing number of jobs that require a college degree (Collins 2002; Long 2010). These include new jobs in the technological sector, as well as jobs that had previously required only a high school education—such as lower-skilled service, clerical, or operative occupations (Autor et al. 2006; Carnevale et al. 2010; Long 2010; Goyette 2008). Today, approximately 60% of all jobs require at least some college, and about 70% of the increase in job requirements for postsecondary training has stemmed from skill upgrading demanded by occupational categories that did not previously require higher education (Carnevale et al. 2010). These job-related pressures have been felt by traditionally-aged students making the decision to enroll in college more or less directly after high school, as well as by older adults as they head back to school for new degrees or to complete degrees left unfinished earlier in their lives (Barr and Turner 2013; Cruce and Hillman 2012; Elman and O'Rand 2002; Goyette 2008).

To meet the demands of a growing and increasingly diverse population of college-goers jostling for the competitive labor market advantages garnered by a college degree, the higher education market has expanded dramatically (Gerber and Cheung 2008; Marcotte et al. 2005). The number of institutions swelled from 3,231 in the fall of 1980 to 4,724 in 2013 (National Center for Education Statistics 2014:Table 317.10). Growth has been particularly

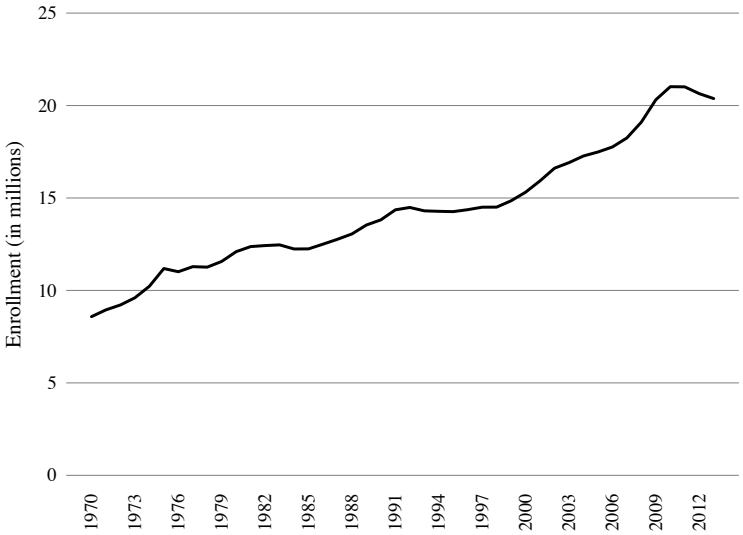
strong among four-year institutions (exhibiting 55% growth over that time, compared to 32% among two-year institutions) and among for-profit institutions, the number of which skyrocketed by nearly 800% compared to 9% growth among public institutions and 7% growth among private, nonprofit schools.

This dissertation examines more closely a number of key dimensions of this increasing heterogeneity among postsecondary students and in the postsecondary education market. While there are a great many dimensions along which one could focus, I focus here on older students enrolled in college, on the pathways students take through their postsecondary education, and on students who select into for-profit colleges. As such, this dissertation is organized around the following three sets of questions. First, how has adults' enrollment in formal schooling changed over the past three decades? To what extent do demographic or labor market factors account for these trends? How have gender– and race-specific enrollment patterns evolved over time? Second, what do students' pathways through postsecondary education look like? In addressing this question, I describe the variation in students' pathways on the basis of their credit completion. How do their background characteristics and traits of the institutions they attend shape these pathways? Do the timing, sequencing, and duration of students' full– or part-time enrollment matter for their likelihood of ultimately attaining a college degree? Third, who attends for-profit colleges, and how do they fare on the labor market? In particular, how do for-profit students' wages compare to those who attained only as much as high school or to those who attended either public or private, nonprofit postsecondary institutions?

### *1.1 Setting the Context: Trends in the Higher Education Market*

In the fall of 1970, just over 8.5 million students were enrolled in degree-granting postsecondary institutions; over 21 million were enrolled in the fall of 2013 (see Figure 1.1). Some of this growth is due to increases in recent high school graduates enrolling more or less directly into college. While roughly half of recent high school completers were enrolled in college in both 1970 and 1980, 60% were in 1990, 63% were in 2000, and 68% were in 2010 (National

Figure 1.1: Total Fall Enrollment in Degree-Granting Postsecondary Institutions, 1970–2013

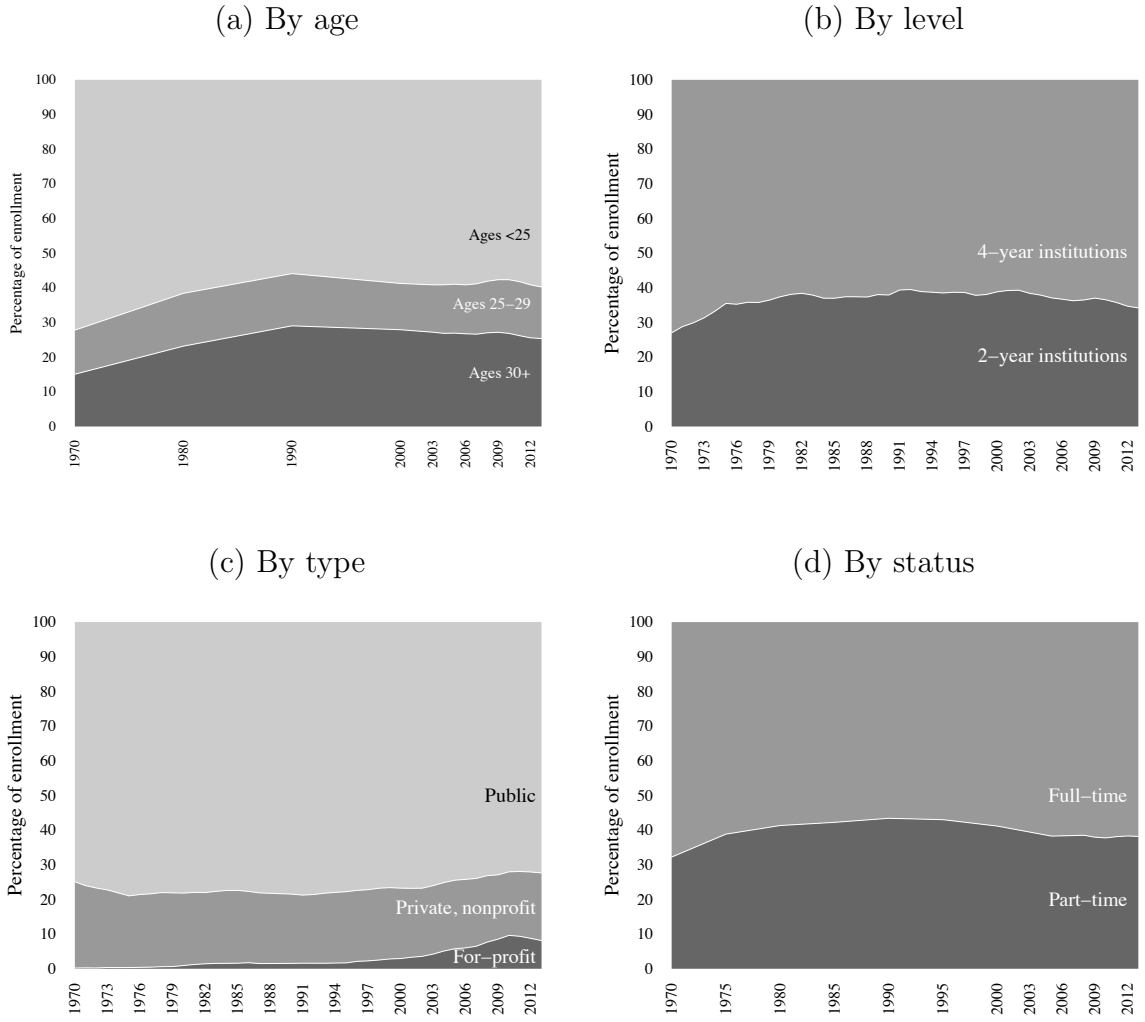



*Source:* Digest for Education Statistics, National Center for Education Statistics, 2014, Table 303.10.

Center for Education Statistics 2014:Table 302.20). At the same time, older students make up a substantial share of college enrollments. As panel (a) in Figure 1.2 illustrates, since about 1990, roughly a quarter of students enrolled in degree-granting postsecondary institutions were at least 30 years old. Put differently, over 5 million postsecondary students were 30 years of age and older in 2013. Another 13 to 16% of college students over the past few decades have been between the ages of 25 and 29.

The 21 million college students currently enrolled have over 4,500 postsecondary institutions from which to choose that run the gamut from community colleges (two-year, public institutions) to Ivy League four-year universities. Panels (b) and (c) in Figure 1.2 shows how the distribution of students in postsecondary schools by institutional level and type has changed over time. Looking first at panel (b), in 1970, 73% of students were enrolled in four-year institutions and just over a quarter were enrolled in two-year institutions. By 2013, about a third of students were enrolled in two-year colleges, and about two-thirds attended four-year colleges. Panel (c) further illustrates how growth among higher education's various

Figure 1.2: Share of Fall Enrollment in Degree-Granting Postsecondary Institutions by Institutional Traits and Attendance Status, 1970–2013




*Source:* Digest for Education Statistics, National Center for Education Statistics, 2014, Tables 303.25, 303.30, and 303.40. For panel 1.1a, between 1970 and 2000, data is present only for 1970, 1980, 1990, and 2000; data is available for every year beginning in 2003. Similarly, for panel 1.1d, data available every five years from 1970 to 2000, then annually.

sectors has not been uniform. The proportion of students enrolled in public and private, nonprofit colleges has stayed relatively steady over the four-decade period covered by Figure 1.2. However, the for-profit sector has surged. Less than one percent of college students enrolled in for-profit institutions through 1980, and these schools enrolled only about 1 to 2.5%

of students between 1980 and 2000. Beginning in 2000, however, enrollment in these schools began to increase, such that roughly 10% of college students attended for-profit institutions by 2010. The sector has experienced decreases since, enrolling about 8% of the college student population in 2013 (the latest year for which data is currently available). Over this same period, from 1970 to 2013, the number of for-profit institutions grew by a factor of nearly 8—from 165 in 1980 to 1,424 in 2013—while the number of public institutions grew by just 9 percent (from 1,497 to 1,625) and the number of private, nonprofit institutions increased by a languid 7 percent (from 1,569 to 1,675) (National Center for Education Statistics 2014:Table 317.10). The growth in market share among two-year colleges and among for-profit schools reflects the increasing diversity of students seeking higher education (Kane and Rouse 1999; Machin and van Reenen 1998; Marcotte et al. 2005; Marti 2008; Morey 2004).

It is likely that these figures underestimate the total number of for-profit institutions and the share of postsecondary students enrolled in them (Cellini and Goldin 2014). Because these estimates rely on official U.S. Department of Education (DOE) counts, they include only institutions eligible for federal grants and subsidized and unsubsidized loans under Title IV of the Higher Education Act of 1965. But not all postsecondary institutions participate in Title IV programs. Cellini and Goldin (Cellini and Goldin 2014) contend that the actual number for-profit institutions in double the official count, while the nubmer of for-profit students may be one-third greater. These official counts are likely to miss a particular category of schools and students: non-Title IV schools tend to offer mainly non-degree programs, and are generally smaller than the Title IV schools (Cellini and Goldin 2014). While this results presented in this dissertation are unable (as they rely on data from official sources that include only the Title IV schools), it is important to keep in mind the potentially larger scope of studnets

In addition to the rising number and diversity of students as well as the increasing heterogeneity of the higher education market, students are attending schools in more varied ways. The proportion of students who attend school part-time has increased from 32.2% in 1970 to 38.2% in 2012, as evident in panel (d) of Figure 1.2. More broadly, the life course has

changed from a set of normative and discrete transitions to a series of overlapping and blurred phases (Elman 2011; O'Rand 2011; Mouw 2005; Bills 2000; Shanahan 2000; Rindfuss 1991). In particular, though it made sense at one time to conceptualize the "student-to-worker" transition in the former way—i.e., "individuals severed their participation in formal schooling [prior to assuming] other adult roles," like that of employee (Bills 2000:65)—diverse, extended, and fluid pathways through education have become more prevalent in recent years (Roksa and Velez 2012; Goldrick-Rab and Han 2011; Bozick and DeLuca 2005; Mouw 2005; McCormick 2003; Jacobs and Stoner-Eby 1998). For example, one in three college entrants delay their transition into higher education by at least a year (Horn et al. 2005), and roughly half of undergraduates attend more than one postsecondary institution (McCormick 2003), making upward, lateral, and even reverse transfers between four-year and two-year colleges (Goldrick-Rab and Pfeffer 2009; Goldrick-Rab 2006).

Despite the opening up of higher education to more students, higher education remains stratified along both its vertical (how much education one attains) and horizontal (how and where that education is earned) dimensions (Charles and Bradley 2002; Gerber and Cheung 2008). The increasingly varied ways in which students attend college have implications for both of these dimensions. When, how, and where students pursue postsecondary education are related to whether or not they complete a degree—that is, how far up the educational ladder they climb—and are patterned along racial and socioeconomic lines. How quickly students transition from high school to college, for instance, and whether students engage in discontinuous or other nontraditional pathways once enrolled are important predictors of degree completion (Bozick and DeLuca 2005; Goldrick-Rab 2006). Part of the reason, then, that students from less advantaged backgrounds are less likely to complete a college degree (even conditional on college enrollment) may be that they are more likely to delay entry to college, to attend multiple institutions, or to take time off from college following their initial enrollment than students from more advantaged backgrounds (Bozick and DeLuca 2005; Goldrick-Rab 2006; Goldrick-Rab and Han 2011; Rowan-Kenyon 2007). Even among individuals with the same amount of education, qualitative differences among college graduates

including the quality or type of their school and when in the life course they completed college affect subsequent earnings (Gerber and Cheung 2008; Monks 1997). For instance, while a college education has a generally positive relationship to income returns, this relationship is even stronger for more selective colleges, in which traditionally disadvantaged students are less likely to be found (Brewer et al. 1999; Haveman and Smeeding 2006).

### *1.2 What's Missing From What We Know About Today's College Students?*

From the above discussion, it is clear that when, how, and where individuals pursue their postsecondary education has changed over time, and that such variation in college attendance matters for later-in-life outcomes. At the same time, key dimensions of educational attainment—older adults' decisions to return to formal schooling, students embarking on varied pathways through their postsecondary careers, and what it means for students to select into the rapidly growing for-profit sector—have been inadequately conceptualized and researched. Indeed, in its recent Request for Applications, the Institute of Education Sciences at the U.S. Department of Education specifically highlights nontraditional postsecondary students—and particularly the trajectories of older and returning students—as gaps in the research.[2]

Current research on adults' participation in formal schooling has generally covered narrow time periods and has not focused on the nexus between race and gender. Twenty years ago, Jacobs and Stoner-Eby (1998) described trends in adults' college enrollment from 1970 to 1990. Since then, however, secular changes have occurred in two areas shown by prior research to influence whether an adult returns to school—prior educational attainment and labor market circumstances. While levels of educational attainment have increased across the board, growth has been particularly pronounced among women, who are currently much more likely than men to enroll in college and earn college degrees (Buchmann and DiPrete 2006; DiPrete and Buchmann 2006). Men and women have also been increasingly exposed

[2]See the Request for Applications, Education Research Grants, CFDA Number 84.305A, pp. 30-31, available here: `http://ies.ed.gov/funding/pdf/2016_84305A.pdf`.

to new incentives to return to school given economic changes related to shifting terms of employment, the erosion of the public sector, and the decline of unions (Barr and Turner 2015; Elman and O'Rand 2002; 2007; Elman 2011; Laird 2015; Rosenfeld and Kleykamp 2012; Shanahan 2000; Wilson et al. 2015). These labor market pressures have been particularly acute among women and blacks, as evidenced by their continued overrepresentation compared to men and whites, respectively, in precarious, lower status, and lower paying employment (del Rio and Alonso-Villar 2015; Huffman and Cohen 2004; Kalleberg 2000; Kmec 2003; Reid and Rubin 2003). It is not well understood, though, whether and how developments in these areas have shaped adults' decisions to return to school over a long period of time through the present day.

Additionally, when describing the antecedents and consequences of students' increasingly nonlinear pathways through postsecondary education, researchers have relied on categories that fail to capture the full heterogeneity therein. Much research relies on dichotomous measures—e.g., students either transitioned directly from high school into postsecondary education or delayed their entry (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011; Roksa and Velez 2012)—or on measures constructed from a small number of categories—e.g., students attended a single school continuously, attended more than one school continuously, attended a single school discontinuously, or attended multiple schools discontinuously (Goldrick-Rab 2006). In other words, prior research looks at students' enrollment pathways via a set of pre-determined categories. What is largely missing from this important work is an appreciation for the characteristics of persistence patterns themselves (Marti 2008). Research has not yet developed consistent measures of the process of students' progression through their education that take into account the timing, duration, and sequencing of enrollment. While we know, for instance, that a substantial portion of today's college students attend part-time, and that part-time enrollment is negatively related to degree completion, we do not have a good sense of the implications for educational attainment of *when* and *for how long* a student enrolls part-time.

Finally, despite their surge in enrollment and their present nontrivial share of the higher

education market, little empirical research has investigated how the post-college labor market outcomes of for-profit students compare to the outcomes of individuals who did not attend for-profit colleges. Does this relatively novel college type—at least in terms of its scope—prepare its students for success on the labor market? The research that exists has demonstrated that students earning degrees or certificates at for-profit colleges earn less or about as much as their nonprofit college-educated counterparts (Deming et al. 2012; Lang and Weinstein 2012; Cellini and Chaudhary 2014). Yet less attention has been paid to how wages of for-profit students compare to less educated individuals. That is, we do not know at what level of attainment for-profit postsecondary education becomes a wise investment relative to not attending college at all, especially given the heavy debt burdens carried by many attendees of for-profit schools.

### *1.3 Outline of This Dissertation*

This dissertation aims to fill these gaps by examining key dimensions of the increasing heterogeneity in when, how, and where individuals pursue their postsecondary education. In Chapter 2, I draw on Current Population Survey data to describe trends in adults' enrollment in formal schooling from 1978 to 2013, and investigate the extent to which labor market and demographic factors account for any observed trends. Results indicate that adult black women in particular have seen relatively high growth rates in their enrollment. Black women were 85% more likely to enroll in 2011, and 46% more likely in 2013, than they were in 1978. Their growing advantage relative to other racial-gender groups occurs against a backdrop of declining labor market prospects, and is due in large part to their increasing educational attainment rates overall, given the relationship between prior schooling and enrollment later-in-life. Taken together, this chapter's findings suggest that adult enrollment is at once equalizing and disequalizing. On the one hand, it has the potential to narrow the gaps between those with some college experience and those with a four-year degree. On the other hand, however, patterns of adults' participation in formal education are widening educational gaps between those with and without traditional-age college experience.

In addition to re-enrolling later into the life course, today's college students are delaying their initial transition into college (Roksa and Velez 2012; Goldrick-Rab and Han 2011; Rowan-Kenyon 2007; Bozick and DeLuca 2005) and taking more circuitous routes through postsecondary education (Andrews et al. 2014; Bound et al. 2012; Goldrick-Rab and Pfeffer 2009; Goldrick-Rab 2006; Mouw 2005; McCormick 2003; Bailey 2003; de los Santos and Wright 1990). Chapter 3 contributes to this literature by drawing on detailed postsecondary transcript data from the National Longitudinal Survey of Youth 1997 (NLSY97) to pursue the following three goals. First, I describe variation in the shape of students' attendance pathways through their postsecondary education. More specifically, I follow recent methodological advances adopted by those who have studied such topics as criminal behavior (Laub et al. 1998) and work (Damaske and Frech 2016) over the life course to estimate developmental trajectories of students' completed course credits over time (Jones and Nagin 2013; Nagin 2005; Nagin and Odgers 2010). This approach uses finite mixture modeling to classify students into qualitatively distinct groups on the basis of their course credit completion behavior over time. Second, I examine the extent to which students are sorted into various pathways by sociodemographic traits. Third, I investigate the relationship between pathways and the completion of a college degree. I find that postsecondary students follow pathways that rarely conform to standard timelines, and that their pathways both reflect their socioeconomic status and relate to whether or not they complete a degree.

Whereas the second chapter explores later-in-life transitions from the labor market back to school, and the third chapter attempts to better understand the postsecondary educational trajectories of contemporary students as they prepare for the labor market, Chapter 4 investigates the labor market outcomes (namely, wages) of students who attended a rapidly growing postsecondary sector—for-profit colleges. Despite the recent growth of for-profit colleges, scholars are only beginning to understand the labor market consequences of attending these institutions. Using data again from the NLSY97, I find that for-profit associate's degree holders encounter lower hourly earnings than associate's degree holders educated at public or private, nonprofit colleges, and earnings that are not significantly different from

high school graduates. However, individuals who complete a bachelor's degree by attending college in either the for-profit or nonprofit sectors encounter positive returns. These findings suggest that the distinction between for-profit and nonprofit colleges constitutes an important axis in the horizontal dimension of education at the sub-baccalaureate level, and complicate notions of vertical stratification such that higher levels of educational attainment do not necessarily guarantee a wage premium.

Chapter 5 offers some concluding thoughts as well as additional questions left unaddressed in this dissertation. Taken together, these chapters offer insights into the increasingly heterogeneous ways individuals select into and experience postsecondary education.

# Chapter 2

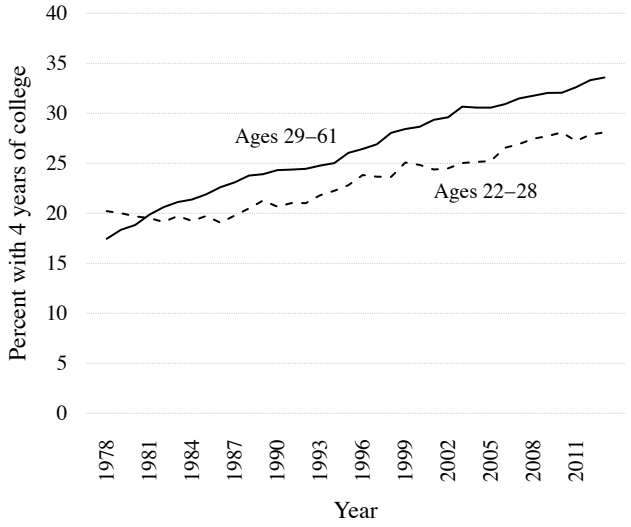
## Back to School: Racial and Gender Differences in Adults' Participation in Formal Schooling, 1978–2013

Media reports point to a growing contingent of adults "over 50 and back in college, preparing for a new career" (Hannon 2015), especially in the wake of a "sour economy" (Jackson 2009; see also Holland 2014; Randall 2009; Rivera 2015; Simpson 2013; Wasik 2015). Policymakers, too, have taken note of the need for older adults to augment their skills through additional formal schooling. President Obama has stressed that workers acquiring new skills is crucial to keeping them employed and restoring their economic security (Obama 2014). The state of Michigan ran a government-funded program called No Worker Left Behind from 2007 to 2010 to encourage workers, especially those in the struggling automotive industry, to go back to college and retrain for jobs in other industries (Hagland 2013). Similarly, the Plus 50 Encore Completion Program, a two-year grant program sponsored by the American Association of Community Colleges that aims to train 10,000 baby boomers nationwide for new jobs in health care, education, and social services, has as its goal making those aged 50 years and older more marketable in growing occupations (Navera 2013).

That formal human capital acquisition has been pushed further into the life course is confirmed by research. Not only are traditionally-aged individuals taking more circuitous routes through postsecondary education (Andrews et al. 2014; McCormick 2003) or delaying their initial transition into college altogether (Bozick and DeLuca 2005; Roksa and Velez 2012), older adults have also been enrolling in formal schooling at nontrivial rates. In the fall of 2013, less than half of the students enrolled in degree-granting postsecondary institutions belonged to the group that most readily comes to mind when we think of college campuses—those between the ages of 18 and 22—while roughly a quarter (about 5 million students)

were at least 30 years old (National Center for Education Statistics 2014:Table 303.45). As Figure 2.1 shows, college completion rates have risen faster among those over the age of 29 compared to those between 22 and 28 years old. Among the younger group, completion of at least four years of college has grown by about 40%, from 20.0% in 1978 to 28.1% in 2013. Among those between the ages of 29 and 61, however, the proportion with at least four years of college has risen by over 80%, from 18.3 to 33.6%. We would certainly expect some difference in the attainment rates of these two groups, but the markedly faster growth among the older population reveals an important fact: more and more older adults are beginning or returning to postsecondary degree programs.

Figure 2.1: Percentage of adults who have completed at least four years of college, by age group, 1978–2013




*Notes:* Author's calculations using the CPS October supplement data. Percentages are weighted by the appropriate weights.

In this chapter, I describe trends in adults' enrollment in formal schooling from 1978 to 2013, and investigate the extent to which labor market and demographic factors account for any observed trends. Prior research finds that a return to formal schooling in later-adulthood reflects an individual's unease about their labor market prospects as well as prior educational

advantages (e.g., Cruce and Hillman 2012; Elman and O'Rand 2002; 2004; 2007; Elman and Weiss 2014; Jacob and Weiss 2011; Jacobs and King 2002; Taniguchi 2005). But these studies have generally covered narrowly-defined time periods and have not focused on the intersection between race and gender. Jacobs and Stoner-Eby (1998) provide an exception by charting enrollment trends among black and white women and men from 1970 to 1990. Even this longer-term investigation, however, ends before the recent attention by the media and policymakers and before a number of changes in the patterns of earlier-in-life educational attainment and in the economy that might precipitate higher rates of adult enrollment in formal schooling. Further, while some research has found that women and blacks are more likely than men and whites to pursue additional education (Elman and O'Rand 2004; Jacob and Weiss 2011), existing work largely ignores gender differences within racial groups (or racial differences within genders) and how those differences may have evolved over time.

Given secular increases in prior educational attainment and widening attainment gaps by race and gender (McDaniel et al. 2011) as well as economic changes related to declining labor market prospects (Elman 2011; Kalleberg 2000) over the past quarter century, the analyses presented here spanning three and a half decades shed light on whether and how older adults have responded to such shifts. Additionally, I attend specifically to gender gaps among black and whites, and black-white gaps among women and men, for two reasons. First, much of the recent literature on trends in and correlates of earlier-in-life educational attainment by race *and* gender focuses on how the gap between blacks and whites has changed over time (see, e.g., Buchmann and DiPrete 2006; DiPrete and Buchmann 2006; McDaniel et al. 2011). I contribute to this literature by describing whether and how older black and white women and men differ in their formal schooling enrollment rates, how these differences have changed over time, and the extent to which demographic and labor market factors might account for their transitions back into schooling.

Second, educational and economic developments over the past few decades have been particularly salient for trends in inequality among blacks and whites. Indeed, black men trail whites and black women in terms of educational attainment (McDaniel et al. 2011), while

black women's labor market prospects have been especially hurt by the erosion of public employment, the decline of unions, and increasing wage inequality between black and white women (Dozier 2010; Laird 2015; Pettit and Ewert 2009; Rosenfeld and Kleykamp 2012). To the extent that prior educational attainment and economic circumstances incentivize or constrain an adults' decision to return to school, this chapter sheds light on trends and stratification in educational transitions beyond the period in the life course when formal human capital acquisition is often assumed to be complete.

### *2.1 Background*

Sociologists and demographers have become increasingly interested in the ways in which the life course has changed from a set of normative and discrete transitions to a series of overlapping and blurred phases (Elman 2011; Shanahan 2000). In particular, though it made sense at one time to conceptualize the "student-to-worker" transition in the former way—i.e., "individuals severed their participation in formal schooling [prior to assuming] other adult roles," like that of employee (Bills 2000:65)—diverse, extended, and fluid pathways through education have become more prevalent in recent years (Andrews et al. 2014; Bozick and DeLuca 2005; Mouw 2005; Roksa and Velez 2012). Beyond the delayed transitions and interrupted enrollment patterns of traditionally-aged college students, adults further into the life course are choosing to augment their human capital.

While some of this later-in-life educational activity occurs in on-the-job, vocational, and other work-related training programs (Bills 2005; Elman and O'Rand 1998), older adults' participation in formal schooling has also captured researchers' attention.[1] Existing research finds that the decision to return to formal schooling later-in-life is shaped by a number of interconnected factors, including prior and current choices and experiences related to family, work, and education. In general, those who seek and complete additional education later-in-

[1] As discussed further in the next section, the October supplement of the Current Population Survey asks respondents to respond separately to questions about their enrollment in "vocational" and "regular" (or formal) schooling; this chapter focuses on the latter.

life tend to be more socioeconomically advantaged—as measured, for instance, by fathers' occupational prestige (Elman and O'Rand 2007), mothers' schooling (Elman and O'Rand 2004), or parents' class (Jacob and Weiss 2011)—than those who do not. Relatedly, those who have attained more years of education earlier in life are more likely to enroll as adults than those who have less prior education (Cruce and Hillman 2012; Elman and O'Rand 2004; 2007; Jacob and Weiss 2011).

For some, concerns about job security motivate the pursuit of additional training (Barr and Turner 2015; Elman and O'Rand 2002). Adults who expect that they will lose their jobs in the next year are about 40% more likely to participate in education than those who feel their job is secure (Elman and O'Rand 2002). By contrast, those who have more job experience—perhaps indicative of working in a good job with greater security—are less likely to re-enroll (Elman and O'Rand 2004; 2007). Similarly, the unemployment rate positively influenced whether men returned to school in a sample of males from the National Longitudinal Survey of Youth 1979, while earnings were inversely related to the likelihood of re-enrollment (Light 1996). Women appear particularly sensitive to feelings of generalized job insecurity (Hostetler et al. 2007). For example, in a sample of adults aged 29–61 in the late 1980s and early 1990s, women were much more likely to enroll during recessionary periods; this was not true for men (Elman and O'Rand 2007).

The desire or ability to return to school later-in-life is also constrained by an individual's resources and incentives for doing so. Those who are married or who have young children are less likely to pursue formal schooling later in life given the competing demands for their time and attention (Bradburn et al. 1995; Elman and O'Rand 2007; Jacobs and King 2002). The likelihood of re-enrollment also declines with age, since returning to school at more advanced ages incurs higher opportunity and direct costs, necessarily involves a shorter time frame in which to recoup those costs once the additional schooling is completed, sends a weaker signal of productivity to current or potential employers, and results in lower wage returns (Elman and O'Rand 2004; Monks 1997; Pallas 1993; Spence 1973).

Although the returns to education pursued later-in-life are weaker than the returns to

education completed on a more normative timeline, they still matter (Elman and O'Rand 2004; Monks 1997; Taniguchi 2005). Later-in-life education is particularly important to the wages of women and nonwhites. While women who do not update their skills over time see their wages stagnate or decline, women without a high school diploma who engaged in work-related training experience significant returns to that training (Hamil-Luker 2005). Elman and O'Rand (2004) similarly find that delayed human capital investments play a compensatory function in terms of wages, especially for women who return to complete baccalaureate degrees. Further, nonwhites earn roughly the same as whites for the same credentials when they return to school, in contrast to wage differentials among blacks and white who have completed college at more traditional ages (Elman and O'Rand 2004).

Yet, with one exception, the extant scholarship on the correlates of adults' participation in formal schooling considers neither long periods of time nor race and gender jointly. In the exception that examines a longer time frame and describes trends in enrollment by discrete demographic groups (i.e., black and white women and men), Jacobs and Stoner-Eby (1998) find small increases in undergraduate enrollment rates among adults between 1970 and 1990. However, secular changes in two key areas shown by prior research to influence whether an adult returns to school—prior educational attainment and labor market circumstances—leave open the question of whether, and how, rates of adults' return to schooling may have evolved in response to such changes. Further, developments in these areas have led to particular divergence among black and white women and men, motivating a focus here on these demographic groups' trends in adult enrollment.

While levels of educational attainment have increased across the board, growth has been particularly pronounced among women, who are currently much more likely than men to enroll in college and earn college degrees (Buchmann and DiPrete 2006; DiPrete and Buchmann 2006). Among individuals between the ages of 22 and 28, white women's college completion rates surpassed those of white men in the mid-1980s, whereas black women's advantage over black men has existed since at least 1940 and began to grow in the 1980s (McDaniel et al. 2011). Additionally, the college completion rates of black and white women and black men

have increased faster than those of white men. The proportion of black women aged 25–29 who completed at least four years of college increased 87% from 1980 to 2014 (from 12.5 to 23.4%), the college completion rate of white women increased 74% (from 22.0 to 38.2%), and the completion rate of black men increased 86% (from 10.5 to 19.5%); by contrast, the proportion of white men who completed at least four years of college increased just 24% (from 25.5 to 31.6%) over the same period (U.S. Census Bureau 2014).

These trends in prior educational attainment might influence trends in adults' re-enrollment in two ways. First, we might expect that older adults' enrollment rates among black and white men and women will rise over time in step with their increasing earlier-in-life education levels insofar as prior attainment facilitates later enrollment. Second, re-entering formal schooling may be a compensatory strategy among adults who stopped their educational career earlier in life, whereby they return to school to complete a previously begun credential in an attempt to catch up to those with more education (Maralani 2011; Taniguchi 2005). While college enrollment rates have increased, rates of baccalaureate completion have stagnated in recent decades (Turner 2004). Black adults are more likely than whites, and black women are more likely than black men, to be in this liminal status of having some college education but no degree. Among those aged 25 years and older in 2014, 17.5% of non-Hispanic white women and 16.9% of white men attended college but did not complete a degree, while 20.8% of black women and 18.7% of black men fell into this category (U.S. Census Bureau 2014). Much lower percentages of Hispanic men (13.6%) and women (14.0%) had some college but no degree. In this way, we might expect black adults, and especially black women, to have seen particularly strong growth in later-in-life enrollment over time.

Men and women have also been increasingly exposed to new incentives to return to school given economic changes related to shifting terms of employment, the erosion of the public sector, and the decline of unions (Barr and Turner 2015; Elman and O'Rand 2002; 2007; Elman 2011; Laird 2015; Rosenfeld and Kleykamp 2012; Shanahan 2000; Wilson et al. 2015). These labor market pressures have been particularly acute among women and blacks, as evidenced by their continued overrepresentation compared to men and whites, respectively,

in precarious, lower status, and lower paying employment (del Rio and Alonso-Villar 2015; Huffman and Cohen 2004; Kalleberg 2000; Kmec 2003; Reid and Rubin 2003). The economic standing of black women has especially suffered in recent decades, as indicated by substantial increases in the black-white wage gap among women (Browne and Askew 2005; Dozier 2010; Pettit and Ewert 2009). This trend holds even among women employed in professional and managerial occupations (Dozier 2010). Additionally, women and blacks have been more negatively impacted by the undermining of traditional wage-setting and employment-protection institutions (Rosenfeld and Kleykamp 2012; Wilson et al. 2015). Indeed, black-white wage gaps among women would be between 13 and 30% lower if union representation had not declined so precipitously over the past few decades (Rosenfeld and Kleykamp 2012). Similarly, the public sector has traditionally guaranteed greater wage parity and reduced discrimination in the workplace, and so the trend toward privatization and the decline of public sector jobs, particularly given the contraction of government employment in the wake of the Great Recession, have been particularly damaging to women and blacks, who are overrepresented in the public sector (Cooper et al. 2012; Stevenson and Langan 2011; Wilson et al. 2015). In this context, it is possible that women—and particularly black women—have increased their later-in-life enrollment in formal schooling in an effort to compensate for their deteriorating labor market circumstances.

### *2.2 Data and Methods*

To examine long-term patterns in adults' formal school enrollment, particularly with respect to race, gender, prior educational attainment, and labor market position, I draw on data from the 1978–2013 October supplements of the Current Population Survey (CPS).[2] These annual surveys are administered to nationally representative samples of about 60,000 households that contain information on school enrollment, household background, and labor

[2]I use data provided by the Unicon Research Corporation (`http://www.unicon.com`). Though the October supplement has been fielded since 1968, questions on school enrollment were posed to individuals ages 35 and over beginning in 1978. In other CPS monthly supplements, questions about enrollment are asked only of those 24 years and younger.

market participation. The primary analytical sample consists of men and women between the ages of 29 and 61 and who may be employed, unemployed, or outside of the labor force, and who have no missing values on either the dependent variable (enrollment status) or key demographic variables (race, gender, and age); missing information for other variables is generally handled through dummy variable adjustment (see text below for more details).[3]

In analyses focused on those who are employed (either full-time or part-time), the sample is further restricted in three ways. First, years 1978, 1980, and 1994 are excluded from these analyses; wage data were not collected in the October supplement in 1978 or 1980 and, as discussed further below, the CPS did not contain a valid earnings allocation flag in 1994. Second, as described in greater detail below, individuals are excluded if they have missing, imputed, or extreme-value earnings. Third, the employed sample is restricted based on the month in which a respondent is interviewed. Households in the CPS typically participate in eight surveys over the course of 16 months; they are interviewed for four consecutive months, rotated out of the sample for the next eight months, and then interviewed again for another four consecutive months. When households participate in the October survey, the questions they are asked depend on the month in their interview cycle. In particular, only respondents in their fourth or eighth month are posed questions about their jobs such as earnings. As a result, the employed sample includes those in either of these two months.

The October supplement is well-suited to the aims of this chapter since it is the only large-scale micro-level dataset to ask older adults about their school enrollment. The education supplement data also include basic labor force information such as employment status, occupation, and earnings. These features allow for an examination of broad trends over the past three and a half decades in the formal enrollment decisions of older adults. At the same time, the CPS is limited by its lack of detailed information about ability, prior academic achievement, health status, and job history and tenure. While this kind of information would

[3]The cutoff age of 61 removes from the sample those who are most likely to be on the verge of retirement and thus, by definition, least likely to engage in educational activities that could be beneficial to their labor market position (Elman and O'Rand 2007).

be useful for homing in on the factors which may constrain or enable mid-to-late-adulthood enrollment, I do control for a host of other variables that are likely related to job history and tenure and to other (dis)advantages, including gender, race/ethnicity, current educational attainment, occupation, marital status, and family income. Further, it is not feasible to measure enrollment persistence. Even though the October respondents are included in other months of the CPS, given the rotation structure, enrollment questions in these surveys are only posed to individuals aged 24 years and younger, and so I cannot examine month-to-month persistence in enrollment. Individuals might also be observed in multiple October surveys (Elman and O'Rand 1998), but others have found that linking individuals across years results in poor match rates (Barr and Turner 2015).

Nevertheless, the ability to track adults' enrollment over a 36-year period and to account for key demographic and labor market factors makes the CPS October supplement useful to the aims of this chapter. Table A.1 in the appendix reports summary statistics for the variables used in the analyses, which are described further below.

### *2.2.1 Measures*

*Enrollment*

The outcome variable of interest measures whether or not one is currently attending or enrolled in "regular school," defined by the CPS as primary school or schooling that leads to a high school diploma or a college, graduate, or professional degree. The vast majority of enrolled respondents in the sample (93%) attend either college or a graduate program. This is a narrow definition of schooling and it certainly understates the full extent to which adults are participating in educational activities or upgrading their skills. Indeed, many adults also participate in what the CPS labels "vocational" schooling (Bills 2005; Elman and O'Rand 1998). However, my definition focuses our attention on the kinds of education that entail substantial investments of time, financial, and other resources, is a major determinant of labor market outcomes, and has the potential to produce or enhance

skills that are transferrable across firms or occupations (Becker 1964).[4]

*Race and Gender*

This analysis centers on the differences and trends in enrollment by race and gender. As discussed above, I focus on patterns of formal school enrollment among whites and blacks, and I include Hispanic individuals and those who fall into other racial groups for added context. Race/ethnicity is thus measured as a series of dummy variables: non-Hispanic white, non-Hispanic black, Hispanic, and other non-Hispanic racial groups. Gender is coded in dichotomous fashion (1=female, 0=male).

*Prior Educational Attainment*

Obtaining a consistent measure of current educational attainment across the study period requires harmonizing two different categorization schemes. Through 1991, the CPS asked individuals which grade they had attained (ranging from 0 through 18+); a separate "yes/no" question asked whether they had completed that grade. Since 1992, the CPS has asked what grade or degree an individual has completed. For the analyses presented here, I follow the recommendation by Jaeger (1997) and convert both schemes into a series of four dummy variables: individuals are coded as having attained *less than high school* if under the pre-1992 scheme they responded that they had not completed the twelfth grade or if under the post-1991 scheme they responded that they had attended through the twelfth grade but had not received a diploma; they are coded as having *completed high school* if they completed the twelfth grade under the earlier scheme or were marked as being a high school graduate or equivalent under the later scheme; they are coded as attaining *some college* if they attended through (but did not complete) grade 16 under the earlier scheme or if they responded that they had either "some college but no degree" or they had earned an associate's degree under

[4]Additionally, the vocational school enrollment variable in the CPS does not appear to be complete or consistent over time, especially during the 1980s; multiple years have missing data (1982, 1985, 1986, and 1988) and enrollment rates during 1983–1984 are markedly different than prior and later years.

the later scheme; and they are coded as having *completed at least four years of college* if under the pre-1992 scheme they completed grade 16 or attended any higher grade (17 or 18+), or if under the post-1991 scheme they are coded as having completed a bachelor's, master's, professional, or doctorate degree.

*Demographic and Background Factors*

Demographic and background factors include age (measured continuously in years), marital status (coded as a series of dummy variables for never married, currently married, separated, divorced or widowed, or missing), the presence of children in the household (respondents may have no children under the age of 18, an infant or very young child between the ages of 0 and 5, a child between 6 and 12 years old, or a child in their teenage years between 13 and 17),[5] and whether one is a veteran (coded dichotomously). Given the financial commitment of re-enrolling in formal schooling, I also control for one's family income. The CPS October supplement includes a categorical measure of family income. Because these categories contain varying numbers of respondents and represent different income ranges over time (the categories have changed four times since 1978), I construct within-year income quartiles following Bainbridge et al. (2005). Within each year and income category, I assign each respondent a rank using a random number generator. Each income category's rank begins at one more than the lower category's maximum rank. For example, if there are 100 respondents in the lowest CPS income category in a given year, then the random-number rank of the first person in the second income category begins at 101. I then use respondents' rank to sort them into quartiles in each year.[6] A fifth category captures those who have missing family income information.

[5]For households with more than one child, this variable records the age range of the youngest child.

[6]In separate analsyes, I tested whether different random number draws affected the overall results; they did not, suggesting that the rank order from poor to rich is roughly accurate in each year.

*Labor Market Factors*

A number of variables measure one's labor market position, including employment status, union membership, employment sector, occupation, and earnings. In terms of their employment status, individuals are coded as employed full-time if they work at least 35 hours per week, as employed part-time if they work less than 35 hours per week, as unemployed if they do not have a job but have actively looked for work in the past four weeks and are currently available for work, and as not in the labor force if they are not employed and are not looking for a job. Employment sector is measured by the CPS's "class of worker" variable, which indicates whether a respondent's current or most recent job is in the private or public sector. Respondents are also asked whether they belong to a labor union or association. For these two variables, I include a "missing" category. In addition to those who were not asked about union membership or sector on account of their employment status, this "missing" category includes union status for years 1978–1983, before the question was introduced in the CPS October supplement (sensitivity analyses show no differences in results if I limit the analyses to only years 1984–2013). I use a 25-category occupation scheme, and include a 26$^{\text{th}}$ category—"missing"—to accomodate those with no occupation listed as well as those who are currently not working and who may not have had a prior job to reference when responding to the occupation question.[7]

Earnings are measured for those currently employed as logged hourly wages in 2013 constant dollars in a manner consistent with Lemieux (2006) and Western and Rosenfeld

[7]The 25 occupation categories are: executive, administrative, and managerial; management-related; professional specialty; technicians and related support; financial sales and related; retail sales; administrative support; fire fighting, police, and correctional institutions; farm operators and managers; other agricultural and related; mechanics and repairers; construction trades; extractive; precision production; machine operators, assemblers, and inspectors; transportation and material moving; and 9 categories of service occupations: housekeeping and cleaning; protective service; food preparation and service; healthcare support; building and grounds cleaning and maintenance; personal appearance; recreation and hospitality; child care workers; and miscellaneous personal care and service. These occupation recodes are based on a system developed by Autor and Dorn that reconciles the changes made to the Census occupation classification scheme over time (2013; see also Dorn 2009).

(2011).[8] Non-hourly workers' earnings are calculated by dividing their weekly earnings by the number of hours worked per week at the worker's main job. For hourly workers, I select the higher of the individual's (a) weekly earnings divided by weekly hours worked or (b) CPS-provided hourly wage variable. I drop unrealistically low and high earners—i.e., those with earnings of less than $1.00 per hour or earnings above $100.00 per hour in 1979 dollars. Because earnings top-codes change across years of the CPS, I multiply hourly wages of top-coded earners by a constant of 1.4 (Lemieux 2006). Additionally, given research which has shown that the inclusion of respondents whose earnings were not reported but were imputed by the BLS could lead to bias (Hirsch and Schumacher 2004; Mouw and Kalleberg 2010), I exclude these respondents from the sample. For the majority of years in this study's time period, the CPS-provided allocation flag accurately identifies imputed earners. For other years (1989–1993), I compare respondents' unedited earnings variable to their edited earnings variable to identify imputed earners. The 1994 survey includes imputed earners but does not accurately identify them, and so I exclude 1994 from the analyses.

*Additional Controls*

Finally, I include state and metro/non-metro fixed effects to account for observed and unobserved geographic variation in one's access to schools, in labor market conditions, and in local requirements for additional human capital. For instance, living in a metropolitan area likely means an individual resides closer to more potential schools in which to enroll, while different states have historically provided varying amounts of public support for higher education programs.

### *2.2.2 Analytical Strategy*

In the first part of the analysis, I present descriptive findings to establish whether and how enrollment in formal schooling among adults aged 29–61 years has changed over the study

[8] I use the CPI-U-RS to adjust for inflation.

period. I specifically consider changes with respect to race, sex, prior educational attainment, and employment status. Then, in order to assess whether demographic and labor market factors can account for any observed gaps or trends in enrollment among black and white women and men, I estimate multivariate logistic regression models. The modeling strategy proceeds in two steps. First, I pool all survey years to predict an individual $i$'s probability of enrollment in survey year $t$ as a function of their race, gender, the interaction between race and gender, age, and a vector of fixed effects for survey year, state, and metro/non-metro status. To this base model, I serially add in demographic and labor market factors. The saturated model can be expressed by Eq. 2.1:

$$Logit[P(Y_{it} = 1)] = \alpha_{gr} + \gamma \mathbf{X}_{it} + \beta_t \mathbf{Z}_{it} + \beta \mathbf{D}_{it}, \tag{2.1}$$

where $\alpha_{gr}$ represents separate intercepts for each gender $g$ and racial $r$ group combination (the base group is white men); $\mathbf{X}_{it}$ represents the demographic and labor market factors; $\mathbf{Z}_{it}$ is a vector of survey year dummy variables that are equal to 1 if individual $i$ responded to the survey in year $t$ and 0 otherwise; and $\mathbf{D}_{it}$ represents the vector of state and metro/non-metro fixed effects.

Second, to obtain a fuller picture of how racial-gender patterns of enrollment have evolved over time, I add to Eq. 2.1 two– and three-way interaction terms between race, gender, and time interval. To avoid dividing the sample into cells that are too small, I group survey years into seven time intervals of roughly five years each: 1978–1982, 1983–1987, 1988–1992, 1993–1997, 1998–2002, 2003–2007, and 2008–2013.[9]

[9]In separate analyses (not shown, but available upon request), I separated the period into different intervals (e.g., five intervals of roughly seven years each, four intervals of between eight and ten years each, and three periods of about ten years each), and the results were broadly similar across specifications.

## *2.3 Findings*

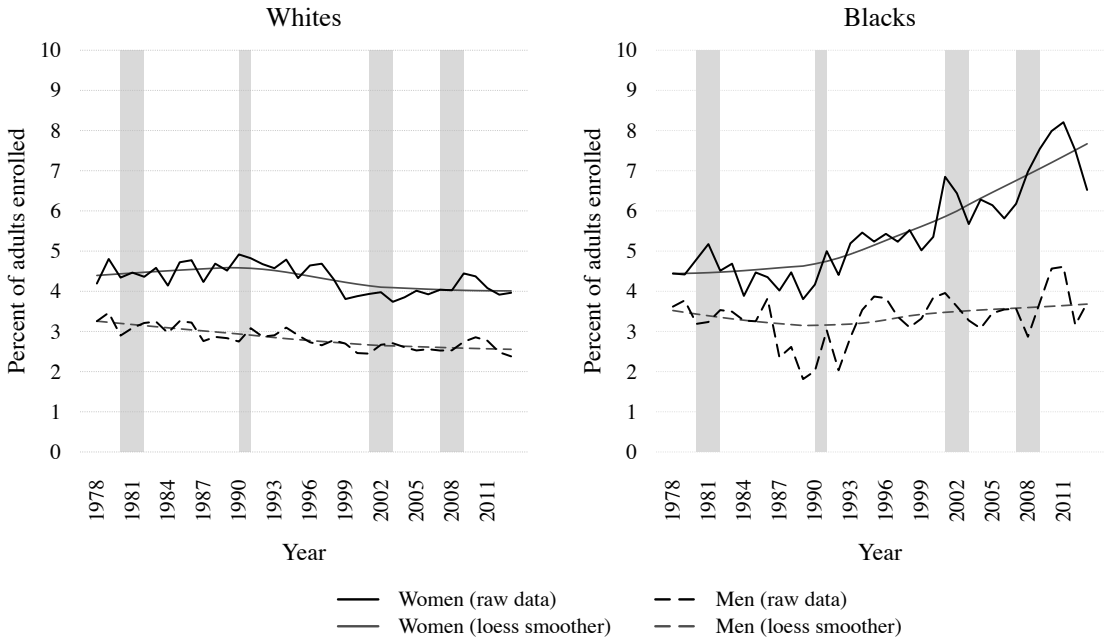
### *2.3.1 Trends in Adults' Formal School Enrollment*

To begin, I present descriptive results to examine whether and how this form of human capital investment among older adults has changed over the past three and a half decades. Figure 2.2 shows the enrollment rates of black and white women and men aged 29 to 61 from 1978 through 2013. I present both the raw percentage of adults in each racial-gender group who reported being enrolled (the darker lines) as well as Lowess smoothed lines (the lighter lines) to get a sense of the overall trends. Across the full study period, both black and white women held an advantage over black and white men. At no point between 1978 and 2013 did white men enroll at higher rates than white women; the same is true among blacks. Further, black women enroll at higher rates—by more than five percentage points between 2010 and 2012—than white men. White women also hold an advantage over black men, though not as large or as consistent as the female-favorable gap between black women and white men. The largest gap between white women and black men is roughly three percentage points (in 1990), though more often than not, the gap is less than one percentage point.

Though not shown here, trends among Hispanic women and men generally follow the patterns among white men and women in Figure 2.2, though at lower levels. Hispanic women's enrollment rate holds relatively steady between 3.5 and 3.9% over the study period, while Hispanic men's rate fluctuates between 2.3 and 3.0%. Women and men in the "other" racial category evince relatively steep declines; women in this group saw their enrollment fall from an average of 6.8% between 1979 and 1983 to 4.8% between 2009 and 2013, and the men's rate dropped from 8.1 to 3.7%. These declines are interesting in their own right, and could reflect the potentially shifting composition of this group. For instance, this "other" racial group consists of Asian individuals as well as individuals of two or more races; Asians are increasingly immigrating into the U.S., and interracial marriage rates have ticked upward (Lichter 2013).[10]

[10]As this chapter is focused on trends and gaps among black and white women and men, I leave deeper

Figure 2.2: Adult enrollment by gender and race, 1978–2013




*Notes:* Author's calculations using the CPS October supplement data. Percentages are weighted by the appropriate weights. Shading in grey indicates recessionary periods, as defined by the National Bureau of Economic Research.

In terms of within-group changes, white men and women's enrollment has declined slightly. Roughly 4.5% of adult white women were enrolled in the early years of the study period, compared to 4.0% in 2013. Similarly, white men began the study period with an enrollment rate of about 3.3%; by 2013, under 2.5% were enrolled. As a result, the gender gap among white adults stayed relatively contant—between one and two percentage points—over the past three and a half decades. Black men's enrollment has held fairly steady, with a drop of nearly two percentage points in the late 1980s and early 1990s.

In sharp contrast to the patterns of white men and women and black men, and of Hispanic men and women for that matter, black women have increased their participation in formal schooling over time. In the early part of the study period, a little less than 5% of black women were enrolled. Recessions appear to be particularly important boons for enrollment

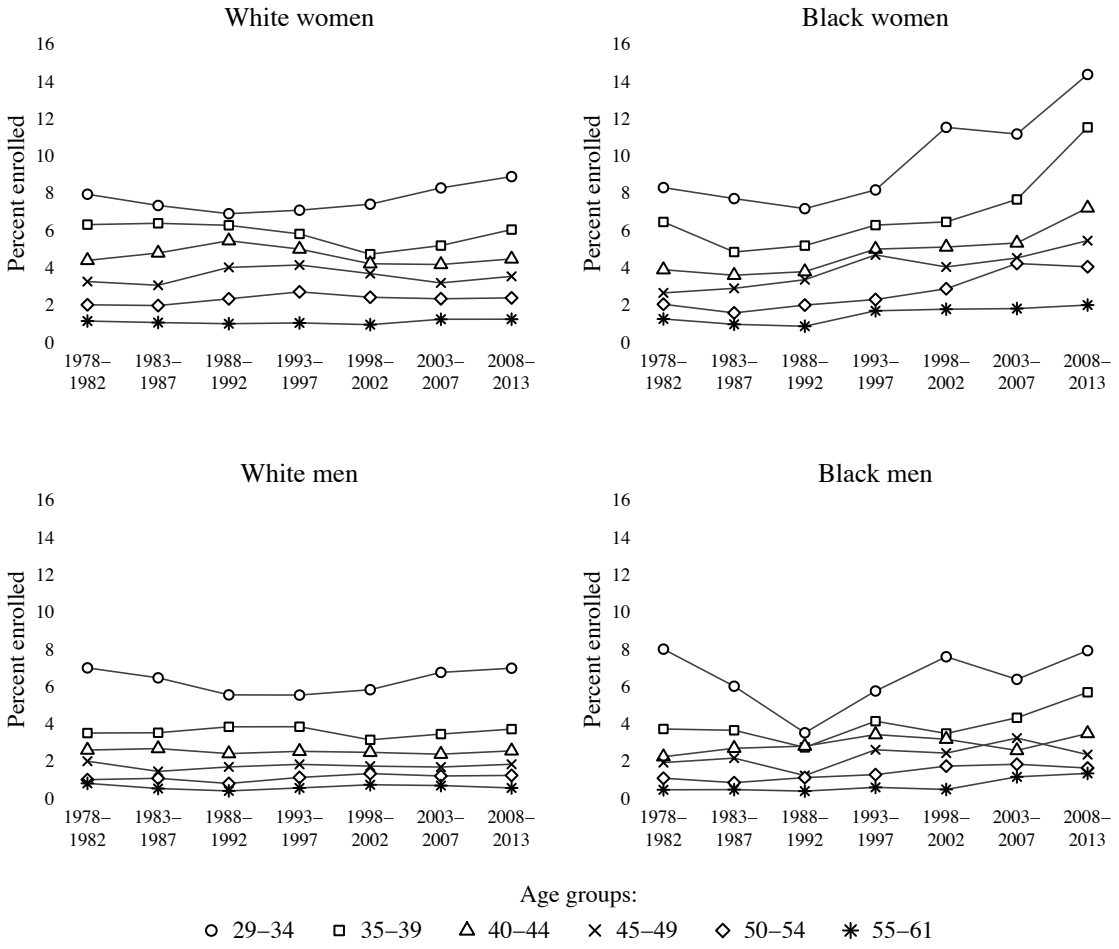
investigation of these declines among the "other" racial group for future research.

trends among black women. During recessionary periods—or, in the case of the recession in the early 2000s, right before—black women substantially increased their transitions into formal schooling. Their enrollment peaked as the country was still reeling from the Great Recession in 2010 and 2011 at around 8.2% before settling around 7% in 2012 and 2013. In 2011, black women's enrollment was 85% higher than it was in 1978. Even with the decrease in enrollment in the most recent couple years, black women were 46% more likely to enroll in 2013 than they were in 1978.

How do changes in enrollment vary by age group among these four racial-gender groups? Figure 2.3 shows the percentage of adults who are enrolled by age group and five-year time interval. That younger age groups typically out-enroll their older counterparts is consistent among black and white women and men. Again, though, growth in black women's enrollment rates stands out. Among all age groups, black women's enrollment was higher in 2008–2013 than it was in 1978–1982, with the largest gains occurring for those aged 29–34 (from 9.3 to 14.4%), 35–39 (from 6.5 to 11.5%), and 40–44 (3.9 to 5.3%). White women and men and black men evinced much lower growth—and often small declines—in their age-group-specific enrollment rates. While white women between the ages of 29 and 34 saw their enrollment rate grow from 7.9 to 8.9%, the enrollment rates of all other age groups held relatively steady. The same is generally true among white men, though even their youngest age group saw no long-term increase in enrollment over time. Enrollment among black men aged 29–34 is halved between 1978–1982 and 1998–1992, from 8.0 to 3.5%. After this period, black men aged 29–34, and to a lesser extent those aged 35–39, see their enrollment rates begin to rise until the 2010s.

In some ways, the patterns in Figures 2.2 and 2.3 align well with prior research on educational attainment and transitions among both younger and older cohorts. By the start of this study's observation period, white and black women between the ages of 22 and 28 were already completing college at higher rates than their male counterparts (McDaniel et al. 2011), and so it is possible that their advantage earlier in the life course has manifested as a female-favorable enrollment gap later in life (Cruce and Hillman 2012; Elman and

Figure 2.3: Adult enrollment by age group, gender, and race, 1978–2013




*Notes:* Author's calculations using the CPS October supplement data. Percentages are weighted by the appropriate weights.

O'Rand 2004; 2007; Jacob and Weiss 2011). However, accounts linking later-in-life educational transitions with higher prior attainment fail to explain the racial trends within the two genders—namely, black men's parity with white men and black-female-favorable divergence in enrollment among women. Black men and women continue to lag their white counterparts in terms of prior educational attainment, suggesting that their later-in-life enrollment rates should be lower as well. To better understand the relationship between prior educational attainment and enrollment during later adulthood, I next ask how enrollment has changed

Table 2.1: Enrollment by educational attainment, race, and gender, 1978–2013

| | Enrollment | | | | | | | | Attainment share | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1978-1982 | 1983-1987 | 1988-1992 | 1993-1997 | 1998-2002 | 2003-2007 | 2008-2013 | Δ | 1978-1982 | 2008-2013 | Δ |
| *Black women* | | | | | | | | | | | |
| <HS | 1.3 | 1.7 | 1.6 | 2.3 | 2.0 | 2.9 | 2.5 | 1.91 | 41.3 | 10.8 | 0.26 |
| High school | 2.2 | 1.3 | 1.1 | 2.0 | 2.0 | 2.0 | 2.6 | 1.14 | 34.4 | 31.6 | 0.92 |
| Some coll. | 15.4 | 12.0 | 10.7 | 9.7 | 9.8 | 10.0 | 12.3 | 0.80 | 15.2 | 33.2 | 2.19 |
| 4 yrs coll. | 11.3 | 8.1 | 8.0 | 8.3 | 9.6 | 8.6 | 9.5 | 0.84 | 9.1 | 24.3 | 2.67 |
| *White women* | | | | | | | | | | | |
| <HS | 1.1 | 1.1 | 1.0 | 1.2 | 1.0 | 1.2 | 1.2 | 1.06 | 20.0 | 4.9 | 0.24 |
| High school | 1.1 | 1.0 | 0.8 | 1.1 | 0.9 | 1.1 | 1.2 | 1.08 | 44.8 | 27.0 | 0.60 |
| Some coll. | 10.7 | 10.0 | 10.3 | 8.3 | 6.2 | 5.9 | 6.7 | 0.62 | 19.2 | 30.6 | 1.60 |
| 4 yrs coll. | 10.3 | 8.7 | 7.4 | 6.5 | 5.8 | 5.0 | 4.5 | 0.44 | 16.0 | 37.5 | 2.34 |
| *Black men* | | | | | | | | | | | |
| <HS | 0.9 | 0.6 | 0.6 | 1.1 | 1.2 | 1.5 | 1.6 | 1.65 | 43.6 | 11.9 | 0.27 |
| High school | 1.1 | 1.0 | 0.3 | 1.0 | 1.3 | 0.9 | 1.4 | 1.27 | 31.2 | 39.0 | 1.25 |
| Some coll. | 10.4 | 8.9 | 5.5 | 5.9 | 6.2 | 6.4 | 6.3 | 0.60 | 15.4 | 28.8 | 1.88 |
| 4 yrs coll. | 11.1 | 7.7 | 5.9 | 8.6 | 6.4 | 5.2 | 6.0 | 0.53 | 9.9 | 20.3 | 2.06 |
| *White men* | | | | | | | | | | | |
| <HS | 0.6 | 0.7 | 0.4 | 0.8 | 0.7 | 0.7 | 0.5 | 0.85 | 20.8 | 6.4 | 0.31 |
| High school | 0.8 | 0.8 | 0.4 | 0.7 | 0.6 | 0.6 | 0.8 | 0.98 | 32.9 | 30.8 | 0.94 |
| Some coll. | 6.3 | 5.8 | 5.6 | 5.0 | 4.1 | 4.0 | 4.4 | 0.69 | 20.1 | 27.2 | 1.35 |
| 4 yrs coll. | 5.8 | 5.0 | 4.6 | 3.9 | 3.7 | 3.6 | 3.3 | 0.56 | 26.1 | 35.6 | 1.36 |

*Notes:* Data come from the CPS October supplements, 1978-2013. Weighted percentages are presented. Sample is restricted to men and women between the ages of 29 and 61. Columns 2–9 show the percentage of adults who are enrolled by racial-gender group, level of educational attainment, and time interval (percentages may not sum exactly to 100.0 due to rounding); columns 10–11 show the percentage of adults with a given level of educational attainment in the first and last time intervals for context; columns 9 and 12 (labeled Δ) provide the ratio of the proportion enrolled (or with a given education level) in the last interval to the proportion in the first interval.

Table 2.2: Enrollment by employment status, race, and gender, 1978–2013

| | Enrollment | | | | | | | | Employment status share | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1978-1982 | 1983-1987 | 1988-1992 | 1993-1997 | 1998-2002 | 2003-2007 | 2008-2013 | Δ | 1978-1982 | 2008-2013 | Δ |
| *Black women* | | | | | | | | | | | |
| Full-time | 5.6 | 4.0 | 4.4 | 4.9 | 5.7 | 5.8 | 6.6 | 1.18 | 39.1 | 50.8 | 1.30 |
| Part-time | 4.8 | 4.5 | 4.8 | 6.2 | 7.2 | 8.2 | 9.6 | 1.98 | 20.5 | 15.7 | 0.76 |
| Unemployed | 4.0 | 4.2 | 3.8 | 5.9 | 7.2 | 5.7 | 9.5 | 2.41 | 6.1 | 7.4 | 1.21 |
| NILF | 3.7 | 4.6 | 4.1 | 5.3 | 5.0 | 5.1 | 7.2 | 1.97 | 34.3 | 26.2 | 0.76 |
| *White women* | | | | | | | | | | | |
| Full-time | 5.1 | 4.8 | 4.6 | 4.3 | 3.9 | 3.7 | 3.6 | 0.71 | 34.9 | 48.1 | 1.38 |
| Part-time | 5.3 | 5.1 | 5.3 | 5.1 | 4.7 | 4.5 | 4.6 | 0.87 | 23.2 | 23.1 | 0.99 |
| Unemployed | 4.3 | 4.5 | 4.7 | 4.8 | 3.9 | 3.9 | 5.8 | 1.33 | 3.1 | 3.9 | 1.25 |
| NILF | 3.3 | 3.7 | 4.4 | 4.6 | 3.4 | 3.7 | 4.5 | 1.33 | 38.8 | 25.0 | 0.64 |
| *Black men* | | | | | | | | | | | |
| Full-time | 3.6 | 3.0 | 2.0 | 3.4 | 3.4 | 3.0 | 3.4 | 0.97 | 62.5 | 56.6 | 0.91 |
| Part-time | 3.6 | 3.7 | 3.6 | 5.4 | 4.3 | 6.0 | 5.3 | 1.48 | 16.0 | 11.8 | 0.74 |
| Unemployed | 1.7 | 3.4 | 1.8 | 2.8 | 3.6 | 3.1 | 4.4 | 2.52 | 7.2 | 9.4 | 1.30 |
| NILF | 3.8 | 3.7 | 2.4 | 2.8 | 3.8 | 3.1 | 3.5 | 0.93 | 14.3 | 22.2 | 1.55 |
| *White men* | | | | | | | | | | | |
| Full-time | 2.8 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.1 | 0.76 | 74.0 | 69.3 | 0.94 |
| Part-time | 4.2 | 4.3 | 4.3 | 4.2 | 3.6 | 3.9 | 3.8 | 0.90 | 15.3 | 13.3 | 0.87 |
| Unemployed | 3.0 | 2.4 | 2.5 | 2.6 | 3.3 | 2.4 | 3.6 | 1.17 | 3.2 | 4.8 | 1.50 |
| NILF | 5.3 | 5.4 | 4.6 | 4.9 | 4.1 | 4.1 | 4.0 | 0.74 | 7.5 | 12.6 | 1.68 |

*Notes:* Data come from the CPS October supplements, 1978-2013. Weighted percentages are presented. Sample is restricted to men and women between the ages of 29 and 61. Columns 2–9 show the percentage of adults who are enrolled by racial-gender group, employment status, and time interval (percentages may not sum exactly to 100.0 due to rounding); columns 10–11 show the percentage of adults in each employment category in the first and last time intervals for context; columns 9 and 12 (labeled Δ) provide the ratio of the proportion enrolled (or by employment status) in the last interval to the proportion in the first interval.

across levels of educational attainment.

Table 2.1 breaks down enrollment rates by race, gender, time interval, and level of educational attainment. The table also shows how the proportion of adults with a given level of education has changed over the past three decades. For all racial-gender groups, and in nearly all time intervals (with the exception of black men during the 1990s), those with some college (but no degree) had the highest enrollment rates compared to those with other levels of education. At the same time, the enrollment rates of those with some college declined among black and white women and men from 1978–1982 to 2008–2013, as did the enrollment rates of adults with at least four years of college. If the enrollment rates among these individuals have decreased over time, what accounts then for the fairly steady overall enrollment rate among black and white men and white women, and the dramatic rise in enrollment among black women? The answer may lie in these groups' increasing levels of prior educational attainment, as evident in the last column of Table 2.1. Indeed, the proportion of black women with at least some college more than doubled over the past three decades.

To compare how enrollment rates may be related to one's labor market position, I next examine the percentage of adults who are enrolled by their employment status. Table 2.2 shows the percentage of adults enrolled by race and gender, conditional on one's employment status. Enrollment rates rose for black women across all employment categories, over a period when black women increased their full-time employment, decreased their part-time employment, and saw their unemployment rate nudge upwards (as the final column in the table shows). The rise in enrollment has been particularly pronounced among part-time and unemployed black women. Whereas around 5% of part-time employed black women were enrolled at the start of the study period, nearly 10% were in the most recent years. Unemployed black women evince a very similar pattern, increasing their enrollment rate from roughly 4 to 9.5% over the last three decades. Black men who were employed part-time or who were unemployed also saw their enrollment rates increase, though not to the extent as black women. Further, the enrollment rates among black men who were employed full-time or who were outside the labor force held fairly steady. As in Figure 2.2, enrollment rates

among white women and men either declined slightly or held relatively constant over time.

### *2.3.2 Multivariate Analyses*

I turn now to the results from multivariate regression analyses to examine whether and how the observed shifts and racial-gender gaps in enrollment are linked to demographic and labor market characteristics. In particular, I address the following question: Do the apparent gaps and trends observed above remain when accounting for prior educational attainment, labor market factors, and other demographics? Table 2.3 presents the results as odds ratios of logistic regression models that test whether demographic and labor market factors can account for the racial and gender differences in the probability of enrollment among adults aged 29 to 61.[11] Models 1 through 8 are run on the full sample, while the sample in model 9 is limited to those who are employed and who have non-zero, non-imputed earnings (as detailed above).

The effects of the control variables are generally consistent with prior research and with the descriptive findings in this chapter. Across all models, the likelihood that an adult enrolls in formal schooling declines linearly as individuals get older.[12] For each additional year older, adults are about 7 to 8% less likely to be enrolled. This confirms the finding in Figure 2.3, and accords with research finding diminishing returns for education and degrees acquired later-in-life (Monks 1997). Those with competing demands for time, attention, and resources—i.e., those who are married and who have young children in the household—are less likely than those without such demands to enroll. Veterans are more likely to enroll in formal schooling, potentially due to their access to military-provided education benefits and the possibility that they delayed schooling to enlist (Kleykamp 2013).

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[11] A similar table, Table A.2 in the Appendix, displays results from the saturated model (model 8 in Table 2.3) by time interval. Results indicate that the correlates of adults' participation in formal schooling are relatively constant across the 30-year period. Some differences are apparent, however: for instance, those who are employed part-time or those who are unemployed increase their likelihood of enrolling over time relative to those who are employed full-time.

[12] I tested whether the addition of an age squared term improved the fit of the model; it did not.

Table 2.3: Odds ratios from logistic regressions predicting enrollment among adults aged 29–61, 1978–2013

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 |
|---|---|---|---|---|---|---|---|---|---|
| Female | 1.586*** | 1.612*** | 1.404*** | 1.253*** | 1.501*** | 1.726*** | 1.155*** | 1.277*** | 1.195*** |
| | (0.016) | (0.016) | (0.015) | (0.014) | (0.016) | (0.019) | (0.013) | (0.016) | (0.040) |
| Black (ref. is white) | 1.145*** | 1.422*** | 1.100*** | 1.260*** | 1.116*** | 1.313*** | 1.215*** | 1.237*** | 1.204** |
| | (0.027) | (0.034) | (0.026) | (0.031) | (0.027) | (0.032) | (0.030) | (0.031) | (0.083) |
| Hispanic | 0.699*** | 1.226*** | 0.689*** | 0.935* | 0.720*** | 1.226*** | 0.933** | 1.294*** | 1.249** |
| | (0.018) | (0.032) | (0.018) | (0.025) | (0.019) | (0.033) | (0.025) | (0.035) | (0.092) |
| Other racial group | 1.442*** | 1.479*** | 1.418*** | 1.308*** | 1.445*** | 1.515*** | 1.313*** | 1.418*** | 1.215* |
| | (0.040) | (0.041) | (0.039) | (0.036) | (0.039) | (0.042) | (0.036) | (0.039) | (0.104) |
| Female × Black | 1.106*** | 1.041 | 1.183*** | 1.080** | 1.127*** | 1.004 | 1.136*** | 1.096** | 1.120 |
| | (0.031) | (0.030) | (0.033) | (0.031) | (0.032) | (0.029) | (0.032) | (0.032) | (0.093) |
| Female × Hispanic | 0.957 | 0.900** | 0.953 | 0.832*** | 0.921* | 0.864*** | 0.846*** | 0.835*** | 1.002 |
| | (0.031) | (0.029) | (0.031) | (0.027) | (0.030) | (0.028) | (0.028) | (0.028) | (0.094) |
| Female × Other racial group | 0.640*** | 0.655*** | 0.653*** | 0.727*** | 0.637*** | 0.633*** | 0.744*** | 0.695*** | 0.738** |
| | (0.023) | (0.024) | (0.023) | (0.026) | (0.023) | (0.023) | (0.027) | (0.025) | (0.086) |
| Age | 0.929*** | 0.934*** | 0.928*** | 0.928*** | 0.927*** | 0.927*** | 0.927*** | 0.922*** | 0.928*** |
| | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.001) | (0.002) |
| *Educational attainment* | | | | | | | | | |
| Completed high school (ref.= no HS) | | 0.957 | | | | 0.999 | | 1.052* | 1.033 |
| | | (0.023) | | | | (0.025) | | (0.026) | (0.092) |
| Completed some college | | 6.564*** | | | | 7.079*** | | 7.096*** | 7.454*** |
| | | (0.142) | | | | (0.155) | | (0.159) | (0.615) |
| Completed at least 4 years of college | | 5.275*** | | | | 6.278*** | | 5.466*** | 5.789*** |
| | | (0.116) | | | | (0.142) | | (0.130) | (0.500) |
| *Demographic factors* | | | | | | | | | |
| Family income: 2nd quartile (ref.=1st) | | | | | | 0.770*** | | 0.841*** | 0.853*** |
| | | | | | | (0.010) | | (0.012) | (0.034) |
| Family income: 3rd quartile | | | | | | 0.725*** | | 0.792*** | 0.871*** |
| | | | | | | (0.010) | | (0.012) | (0.036) |
| Family income: 4th quartile | | | | | | 0.636*** | | 0.699*** | 0.835*** |
| | | | | | | (0.010) | | (0.011) | (0.039) |
| Family income: missing | | | | | | 0.672*** | | 0.721*** | 0.853* |
| | | | | | | (0.013) | | (0.014) | (0.065) |
| Married (ref.=never married) | | | | | | 0.876*** | | 0.868*** | 0.965 |
| | | | | | | (0.012) | | (0.012) | (0.037) |
| Separated | | | | | | 1.011 | | 1.042 | 0.948 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.023) | | (0.024) | (0.065) |
| Divorced or widowed | | | | | | 1.067*** | | 1.130*** | 1.200*** |
| | | | | | | (0.016) | | (0.018) | (0.053) |
| Oldest child: 0–5 years (ref.=none) | | | | | | 0.689*** | | 0.640*** | 0.647*** |
| | | | | | | (0.009) | | (0.009) | (0.024) |
| Oldest child: 6–12 years | | | | | | 0.955*** | | 0.944*** | 0.836*** |
| | | | | | | (0.012) | | (0.012) | (0.029) |
| Oldest child: 13 to 17 years | | | | | | 1.112*** | | 1.140*** | 1.031 |
| | | | | | | (0.017) | | (0.017) | (0.044) |
| Veteran | | | | | | 1.385*** | | 1.367*** | 1.303*** |
| | | | | | | (0.021) | | (0.021) | (0.055) |
| *Labor market factors* | | | | | | | | | |
| Employed part-time (ref.=full-time) | | | 1.470*** | | | | 1.470*** | 1.502*** | 1.591*** |
| | | | (0.016) | | | | (0.016) | (0.017) | (0.044) |
| Unemployed | | | 1.107*** | | | | 1.404*** | 1.385*** | |
| | | | (0.025) | | | | (0.033) | (0.033) | |
| Not in labor force | | | 1.476*** | | | | 2.612*** | 2.835*** | |
| | | | (0.017) | | | | (0.092) | (0.102) | |
| Private sector (ref.=public/other) | | | | | 0.618*** | | 0.756*** | 0.793*** | 0.668*** |
| | | | | | (0.006) | | (0.008) | (0.009) | (0.020) |
| Missing sector | | | | | 0.893*** | | 0.525*** | 0.615*** | |
| | | | | | (0.012) | | (0.041) | (0.046) | |
| Union | | | | | 0.980 | | 1.023 | 1.026 | 1.037 |
| | | | | | (0.029) | | (0.031) | (0.031) | (0.039) |
| Missing union | | | | | 0.965** | | 0.987 | 0.993 | |
| | | | | | (0.013) | | (0.014) | (0.014) | |
| Log hourly earnings | | | | | | | | | 0.692*** |
| | | | | | | | | | (0.019) |
| Occupation fixed effects (26-category) | No | No | No | Yes | No | No | Yes | Yes | Yes |
| *N* | 2,135,841 | 2,135,841 | 2,135,841 | 2,135,841 | 2,135,841 | 2,135,841 | 2,135,841 | 2,135,841 | 252,402 |

*Notes:* Data come from the CPS October supplements, 1979-2013. Estimates are weighted. Results of logistic regression models presented as odds ratios. Sample restricted to adults aged 29–61 with non-missing values for dependent and independent variables. Sample further restricted in model 9 to employed adults with non-zero, non-imputed earnings (see text for further details). All models also include year, region, and metro/non-metro fixed effects. Constant not shown. Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

Further, those in higher family income quartiles are less likely than those in lower quartiles to enroll, suggesting either a compensatory strategy to improve one's income or a smaller need among more advantaged individuals to obtain more education in order to make a living (Brand and Xie 2010; Mangino 2014). It is also evident that those with the lowest levels of current educational attainment are the least likely to go back to pursue further education. As in Table 2.1, those who have at most completed high school are the least likely to be enrolled, while those who have completed some (but less than four years of) college are the most likely to be enrolled. This suggests that adult enrollment is at once equalizing and disequalizing—widening educational gaps between those with and without traditional-age college experience on the one hand, while on the other hand narrowing the gaps between those with some college experience and those with a four-year degree.

In terms of labor market factors, those who have a full-time job are the least likely to be enrolled, while those who are not in the labor force—and who may have time to enroll or for whom formal schooling may be a matter of pursuing a personal interest—are the most likely. Adults who are either employed part-time (and who may be seeking more leverage for fuller-time employment, or who could be working part-time in part to accomodate attending classes) or unemployed (and therefore may be looking for ways to boost their employability) occupy a middle-ground. In model 8, they are about 50 and 39%, respectively, more likely to be enrolled than their counterparts with full-time jobs but substantially less likely than their counterparts who are out of the labor force. One's earnings are negatively related to one's likelihood of being enrolled. Finally, while those in a union appear no more or less likely to enroll in formal schooling than those who do not belong to a union, those working in the private sector are significantly less likely to enroll than adults working in the public sector.

These factors do not fully account for the gaps in enrollment by race and gender. To get a sense of how the racial and gender gaps are responsive to the inclusion of demographic and labor market factors and how these gaps have changed over time, I calculate the average adjusted marginal effects of being a black women or a white women relative to other racial-

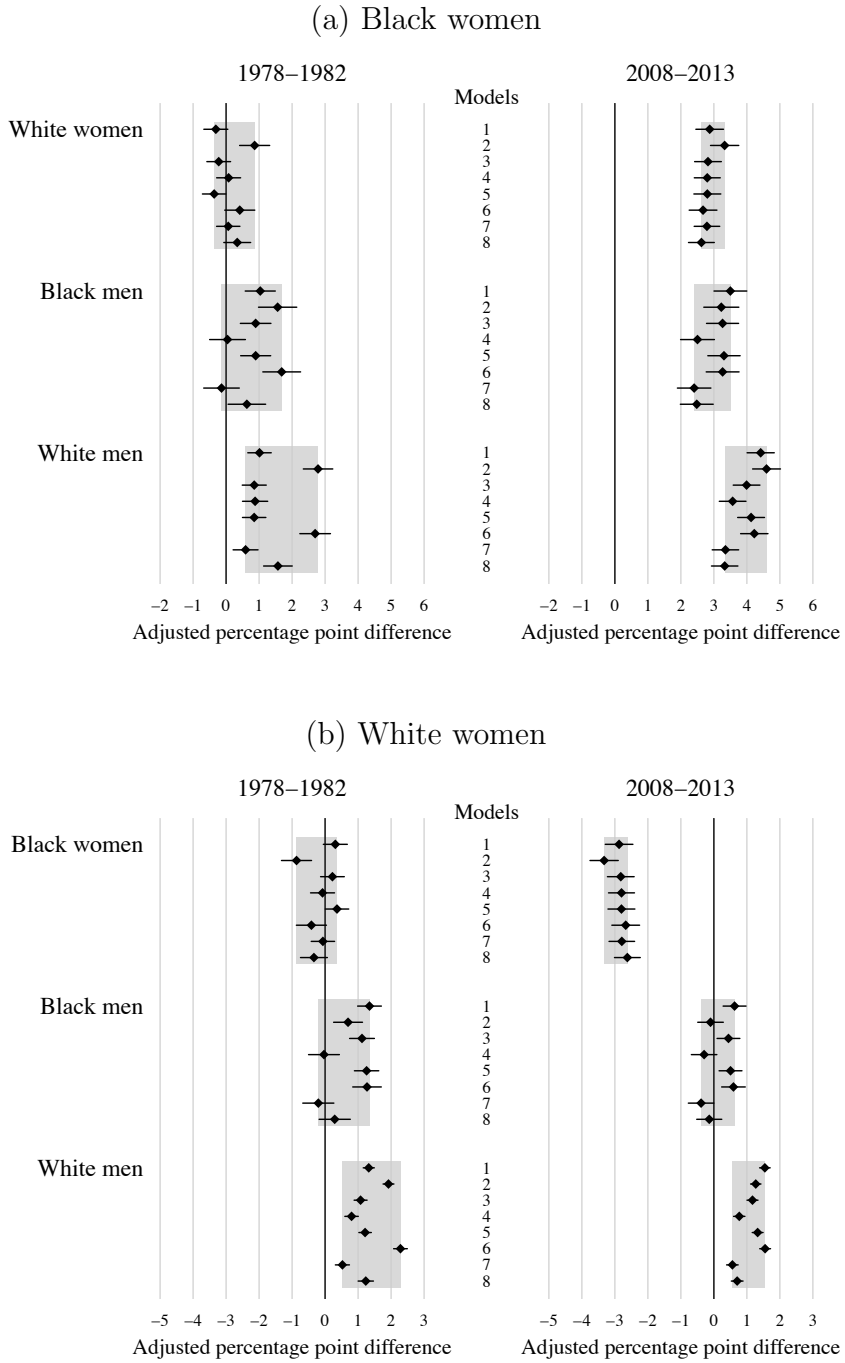
gender groups in 1978–1982 and in 2008–2013. To obtain these marginal effects, I re-estimate the logistic regression models from Table 2.3 (specifically, models 1 though 8) separately for the two time intervals.[13]

As panel (a) in Figure 2.4 shows, black women's advantage in enrollment relative to white women and men and to black men grows from the beginning to the end of the study period. In 1978-1982, black adult women enrolled in formal schooling at statistically equivalent rates as white women across all models but one: in model 2, which controls only for educational attainment (in addition to race, gender, metro status, and state), black women hold a one percentage point advantage over white women. By 2008-2013, black women's advantage over white women grew to about 3 percentage points. Relative to black men, black women held a small advantage in 1978-1982 in some models, but that advantage disappears when controlling for occupation (model 4) or for the full suite of labor market factors (model 7); their enrollment is only marginally greater than that of black men in the fully saturated model (model 8). However, over time, black women increased their advantage until 2008-2013, when their enrollment rate was between 2.5 and 3.5 percentage points higher than that of black men. Across the study period, black women were more likely than white men to enroll, though their advantage does grow from 1978 to 2013. Importantly, compared to the other three groups, black women's enrollment advantage in 2008-2013 remains robust to inclusion of all measured demographic and labor market factors.

The enrollment pattern of white women, however, tells a different story, as evident in panel (b) of Figure 2.4. White women's enrollment is only about 1.5 percentage points higher than that of black men in 1978-1982, but accounting for occupation (as in model 4, as well as in models 7 and 8 when other variables are included) renders this small advantage

[13]Showing adjusted marginal effects has the benefit of addressing problems noted by prior research in expressing group comparisons with interactions in non-linear models given that such models cannot parse group coefficient differences from group differences in residual variation or unobserved heterogeneity (Allison 1999; Kleykamp 2013; Long 2009; Williams 2009). While various solutions have been proposed, such as heterogeneous choice models, these may in fact introduce new problems of their own (Keele and Park 2006). Since marginal effects and predicted probabilities are not affected by residual variation (Long 2009), I present them here. Additionally, results from models in which the sample was restricted to employed adults with non-zero, non-imputed earnings were substantively similar (results available upon request).

Figure 2.4: Average adjusted enrollment advantage of black and white women, 1978-1982 and 2008-2013




*Notes:* Figure shows the marginal effects on enrollment of being a black woman (panel *a*) or a white woman (panel *b*) compared to other racial-gender groups in 1978-1982 and 2008-2013. Marginal effects are calculated based on models 1 through 8 from Table 2.3. Lines show 95% confidence intervals, and shaded regions show range of marginal effects across models.

statistically non-significant. By 2008-2013, their enrollment advantage relative to black men shrinks to under one percentage point (in the base model 1), and becomes non-significant whenever we account for educational attainment or occupation. Compared to white men, white women enjoy a small enrollment advantage in both time intervals.

For context, enrollment rates of Hispanic men and women generally trail those of black and white women (not shown given the focus of this chapter on black/white gaps and space constraints, but available upon request). In 1978–1982, the gap between Hispanics' enrollment rate and that of black and white women fluctuates between 1 and 2 percentage points, depending on the model; many of these gaps are statistically significant with the exception of Hispanic women's gaps in models that control for prior educational attainment (models 2, 6, and 8) and Hispanic men's gaps in the fully saturated model (model 8). The gaps between Hispanic women and white women hold in 2008–2013, while the gap grows slightly between Hispanic men and white women (such that only model 8 is statistically insignificant). But, by the end of the study period, the gap between black women and Hispanic men and women has grown to 2.5–5.0 percentage points (all gaps here are statistically significant).

Finally, I examine the extent to which within-racial-gender group trends in enrollment over time reflect key demographic and labor market factors. Specifically, I am interested in whether changes in educational attainment and one's labor market position as measured by their employment status, occupation, and sector and union membership account for the relatively large rise in black women's enrollment over the past 30 years. Prior educational attainment has been shown here and elsewhere to be a powerful predictor of re-enrollment in later-adulthood (Cruce and Hillman 2012; Elman and O'Rand 2004; 2007; Jacob and Weiss 2011), while one's labor market position reflects long-term shifts in economic circumstances (Kalleberg 2000; 2011). To address this question, Table 2.4 shows how the addition of variables to a base model (i.e., model 1 in Table 2.3, with two– and three-way interactions among race, gender, and time interval) changes the difference in the race-gender-specific enrollment rate between 1978–1982 and 2008–2013.

Recall that in Figure 2.2, adult black women increased their enrollment rate from about

Table 2.4: Accounting for the trends in enrollment by race and gender, 1978–1982 to 2008–2013

| | Black women | | White women | | Black men | | White men | |
|---|---|---|---|---|---|---|---|---|
| | Margin | % Change | Margin | % Change | Margin | % Change | Margin | % Change |
| Base model | 3.47*** | | 0.25** | | 0.67** | | -0.16* | |
| + educational attainment | 0.90** | -2.57 | -1.46*** | -1.71 | -0.52 | -1.19 | -0.57*** | -0.41 |
| + employment status | 3.57*** | 0.10 | 0.44*** | 0.19 | 0.61* | -0.06 | -0.22** | -0.06 |
| + occupation | 2.81*** | -0.66 | -0.02 | -0.27 | -0.01 | -0.68 | -0.41*** | -0.25 |
| + sector, union | 3.57*** | 0.10 | 0.43*** | 0.18 | 0.69** | 0.02 | -0.11 | 0.05 |
| + demographics | 3.06*** | -0.41 | -0.07 | -0.32 | 0.74** | 0.07 | 0.10 | 0.26 |
| + educ., demog. | 0.30 | -3.17 | -1.74*** | -1.99 | -0.43 | 1.10 | -0.32*** | -0.16 |
| + labor market | 1.07*** | -2.40 | -0.93*** | -1.18 | -0.96** | 1.63 | -0.76*** | -0.60 |
| Saturated model | 0.66* | -2.81 | -1.14*** | -1.39 | -0.76* | -1.43 | -0.45*** | -0.29 |

*Notes:* Data come from the CPS October supplements, 1978-2013. The base model contains only age, metro, and state controls as well as two– and three-way interactions between race, gender, and time interval. "Demographics" refer to family income, marital status, children, and veteran status. "Labor market" factors include employment status, occupation, sector of employment, and union membership. The saturated model contains the same covariates as in model 8 in Table 2.3, plus the two– and three-way interactions between race, gender, and time interval. Marginal effects, shown in the column labeled "Margin," are calculated as the change in the percent enrolled from the first time interval (1978–1982) to the last (2008–2013) for each racial-gender group, setting all other variables at their observed values. Values in the "% Change" columns show the percentage point difference in the predicted marginal effect of the given model and that of the base model. Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

4.5% in 1978 to a peak of over 8.0% 30 years later. The top row of Table 2.4 confirms this trend: in the base model, black women increased their enrollment by about 3.5 percentage points from the first to the last time interval. However, when we add prior educational attainment to the model, the predicted percentage of black women enrolled in 2008–2013 is less than one percentage point higher than in 1978–1982. In other words, accounting for secular changes in educational attainment among black women attenuates their adult enrollment trend by roughly three-quarters. The same cannot be said for the inclusion of either employment status, occupation, or other demographic factors—that is, until a model which includes all measured labor market factors. Individually, these have much smaller influence on the marginal difference in enrollment between the first and last time intervals. Educational attainment as well as the joint inclusion of labor market factors also appears to have outsized influence on the changes in enrollment rates among white women and black and white men, though unadjusted trends (as in Figure 2.2) and regression-adjusted trends in the base model are much flatter to begin with for these groups.

## *2.4 Conclusion*

Patterns of educational attainment have changed in large and fundamental ways over the past several decades. Women have caught up to and surpassed men in terms of college enrollment and completion, and black women in particular have widened their advantage over black men (Buchmann and DiPrete 2006; DiPrete and Buchmann 2006; McDaniel et al. 2011). And the timing of postsecondary enrollment and completion has changed, such that individuals are delaying their initial transition into college and taking more circuitous pathways through higher education once there (Andrews et al. 2014; Bozick and DeLuca 2005; Mouw 2005; Roksa and Velez 2012). Using nationally representative data from 1978 to 2013, I offer additional evidence on long-term changes in the timing and patterning of educational attainment. In particular, this chapter moves beyond existing research on trends and patterns in the educational participation among older adults, which has generally examined their participation in formal schooling during narrowly defined time periods or has not focused on

the intersection between race and gender, and provides a more comprehensive view of how enrollment among older adults across racial-gender groups has evolved over the past three and a half decades.

Though black women continue to lag behind white women and men in terms of education attained earlier in life (McDaniel et al. 2011), this analysis shows that black women are catching up as they enroll later in life. Not only do older black women hold an advantage over white women and black and white men, this advantage is robust when controlling for demographic and labor market factors. The particularly large enrollment rate among adult black women with some college but no degree (over 12% in 2008-2013, compared to 6.7, 4.4, and 6.3 of white women, white men, and black men, respectively) suggests that black women may be building on the gains they have made during the more traditional college years. Indeed, accounting for black women's educational attainment substantially attenuates the gains they have made over time in terms of later-in-life enrollment.

In this way, education pursued later-in-life might serve an equalizing function. More education, even earned later in life, is better than less in terms of securing labor market rewards like wages and stable employment (Elman and O'Rand 2004). Life chances and labor market outcomes have become increasingly tied to educational attainment as jobs have become more tenuous and have increasingly required postsecondary credentials (Barr and Turner 2015; Elman and O'Rand 2002; 2007; Elman 2011; Shanahan 2000). The investment in additional education during adulthood, then, especially among black women compared to white women and men, can be understood as a strategy to achieve greater socioeconomic parity with their more privileged counterparts (Elliott and Smith 2004; Mangino 2014).

And this appears to be a phenomenon among the comparatively less advantaged—at least as measured by family income and hourly wages. Recall from Table 2.3, adults in successively higher income quartiles were less likely to enroll than individuals in the lower quartiles, and there was a negative relationship between hourly earnings and the likelihood of enrollment. While perhaps a little non-intuitive, this fits with prior research. Traditionally privileged individuals (men, whites, the top 1%) complete four-year college degrees at lower rates than

their less privileged counterparts (women, nonwhites, the bottom 99%) (Mangino 2014). Because privileged people have more informal opportunities to deploy a given level of human capital, they opt out of education at earlier points than their less privileged peers. Even in the absence of a college degree, "individuals from more advantaged social backgrounds can still rely on their superior resources" (Brand and Xie 2010:293). But the less privileged have fewer informal opportunities to convert human capital into rewards on the labor market, and so they may pursue relatively more education later as a strategy toward comparable status and remuneration.

Furthermore, the fact that enrolling in formal schooling entails financial and opportunity costs—which would seem to put it out of reach of the relatively disadvantaged—is perhaps mitigated by the expansion of the educational market in the United States over the past few decades. Open-access institutions, especially the public two-year and for-profit sectors, have grown in number and enrollment recently, making it easier for traditionally underserved groups to take advantage of higher education (Flashman 2013; Jepsen and Montgomery 2009). In fact, this expansion has been cited as one reason for the reversal of the male-female gap in earlier college completion (Flashman 2013). Similar patterns in access and affordability may help explain the consistent female-favorable adult enrollment rates among whites and the growing female-favorable rates among blacks (Figure 2.2) despite the relative disadvantages these groups face in the labor market compared to men.

However, at the same time that black women's advantage in enrollment during adulthood suggests a narrowing of educational gaps, this narrowing could reflect growing economic gaps. While black women's growing enrollment advantage can be attributed in large part to their gains in earlier-in-life educational attainment, it has also occurred against the backdrop of an eroding public sector and the decline of unions—two labor market positions in which black women are disproportionately concentrated. Though these labor market factors independently do not attenuate black women's enrollment growth across the study period, the change in enrollment from 1978 to 2013 is substantially reduced when accounting for all indicators of labor market position (see Table 2.4). Viewed in this way, black women

may be responding to their declining labor market position in addition to closing persistent educational attainment gaps by seeking out additional schooling later in life.

Nearly 20 years ago, Jacobs and Stoner-Eby (1998) called for more research on how women's changing labor force participation and occupational patterns are related to adults' propensity to return to school, and much extant research has shown how prior advantages in educational attainment lead adults to enroll at higher rates (Cruce and Hillman 2012; Elman and O'Rand 2004; 2007; Jacob and Weiss 2011). The analysis in this chapter begins to answer this call, and more research on whether and how older adults—and especially black women—respond to labor market changes in general and growing economic gaps in particular would provide the field with a clearer and more contemporary understanding of how economic circumstances and prior educational choices and experiences push and pull adults back into school.

# Chapter 3

## On a Path to Success: Group-Based Trajectory Modeling of College Student Persistence

The expansion of the higher education market in the last few decades has meant not only a diversification of the types of postsecondary institutions but also increasing heterogeneity in the timing and shape of students' pathways through college (Hearn 1992; Weiss and Roksa 2016). In addition to re-enrolling later into the life course (Barr and Turner 2015; Elman and Weiss 2014; Jacobs and Stoner-Eby 1998; see also Chapter 2), today's college students are delaying their initial transition into and taking circuitous routes through postsecondary educational institutions (Goldrick-Rab 2006; McCormick 2003; Roksa and Velez 2012). One in three college entrants delay their transition into higher education by at least a year (Horn et al. 2005). Even the President's daughter has reportedly decided to take a "gap year" prior to enrolling at Harvard (Andrews-Dyer 2016). Additionally, roughly half of undergraduates attend more than one postsecondary institution (McCormick 2003), making upward, lateral, and even reverse transfers between four-year and two-year colleges (Goldrick-Rab and Pfeffer 2009; Goldrick-Rab 2006).

While the varied ways in which individuals enroll in college reflect the increasing heterogeneity of the students themselves (Goldrick-Rab 2006), the expansion of postsecondary access does not guarantee that longstanding inequalities related to enrollment in and completion of a college degree program will be attenuated or eliminated (Hearn 1992; Shavit et al. 2007; Stephan et al. 2009). Indeed, the recent increase in the proportion of individuals who attend college has not been accompanied by a commensurate increase in the proportion of students who graduate from college (Bound et al. 2012; Turner 2004). Additionally, large enrollment and completion gaps persist between more and less advantaged groups (Kao and

Thompson 2003). Over the last three decades of the 20$^{th}$ century, students whose parents completed college or higher had the same advantage of entering college relative to students whose parents only completed high school (Roksa et al. 2007), and gaps in degree attainment by family income have increased over time (Belley and Lochner 2007; Bailey and Dynarski 2011). While stratification based on *whether* and *where* one attends college continues to matter for postsecondary outcomes such as degree attainment as well as for longer-term outcomes such as employment and wages (Gerber and Cheung 2008; Hout 2012), variations in *how* one proceeds through college represent "an additional layer of stratification in higher education," particularly when they have negative consequences and when they are disproportionately distrubuted among student subgroups (Goldrick-Rab 2006:73, Hearn 1992). The timing of the transition from high school to college and whether students engage in non-traditional pathways are important predictors of persistence, degree completion, and other life course transitions (Bozick and DeLuca 2005; Goldrick-Rab 2006; Roksa and Velez 2012). Prior research has also demonstrated that such pathways characterized by delay, discontinuous enrollment, and attendance at multiple institutions are concentrated toward the lower end of the socioeconomic spectrum (Bozick and DeLuca 2005; Goldrick-Rab 2006; Hearn 1992; Rowan-Kenyon 2007).

Given the variation in pathways and their nonrandom distrubtion across student subgroups, better understanding how attendance patterns manifest among students is critical for addressing the persistent racial and socioeconomic stratification in attainment. To that end, this chapter brings detailed postsecondary transcript data from the National Longitudinal Survey of Youth 1997 to bear on the following three goals. First, I describe variation in the shape of students' attendance pathways through their postsecondary education. Second, I examine the extent to which students are sorted into various pathways by sociodemographic traits. Third, I investigate the relationship between pathways and the completion of a college degree.

Whereas much prior research has developed typologies of students' attendance patterns that rely on discrete indicators of delayed transition to college, part-time or discontinuous

enrollment, or attendance at multiple institutions (e.g., Adelman 2003; Bailey 2003; Goldrick-Rab 2006; Roksa and Velez 2012), the characteristics of persistence patterns themselves are much less clear (Marti 2008). In this analysis, I follow recent methodological advances adopted by those who have studied such topics as criminal behavior (Laub et al. 1998) and work (Damaske and Frech 2016) over the life course to estimate developmental trajectories of students' completed course credits over time (Jones and Nagin 2013; Nagin 2005; Nagin and Odgers 2010). Instead of looking at enrollment pathways in terms of pre-determined categories, the approach taken here allows me to identify—rather than assume—distinctive classes of students who follow similar trajectories of persistence through postsecondary education. Furthermore, by relating pathway membership to sociodemographic background and to attainment outcomes, this analysis evaluates whether and how sorting among different pathways accounts for longstanding racial and socioeconomic gaps in college completion, conditional on college enrollment.

### *3.1 Background*

One key way in which the kind of differentiation that often accompanies expansion of educational systems (Weiss and Roksa 2016:44) has manifested is through the increasingly diverse ways students progress through their postsecondary education. While an increasing number of students attend college, many follow discontinuous or nonlinear pathways. Prior research has looked at the incidence and consequences of nontraditional pathways through higher education along several important dimensions. Roughly one-third of students delay the transition from high school to college by at least one year, half attend more than one postsecondary institution, another half attend part-time, and about one-third take time off (National Center for Education Statistics 2005; McCormick 2003; King 2003; O'Toole et al. 2003).

These pathways are nonrandomly distributed across the college student population. Students from less advantaged backgrounds are more likely to delay entry to college, to attend multiple institutions, or to take time off from college following their initial enrollment than

students from more advantaged backgrounds (Bozick and DeLuca 2005; Goldrick-Rab 2006; Goldrick-Rab and Han 2011; Rowan-Kenyon 2007). For instance, individuals who take a "gap year" between high school completion and postsecondary matriculation are nearly six times more likely to come from families in the bottom quintile of the socioeconomic distribution than from the top quintile (Goldrick-Rab and Han 2011). Students from the lower-end of the socioeconomic spectrum are also more likely *to plan* to delay entry into college (Wells and Lynch 2012). Further, students from lower socioeconomic backgrounds take longer gaps—roughly 13 months, on average—than high-SES students, who delay for a much shorter period of 4.5 months (Bozick and DeLuca 2005). Students from lower socioeconomic backgrounds are also more likely than their more advantaged counterparts to attend multiple institutions or to take time off from college following their initial enrollment (Goldrick-Rab 2006). Students' likelihood of following nontraditional postsecondary pathways, such as delayed entry, is also shaped by their parents' expectations, their own academic preparation, and encouragement from their peers (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011; Rowan-Kenyon 2007)—though these may largely be associated with socioeconomic status. Goldrick-Rab and Han (2011) find, for instance, that academic course-taking and early family formation are key predictors of delayed transition, and these reflect a student's financial or cultural capital, and thus their socioeconomic status (Wells and Lynch 2012).

Not only are these nontraditional pathways disproportionately concentrated among less advantaged students, they are not neutral. The timing of the transition from high school to college and whether students engage in discontinuous or other nontraditional pathways are important predictors of degree completion (Bozick and DeLuca 2005; Goldrick-Rab 2006). Delaying college entry not only increases the time-to-degree, it also affects whether a student completes their degree at all: each additional month that a student delays their entry into college following their graduation from high school reduces the odds of bachelor's degree completion by 6.5 percent (Bozick and DeLuca 2005). Delaying entry into college has negative consequences for degree completion, even after controlling for an array of pre-college factors as well as for other life course transitions such as work, marriage/cohabitation, and parenthood

(Adelman 1999; Bozick and DeLuca 2005; Roksa and Velez 2012). Similarly, when students change institutions or take time off during their college career, they are less likely to complete their degrees (Goldrick-Rab 2006). Continuity of enrollment is particularly important to the eventual educational attainment of students from lower socioeconomic backgrounds. One study found that students in the second lowest SES quartile increased their likelihood of completion by 38 percent, while students in the lowest quartile increased their completion likelihood by 27 percent, by remaining continuously enrolled (Cabrera et al. 2005).

### *3.1.1 Assessing the Shape of College Persistence*

While this sizeable research on students' pathways through and persistence in postsecondary education is useful, it is also limited. In particular, existing work has yet to develop consistent measures of the process of student progression through their education (Robinson 2004), and has largely relied on a limited number of pre-defined categories. For instance, Roksa and Velez (2012) divide students into two groups based on whether they entered college directly out of high school or delayed their entry by at least six months. Goldrick-Rab (2006) assigns students to one of four categories: continuously attended a single institution, discontinuously attended a single institution, continuously attended more than one institution, and discontinuously attended more than one institution. In this way, while researchers have focused on key dimensions of students' enrollment in college, less attention has been paid to the timing, duration, and sequencing of students' enrollment patterns.

I propose another, more holistic way of classifying and understanding students' educational pathways: group-based trajectory models. These models have been used in a wide range of social science investigations to identify latent groups that are defined by their change over time in a given outcome measure. These trajectory models, which have been described as "person– or trend-centered," stand in contrast to "variable-centered" analytical techniques like regression and ANOVA (Muthén and Muthén 2000). Whereas the latter assume that a sample mean represents the best estimate of central tendency and that variables explain the variance around that mean, person– or trend-centered techniques like group-based tra-

jectory models allow for the possibility that there are latent or unobservable groups within the population under investigation and that these groups have measures of central tendency that are independent of one another. This makes trajectory models particularly relevant to the study of *evolving* behaviors—such as employment (Damaske and Frech 2016), criminal behavior (Laub et al. 1998), substance abuse (Chassin et al. 2004), and antisocial behaviors (Nagin and Tremblay 2001), behaviors that may not be adequately represented by either a single central tendency or by a set of pre-determined categories.

It is perhaps surprising that investigations of educational pathways have been slow to adopt this analytical strategy. Indeed, the robust literature discussed above highlights the substantial variability in students' postsecondary educational pathways. This suggests that such pathways represent multiple distinct patterns as opposed to variability around a central tendency or neat organization into pre-defined categories. Nagin and Tremblay (2005:99) identify three limitations of research assigning individuals to a pre-determined taxonomy. First, groups are assumed *a priori*, meaning that researchers are unable to test for the presence or absence of a group. Second, researchers run the risk of over– and/or under-fitting the data by creating pathway groups that reflect only random variation or that fail to capture rare but real patterns. Third, the *ex ante* assignment rules do not allow for the calibration of the precision with which individuals were classified into the taxonomy's categories. In other words, how likely are individuals to be classified in one or another group?

To illustrate these issues, consider the four-pathway taxonomy employed by Goldrick-Rab (2006) and the two-category schema used by Roksa and Velez (2012). Goldrick-Rab (2006) assigns students to groups based, essentially, on two binary variables: (i) whether they attended one or multiple institutions and (ii) whether they attended college continuously or took breaks. But these categories cannot tell us how long the breaks are, whether students who enroll continuously do so full-time or part-time, or the probability that a student enrolled continuously or discontinuously. Further, how are students who enrolled in a single institution only briefly before leaving postsecondary education allocated? Are they treated the same as those who enrolled "at a single institution, continuously," and is this

a reasonable assumption? Similarly, when Roksa and Velez (2012) categorize students into those who enroll in college directly from high school and those who delay their college matriculation, they ignore potential differences in how long students delay (treating those who delay by 6 months equivalently as those who delay by, e.g., 12 months) and in the intensity and persistence of attendance upon enrollment.

By contrast, identifying latent trajectories based on, say, students' credit accumulation captures simultaneously whether a student is enrolled, whether and for how long they persist in college, and whether they are enrolled part-time or full-time. In other words, these models provide an opportunity to visualize and understand the timing, duration, and sequencing of students' enrollment patterns. Being able to more holistically account for full– or part-time enrollment in this way is particularly important for at least two reasons. First, enrolling part-time, or enrolling discontinuously, as opposed to enrolling full-time means it takes longer for students to complete milestones and finish a degree (Jacobs and King 2002; Horn 1996). Second, part-time students are disadvantaged in terms of the financial support they are eligible to receive from their postsecondary institutions, making the likelihood of completion even slimmer (Taniguchi 2005). In short, enrollment status is *the* key correlate of degree completion (Taniguchi 2005), which in turn is a primary predictor of labor market and other later-in-life outcomes (Hout 2012; Elman and O'Rand 2004).

I am aware of only one study to date of students' postsecondary attendance to take this approach. Marti (2008) models latent trajectories of credit hour accumulation among community college students, and finds five qualitatively distinct patterns of persistence: (i) full-time, long-term; (ii) two years and out; (iii) long-term decliners; (iv) part-time, long-term; and (v) one term and out. While his study provides a helpful model of how to use trajectory techniques to investigate the heterogeneity in students' educational pathways, his analyses are limited in a number of ways. In particular, he focuses only on community college enrollment at a single institution. This ignores the ways in which students switch between institutions and between institutional types. Given limitations of the data, he is also able to look only over a three-year period, which necessarily misses the full picture of students'

enrollment as well as their likelihood of eventually completing their degrees. Only about 30 percent of students who enroll full-time in community college complete an associate's degree in three years (National Center for Education Statistics 2014:Table 326.20). In this chapter, I build on Marti's work by examining the pathways of students across the complete market of postsecondary educational institutions and by relating students' enrollment patterns to their degree attainment outcomes.

## *3.2 Data and Methods*

### *3.2.1 Data*

In order to identify longitudinal group-based pathways of students' persistence and progress through postsecondary education, I draw on data from the National Longitudinal Survey of Youth 1997 (NLSY97). The NLSY97 is a nationally representative longitudinal survey that tracks the educaitonal, family, and employment experiences of a cohort of individuals born between 1980 and 1984 (they were between 12 and 16 years old as of December 31, 1996). The initial survey was sent to about 9,000 individuals in roughly 6,800 households in 1997, annually through 2011, and most recently in 2013.

The NLSY97 is well-suited to examine heterogeneity in how students navigate through postsecondary education. The data follow individuals over a relatively long period of time. By 2013, respondents were between 29 and 33 years old. While this will miss those who enroll in postsecondary institutions much later-in-life, the long time period over which we can observe more traditionally-aged students means that the data capture those who have relatively extended educational careers. Of particular utility to this study is the newly released Post-Secondary Transcript Study (PSTS). Between 2012 and 2013, researchers from the University of Texas-Austin and the University of Wisconsin-Madison collected transcripts from the colleges attended by NLSY respondents. These data include detailed chronological information about students' enrollment patterns across postsecondary institutions, the number of credits in which they were enrolled, the number of credits they earned, and course-level

information such as field of study and whether the course was remedial.[1] As Goldrick-Rab (2006) notes, data drawn from transcripts are more reliable than students' self-reports of their course-taking and enrollment behavior.

The PSTS research staff collected college transcript data for 3,818 respondents who had reported at least one postsecondary enrollment as of the 15$^{th}$ round of the survey (conducted in 2011) and who signed a waiver allowing the research staff to request transcript(s) from their postsecondary institution(s). I further limit the sample to the 2,576 respondents from whose colleges the research staff received all transcripts requested, who had nonmissing high school or equivalent completion dates, who had complete information about when each of their college terms started, and who had at least one year with non-missing credits across the first ten years since leaving high school.[2]

The sample notably includes all college students regardless of whether they began at a two-year or four-year institution. While this pools together students who may have very different plans related to their postsecondary training (for instance, students attend two-year colleges for a wide variety of reasons that reflect these schools' diverse missions that range from equipping students with skills and credits that they can use to eventually transfer to four-year institutions, to providing courses leading to a certification or for personal development; see Bailey and Averianova 1998), the facilitation of an upward transfer to a four-year

[1]For more on the PSTS of the NLSY97, see Appendix 12 of the codebook, available here: `https://www.nlsinfo.org/content/cohorts/nlsy97/other-documentation/codebook-supplement/appendix-12-post-secondary-transcript`.

[2]Respondents for whom the PSTS research staff did not receive a transcript they requested from a college were excluded because it is not possible to determine where in a student's academic career this missingness occurs (and thus which 12-month periods would need to be adjusted or set to missing as a result of missing transcripts). Respondents with missing high school or GED completion dates had to be excluded because this date is used to set the starting point for an individual being "at risk" of college attendance, during which time credits are aggregated to 12-month periods. Similarly, respondents with missing information about when college terms began are excluded because it is not possible to allocate credits earned during these terms to the aggregated 12-month periods. In general, few differences are apparent when comparing the full 3818 respondents in the PSTS to the 2576 respondents in my sample—differences with respect to proportion white, family income, academic achievement (e.g., ASVAB scores and high school GPA), and bachelor's degree attainment by age 29 are not statistically significant (though excluded respondents are slightly more likely to be black and slightly less likely to be Hispanic).

institution is an increasingly important part of two-year colleges' mission (especially for students from less advantaged backgrounds) and one that defines them as colleges (Grubb 1991; Anderson et al. 2006). In this way, and given this study's focus on socioeconomic and racial differences in enrollment patterns, pooling all college students is useful.

### *3.2.2 Measures*

*Time-Varying Measure of Postsecondary Persistence*

I calculate the number of undergraduate credits earned per year, as a measure of *successful* persistence and movement through one's postsecondary education. I aggregate the PSTS term-level data to 12-month periods following respondents' high school or equivalent completion. The first period begins in the month after they leave high school, and ends 12 months later. An individual exits the study period when one of two events occur: (i) the postsecondary transcript data collection ends, or (ii) the student completes a bachelor's and their transcripts contain no additional undergraduate credits. In short, there is some censoring of the data. Years after the completion of high school and prior to the censoring point in which no credit information is reported are assigned a value of 0 (i.e., they were "at risk" of being enrolled and having completed credits, but they did not do so). Individuals are also assigned missing credits for years in which any term has a missing number of credits.

Individuals in the sample are enrolled between 1 and 15 years following the completion of high school. In this study, I focus on the first ten years following respondents' completion of high school. Sample sizes are quite low after this point, and a ten-year period should capture those who progress through or return to college through their mid– and late-twenties. Credits earned in quarter or trimester term types (as opposed to semesters) are multiplied by two-thirds, following the advice of the PSTS research staff, and I top-code annual credits at the $99^{\text{th}}$ percentile. Table 3.1 shows the number of student-year observations at each year, as well as the mean, standard deviation, and range of students' earned credits by year.

I aggregate terms to year-long periods for several reasons. First, term lengths vary by

Table 3.1: Students' credit accumulation: Means, standard deviations, ranges, and sample sizes by year since high school

| Year since HS | Mean | SD | Min. | Max. | *N* |
|---|---|---|---|---|---|
| 1 | 14.63 | 13.91 | 0 | 48.00 | 2,487 |
| 2 | 14.15 | 14.01 | 0 | 49.33 | 2,490 |
| 3 | 12.67 | 13.96 | 0 | 48.00 | 2,498 |
| 4 | 11.54 | 13.94 | 0 | 48.00 | 2,458 |
| 5 | 7.10 | 11.23 | 0 | 40.67 | 2,134 |
| 6 | 4.44 | 9.00 | 0 | 38.00 | 1,888 |
| 7 | 3.61 | 8.27 | 0 | 36.00 | 1,772 |
| 8 | 3.12 | 7.65 | 0 | 36.00 | 1,683 |
| 9 | 2.71 | 7.15 | 0 | 34.00 | 1,632 |
| 10 | 2.43 | 6.75 | 0 | 34.00 | 1,594 |

*Notes:* Data come from the NLSY97 Post-Secondary Transcript Study. Credits earned are aggregated into 12-month periods following respondents' exit from high school. Credits are top-coded at the $99^{\text{th}}$ percentile.

college. Students enroll in schools that divide the academic year into semesters, quarters, or trimesters, and each of these may have different start and end dates. By adding the credits a student completes in a 12-month period, I standardize the length of time under investigation. Second, aggregating credits to 12-month periods provides for a common starting point at which to begin measuring college enrollment—namely, leaving high school. Students who enroll in college courses directly after completing high school are likely to accumulate more credits in the first year than those who delay by several months or more. Third, this approach allows for the inclusion of credits completed during summer terms without biasing the results. In taking a term-level approach, Marti (2008) excludes summer terms because not all students enroll during summer but this does not necessarily mean that they enrolled discontinuously. Yet, credits earned during the summer months may help a student complete a degree more quickly or at all.

*Explanatory Variables*

I examine a number of sociodemographic, achievement, and institutional factors that may co-vary with students' credit accumulation trajectories. Table B.1 in the appendix presents summary statistics for these explanatory variables.

Student background characteristics include those highlighted by Hearn (1992:661) as important to modeling postsecondary attendance patterns: socioeconomic status, race/ethnicity, gender, prior academic achievement, and students' level of educational expectations. I capture several dimensions of socioeconomic status, including financial capital (family income) and cultural capital (parental education). Respondents' family income is measured as the average across the first few years of the survey (1997–2003), and respondents are then divided into quintiles. To construct a measure of parents' education, I code respondents based on whether at least one of their parents has attained four or more years of college (1=yes, 0=no). Race is measured as a series of four binary indicators (white, black, Hispanic, and other); I combine all other racial groups into a single category given relatively small sample sizes (taken together, this category accounts for only 6.3% of the sample). Gender is measured dichotomously (1=female, 0=male).

I include five measures of students' academic achievement and cognitive ability. Students' cognitive ability is operationalized by respondents' scores on the Armed Services Vocational Aptitude Battery (ASVAB), which was administered to respondents during the first round of the NLSY in 1997 and tested them on mathematical reasoning, word knowledge, and reading comprehension. High school academic performance is measured as the student's overall high school grade point average. Two variables measure how a student concluded high school: whether they exited high school with a diploma (versus a different manner, like the GED) and whether they completed high school at a "normative" age (taken here to be between 17 and 19 years old). I also include the percent chance a respondent gave themselves in 1997 that they would complete a four-year college degree by the age of 30, measured continuously from 0 to 100, as an indicator of students' educational expectations.

Additionally, to examine the extent to which family formation influences students' persistence and progression through college, I look at whether respondents (i) had a child and (ii) were married by the time they first enrolled in college. I compare the dates of first childbirth and the dates of first marriage to the date of students' first term of college enrollment. Parenthood and marriage represent roles that may be incompatible with persistence in higher

education, as they typically involve "intense emotional, social, and physical relationship[s] that may distract young adults from their responsibilities as students" as well as being accompanied by "a dramatic shift in time use and increased demand for financial resources" (Bozick and DeLuca 2005:534).

Finally, I examine the relationship between students' credit accumulation trajectories and other features of their experience during their first year of college enrollment. These features include the level (four-year; two-year; less than two-year or other) and type (public; private, nonprofit; for-profit; unknown) of the institution in which students first enrolled; the percentage of courses during their first year that were remedial, that they failed, and that were in their stated major field of study; and their grade point average in the first year. These measures help assess the extent of fit between a student's ability and effort and institutional academic characteristics (Ewert 2010; Bailey and Alfonso 2005). Furthermore, employment while in college has become increasingly prevalent, is unequally distributed among students from lower socioeconomic backgrounds, and is negatively related to degree completion (Bound et al. 2012; Weiss and Roksa 2016). As such, I measure the average number of hours they worked per week across the 12 months following their initial enrollment in college. In addition, I measure multi-institutional attendance by counting the number of postsecondary institutions that students in the sample attend across the 10-year observation period. This number ranges from 1 to 7, with a sample mean of 1.5 schools.

*Outcomes*

I consider whether and how students' college persistence trajectories may be related to their eventual degree completion by measuring whether respondents had completed either an associate's or a bachelor's degree, or at minimum a bachelor's degree, by ages 25 and 29. I measure degree completion by comparing the date respondents report earning an associate's or bachelor's degree with their date of birth. Looking at these four measures offers the opportunity to examine two levels of attainment at what could be considered more and less normative ages (Bound et al. 2012). Further, most NLSY97 participants had turned 29 by

the latest round of data collection in 2013. In this study's sample, 43% had earned a college degree by the age of 25, and 53% had done so by the time they turned 29. In terms of bachelor's degree attainment more specifically, 34% had completed their four-year degree by 25, while 42% had done so by 29.

*Missing Data*

A nubmer of sociodemographic and background variables contained missing information: family income (missing for 1.6% of respondents), whether a respondent's parent had at least four years of college (3.3%), ASVAB score (14.7%), high school grade point average (24.4%), whether a student expected to earn a college degree by age 30 (44.0%), college grade point average in the first year enrolled (6.3%), and the average number of hours worked in the first year of college (0.4%). To handle these missing data, I employ multiple imputation using the `ice` command in Stata 14, which is based on multivariate imputation by chained equations (Royston 2004). I created ten sets of imputed data and followed Rubin's rules for combining regression results across the ten datasets (Rubin 1987). I do not impute missing values for the dependent variable of the trajectory analysis, the annual number of college credits earned, or for variables measuring degree attainment by ages 25 and 29 (von Hippel 2007). Those missing transcripts or all credit information are removed from the full analytical sample (as noted above), while those missing degree attainment information are removed from the analysis focused on this outcome. Of the 2,576 respondents in the sample, 1.1% ($N$=27) are missing dates for completion of either their associate's or their bachelor's degrees.

### *3.2.3 Analytical Strategy*

The analysis in this study proceeds in three stages. First, I employ group-based developmental trajectory models, a type of discrete or finite mixture modeling (Jones and Nagin 2013; Nagin 2005; Nagin and Odgers 2010), to identify latent pathways of students' credit accumulation during the first ten years following the completion of high school or its equivalent. Developmental trajectories describe the course of an outcome over time, and in this

study's case, these models identify clusters of individuals following similar patterns of credit completion over time. The distribution of outcome trajectories is denoted by $P(Y_i|Year_i)$, where the random vector $Y_i$ represents student $i$'s longitudinal sequence of college credits earned in each year since high school, $Year_i$ (Jones and Nagin 2013). The likelihood for each student $i$, given $J$ groups, can be expressed by:

$$P(Y_i|Year_i) = \sum_{j=1}^{J} \pi^j \cdot P(Y_i|Year_i, j; \beta^j), \tag{3.1}$$

where $\pi^j$ is the probability of membership in group $j$, and the conditional distrubution of $Y_i$ given membership in $j$ is indexed by the unknown parameter $\beta^j$. These parameters determine each group-specific trajectory's shape, and minimally contain an intercept and usually one or more slope parameters to represent time. The number of these parameters depends on the polynomial complexity of each group's latent trajectory. In the present study, various configurations of $\beta^j$ terms were tested, and the best fitting trajectories contained an intercept as well as a linear term and a quadratic term for years since high school.[3]

For each group $j$, the model assumes conditional independence for the sequential realizations of $Y_i$, denoted by $y_{it}$, over the $T$ years of observation (in this case, $T = 10$). In this way, the model above can be rewritten as:

$$P(Y_i|Year_i) = \prod_{t=i}^{T} p(y_{it}|year_{it}, j; \beta^j), \tag{3.2}$$

where $p(.)$ is the distribution of $y_{it}$, conditional on the year since high school of student $i$ in year $t$ and on membership in group $j$. Students are assigned probabilities of membership into each trajectory, and I classify students as following the trajectory for which they have the highest probability.

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[3]I also examined models that included only a linear term for time and models that contained higher order polynomials (e.g., cubic terms) for time, both for all trajectories in the model and for particular trajectories. None proved a better fit than the models reported in this chapter, with a linear and quadratic term for time for all trajectories.

This approach is not without its limitations or criticisms. In particular, they are rarely appropriate for identifying concrete groups that can be treated as truly distinct and substantively useful entities (Erosheva et al. 2014). Multiple, disinct trajectory classes can be identified where there is only one or even none at all (Bauer and Curran 2003a;b; Skardhamar 2010). Additionally, the models can be sensitive to differences in study design (e.g., the number of groups can be influenced by variability in the data such as measurement frequency, measurement error, or time span over which measurements are taken), and individuals can "switch" groups given relatively small changes in their trajectories (Bauer and Curran 2003a; Eggleston et al. 2004; Piquero 2008). At the same time, the trajectories identified are approximations of—and can provide valuable descriptive information about—the unknown and complicated distribution of heterogeneity in the population of interest (Marti 2008; Nagin and Land 1993; Nagin 2005; Erosheva et al. 2014). In short, they provide "approximations of a more complex reality" (Nagin and Odgers 2010:118).

After identifying college persistence trajectories, I compare the sociodemographic composition across the trajectory groups as well as first-year college experiences of students in each group. Finally, I examine the relationship between students' assigned trajectory groups and their likelihood of completing a college degree. I do this first descriptively, by cross-classifying trajectory group assignment with the four measures of degree attainment: college degree by age 25, bachelor's degree by age 25, college degree by age 29, and bachelor's degree by age 29. I then estimate logistic regression models to predict the likelihood of obtaining a bachelor's degree by age 29 as a function of students' assigned trajectory group, their sociodemographic background, and features of their experiences during their initial year of college enrollment.

## *3.3 Findings*

### *3.3.1 Identifying Group-Based Trajectories of Students' Credit Accumulation*

This study's first finding relates to the sheer number of pathways students take as they accumulate credits across the first ten years since completing high school. Table 3.2 displays the average posterior probabilities (APP) of group assignment and Bayesian Information Criterion (BIC) statistics for models with between three and ten groups. Most solutions easily pass Nagin's (2005) recommendation that each group have an APP of at least 0.700. This confirms what other researchers have found: contemporary college students follow a myriad of pathways as they progress through their postsecondary education (Andrews et al. 2014; Bailey 2003; Bound et al. 2012; Goldrick-Rab and Pfeffer 2009; Goldrick-Rab 2006; McCormick 2003; Mouw 2005).

I contend that the seven-group solution strikes the best balance among model fit, parsimony, and theoretical grounding (Nagin 2005). The seven-group model has APPs of 0.886, 0.838, 0.825, 0.896, 0.875, 0.775, and 0.838. Though a couple of the nine-group solution's APPs fall below the 0.700 threshold, both the eight– and ten-group models have similarly high APPs as the seven-group model and lower BIC statistics. However, the additional groups do not vary substantively from those in the seven-group model. For instance, in moving from the seven– to the eight-group model, the "quick exit" group is split into two: the first group completes about ten credits in their first year following high school, while the latter group completes less than half as many credits. Both of these groups represent students who "dip their toes" into college at a relatively low level immediately following high school completion and then quickly exit without returning for the duration of the study period. For the sake of parsimony, the preferred model combines these students.

Figure 3.1 illustrates the pathways from the seven-group model, and Table B.2 in the appendix provides the model parameters for each group. Roughly half of the study's sample fall fairly evenly into two groups. The first of these groups ("full-time, long-term", comprising about 25.1% of the sample) completes college credits at a full-time rate over the first four

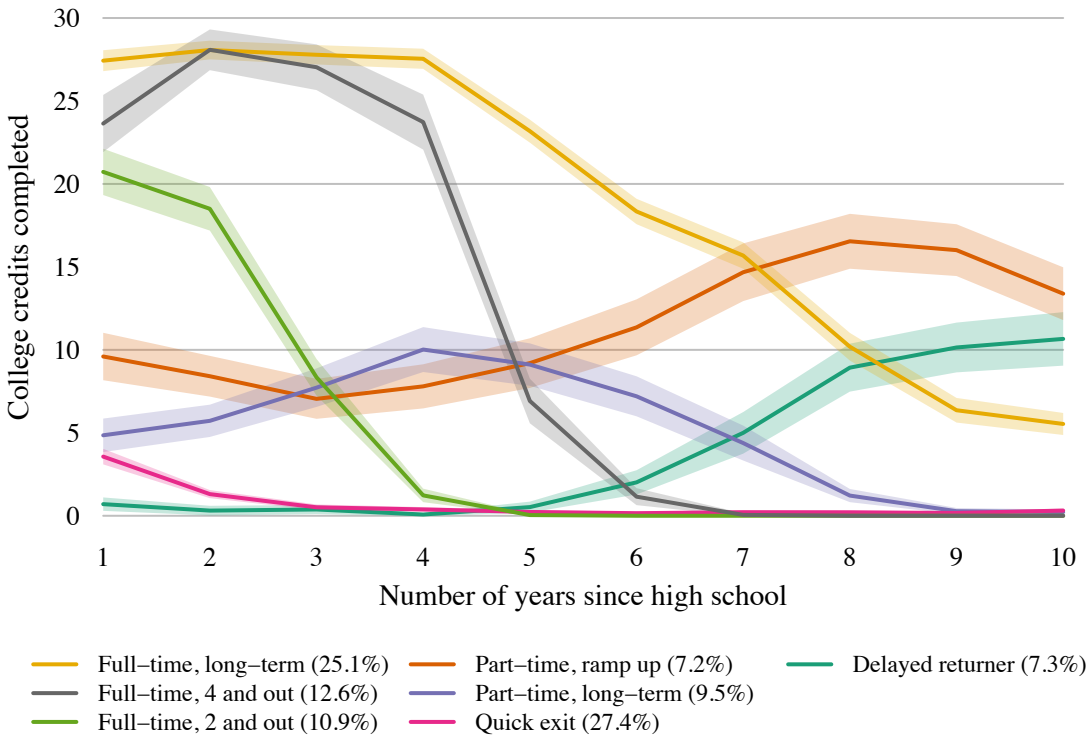
Table 3.2: Measures of model fit for students' credit accumulation

| | Number of groups in model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | **7** | 8 | 9 | 10 |
| Group 1 | 0.957 | 0.936 | 0.913 | 0.873 | **0.886** | 0.716 | 0.903 | 0.726 |
| Group 2 | 0.901 | 0.909 | 0.883 | 0.871 | **0.838** | 0.760 | 0.913 | 0.768 |
| Group 3 | 0.974 | 0.874 | 0.881 | 0.833 | **0.825** | 0.877 | 0.835 | 0.844 |
| Group 4 | | 0.957 | 0.878 | 0.861 | **0.896** | 0.864 | 0.810 | 0.861 |
| Group 5 | | | 0.954 | 0.851 | **0.875** | 0.868 | 0.838 | 0.792 |
| Group 6 | | | | 0.785 | **0.775** | 0.803 | 0.863 | 0.874 |
| Group 7 | | | | | **0.838** | 0.763 | 0.594 | 0.867 |
| Group 8 | | | | | | 0.835 | 0.486 | 0.844 |
| Group 9 | | | | | | | 0.768 | 0.770 |
| Group 10 | | | | | | | | 0.825 |
| BIC | | | | | | | | |
| Student-years | -41,363 | -40,847 | -40,659 | -40,520 | **-40,279** | -40,266 | -40,118 | -40,053 |
| Students | -41,350 | -41,830 | -40,638 | -41,495 | **-40,250** | -40,233 | -40,081 | -40,012 |

*Notes:* This table providestwo sets of statistics that are useful for evaluating group-based trajectory models that estimate solutions based on different numbers of groups: the average posterior probabilities of assignment into each group (in the top panel) and Bayesian Information Criteria (BIC) statistics of model fit (in the bottom panel) for students' trajectories of credit accumulation over the first ten years following their exit from high school. The seven-group model in bold indicates this study's preferred solution.

to six years, before tapering off through the remaining years. By contrast, the "quick exit" group (27.4%) enrolls at very low levels right after leaving high school for one or two years, and then stops earning college credits for the duration of the observation period. Another quarter of the sample is divided between the two other groups that enroll full-time in college directly after completing high school. These two groups differ largely in the length of time following high school that they sustain their full-time enrollment. About 12.6% of the sample enrolls for about four years at levels we would consider full-time ("full-time, 4 and out"), while another 10.9% enrolls full-time for only about two years before leaving college ("full-time, 2 and out"). The three remaining groups evince delayed credit accumulation. The starkest example is "delayed returner" group, which is comprised of the roughly 7.3% of the sample who enroll in college 6 or 7 years following the completion of high school. But even the "part-time, ramp up" and "part-time, extended" groups follow paths characterized by relatively slow starts followed by increases in college credit completion. For the 7.2%

Figure 3.1: Group-based trajectories of students' college credit completion




*Notes:* Figure illustrates the seven-group developmental trajectory model of students' college credits completed each year across the first ten years following high school exit. Lines indicate the average number of completed credits in a given year within each group, and shaded regions represent the 95% confidence intervals around those averages (that is, 95% of individuals' earned credits in a given group and year fall within the shaded regions).

of the study's sample whose trajectories most resemble the "part-time ramp up" group, credit completion begins at relatively low rates for the first 4-5 years following high school graduation, before "ramping up" to higher levels beginning in about the 6$^{th}$ or 7$^{th}$ year. The "part-time, long-term" group (comprising 9.5% of the study's sample) similarly starts at low credit completion rates in the first few years following high school, then increases their credit completion between the 3$^{rd}$ and 6$^{th}$ years, before leaving college in the later years of observation. Taken together, the trajectories in Figure 3.1 highlight the numerous and varied ways in which students enroll in and complete credits at postsecondary institutions.

Given the limitations of the group-based trajectory model identified above, it is important

to consider how well these seven pathways approximate the trajectories of the individuals assigned to each group. Figure B.1 in the appendix presents the predicted group mean trajectories (reproduced from Figure 3.1) along with the observed trajectories for individuals classified into each group. These figures help us visualize the extent to which individual variability is explained by group means and the degree of overlap between observations of individuals from different groups (see Erosheva et al. 2014). From this figure, it is evident that the groups are not perfect representation of truly distinct or concrete subgroups within the larger population of college-goers. Indeed, the within-group variability in credits earned over time is high. This is not surprising; existing scholarship has struggled to adequately capture the myriad ways in which individuals navigate postsecondary education (Robinson 2004). At the same time, however, a number of groups do show clear separation from one another, lending credence to this analytical approach's ability to approximate what is a very complex reality—namely, persistence through college courses. For instance, while all three "full-time" trajectories show clustering at relatively high levels of completed credits, they differ in how long these credits extend in time. Individuals assigned to the "long-term" trajectory continue earning credits into the $6^{th}$ or $7^{th}$ year after leaving high school, whereas the "4 and out" trajectory's assigned individuals evince a steep drop-off in earned credits in year 5 or 6 and those assigned to the "2 and out" trajectory taper off beginning in the $2^{nd}$ and $3^{rd}$ years. These three also stand in stark contrast to the "delayed returner" trajectory, for which we observe a marked uptick in credits earned before the $5^{th}$ or $6^{th}$ year since leaving high school; prior to this point in time, virtually no credits are earned by the individuals classified to this group.

### *3.3.2 Group Differences in Credit Accumulation Pathways*

Given the many pathways students take as they progress through postsecondary education, do students taking different pathways differ in terms of their sociodemographic background? Table 3.3 answers this question in a bivariate manner by showing trajectory-specific measures of students' background, academic preparation, and family formation. The tests

for association presented in the last column indicate whether there is signfiicant variation in these sociodemographic measures across trajectory groups. The descriptive statistics presented suggest that students are not randomly distributed across the college credit pathways.

White students, for instance, are overrepresented in pathways reflective of steady, full-time enrollment ("full-time, long-term," "full-time, 4 and out"), while black students are disproportionately likely to follow pathways that are not likely to lead to completion of a degree ("quick exit") or that are marked by a lenghy delay between high school and college ("delayed returner"). Similarly, we see a nearly linear relationship between students' family income and their college pathways. Whereas 33% of students in the top quintile of the family income distribution are assigned to the "full-time, long-term" pathway, just 14% exit almost immediately following their first enrollment and 11% delay their enrollment into college altogether. Virtually the opposite is true for students at the other end of the distribution; while only 8% of students in the bottom quartile attend college "full-time, long-term," 23% make a quick exit after initially enrolling and 29% follow the delayed enrollment pathway.

There are other ways in which the full-time pathways appear to be comprised of more advantaged students than the more "non-normative" pathways. Students enrolling full-time (either long-term or for at least four years) tend to be better prepared academically (as evidenced by their higher ASVAB scores, high school grade point averages, completion of high school via a diploma and between the expected ages of 17 and 19, and the higher chance they gave themselves of attaining a bachelor's degree earlier in life). Students who enroll part-time, who exit college quickly, and who delay entry altogether are also more likely to be parents or to be married prior to enrolling in college.

Furthermore, students across the trajectory groups also differ with respect to features of their initial institutions and first-year college experiences, as evidenced by the descriptive statistics in Table 3.4. Enrolling directly from high school into four-year colleges, for instance, has been shown to positively relate to students' long-term persistence in postsecondary education (Bozick and DeLuca 2005; Pascarella and Terenzini 2005). In this study's sample, 83% of "full-time, long-term" college attendees and 71% of "full-time, 4 and out"

Table 3.3: Sociodemographic composition by trajectory group

| | Sample overall | FT long-term | FT 4 and out | FT 2 and out | PT, ramp-up | PT long-term | Quick exit | Delayed returner | Test for assoc. |
|---|---|---|---|---|---|---|---|---|---|
| *Background* | | | | | | | | | |
| White | 0.70 | 0.78 | 0.75 | 0.70 | 0.68 | 0.68 | 0.62 | 0.59 | $p<0.001$ |
| Black | 0.12 | 0.08 | 0.08 | 0.11 | 0.13 | 0.12 | 0.18 | 0.16 | |
| Hispanic | 0.12 | 0.07 | 0.08 | 0.11 | 0.13 | 0.15 | 0.15 | 0.20 | |
| Other | 0.06 | 0.07 | 0.08 | 0.08 | 0.06 | 0.06 | 0.05 | 0.05 | |
| Family income quintile 1 | 0.16 | 0.08 | 0.09 | 0.18 | 0.14 | 0.16 | 0.23 | 0.29 | $p<0.001$ |
| Family income quintile 2 | 0.19 | 0.15 | 0.16 | 0.17 | 0.22 | 0.20 | 0.22 | 0.25 | |
| Family income quintile 3 | 0.20 | 0.19 | 0.17 | 0.25 | 0.23 | 0.21 | 0.19 | 0.18 | |
| Family income quintile 4 | 0.22 | 0.24 | 0.25 | 0.18 | 0.18 | 0.23 | 0.21 | 0.17 | |
| Family income quintile 5 | 0.23 | 0.33 | 0.32 | 0.21 | 0.22 | 0.20 | 0.14 | 0.11 | |
| Female | 0.51 | 0.56 | 0.52 | 0.47 | 0.49 | 0.47 | 0.46 | 0.55 | $p<0.01$ |
| Parent with $\geq$4 years of college | 0.40 | 0.57 | 0.51 | 0.34 | 0.46 | 0.28 | 0.24 | 0.22 | $p<0.001$ |
| *Academic preparation* | | | | | | | | | |
| ASVAB | 58.26 | 72.17 | 63.56 | 54.68 | 62.73 | 52.37 | 44.47 | 44.06 | $p<0.001$ |
| High school GPA | 3.01 | 3.36 | 3.21 | 3.00 | 3.02 | 2.82 | 2.66 | 2.60 | $p<0.001$ |
| Exit HS with diploma | 0.93 | 1.00 | 0.99 | 0.96 | 0.99 | 0.85 | 0.82 | 0.79 | $p<0.001$ |
| Completed HS at normative age | 0.93 | 0.99 | 0.98 | 0.94 | 0.96 | 0.91 | 0.87 | 0.81 | $p<0.001$ |
| Expects to complete 4-year degree | 0.76 | 85.33 | 80.20 | 75.03 | 78.85 | 73.12 | 65.83 | 65.56 | $p<0.001$ |
| *Family formation* | | | | | | | | | |
| Parent prior to first enrolled | 0.12 | 0.01 | 0.03 | 0.06 | 0.08 | 0.16 | 0.24 | 0.46 | $p<0.001$ |
| Married prior to first enrolled | 0.06 | 0.01 | 0.01 | 0.04 | 0.05 | 0.05 | 0.08 | 0.29 | $p<0.001$ |

*Notes:* The $p$-values reported in the last column summarize tests for association between the trajectory groups (columns) and the sociodemographic variables (rows). Specifically, I estimate multinomial logit models predicting assignment into trajectory groups conditional on a given row variable, and report the $p$-value of an $F$-test that the coefficients of a given explanatory variable are zero.

Table 3.4: First-year college experiences by trajectory group

| | Sample overall | FT long-term | FT 4 and out | FT 2 and out | PT, ramp-up | PT long-term | Quick exit | Delayed returner | Test for assoc. |
|---|---|---|---|---|---|---|---|---|---|
| *Level of first institution* | | | | | | | | | |
| Four-year | 0.53 | 0.83 | 0.71 | 0.44 | 0.49 | 0.33 | 0.27 | 0.23 | $p<0.001$ |
| Two-year | 0.46 | 0.17 | 0.29 | 0.55 | 0.51 | 0.66 | 0.70 | 0.71 | |
| Less than 2-year/other | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.03 | 0.06 | |
| *Type of first institution* | | | | | | | | | |
| Public | 0.69 | 0.71 | 0.75 | 0.74 | 0.74 | 0.76 | 0.59 | 0.62 | $p<0.001$ |
| Private, nonprofit | 0.14 | 0.23 | 0.17 | 0.09 | 0.20 | 0.07 | 0.05 | 0.05 | |
| For-profit | 0.05 | 0.01 | 0.03 | 0.09 | 0.02 | 0.07 | 0.06 | 0.15 | |
| Unknown | 0.12 | 0.06 | 0.05 | 0.08 | 0.03 | 0.10 | 0.29 | 0.19 | |
| *Percent of courses in first year by type/outcome* | | | | | | | | | |
| Remedial | 0.08 | 0.02 | 0.06 | 0.06 | 0.07 | 0.13 | 0.14 | 0.16 | $p<0.001$ |
| Failed | 0.28 | 0.13 | 0.16 | 0.17 | 0.28 | 0.31 | 0.52 | 0.35 | $p<0.001$ |
| In major field of study | 0.38 | 0.51 | 0.43 | 0.37 | 0.42 | 0.47 | 0.21 | 0.26 | $p<0.001$ |
| GPA | 2.43 | 2.99 | 2.91 | 2.61 | 2.47 | 2.31 | 1.52 | 2.50 | $p<0.001$ |
| Average hours worked per week | 18.33 | 13.37 | 14.31 | 18.93 | 16.47 | 22.82 | 24.20 | 19.79 | $p<0.001$ |
| Number of institutions (across all years of enrollment) | 1.49 | 1.65 | 1.56 | 1.35 | 2.02 | 1.52 | 1.17 | 1.38 | $p<0.001$ |

*Notes:* The $p$-values reported in the last column summarize tests for association between the trajectory groups (columns) and the experiences of students in their first year of college (rows). Specifically, I estimate multinomial logit models predicting assignment into trajectory groups conditional on a given row variable, and report the $p$-value of an $F$-test that the coefficients of a given explanatory variable are zero.

attendees enroll initially in a four-year college, compared to about half of those who follow the "full-time, 2 and out" or the "part-time, ramp up" pathways. At most one-third of students who enroll part-time over a longer period of time, who enroll then quickly exit, or who delay their enrollment altogether enroll initially in a four-year institution. Prior research has also demonstrated the salience of institutional type to persistence. While the majority of all groups attend public institutions, a higher proportion of "delayed returners" (who tend to be older, given the length of time that has passed since leaving high school) enroll initially in for-profit institutions, at 15%, than any other trajectory group. In the next highest category, about 9% of students in the "full-time, 2 and out" group attend for-profit colleges as their first postsecondary insitution. These findings are consistent with research showing that students at for-profit institutions tend to be older and take less direct and less sustained pathways through postsecondary education (Morey 2004; Deming et al. 2012).

Supplemental analyses were run that separated the sample into distinct groups based on the level of the institution at which they started (not shown, but available from the author upon request). In other words, instead of pooling all students, I estimated group trajectories separately for those who started in two-year colleges and for those who started in four-year colleges. By cross-classifying students by their trajectory in (a) the full sample and (b) their sample based on their initial institutional level, I found a high degree of correspondence. This suggests that pooling students in the manner of the analyses presented is appropriate. At the same time, the results in Table 3.4 show how students' trajectories differ systematically by where they began their postsecondary education.

Related to findings from Table 3.3, which showed that students embarking on full-time and longer-term college pathways tended to be more academically prepared than students in the part-time, shorter-term, and delayed pathways, Table 3.4 suggests that students course-work and outcomes vary across the pathway groups. While just 2% of students' first-year courses in the "full-time, long-term" pathway are remedial, 13%, 14%, and 16% percent of the courses taken by students in the "part-time, long-term," "quick exit," and "delayed returner" pathway groups, respectively, are remedial. A similar pattern holds for course

failure. While students in the part-time, shorter-term, and delayed pathways fail between a third and half of their courses during their first year of college, students in the full-time pathways fail less than one-fifth of their courses. Students in long-term and/or full-time pathways are also more likely to take coursework in their stated major field of study during their first year, to earn higher grade point averages, and to work fewer hours per week than students in the shorter-term and/or part-time pathways.

We also see some variation in terms of how many institutions a student attends over the course of their observed postsecondary careers (that is, across the first ten years since leaving high school). Students in the "part-time, ramp up" pathway, for example, attend about two institutions, on average; it is possible that their attendance at the second institution is coincident with their ramp up in credit accumulation. Students in the full-time pathways attend roughly 1.4-1.7 institutions, while those making a quick exit attend just over one institution, on average.

### *3.3.3 Which Pathways Are Related to College Completion, and For Whom?*

Because the way in which students accumulate credits likely shapes and constains their ability to ultimately earn a postsecondary degree, I turn next to questions of attainment: How are these pathways related to college degree completion? Table 3.5 displays the proportion of students who complete a college degree (either an associate's or a bachelor's degree) and who complete a bachelor's degree by ages 25 and 29 by their assigned trajectory. These descriptive results indicate that 86% of the students who follow the "full-time, long-term" pathway attain a college degree—a bachelor's degree, for that matter—by age 25, while those who follow full-time but shorter-term as well as those who follow part-time pathways are much less likely to have earned any college degree even by the time they turn 29. Some pathways appear more geared to associate's rather than bachelor's degrees. Students in the "full-time, 2 and out" trajectory, for example, rarly earn a bachelor's degree (even by age 29), but about one-third have earned an associate's degree by age 25. Very low proportions of students making a "quick exit" have completed any college degree by age 25 or 29; those

Table 3.5: College degree attainment by trajectory group

| | College degree attainment | | Bachelor's degree attainment | |
|---|---|---|---|---|
| | By age 25 | By age 29 | By age 25 | By age 29 |
| Full-time, long-term | 0.90 | 0.98 | 0.86 | 0.97 |
| Full-time, 4 and out | 0.53 | 0.69 | 0.31 | 0.46 |
| Full-time, 2 and out | 0.35 | 0.39 | 0.05 | 0.08 |
| Part-time, ramp up | 0.28 | 0.69 | 0.17 | 0.48 |
| Part-time, long-term | 0.19 | 0.31 | 0.05 | 0.08 |
| Quick exit | 0.06 | 0.08 | 0.03 | 0.04 |
| Delayed returner | 0.01 | 0.16 | 0.00 | 0.02 |

*Notes:* Table shows proportion of students who complete a college degree (either an associate's or a bachelor's degree) and a bachelor's degree by ages 25 and 29 for each credit accumulation trajectory group. Data are weighted by the NLSY97 Post-Secondary Transcript Study weights. Data for attainment variables were not multiply imputed; sample sizes are as follows: 2,554 for college degree attainment, 2,549 for bachelor's degree attainment.

who do are likely to be included in this trajectory as a result of their very low, but sustained, college credit accumulation.

It is also instructive to look at the differences in attainment between ages 25 and 29 within trajectory groups. While certain groups have very low degree attainment rates by age 25, students following these pathways are comparatively more likely to have obtained a degree by age 29. This is particularly true of the "part-time, ramp up" trajectory group. While just over one-quarter of these students have completed a college degree (and just under one-fifth have completed a bachelor's degree) by age 25, nearly 70% have obtained a college degree by 29—the majority of whom appear to have completed a bachelor's degree. Similarly, despite initially enrolling in college between 6 and 8 years after leaving high school (when, normatively, they would be between the ages of 24 and 26), 16% of the "delayed returners" have earned a college degree (generally, an associate's degree) by age 29. These patterns suggest that pathways that are typically thought of as "non-normative" can—and do—lead to persistence in postsecondary education and to the ulimate attainment of a degree.

Whereas Table 3.5 demonstrates variation across the credit accumulation trajectory groups, the logistic regression models in Tables 3.6 test whether variation in bachelor's

degree attainment rates by age 29 among racial groups are attenuated by the systematic distribution of racial groups across the trajectories, in addition to other background traits and other features of a student's college experience. I focus here on bachelor's degree attainment in this analysis because prior research has shown the particularly strong premium in terms of wages and other employment outcomes that come with a four-year, as opposed to a two-year, college degree (Hout 2012; Gerber and Cheung 2008).

Table 3.6: Logistic regression results: Predicting bachelor's degree attainment by age 29

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| *Race (ref.=white)* | | | | | |
| Black | -0.91*** | -0.96*** | -0.67* | -0.15 | -0.19 |
| | (0.12) | (0.26) | (0.29) | (0.32) | (0.36) |
| Hispanic | -0.74*** | -0.03 | 0.18 | 0.68* | 0.87** |
| | (0.12) | (0.22) | (0.23) | (0.27) | (0.29) |
| Other | 0.30 | 0.79* | 0.90* | 0.97** | 1.11** |
| | (0.19) | (0.34) | (0.35) | (0.35) | (0.35) |
| *Trajectory (ref.=full-time, long-term)* | | | | | |
| Full-time, 4 and out | | -3.63*** | -3.76*** | -3.78*** | -3.92*** |
| | | (0.26) | (0.27) | (0.30) | (0.73) |
| Full-time, 2 and out | | -5.94*** | -6.01*** | -5.83*** | -5.76*** |
| | | (0.32) | (0.33) | (0.34) | (0.35) |
| Part-time, ramp up | | -3.48*** | -3.52*** | -3.28*** | -2.90*** |
| | | (0.25) | (0.26) | (0.29) | (0.31) |
| Part-time, long-term | | -5.87*** | -5.98*** | -5.55*** | -5.33*** |
| | | (0.33) | (0.33) | (0.31) | (0.39) |
| Quick exit | | -6.54*** | -6.58*** | -5.82*** | -5.14*** |
| | | (0.29) | (0.30) | (0.31) | (0.33) |
| Delayed returner | | -7.44*** | -7.44*** | -6.47*** | -6.32*** |
| | | (0.66) | (0.65) | (0.69) | (0.73) |
| *Family income (ref.=top quintile)* | | | | | |
| Quintile 1 | | | -1.79*** | -1.26*** | -1.40*** |
| | | | (0.29) | (0.30) | (0.33) |
| Quintile 2 | | | -0.62* | -0.45 | -0.36 |
| | | | (0.25) | (0.28) | (0.29) |
| Quintile 3 | | | -1.09*** | -0.96*** | -1.00*** |
| | | | (0.26) | (0.27) | (0.30) |
| Quintile 4 | | | -1.04*** | -0.97*** | -1.05*** |
| | | | (0.25) | (0.28) | (0.30) |
| *Background and high school achievement* | | | | | |
| Female | | | | 0.33 | 0.29 |
| | | | | (0.19) | (0.20) |

| | | | | | |
|---|---|---|---|---|---|
| Parent with at least 4 years of college | | | | 0.65*** | 0.61** |
| | | | | (0.20) | (0.22) |
| ASVAB | | | | 0.02*** | 0.01* |
| | | | | (0.005) | (0.005) |
| High school GPA | | | | 1.00*** | 0.48* |
| | | | | (0.24) | (0.25) |
| Completed HS at 17-19 years | | | | 1.08 | 0.94 |
| | | | | (0.71) | (0.60) |
| Expects to complete a 4-year degree | | | | 0.01* | 0.01* |
| | | | | (0.005) | (0.006) |
| *Family formation* | | | | | |
| Parent prior to first term in college | | | | -0.77* | -0.90* |
| | | | | (0.35) | (0.37) |
| Married prior to first term in college | | | | 0.40 | -0.05 |
| | | | | (0.44) | (0.42) |
| *First-year college experiences* | | | | | |
| Level - 2-year inst. (ref.=4-year) | | | | | -1.23*** |
| | | | | | (0.23) |
| Level - less than 2 or other inst. | | | | | 0.82 |
| | | | | | (0.93) |
| Type - private inst. (ref.=public) | | | | | -0.01 |
| | | | | | (0.27) |
| Type - for-profit inst. | | | | | -0.61 |
| | | | | | (0.36) |
| Type - unknown inst. | | | | | 0.32 |
| | | | | | (0.34) |
| % remedial courses | | | | | -0.81 |
| | | | | | (0.63) |
| % failed courses | | | | | -0.51 |
| | | | | | (0.50) |
| % courses in major field of study | | | | | 0.22 |
| | | | | | (0.22) |
| College GPA | | | | | 0.59*** |
| | | | | | (0.14) |
| Average hours worked per week | | | | | -0.02** |
| | | | | | (0.007) |
| Pseudo $R^2$ | 0.03 | 0.64 | 0.65 | 0.69 | 0.72 |
| *N* | 2,549 | 2,549 | 2,549 | 2,549 | 2,549 |

*Notes:* Data come from the NLSY97 Post-Secondary Transcript Study. Estimates are weighted. Results of logistic regression models presented as logit coefficients; standard errors are in parentheses. Constant is not shown. Statistical significance is indicated by: *$p<0.05$, **$p<0.01$, ***$p<0.001$.

Model 1 of Table 3.6, which shows the unconditional differences in bachelor's degree attainment by race, confirms well-researched gaps (McDaniel et al. 2011). In particular, white students are nearly twice as likely as black and Hispanic students to complete a four-

year college degree by age 29. Whereas 46% of whites in the sample completed a bachelor's degree, just 26% of blacks and 29% of Hispanics did so. A little more than half (about 54%) of students in other racial groups had completed a bachelor's degree by age 29.

Model 2 adds indicators for a student's assigned trajectory group, and reflects the large differences in bachelor's degree attainment across the groups found in Table 3.5. Furthermore, the addition of trajectory groups has no effect on the difference in degree attainment between white and black students. Black students remain about half as likely as white students to earn a bachelor's degree by age 29, even controlling for trajectory group. However, the addition of trajectory groups to the model virtually wipes out the white–Hispanic difference, suggesting that the lower rates of Hispanic attainment can be at least partially explained by the different paths white and Hispanic students take through college—specifically, with respect to whether they begin full– or part-time and whether they sustain their credit load.

We see large and statistically significant differences by family income quintile in model 3, and these differences hold across the remaining models. While about 63% of students in the top quintile complete a bachelor's degree by age 29, only 19% of students in the bottom quintile do.[4] With the addition of family income in model 3, roughly one-third of the white–black difference is absorbed by the addition of family income. The remainder of white–black difference is attenuated by the addition of the other variables measuring a student's background, including whether they had a parent who had completed at least four years of college and their academic achievement in high school. In this model, furthermore, Hispanic students hold an advantage compared to white students, conditional on their family background, high school achievement, and college credit trajectory. Finally, the addition of variables measuring other aspects of a students' college experience—including the level and type of school they initially enrolled in and their coursework during their first year—do little to explain the relationships between student socioeconomic status (race and family income)

[4]These percentages are calculated by predicting the probability that a student in each income quintile completes a bachelor's degree by age 29 based on the results in model 3 of Table 3.6.

and trajectory assignment on the one hand, and likelihood of completing bachelor's degree by age 29 on the other hand.

I also tested whether adding interactions between either race or family income quintile and trajectory group improved the fit of the model. Neither set of interactions was jointly significant at $p<0.05$. That said, the fact remains that students from different racial groups and from various points along the socioeconomic distribution follow systematically different college pathways (see Table 3.3)—pathways which have varied implications for the successful completion of a college degree (as in Table 3.5).

## *3.4 Conclusion*

Understanding how students progress through postsecondary education is crucial in the current context of rising college enrollment coupled with static rates of and growing racial and socioeconomic gaps in degree completion (Bailey and Dynarski 2011; Belley and Lochner 2007; Bound et al. 2012; McDaniel et al. 2011; Turner 2004). This chapter makes two signficant contributions to the extant literature on this subject.

First, I draw on detailed postsecondary transcript data from a nationally-representative longitudinal survey that includes students who enroll in institutions from across the higher education market to identify group-based pathways of credit completion. By focusing on credits earned in each year following a student's completion of high school, this analysis is grounded in a key component of students' successful persistence through a postsecondary academic program (Marti 2008). I find substantial variation in patterns of students' attendance and persistence. Indeed, postsecondary students follow pathways that rarely conform to standard timelines. This finding corroborates prior research that has also found similarly high—and increasing—heterogeneity in *how* students attend college across a number of dimensions (e.g., Bozick and DeLuca 2005; Goldrick-Rab 2006; Goldrick-Rab and Pfeffer 2009; Goldrick-Rab and Han 2011; Roksa and Velez 2012), and builds on that prior work by describing characteristics of the shape of the pathways themselves. In particular, studies investigating students' college pathways have largely overlooked the timing, sequencing, and

duration of attendance intensity. While some have identified students who delay their initial transition from high school to college (Bozick and DeLuca 2005; Roksa and Velez 2012), they have not examined the shape of students' attendance after eventually enrolling. Similarly, whereas other researchers have noted the prevalence and consequences of part-time enrollment, they have not considered how long students enroll part-time, or whether they do so following or prior to full-time stints. The pathways identified by this analysis, by contrast, describe not only whether a student completed credits on a part-time basis but also when and for how long.

Second, I test whether different persistence patterns are associated with students' sociodemographic backgrounds and with their eventual degree attainment. While other have found that such factors as beginning at a two-year college, delaying initial entry into college, and enrolling part-time reduce the likelihood of bachelor's degree attainment (Bozick and DeLuca 2005; Goldrick-Rab 2006), the findings of this study suggest that pathways of persistence are related to degree completion as well. That is, even when controlling for a wide range of college experiences (including the type and level of a student's initial institution, and measures of fit between a student's ability and effort and institutional academic characteristics) and sociodemographic measures (such as race and socioeconomic status), as in model 5 of Table 3.6, whether or not a student completes a bachelor's degree by age 29 is significantly related to characteristics of students' postsecondary persistence—i.e., the timing, sequencing, and duration of credit completion identified via the group-based developmental trajectory modeling approach. In this way, this analysis pushes our understanding of the relationship of pathways to attainment. Part-time credit completion, for instance, masks a lot of heterogeneity with respect to degree completion. As evident in Table 3.5, 69% of the students in the "part-time, ramp up" trajectory group complete any college degree by the time they turn 29 years old, compared to just 31% of the students in the "part-time, long-term" group. Even attending full-time is no guarantee of degree completion. While 97% of students in the "full-time, long-term" trajectory group complete a bachelor's degree by age 29, less than half of the students in the "full-time, 4 and out" group do. As Table 3.6

shows, these relationships hold when accounting for students' sociodemographic traits and other features of their postsecondary experiences.

Furthermore, while the nonrandom sorting of students to the various persistence pathways with respect to race and socioeconomic status explains some of the racial and income-related gaps in college completion, it does not fully account for these gaps. As in prior work, nonwhite and lower-income students are disproportionately likely to follow pathways that inhibit the completion of college degrees (Goldrick-Rab 2006). In this study, the inclusion of persistence pathways to the multivariate models in Table 3.6 (see model 2) accounts for nearly the entire gap in degree completion between white and Hispanic students, but this does not attenuate the gap between white and black students. The black-white gap is reduced by one-third when family income is also accounted for, and becomes statistically non-significant when prior academic achievement is included in the model. Degree completion gaps among income quintiles are also statistically significant when accounting for students' trajectories through college (model 2), and they remain relatively unchanged even with the addition of additional background, achievement, and educational context measures. Pathways further do not appear to have particular implications for degree attainment for certain segments of the increasingly diverse undergraduate population. Interaction terms between a student's race/ethnicity and their credit trajectory, and between a student's family income quintile and their trajectory, were not statitiscally significant.

While this study provides a fuller understanding of the shape of college students' enrollment and persistence pathways, there are a few limitations worth noting. The sample from which the latent trajectories are drawn is likely more advantaged than the overall population of college-goers. This analysis required complete information about students' term start dates and thus the receipt of all transcripts requested by the Post-Secondary Transcript Study research staff.[5] This means, in part, that no financial or other administrative holds

[5]Students in this study's sample could have had missing term credit information; when this was the case, students were assigned missing credits for the year during which that term occured. However, in order to ensure that I knew when to mark years as missing credit information in aggregating students' term credits to years since high school completion, it had to be clear when a student was and was not enrolled in a

had been placed on the transcripts by the postsecondary institutions (e.g., due to outstanding student obligations such as tuition payments). Further, transcripts were not requested (and not obtained) for enrollment spells in non-degree programs and in spells that did not result in a single completed course (even if that course was failed). Additionally, this study cannot look at older students given that collection of the transcript data occurred when respondents were at most in their early thirties. Such restrictions mean that the analyses presented in this chapter understate the full extent of enrollment heterogeneity.

Despite these limitations, the findings of this study are relevant to discussions about postsecondary enrollment, persistence, and completion in our contemporary "college-for-all" environment (Goyette 2008; Rosenbaum 2001)—wherein more jobs require a college degree, more individuals are entering college, but smaller proportions of students are actually completing degrees. As the variation in pathways and their relationship to degree attainment illustrate, simply getting to college far from guarantees that individuals will persist in, continue to complete credits at, and earn a degree from a postsecondary institution. Helping all students who enroll in college, and thus take on the corresponding substantial financial and other costs, means taking seriously the myriad ways in which student move and progress through higher education.

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degree program.

# Chapter 4

## Does it Pay to Attend a For-Profit College? Vertical and Horizontal Stratification in Higher Education

While labor market outcomes such as earnings are most crucially shaped by one's level of educational attainment, qualitative differences in where and how that education is obtained matter, too. A large body of research on what can be termed the vertical dimension of education demonstrates a strong correlation between earnings and educational attainment (for reviews, see Hout 2012; Oreopoulos and Petronijevic 2013). Among individuals with equivalent levels of education, however, substantial variation in earnings is associated with a horizontal dimension of stratification—that is, such features of their education as the type or selectivity of college they attend and the kinds of experiences they have while there (Charles and Bradley 2002; Gerber and Cheung 2008). But do such patterns of vertical and horizontal stratification obtain for the for-profit college sector? That is, does pursuing higher education at a for-profit college result in higher earnings than stopping at a high school diploma and comparable earnings as compared to similarly educated individuals who attended public or private, nonprofit colleges?

Enrollment in for-profit colleges has skyrocketed in recent decades, outpacing growth in postsecondary enrollment as a whole. This sector has seen its student population triple over the last decade alone, compared to postsecondary education enrollment's overall growth of 22% (Deming et al. 2012), and increase sixfold since 1986 (Bennett et al. 2010). In the fall of 2008, the for-profit sector enrolled about 9% of all college students, 12% of those enrolled at any point during the 2008–2009 academic year, and 14% of full-time equivalent students in all institutions of higher education eligible for federal financial aid (Bennett et al. 2010). It is likely that these figures vastly underestimate the total number of for-profit institutions

and the share of postsecondary students enrolled in them. These estimates rely on official U.S. Department of Education (DOE) counts, which include institutions eligible for federal grants and subsidized and unsubsidized loans under Title IV of the Higher Education Act of 1965. However, not all postsecondary institutions participate in Title IV programs, and Cellini and Goldin (Cellini and Goldin 2014) use administrative data from five states to show that the actual number for-profit college students may be one-third greater than what is typically published based on official U.S. DOE sources.[1]

The Great Recession was a particular boom time for for-profit colleges, which absorbed roughly 30% of this period's enrollment growth (Barr and Turner 2013). This expansion reflects in part widespread economic changes in the U.S. labor and higher education markets. As globalization, its accompanying technological changes, and an increasingly information-dominated economy helped precipitate a growing need for educated, skilled workers, and as state support for public postsecondary institutions has declined, more and more students have looked to the open-access for-profit sector for opportunities to gain the competitive labor market advantages garnered by a college education (Machin and van Reenen 1998; Morey 2004; Cellini 2009; Barr and Turner 2013).

While the sector's growth has been quite profitable for its schools, particularly for those owned by the fifteen large, multistate, publically-traded companies that enroll nearly half of the sector's students (Bennett et al. 2010), their students have fared less well. Indeed, the Apollo Group, which owns the University of Phoenix, saw its earned revenues grow from $12 million in 1994 to $1.3 billion in 2003 and $3.7 billion in 2013 (Mettler 2014:88, Apollo Group 2013). But this explosion in revenue is due in no small part to the high financial burden taken on by these schools' students (Mettler 2014). Not only are these schools more expensive to attend than public institutions, particularly community colleges (Knapp et al. 2011; Cellini 2012), the sector's disproportionately low-income and at-risk students take on an outsized share of federal student loans (Deming et al. 2012; Mettler

[1]Non-Title IV schools tend to offer mainly non-degree programs, and are generally smaller than the Title IV schools (Cellini and Goldin 2014).

2014). In the first decade of the twenty-first century, federal student aid increased by 325% (from $7.6 billion to $32.3 billion) at for-profit institutions, compared to the 106% and 78% increases, respectively, at public and private, nonprofit schools (Government Accountability Office 2011). For-profit students received nearly a quarter of all Pell grant disbursements and 26% of all federal loan disbursements, and they account for roughly 47% of all defaults on educational loans (Deming et al. 2012). The for-profit sector has also been criticized by the media and government agencies for its aggressive recruiting strategies, its students' low completion rates, and the questionable employment outcomes secured for its students (e.g., Government Accountability Office 2011; Stratford 2012a;b; Weinberg 2013; Health, Education, Labor and Pensions Committee 2012; Pérez-Pẽna 2014). Anecdotal evidence further suggests that employers in certain industries—including those for which for-profit schools have marketed specialized programs like video game development (Williams 2013)—pass over applicants educated at for-profit institutions.

Anecdotes and the higher costs notwithstanding, does attending a for-profit college pay off? Despite their surge in enrollment and their present nontrivial share of the higher education market, little empirical research has investigated how the post-college earnings of for-profit students compare to the earnings of individuals who did not attend for-profit colleges. The research that exists has demonstrated that students earning degrees or certificates at for-profit colleges earn less or about as much as their nonprofit college-educated counterparts (Deming et al. 2012; Lang and Weinstein 2012; Cellini and Chaudhary 2014). Yet less attention has been paid to how wages of for-profit students compare to less educated individuals. That is, we do not know at what level of attainment for-profit postsecondary education becomes a wise investment relative to not attending college at all, especially given the debt burdens carried by many attendees of for-profit schools.

This chapter thus has two goals. First, this study examines whether the positive correlation between earnings and educational attainment—the vertical dimension of stratification in education—holds for for-profit college students. To this end, I compare the earnings of individuals who pursued some college (but did not earn a degree), an associate's degree, and

a bachelor's degree at a for-profit college to those who possess only a high school diploma. Second, this chapter re-examines the horizontal dimension of education—that is, whether college sector is associated with heterogeneity in earnings among college-educated individuals. Specifically, I test whether those who attended for-profit colleges in part or exclusively to complete some college, an associate's degree, or a bachelor's degree earn more, less, or about the same in hourly wages as those with the same education levels who attended only public or private, nonprofit colleges. Using data from the 1997 cohort of the National Longitudinal Survey of Youth, I find that the wages of individuals who complete some college or an associate's degree by attending for-profit colleges do not differ significantly from those with only a high school diploma. However, bachelor's degree holders who attended for-profit colleges do earn significantly more than high school graduates and about the same as bachelor's degree holders who attended only a public or private, nonprofit college. These results indicate that college sector, particularly at the sub-baccalaureate level, represents a meaningful dimension of horizontal stratification within higher education as well as a complication to the vertical dimension of education by failing to provide a consistently positive wage premium as compared to possessing only a high school diploma.

### *4.1 Stratification within Higher Education and For-Profit Colleges*

I explore how college sector fits into recent discussions of vertical and horizontal stratification in education by comparing the wages of individuals who attended for-profit colleges to the wages of both high school graduates and individuals who attended public or private, nonprofit colleges. While some research on for-profit students has focused on the horizontal dimension, this work has largely addressed individuals who set out to earn a two-year degree or has not included in their samples those with no college experience. For instance, Lang and Weinstein (2012) employ the Beginning Postsecondary Student Survey (BPS) and find that students beginning associate's degree programs at for-profit colleges earn yearly incomes about $3000 less than those who began at public or nonprofit institutions, a statistically significant difference. Similarly, Deming et al. (2012), also using the BPS data,

find that individuals who began their college careers at for-profit schools earn about $1800 to $2000 less annually than they would have had they started out at a public or private, nonprofit institution. In contrast, Cellini and Chaudhary (2014), using the National Longitudinal Survey of Youth 1997 (NLSY97) and focusing on earnings gains among those who are employed as opposed to absolute differences in earnings, find that individuals who enroll in two-year degree programs at for-profit colleges encounter weekly earnings gains of about 10% relative to high school graduates and gains that are on par with public community college attendees. The present study focuses on the vertical dimension of education by comparing the wages of for-profit college-educated individuals to those of high school graduates, and expands research on the horizontal dimension by exploring wage differentials among bachelor's degree holders as well as those with associate's degrees and some college but no degree. The remainder of this section examines the relevant empirical literature linking the vertical and horizontal dimensions of stratification within education to labor market outcomes, and presents hypotheses as to how one might expect college sector to operate along those dimensions.

### *4.1.1 The Vertical Dimension*

Much sociological and economic research has investigated the individual economic returns to postsecondary education (recent examples include Autor 2014; Brand and Halaby 2006; Fischer and Hout 2006; Goldin and Katz 2008; Long 2008; 2010; Hout 2012; Oreopoulos and Petronijevic 2013), finding a substantial and growing college wage premium. Indeed, the correlation between level of educational attainment—the vertical dimension of education (Charles and Bradley 2002; Gerber and Cheung 2008)—and economic returns in the United States has never been higher (Goldin and Katz 2008). One recent study estimates that some college or an associate's degree is worth nearly $500,000 more in lifetime earnings than a high school diploma and a bachelor's degree is worth about $1.6 million more (Carnevale et al. 2010). Such gains are particularly important for those typically underserved by postsecondary institutions given what Brand and Xie (2010) identify as a "negative selection"

effect, whereby those who are least likely to attend college are most likely to benefit from doing so. In short, as Gerber and Cheung (2008:300) have recently remarked, "One's level of education is the single most important factor shaping labor market opportunities in modern societies."

Such systematic differences in wages based on one's level of educational attainment suggest that a college degree, regardless of whether it is earned in the for-profit or nonprofit sector, should result in increased wages as compared to wages earned by those with only a high school diploma. This positive association between education level and wages should hold for any level of postsecondary attainment, including for sub-baccalaureate degrees (Kane and Rouse 1995; 1999; Jepsen et al. 2014). For-profit colleges may be particularly well positioned to prepare individuals for a labor market that increasingly rewards postsecondary education for at least two reasons. First, the sector's schools tend to offer programs and degrees focused on practical skills and concrete knowledge in areas like allied health professions, computer and technical services, and legal support (Morey 2004; Chung 2012; Deming et al. 2012), areas that are experiencing significant job growth and that increasingly require a college education (Lockard and Wolf 2012; Carnevale et al. 2010). Second, to the extent that the for-profit sector has extended access to individuals who previously would have been very unlikely to attend college as a result of their lower socioeconomic status and academic preparation (Chung 2012; Deming et al. 2012), Brand and Xie's (2010) "negative selection hypothesis" suggests that for-profit students stand to reap particular wage benefits by attending college. Given the centrality of a college education to labor market outcomes, the for-profit sector's advertised focus on practical skills and growing occupations, and the extension of higher education to traditionally underserved populations, I hypothesize that:

> **H1a:** Individuals who attend a for-profit college receive higher hourly earnings than those who did not attend college at all.

On the other hand, there are also reasons to suspect that earning a degree, particularly an associate's degree, at a for-profit college might not lead to a wage premium compared to high school graduates. One recent audit study found, for instance, that employers do not reach

out to job applicants who list a sub-baccalaureate degree from a for-profit college on their resumes at any higher rate than they reach out to applicants with no postsecondary schooling (Darolia et al. 2014) Similarly, Deming and associates (2016) found that individuals who earned a bachelor's degree in business from a for-profit online institution are 22 percent less likely to receive a callback than business bachelor's degree holders from nonselective public institutions. The relative newness—at least in terms of their scale—and questionable quality of for-profit colleges may make employers unsure of what to expect from job candidates educated at for-profit institutions; employers may thus be more hesitant to hire and compensate the sector's sub-baccalaureate graduates for work that could either be performed by high school graduates or public community college graduates (Government Accountability Office 2011; Hagelskamp et al. 2014; Darolia et al. 2014). In this way, then, we might expect the value of attending a for-profit college compared to a high school diploma to vary by the level of postsecondary attainment. I thus test a competing hypothesis to H1a:

> **H1b:** Individuals who attend a for-profit college and complete a sub-baccalaureate degree receive earnings that are no higher than high school graduates.

### *4.1.2 The Horizontal Dimension*

In addition to the growing wage gap between those with and without a college education, the rising returns to postsecondary education have produced increasing variation in wages among college educated workers (Autor et al. 2006; Lemieux 2006). Researchers have paid mounting attention over the past few decades to how qualitative differences among college graduates including the quality or type of their school and their experiences such as field of study and pathway—the horizontal dimension of education—affect subsequent earnings (for a review, see Gerber and Cheung 2008). For instance, while a college education has a generally positive relationship to income returns, this relationship is even stronger for more selective colleges (Brewer et al. 1999; Haveman and Smeeding 2006). Monks (2000), for instance, finds that graduates from the most competitive colleges and universities earn about 15% more than graduates from the least competitive institutions. The wage premium for

attending an elite private college relative to a less-competitive public institution increased during the 1980s and 1990s (Brewer et al. 1999; Long 2010) and continues to rise today (Hout 2012). Other studies draw distinctions between types of institutions, such as whether the school is a two– or four-year institution or whether the school grants graduate degrees (Monks 2000; Marcotte et al. 2005), and these too find significant differences in employment outcomes. For example, each year of community college enrollment leads to substantially lower wage returns compared to a year of enrollment in a bachelor's degree program (Gill and Leigh 2000).

In terms of student experiences, majoring in business-related and science/math fields yields higher returns on average than majoring in the humanities and education (Gerber and Cheung 2008). The pathways that students take to and through college can also affect their returns. Individuals who delay the transition from high school to college are less likely to complete bachelor's degrees and encounter lower earnings than those who make the transition on-time (Bozick and DeLuca 2005; Monks 1997; see also Chapter 3). Additionally, taking a non-traditional path through one's college career—e.g., by transferring across different institutions, by taking pauses, or by taking longer to complete a degree—negatively impacts one's earnings (Light 1995; Monks 1997; Elman and O'Rand 2004).

College sector may represent another, relatively underexplored, dimension of horizontal stratification within higher education. Any potential heterogeneity in wages by sector may be at least partly a result of differences in quality or student experiences between the for-profit and nonprofit sectors. In particular, the unproven and questionable quality of the for-profit sector, coupled with its largely negative public image, may impinge upon its students' opportunities and compensation in the labor market (Government Accountability Office 2011; Chung 2012; Hagelskamp et al. 2014). Institutional quality can also be measured by the amount of resources colleges deploy in helping their students obtain employment. While for-profit colleges heavily market their ability to land their graduates jobs (Darolia et al. 2014), Deming et al. (2012) are skeptical of the claim that for-profit colleges offer particularly helpful student services given the fact that their students report lower levels of

satisfaction with their programs compared to their counterparts at nonprofit schools. In this way, the sector's lower quality—at least as perceived by the public and employers—suggests the following hypothesis:

> **H2a:** For-profit college attendees earn lower hourly wages as compared to their similarly college-educated counterparts who attended public or private, nonprofit colleges.

Wage outcomes may also vary among college-goers in the two sectors due to student experiences such as their choice of major and their pathways to and through college. If, for instance, for-profit colleges were systematically more likely than public or private, nonprofit colleges to offer or specialize in fields of study that led to lower or higher wages, we might expect variation in wages among students by sector. However, this does not appear to be the case. As we shall see in Table 4.3 , students across the sectors do not vary so systematically in their chosen fields of study. It is possible that the indirect pathways to and through college that for-profit students are more likely to take than their public and nonprofit, private counterparts negatively influence their wages. The wage models in this chapter explicitly account for these pathways. Given that they are more prevalent in the for-profit student population (Deming et al. 2012; see also Table 4.3), I test the following hypothesis:

> **H2b:** The inclusion of measures of indirect pathways to and through college will attenuate the observed wage differences by sector among college-educated workers.

Finally, it may be that the vertical and horizontal dimensions of education will interact in unique ways for the for-profit sector. That is, baccalaureate degrees earned at for-profit or nonprofit colleges may lead to more comparable wages than sub-baccalaureate degrees. The bachelor's degree holds particular value in the current labor market, with the Bureau of Labor Statistics predicting that occupations requiring at least a bachelor's degree for an entry-level position will grow faster than the average for all other occupations (Dohm and Schniper 2007). Indeed, employer demand for bachelor's degrees in the labor market is projected to outpace the supply (Carnevale et al. 2010). Given the importance of a bachelor's degree, it may be reasonable to expect that the average entry-level wages of bachelor's degree holders from for-profit and nonprofit colleges may be not be that different. At the same time,

employers may be more attentive to sector differences at the sub-baccalaureate level. While both public community colleges and for-profit schools, at which the majority of two-year degrees are earned, are open-access and offer overlapping programs (Cellini 2009), some evidence indicates that employers view community colleges as more effective at preparing students to work in their organizations than for-profit colleges (Hagelskamp et al. 2014). While this employer preference for nonprofit college attendance has not yet been tested for the baccalaureate level, employer demand for workers with bachelor's degrees may override the sector at which the degree is pursued in terms of compensating employees. I thus test the following hypothesis as a competing expectation to H2a:

> **H2c:** Differences in earnings between for-profit attendees and equivalently educated public and private, nonprofit attendees will vary by level of educational attainment, such that earnings will not be significantly different at the baccalaureate level but will be significantly different at the sub-baccalaureate level.

## *4.2 Data and Methods*

### *4.2.1 Data*

To test the hypotheses enumerated above that link earnings and the vertical and horizontal dimensions of education with respect to college sector, I use data from the 1997 cohort of the National Longitudinal Survey of Youth (NLSY97). More information on the NLSY97 can be found in Chapter 3. For the analyses in this chapter, I restrict the sample to respondents who were interviewed in the 2009 round of data collection, were not still enrolled in school at the time of the interview, had earned at least a high school diploma and at most a bachelor's degree,[2] were not currently serving in the armed forces, and did not have missing data on the

[2]In supplemental analyses (not shown, but available from the author upon request), I included those who did not graduate from high school as well as those who had earned a GED. While the core results were substantively similar, this study's focus is on the extent to which pursuing higher education at a for-profit college represents a worthwhile investment as compared to stopping education after the completion of high school and as compared to the pursuit of postsecondary education at a public or private, nonprofit college in terms of early-career wages. In other analyses, I included those who had earned a graduate degree. Again, the core results for those at the sub-baccalaureate and baccalaureate levels were substantively

dependent variable.[3] Given that the respondents are relatively young (in their late twenties) in 2009 and the sample restrictions described, I evaluate the effects of attending a for-profit college on a single-year cross-section of early career wages.

Table 4.1 shows the sample's distribution of educational attainment and college sector, and Table 4.2 presents summary statistics of the variables used in the main analysis.[4] The outcome variable is the log of hourly wages. Because in the NLSY97's 2009 round, respondents reported their wages and hours worked for up to nine jobs, I calculate an average of hourly wages, weighted by the hours worked, across the particular number of jobs reported by each respondent. Logging hourly wages allows easy interpretation of the coefficients, which can be read roughly as increasing or decreasing wages in terms of a given percentage (Monks 2000).[5] Additionally, because some individuals reported making a non-missing amount of $0.00, I added a small positive constant ($0.01) to all individuals before taking the logs.

The main predictor variables of interest are a series of interaction terms measuring educational attainment and whether or not an individual attended a for-profit college in pursuit of their higher education.[6] Individuals may have graduated high school, completed some college but did not earn a degree, completed an associate's degree, or completed a bachelor's degree. College-goers at the "some college" and "associate's degree" levels are coded further in one of three ways: (1) having attended only for-profit colleges during their college career,

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similar, but the cell sizes of those with graduate degrees (particularly those who had attended for-profit colleges) were too small to produce meaningful or precise estimates.

[3]This last restriction removes roughly 1,000 respondents, who on average are less educated, are more likely to be black, and come from lower socioeconomic statuses than those retained. Importantly, however, there were no significant differences in the proportion of respondents who attended for-profit colleges based on whether or not they had missing wage data.

[4]I used NLSY97 sample weights for the descriptive statistics and analyses, which adjust for over-sampling and differential attrition.

[5]In presenting my results, I calculate more accurate percent-change figures by: $exp(\beta) - 1$.

[6]In the NLSY97, respondents report on the colleges in which they were enrolled in each survey year. If during a given year, respondents attended multiple colleges, they report on each of those schools separately. The colleges that respondents report attending are linked to the colleges' sector (for-profit, or public or private, nonprofit) via the Integrated Postsecondary Education Data System (IPEDS) from the National Center for Education Statistics.

Table 4.1: Distribution of educational attainment and college type

| | Unweighted $N$ | Weighted percent | SE |
|---|---|---|---|
| Completed high school | 1119 | 26.68 | 0.75 |
| Completed some college | | | |
| Attended for-profit only | 94 | 1.87 | 0.22 |
| Attended both sectors | 145 | 3.03 | 0.28 |
| Attended nonprofit only | 1203 | 28.11 | 0.76 |
| Completed an associate's degree | | | |
| Attended for-profit only | 48 | 1.09 | 0.17 |
| Attended both sectors | 60 | 1.46 | 0.20 |
| Attended nonprofit only | 225 | 5.95 | 0.41 |
| Completed a bachelor's degree | | | |
| Attended for-profit[a] | 56 | 1.36 | 0.20 |
| Attended nonprofit only | 1077 | 30.46 | 0.80 |
| Total | 4027 | 100.00 | |

*Notes:* Percentages are weighted by NLSY97 sample weights; $N$ values are not weighted.
[a] The number of individuals in the sample who earned a bachelor's degree by attending for-profit colleges only is 10 (0.24%), and the number who earned a bachelor's degree by attending both sectors is 46 (1.11%). Given the small sample size of the former group, I combine these two groups into a single category based on whether one attended for-profit college at all. See Table C.1 for supplemental analyses that use the three-category college sector scheme.

(2) having attended both the for-profit and nonprofit sectors, or (3) having attended only public or private, nonprofit colleges. Given the relatively small number of bachelor's degree holders who attended only for-profit colleges (0.24% of the sample, or 10 individuals), this group is categorized by sector differently to ensure that there is sufficient power to estimate the wage effect of attending college in the for-profit sector. Bachelor's degree holders are coded in one of two ways: (1) having attended a for-profit college (exclusively or in conjunction with attendance at public or private, nonprofit colleges), or (2) having attended only public or private, nonprofit colleges. In short, categories 1 and 2 at the sub-baccalaureate level are collapsed into a single category (1) at the baccalaureate level.[7] As shown in Table

[7]While the NLSY97 is a useful dataset because it captures college-goers in the period of for-profit expansion, the fact that very few for-profit students complete a bachelor's degree is certainly a limitation (Bennett et al. 2010; Deming et al. 2012). Where there exist sufficiently large samples (i.e., for the "some college" and "associate's degree" groups), I use the three-category college sector scheme in the main analyses to capture potential variation in how individuals move through and experience college. Importantly,

4.1, roughly 8.8% of the sample attended a for-profit college (either exclusively or in combination with attending a public or private, nonprofit college) in pursuit of some college, an associate's degree, or a bachelor's degree.

The background individual-level measures used in this study have been shown to be significant predictors of educational attainment and earnings (Monks 2000; Dale and Krueger 2002; Black and Smith 2004; Brand and Halaby 2006; Brand and Xie 2010). An individual's background is measured by eight variables: age, sex, race, socioeconomic status, their mother's level of education, educational aspirations of their childhood peers, cognitive ability, and high school achievement. Sex is coded as a dummy variable, where 1 = female. Race is coded as a series of dummy variables, indicating individuals who are black, Hispanic, mixed race (non-Hispanic), or non-black, non-Hispanic (the final variable includes white and Asian respondents, and serves as the referent category throughout the analyses).[8] Socioeconomic status is operationalized as the net worth (in 10,000 dollars) of the individual's household during the initial few years of the NLSY survey period. Mother's education is a dummy variable indicating whether she has attended at least four years of college. The educational childhood aspirations of one's childhood peers is measured as a dummy variable, where 1 = at least half of an individual's peers aspired to college. Cognitive ability is operationalized by an individual's score on the Armed Services Vocational Aptitude Battery (ASVAB), which

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the difference in categorization at the sub-baccalaureate and baccalaureate levels retains the theoretical focus of this study—namely, the effect of attending a for-profit college (as opposed to, e.g., where a degree was earned). The question under investigation is whether attendance at this sector results in earnings that are lower or higher than what would be expected had one stopped their education after completing high school or pursued their postsecondary education solely at a public or private, nonprofit colleges. Attendance at the for-profit sector incurs high costs and debt (Knapp et al. 2011; Deming et al. 2012; Mettler 2014), and so attendance is particularly policy-relevant. Additionally, I include supplementary analyses in Table C.1 in which I code bachelor's degree holders according the three sector categories used for the sub-baccalaureate level. The core results are substantively similar (see the notes in Table C.1 for a fuller discussion).

[8]There may be reasons to disaggregate the referent category to its constituent parts (i.e., to separate white respondents from Asian or other racial groups). However, prior research shows—and results from Table 4.3 in this chapter corroborate—that differences in for-profit attendance and in post-schooling earnings are most stark between non-Asian minorities (and especially black students) and white/Asian students (Chung 2012; Deming et al. 2012). The "non-black, non-Hispanic" group in this chapter's analyses constist overwhelmingly of these latter racial groups.

Table 4.2: Summary statistics of dependent and independent variables

| | Mean/percent | SE |
|---|---|---|
| Dependent variable | | |
| Logged average hourly wages | 2.74 | 0.01 |
| College pathway variables | | |
| Age at college entry[a] | 19.15 | 0.03 |
| Deviation from college entry to completion (%)[a] | 57.69 | 0.01 |
| Demographic characteristics | | |
| Age | 26.87 | 0.03 |
| Female (%) | 48.19 | 0.86 |
| Black (%) | 13.17 | 0.46 |
| Hispanic (%) | 12.59 | 0.46 |
| Mixed race, non-Hispanic (%) | 1.22 | 0.20 |
| Non-black, non-Hispanic (%) | 73.02 | 0.66 |
| Household net worth (in $10k) | 9.86 | 0.26 |
| Mother has at least 4 years of college (%) | 21.18 | 0.73 |
| At least half of peers aspired to college (%) | 88.81 | 0.52 |
| Married in 2009 (%) | 35.36 | 0.83 |
| Had any children in 2009 (%) | 36.47 | 0.82 |
| ASVAB | 52.44 | 0.50 |
| High school GPA | 2.90 | 0.01 |
| Regional controls | | |
| Lives in MSA in 2009 (%) | 95.39 | 0.36 |
| Lives in the northeast (%) | 16.28 | 0.64 |
| Lives in the north central (%) | 25.89 | 0.77 |
| Lives in the south (%) | 35.67 | 0.82 |
| Lives in the west (%) | 22.16 | 0.71 |
| Employment controls | | |
| Number of weeks unemployed in 2009 | 2.5 | 0.12 |
| Work experience (years since age 16) | 8.41 | 0.04 |
| Tenure in current job (in years) | 3.22 | 0.04 |
| *N* | 4027 | |

*Notes:* All means are weighted by NLSY97 sample weights; *N* value is not weighted. Descriptive statistics and variable descriptions for field of study and occupation can be found in Tables C.2 and C.3, respectively.
[a] Pathway variables refer only to college-goers ($N$=2908).

was administered to respondents during the first round of the NLSY in 1997 (thus prior to college attendance), and tested individuals on mathematical reasoning, word knowledge, and reading comprehension.[9] High school achievement is measured as the student's overall high

[9]While ASVAB scores are imperfect measures of ability, they are commonly used in the literature as a

school grade point average. Including measures of ability as proxies for unobserved selection effects should reduce the estimated education coefficients so that these coefficients capture the effect of education alone (Harmon et al. 2003). To these background variables, I add two life-course measures known to affect wages: whether an individual was married and had any children at the time of the 2009 survey (Hodges and Budig 2010; Light 2004; Budig and England 2001).

The full models also control for the regional location and employment experiences of individuals. Whether or not one resides in a metropolitan statistical area, the region of the country in which one lives, and the occupational field in which one works are all measured by dummy variables. Additionally, I include the number of weeks one is unemployed during 2009 (the year in which one's wages are measured and which is after one has completed—at least for now—their education), one's work experience (measured as the number of years worked since age 16), and one's tenure (number of years) in their current job. The inclusion of occupational field dummies should absorb the portion of the effect of education on wages that comes from occupational mobility (Psacharopoulos and Patrinos 2004), while experience and tenure should control for the additional human capital one gains on-the-job both pre– and post-college (Monks 2000).

Finally, in models restricted to college-goers, I include variables that measure an individual's pathway to and through college in certain model specifications (i.e., those which examine horizontal stratification among college-goers). When an individual enters college and how long they take to complete a college degree affect how much they can expect to benefit from their advanced education (Bozick and DeLuca 2005; Elman and O'Rand 2004; Monks 1997; Light 1995), and so I include two variables measuring individuals' postsecondary pathways. First, I include their age in years when they first matriculated to college. Second, I include a dichotomous variable indicating whether individuals took longer than 3 years to complete an associate's degree or longer than 6 years to complete a bachelor's degree.[10]

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measure of cognitive aptitude and intelligence (Monks 2000; Belley and Lochner 2007).

[10]Over all rounds of the NLSY97, individuals report whether they were enrolled in a postsecondary in-

### *4.2.2 Missing Data*

A number of variables contained missing information: household net-worth (missing for 1.19% of individuals), mother's educational attainment (4.84%), peers' educational aspirations (1.12%), ASVAB score (16.76%), high school grade point average (24.76%), whether an individual lived in an MSA (0.05%), and the region of the country in which an individual lived (0.45%). To handle this missing data, I employ multiple imputation using the ice program in Stata 12, which is based on multivariate imputation by chained equations (Royston 2004). I created ten sets of imputed data and followed Rubin's rules for combining regression results across the ten datasets (Rubin 1987). Other, though more biased, methods for dealing with missing data include list-wise deletion (which leads to a substantial loss of observations) and single imputation (which tends to produce overly conservative standard errors).[11]

### *4.2.3 Analytical Strategy*

For the main analyses, I will estimate a similar statistical model using Ordinary Least Squares (OLS) as has been consistently employed in research investigating the relationship between education and wages (Mincer 1974; Brewer et al. 1999; Monks 2000; Yakusheva 2010):

$$Log(W_i) = \beta_0 + \beta_1 \mathbf{X}_i + \beta_2 \mathbf{C}_i + \mu_i, \tag{4.1}$$

where the logged hourly wages ($Log(W_i)$) are regressed on a vector of individual characteris-

stitution and whether they had received a degree from a particular college for each month of the given survey year. I use this information to calculate how long it took an individual to earn a given degree. I also estimated the models using other specifications (whether individuals took longer than 2 years to earn an associate's degree or longer than 4 years to earn a bachelor's degree, and whether individuals took longer to complete a given degree than one standard deviation above the sample mean), and the results were substantively similar.

[11] I also estimated the models presented throughout using these two methods (not shown), and obtained substantively similar core results as those presented here.

tics ($\mathbf{X}_i$) and a vector of the interaction terms indicating educational attainment and college sector ($\beta_2\mathbf{C}_i$), with a normally distributed error term ($\mu_i$).

There is concern that Eq. 4.1 suffers from omitted variable bias, particularly if an individual or family trait is omitted that affects both wages and college attendance (both in general and by sector). However, the models include a rich set of controls, some of which (e.g., the individual's high school performance, mother's level of education, the aspirations of one's peers to attend college) proxy for the individual's and family's taste and ambition for education, thereby minimizing such bias (Brand and Halaby 2006; Brand and Xie 2010). In addition, I estimate the effect of attending a for-profit college experienced by those who receive the treatment using propensity score matching as a robustness check to the OLS results (Brand and Halaby 2006; Brand and Xie 2010; Lang and Weinstein 2012).[12]

The propensity score is the probability of receiving a treatment given pretreatment characteristics (Rosenbaum and Rubin 1983). In this case, the treatment is attending a for-profit college (either exclusively or in addition to attending nonprofit colleges) on their way to their current education level. Propensity scores were calculated by estimating logistic regressions modeling selection into for-profit colleges. The covariates that will be used to predict for-profit college attendance as compared to graduating from high school or attending a public or private, nonprofit college, and which mirror those presented in Table 4.1, are rooted in the prior literature. For instance, the opportunity to pursue higher education is unequally distributed across the population (Hout 2012; Raftery and Hout 1993; Lucas 2001). Coming from a family of lower socioeconomic status, for instance, is expected to increase the odds of attending a for-profit college among those who do attend college at all since socioeconomically advantaged parents may not only encourage their children to attend college but are also able to coach them on how and where to apply (Lucas 2001). Additionally, ability (as mea-

[12]Other methods used by researchers to deal with this issue include an instrumental variable (IV) approach (Behrman et al. 1996). However, there is some evidence that IV estimation may further bias estimates of the effect of education on earnings. IV estimates are often higher than OLS estimates, though it is unclear whether this is due to measurement error or weak instrumentation (Psacharopoulos and Patrinos 2004; Heckman and Urzua 2009).

sured by one's score on the ASVAB), prior academic achievement (high school grade point average), sex, and race have been shown to enter into both the decision to attend college after high school and the decision of which college to attend (Perna 2000; Jacob 2002; Cho 2007; Turley et al. 2007). I also include additional measures in the logistic models such as the number of siblings in one's family (Downey 1995) and competing life demands like being married or having a child prior to high school graduation or college matriculation (Bozick and DeLuca 2005).

This analytical approach is not without its limitations. A key assumption of propensity score matching is that observables can account for the selection process into treatment (Dehejia and Wahba 2002). In other words, like linear regression, matching does not account for selection into the treatment on unobservables (Brand and Halaby 2006). Until more is known about what influences an individual to enroll in a for-profit college, as opposed to a public or private, nonprofit institution or not enrolling in college at all, the covariates used in this study to estimate one's propensity to attend a for-profit college are likely to miss some variation. Recognizing this difficulty, I assess both whether the propensity score successfully balanced the data on observed covariates and whether the propensity score analyses are robust to potential omitted variable bias. To assess the former, I examine $t$-tests of covariates' mean values between the treatment and control groups prior to and after matching, and the samples appear balanced. Additionally, as shown in Table 4.5, the overall mean bias decreases considerably post-match. I test for potential omitted variable bias using the Rosenbaum bounds test (Gangl 2004; DiPrete and Gangl 2004). This test estimates "gamma" statistics (also shown in Table 4.5); higher gamma values suggest that the model is less sensitive to bias from omitted variables. These gamma statistics represent "worst case scenarios" in that a given value of gamma does not mean that there is no true positive or negative effect of attending a for-profit college on wages, only that the effect may contain zero if an unobserved variable caused the odds ratio of attending a for-profit college (i.e., assignment to the treatment) to differ between treatment and control groups by the gamma value and strongly predicted the outcome variable (DiPrete and Gangl 2004:291). To take

one example, the for-profit associate's degree versus public or private, nonprofit effect has a gamma of 1.2, indicating that for the difference in wages to be rendered statistically non-significant, there would need to be an unmeasured variable that both increases the odds of earning an associate's degree from a for-profit college as opposed to earning an associate's degree form a public or private, nonprofit college by 1.2 and is strongly predictive of one's logged hourly wages.

Once assignment to the treatment has been conditioned on the observables by the logistic regressions, I estimate the Average Treatment Effect on the Treated (ATT), which can be expressed as follows:

$$\tau|(T = 1) = E[(Y_T - Y_{\sim T})|T = 1], \tag{4.2}$$

where $T = 1$ if an individual attended a for-profit college. The value of $\tau$ provides an estimate for the mean effect experienced by those who receive the treatment.[13] In this way, the ATT provides a comparison of the wages of for-profit attendees to what their wages would have been had they not attended a for-profit college (but instead either attended only a public or private, nonprofit college, or ended their education after graduating from high school). While the results from the OLS regressions compare all cases in the treatment (for-profit college attendees) and control (high school graduates or public and private, nonprofit college attendees) groups, the propensity score matching results compare only those cases that have matches.

[13]To perform the propensity score matching and compute the ATT and its standard error, I use the `pscore` (Becker and Ichino 2002) and `psmatch2` (Leuven and Sianesi 2003) procedures in Stata 12. To match treatment and control individuals, I used both radius and nearest neighbor matching, and they produced similar results. As in the OLS analyses, I estimate a separate ATT and standard error for each of the ten multiply imputed datasets and combine the estimates according to Rubin's rules (Rubin 1987). To test for omitted variable bias, I use the `rbounds` procedure (Gangl 2004).

## *4.3 Findings*

### *4.3.1 Comparing For-Profit College Students to High School Graduates and to Public and Private, Nonprofit College Students*

The discussion of findings begins with a brief descriptive comparison, presented in Table 4.3, of individuals who attended for-profit colleges at any point during their college career to those with only a high school diploma and those who attended only public or private, nonprofit colleges. For-profit students are significantly more likely to be black or of mixed race, and significantly less likely to be non-black and non-Hispanic, than either high school graduates or nonprofit college students. In terms of academic and family background, for-profit students appear to occupy a "middle ground" between high school graduates and nonprofit college-goers. For-profit students have weaker cognitive ability (as measured by ASVAB scores) and high school achievement than students who only attend public and private, nonprofit colleges, but stronger cognitive ability and high school achievement than high school graduates. Similarly, for-profit students come from families of lower socioeconomic status and have less educated mothers than public and private, nonprofit college students; compared on these measures to high school graduates, however, for-profit students are more advantaged. Individuals who attend any sector of college are also more likely to be surrounded by peers who aspire to college and to be female as compared to high school graduates. In these ways, for-profit colleges do appear to be extending access to higher education, at least to individuals on the margins; that is, for-profit students may not have pursued college in a market consisting only of public or private, nonprofit institutions but they are also more advantaged—and thus more likely to enter higher education—than those who stop their education after completing high school.

Additionally, students attending for-profit colleges take on over $3500 more in education-related loans, and are more likely than students who did not attend for-profit colleges to complete some college (without earning a degree) or to complete an associate's degree, but much less likely to complete a bachelor's degree. For-profit students entered college later on

average than their nonprofit counterparts, and were more likely to take longer than 3 years to complete their associate's degree or longer than 6 years to complete their bachelor's degree. They were also unemployed for more weeks in 2009. These descriptive findings support what prior research has also found (Morey 2004; Bennett et al. 2010; Deming et al. 2012). Furthermore, some differences between for-profit students on the one hand and high school graduates or public and private, nonprofit college students on the other hand are apparent in terms of occupation and field of study. Looking at occupations, for-profit students are less likely to enter the management and business fields compared to public and private, nonprofit students. As compared to high school graduates, for-profit college students are more likely to work in either management or administrative occupations, and much less likely to work in a blue-collar occupation. Furthermore, prior research on for-profit colleges notes that these institutions tend to focus on particular fields of study—namely, those rooted in practical and technical skills (Morey 2004). More recently, however, for-profit colleges have increasingly set their sights on the traditional curriculums of public and private nonprofit schools (Morey 2004). The results in Table 4.3 bear both these assertions out. While for-profit students are no more or less likely to major in such fields as science and math or the social sciences and humanities, they are significantly less likely to major in education and more likely to major in business, health, and pre-professional fields.

Table 4.3: Descriptive statistics by education level and for-profit college attendance

| | High school graduate | Attended for-profit colleges | Attended only nonprofit colleges |
|---|---|---|---|
| Logged average hourly wages | 2.59 | 2.63 | 2.81*** |
| Total education debt (in $1k)[a] | | 8.55 | 4.84*** |
| Female (%) | 39.63*** | 55.46 | 50.74 |
| Black (%) | 14.07*** | 21.93 | 11.60*** |
| Hispanic (%) | 15.60 | 17.38 | 10.69*** |
| Mixed race, non-Hispanic (%) | 0.74** | 3.39 | 1.13** |
| Non-black, non-Hispanic (%) | 69.60*** | 57.31 | 76.58*** |
| Age | 26.91 | 26.97 | 26.84 |
| ASVAB | 35.46*** | 47.34 | 60.16*** |
| High school GPA | 2.57*** | 2.75 | 3.06*** |
| Household net worth (in $10k) | 5.68** | 8.56 | 11.73*** |

| | | | |
|---|---|---|---|
| Mother has at least 4 years of college (%) | 5.98*** | 18.45 | 27.84*** |
| At least half of peers aspired to college (%) | 80.62*** | 92.16 | 91.74 |
| Married in 2009 (%) | 33.70 | 32.99 | 36.36** |
| Had any children in 2009 (%) | 47.96 | 42.18 | 30.94*** |
| Has completed some college (%) | | 55.63 | 43.56*** |
| Has associate's degree (%) | | 28.96 | 9.23*** |
| Has bachelor's degree (%) | | 15.41 | 47.21*** |
| Age at college entry | | 19.94 | 19.04*** |
| Deviation from college entry to completion (%) | | 72.16 | 55.72*** |
| Number of weeks unemployed in 2009 | 3.41 | 3.04 | 2.05* |
| Work experience (years since age 16) | 8.46 | 8.32 | 8.41 |
| Tenure in current job (in years) | 3.41*** | 2.79 | 3.19** |
| | | | |
| Occupations | | | |
| Management, business, professional | 8.91*** | 31.27 | 29.54** |
| Service | 25.40 | 22.28 | 17.24* |
| Sales | 9.87 | 10.49 | 13.65 |
| Office and administrative | 13.01* | 18.57 | 14.95 |
| Blue collar | 41.15*** | 16.65 | 14.14 |
| Missing/unknown | 1.66 | 0.75 | 0.48 |
| | | | |
| Fields of study[a] | | | |
| Science and math | | 16.15 | 17.06 |
| Social sciences and humanities | | 27.43 | 29.50 |
| Business | | 24.78 | 19.80* |
| Education | | 1.06 | 8.34*** |
| Health | | 14.02 | 10.26* |
| Pre-professional | | 2.36 | 0.78* |
| Other | | 5.85 | 5.18 |
| Missing/unknown | | 8.35 | 9.07 |
| | | | |
| *N* | 1119 | 403 | 2505 |

*Notes:* Percentages are weighted by NLSY97 sample weights; *N* values are not weighted. Statistical significance of each difference between for-profit college attendees and either high school graduates or college-goers who did not attend for-profit institutions is indicated by: *$p<0.05$, **$p<0.01$, ***$p<0.001$.
[a] Neither total education-related debt (from governmental sources) nor field of study is included in the regression models since they may be endogenous to college choice, but these variables are included in this table given their salience to the educational experiences of for-profit and public or private, nonprofit college students.

Finally, Table 4.3 provides a baseline difference in average hourly wages among these three groups. Without controlling for any background or employment-related traits, individuals who attend for-profit colleges earn roughly 18% ($exp[2.64 - 2.84] - 1 = -0.18$) less per hour than individuals who attend only public or private, nonprofit colleges and a statistically non-significant 5% ($exp[2.64 - 2.59] - 1 = 0.05$) more than high school graduates.

### *4.3.2 Differences in Wages Across Levels of Educational Attainment and College Sector*

Table 4.4 presents the regression coefficients of the effects of an individual's education level, college sector, and background on their average hourly wage. Model 1 shows the reduced-form estimates of the relationship between an individual's logged hourly wages and their level of educational attainment and college sector attended. Without controlling for any background or contextual factors, those who earn a bachelor's degree by attending either nonprofit or for-profit colleges earn significantly more than those with only a high school education. However, those who complete some college or an associate's degree by attending a for-profit college at all in the college career (either exclusively or in combination with nonprofit colleges) appear to earn no more or no less than those with only a high school education. In this way, attending a for-profit college appears to pay off in terms of significantly higher earnings than ending ones education after high school only if a for-profit student can complete a bachelor's degree.[14] It is possible that the non-significant difference in earnings between for-profit associate's degree holders and high school graduates is due either to the groups having statistically equivalent earnings, or to the fact that the estimates of for-profit wages are imprecise given the smaller sample sizes. While the latter is a concern, power analyses suggest that the sample sizes in this study are large enough to guarantee at least 90% statistical power.

Models 2 through 5 in Table 4.4 iteratively add demographic and employment characteristics. Noteworthy is the observation that there is no significant racial difference in wages in the final model. While blacks earn between about 8% ($exp[-0.08] - 1 = -0.08$) and 13% ($exp[-0.14] - 1 = -0.13$) less than non-black, non-Hispanic individuals in models 2 through 4, this difference is no longer significant once employment controls are included in model 5. This fits with research that finds that racial differences in earnings are at least

[14]In column 1 in Table C.1, I report the wage effect for three categories of college sector attendance, finding an insignificant positive return to completing a bachelor's degree by attending for-profit colleges only. However, this result must be interpreted with caution since it is based on a small sample of only 10 individuals.

partly explained by students' socioeconomic and family background, academic performance, and job experience (Rumberger and Thomas 1993; Kao and Thompson 2003; Tomaskovic-Devey et al. 2005; Moore 2010). Black and Hispanic students also attend on average less prestigious institutions than their non-black, non-Hispanic counterparts (Kao and Thompson 2003). Perhaps, then, the effect of race on wages is being absorbed by other factors, including minorities' overrepresentation in for-profit and other less prestigious institutions as well as high school achievement and socioeconomic status (Velez 1985; Donovan 1984).

Table 4.4: Results of the effects of an individual's educational attainment, college type attended, and background on their logged hourly wages in 2009

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| Education & college type (ref.: completed high school) | | | | | |
| Some college, attended FP only | -0.04 | 0.02 | 0.01 | -0.01 | 0.03 |
| | (0.05) | (0.04) | (0.04) | (0.05) | (0.05) |
| Some college, both sectors | -0.03 | 0.02 | -0.01 | -0.03 | -0.01 |
| | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) |
| Some college, attended NP only | 0.10*** | 0.11*** | 0.08** | 0.08** | 0.08** |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Associate's degree, attended FP only | 0.02 | 0.02 | -0.01 | -0.02 | -0.06 |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) |
| Associate's degree, both sectors | -0.02 | -0.00 | -0.04 | -0.07 | -0.10 |
| | (0.20) | (0.20) | (0.20) | (0.20) | (0.19) |
| Associate's degree, attended NP only | 0.24*** | 0.24*** | 0.21*** | 0.20*** | 0.16*** |
| | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) |
| Bachelor's degree, attended FP[a] | 0.33*** | 0.35*** | 0.31*** | 0.28*** | 0.20*** |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) |
| Bachelor's degree, attended NP only | 0.31*** | 0.31*** | 0.24*** | 0.23*** | 0.19*** |
| | (0.03) | (0.03) | (0.04) | (0.04) | (0.04) |
| Background characteristics | | | | | |
| Age | | 0.03*** | 0.04*** | 0.03*** | 0.01 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Female | | -0.21*** | -0.21*** | -0.22*** | -0.19*** |
| | | (0.02) | (0.02) | (0.02) | (0.02) |
| Race (ref.: non-black, non-Hispanic) | | | | | |
| Black | | -0.14*** | -0.10*** | -0.08** | -0.05 |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| Hispanic | | 0.01 | 0.03 | -0.00 | 0.01 |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| Mixed race, non-Hispanic | | -0.02 | -0.01 | -0.01 | 0.00 |
| | | (0.09) | (0.09) | (0.09) | (0.09) |
| Household net worth (in $10k) | | 0.002** | 0.002** | 0.002** | 0.002** |

| | | | | | |
|---|---|---|---|---|---|
| | | (0.001) | (0.001) | (0.001) | (0.001) |
| Mother has at least 4 years of college | | -0.01 | -0.02 | -0.03 | -0.01 |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| At least half of peers aspired to college | | 0.04 | 0.02 | 0.03 | 0.02 |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| Married in 2009 | | 0.06* | 0.05* | 0.06* | 0.03 |
| | | (0.02) | (0.02) | (0.02) | (0.02) |
| Had any children in 2009 | | -0.00 | 0.00 | 0.01 | 0.02 |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| Cognitive ability (ASVAB) | | | 0.002*** | 0.002** | 0.001* |
| | | | (0.001) | (0.001) | (0.00) |
| High school GPA | | | 0.03 | 0.05 | 0.05 |
| | | | (0.03) | (0.03) | (0.03) |
| Employment controls | | | | | |
| Number of weeks unemployed in 2009 | | | | | -0.002 |
| | | | | | (0.002) |
| Work experience (years since age 16) | | | | | 0.02 |
| | | | | | (0.03) |
| Experience$^2$ | | | | | 0.00 |
| | | | | | (0.00) |
| Tenure in current job (years) | | | | | 0.05*** |
| | | | | | (0.01) |
| Tenure$^2$ | | | | | -0.004*** |
| | | | | | (0.001) |
| Regional controls | No | No | No | Yes | Yes |
| Occupation controls | No | No | No | No | Yes |
| *N* | 4027 | 4027 | 4027 | 4027 | 4027 |

*Notes:* Standard errors are in parentheses. Intercept is not shown. Coefficients and standard errors were estimated separately for each of the ten multiply imputed datasets I created; the results, which are presented here, are then pooled using Rubin's rule (Rubin 1987). Data are weighted. Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

[a] Given the small sample size of the group that completed a bachelor's degree by exclusively attending for-profit colleges ($n$=10), I combine these two groups into a single category based on whether one attended for-profit college at all. See Table C.1 for supplemental analyses that use the three-category college sector scheme.

Turning to the effect of education and college sector on hourly wages, the results are markedly consistent across all models. When only age, race, sex, and socioeconomic indicators are included in the model (model 2), attending for-profit colleges (either exclusively or in combination with nonprofit schools) and earning no degree or an associate's degree results in earnings that are not significantly different from those of high school graduates, while attending for-profit colleges and obtaining a bachelor's degree results in about 42%

($exp[0.38] - 1 = 0.42$) higher average hourly wages compared to high school graduates. Adding prior academic achievement, cognitive ability, regional controls, and employment experience (as in models 3 through 5) does not change the non-significant effect of attending a for-profit college for individuals with some college or an associate's degree compared to high school graduates. This suggests that the self-selection of academically weaker individuals and individuals of color or from lower socioeconomic statuses into for-profit colleges (Bennett et al. 2010; Government Accountability Office 2011) cannot fully explain the lack of earnings gains for attending a for-profit institution at the sub-baccalaureate level as opposed to not attending college at all. While the earnings premium for the bachelor's degree holders who attend for-profit colleges compared to high school graduates remains positive and significant, controlling for employment, region, and prior academic achievement does markedly attenuate the effect. In sum, the evidence thus far supports both Hypotheses H1a and H1b; individuals who attend for-profit colleges do receive higher hourly earnings than those who did not attend college at all, but only at the baccalaureate level.

Having explored the vertical dimension of education, we turn now to the horizontal dimension and focus only on college-goers. Column 1 in Table 4.5 reprints the results from model 5 in Table 4.4, but note that the referent educational category has changed. Instead of comparing college-goers to high school graduates, each row in Table 4.5 compares those with a given educational attainment level who attended for-profit colleges (exclusively or in conjunction with nonprofit colleges) to those at the same educational level who attended only public or private, nonprofit colleges. Column 2 then adds the two variables representing one's pathway to and through college.

Four findings related to horizontal stratification emerge from Table 4.5. First, even though individuals who attended for-profit colleges but did not earn a degree earned no more or less than high school graduates (as in Table 4.4), their earnings were also not significantly different from individuals who exclusively attended public or private, nonprofit colleges. Second, bachelor's degree holders who attended for-profit colleges—either exclusively or in conjunction with nonprofit colleges—encountered hourly wages that were also not different

Table 4.5: Taking into account heterogeneous pathways through college

| | Model 5 from Table 4.4 | + Pathway variables |
|---|---|---|
| Referents: attended only public or private, nonprofit for given education level | | |
| Some college, attended FP only | -0.05 | 0.01 |
| | (0.05) | (0.05) |
| Some college, both sectors | -0.09 | -0.09 |
| | (0.11) | (0.11) |
| Associate's degree, attended FP only | -0.22** | -0.25*** |
| | (0.08) | (0.08) |
| Associate's degree, both sectors | -0.26 | -0.25 |
| | (0.20) | (0.20) |
| Bachelor's degree, attended FP[a] | 0.02 | 0.04 |
| | (0.07) | (0.07) |
| Age at college entry | | -0.03** |
| | | (0.01) |
| Deviation from college entry to completion | | -0.14*** |
| | | (0.04) |
| *N* | 2908 | 2908 |

*Notes:* Sample is restricted to college-goers. Each cell displays the coefficient obtained from a regression model in which the referent model is the "attended only public or private, nonprofit college" category at the given education level; in other words, each coefficient in the table compares logged hourly wages for those who attended or eanred a degree from a for-profit college to those who attended or earned that same degree or educational level exclusively from a nonprofit college. All models also include the same set of controls as in model 5 from Table 4.4 (not shown). Standard errors are in parentheses. Intercept is not shown. Coefficients and standard errors were estimated separately for each of the ten multiply imputed datasets I created; the results, which are presented here, are then pooled using Rubin's rule (Rubin 1987). Data are weighted. Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

[a] Given the small sample size of the group that completed a bachelor's degree by exclusively attending for-profit colleges ($n$=10), I combine these two groups into a single category based on whether one attended for-profit college at all. See Table C.1 for supplemental analyses that use the three-category college sector scheme.

from their counterparts who attended only nonprofit colleges. This is in slight contrast with the findings of Deming et al. (2012), who estimated a statistically significant $1800 to $2000 difference in annual income between for-profit and nonprofit college attendees. However, their analysis is based on a different sample (only first-time students, as a function of the BPS dataset), on pooling all levels of college attainment (from some college through a bachelor's degree), and on measuring college sector by the institution at which one begins

their postsecondary education. In supplemental analyses that contain only those starting out in bachelor's degree programs, they find that the effect of starting out in a for-profit college is not significant. Third, individuals who attended only for-profit colleges in pursuit of an associate's degree earned about 20% ($exp[-0.22] - 1 = -0.20$) less than associate's degree holders who attended only nonprofit colleges, a statistically significant difference. In these ways, I find support for Hypotheses H2a and H2c; horizontal stratification appears to operate at the associate's degree level, such that two-year degree holders who attend only for-profit colleges earn significantly less than two-year degree holders who attend only public or private, nonprofit colleges, while no other significant differences by sector obtain. Finally, the addition of the pathway variables does not alter these relationships, though the effects of pathway variables themselves are statistically significant and in the expected direction (Bozick and DeLuca 2005; Elman and O'Rand 2004; Monks 1997; Light 1995). Thus, I fail to find support for Hypothesis H2b.

### *4.3.3 Robustness Check: Propensity Score Matching*

The average treatment effects of attending a for-profit college obtained from the propensity score matching analyses, as well as key tests of balance and bias, are presented in Table 4.6. Here, the treatment is attending a for-profit college, and so the two categories from earlier analyses (attending only a for-profit school and attending for-profit college in conjunction with nonprofit college) are combined.[15] These results from the propensity score analyses largely corroborate the findings related to horizontal and vertical stratification presented above. The effect of attending a for-profit college as compared to only public and private, nonprofit colleges on hourly wages is generally negative. Among those who attend college but do not complete a degree, for-profit students earn about 13% ($exp[-0.14] - 1 = -0.13$)

[15]I also ran the propensity score matching analyses for the some college and the associate's degree completers (columns 1 through 4 of Table 4.6) using as the treatment group just those who attended for-profit colleges exclusively (the control groups remained high school graduates and college-goers who attended only nonprofit institutions). The core results were unchanged. I could not rerun these analyses for the bachelor's degree recipients—columns 5 and 6—who attended for-profit colleges exclusively because this group's cell size was too small at only 0.24% of the full sample.

Table 4.6: Propensity score matching results: ATT and balance and robustness tests

| | FP some college vs. | | FP AA vs. | | FP BA vs. | |
|---|---|---|---|---|---|---|
| | HS | Some college, no FP | HS | AA, no FP | HS | BA, no FP |
| ATT[a] | -0.04 | -0.14* | 0.06 | -0.20* | 0.31*** | -0.01 |
| SE | 0.06 | 0.06 | 0.09 | 0.09 | 0.07 | 0.07 |
| $N$ treatment[b] | 235 | 236 | 104 | 101 | 49 | 55 |
| $N$ control[c] | 1119 | 1203 | 1119 | 225 | 1119 | 1076 |
| Balance of matched samples | | | | | | |
| Mean bias (SD), pre-match | 17.63 (12.13) | 16.38 (9.15) | 23.54 (13.75) | 15.16 (13.11) | 43.21 (35.43) | 24.51 (19.25) |
| Mean bias (SD), post-match | 6.17 (8.63) | 6.74 (4.76) | 3.39 (2.39) | 5.97 (6.66) | 10.89 (7.51) | 12.04 (11.45) |
| Pseudo $R^2$, pre-match | 0.13 | 0.07 | 0.15 | 0.10 | 0.42 | 0.15 |
| Pseudo $R^2$, post-match | 0.04 | 0.02 | 0.01 | 0.02 | 0.05 | 0.05 |
| LR chi$^2$, pre-match | 157.62 | 90.11 | 107.91 | 41.15 | 188.51 | 65.59 |
| LR chi$^2$, post-match | 22.79 | 12.42 | 1.67 | 5.89 | 7.23 | 7.39 |
| Robustness of potential omitted variable bias | | | | | | |
| Gamma[d] | 1.20 | 1.12 | 1.47 | 1.20 | 2.67 | 1.21 |

*Notes:* Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

[a] ATT and its standard error were estimated separately for each of the ten multiply imputed datasets I created; the results, which are presented here, are then pooled using Rubin's rule (Rubin 1987). ATT and SE are weighted by NLSY97 sample weights.

[b] Treatment group refers to individuals who attended a for-profit college.

[c] Control group refers either to high school graduates or to public and private, nonprofit college-goers.

[d] Gamma statistics indicate how much an unobserved variable would need to cause the odds ratio of treatment assignment to increase for a null hypothesis of no effect to fail to be rejected.

less in hourly wages than comparable public and private, nonprofit students; whereas in the OLS results from Table 4.4 the coefficients for neither of the for-profit college groups were statistically significant, the ATT is significant in the propensity score models. Similarly, earning an associate's degree from a for-profit college results in hourly wages that are 18% ($exp[-0.20]-1=-0.18$) less than earning an associate's degree exclusively from public and private, nonprofit colleges. As in the OLS analyses, the wages of bachelor's degree holders do not vary significantly by college type.

Turning to the comparison between for-profit college students and their high school graduate counterparts, we again find evidence that vertical educational stratification is not oper-

ating as we might expect at the sub-baccalaureate level. Neither attending a for-profit college but failing to complete a degree nor earning an associate's degree by attending a for-profit college results in wages that are significantly different from those of high school graduates. However, obtaining a bachelor's degree from a for-profit college does result in significantly higher wages—by about 36% ($exp[0.31] - 1 = 0.36$)—as compared to completing only a high school diploma.

Overall, the propensity score analyses coupled with their Rosenbaum bounds tests do not provide unequivocal evidence as to whether the differences in wages between for-profit college attendance and public or private, nonprofit college attendance at the sub-baccalaureate level are due to unobserved heterogeneity. At the same time, the findings from the OLS regression analyses and the propensity score matching taken together do suggest that these differences—as well as the lack of difference between for-profit college attendees who either did not complete a degree or who earned an associate's degree and high school graduates—are not completely explained by unobserved selection.

### *4.4 Conclusion*

This chapter has explored the vertical and horizontal dimensions of education with respect to college sector. Contrary to the general expectation of the vertical dimension that pursuing higher education is related to higher wages (Fischer and Hout 2006; Goldin and Katz 2008; Long 2008; 2010; Hout 2012; Oreopoulos and Petronijevic 2013), I find no significantly positive returns to completing either some college or an associate's degree at for-profit colleges relative to possessing only a high school diploma. Further, bachelor's degree holders who attend for-profit colleges—either exclusively or in conjunction with public or private, nonprofit colleges–do earn significantly more than high school graduates. In terms of the horizontal dimension, associate's degree holders who attended for-profit colleges earned significantly less than associate's degree holders who did not attend for-profits, while for-profit and nonprofit attendees with some college or bachelor's degrees earned roughly equivalent hourly wages. This study also demonstrated that self-selection into college in general and

college type in particular by observable traits such as cognitive ability and socioeconomic background does not fully explain the lack of a consistent earnings gain from the completion of some college or an associate's degree at for-profit colleges as compared to not attending college at all.

Compared to public and private, nonprofit colleges, for-profit colleges do enroll greater proportions of black and Hispanic students as well as students from lower socioeconomic status and those with lower prior academic achievement. In this way, for-profit colleges might be said to contribute to helping traditionally underserved groups ascend the vertical dimension of educational stratification. However, it is also clear that for-profit college students come from relatively more advantaged backgrounds than high school graduates, suggesting that the opportunity to climb up the vertical ladder of educational stratification remains out of reach for some, despite the expansion of the higher education market represented by for-profit schools' recent growth (Turner 2006).

Additionally, for-profit colleges appear to constitute a distinct class of higher education institution in the sub-baccalaureate market, one that occupies a lower stratum than public and private, nonprofit colleges. Simply extending access to higher education—as for-profit colleges have apparently done—does not guarantee that individuals will encounter labor market outcomes commonly associated with greater levels of education. The lack of a consistent payoff to sub-baccalaureate attendance in the for-profit sector is further troubling given that attending a for-profit college is much more expensive than completing some college or an associate's degree at a public community college (Knapp et al. 2011; Cellini 2012; Mettler 2014). Nor does completing some college or an associate's degree at a for-profit institution compare favorably to a high school diploma in terms of both wage returns (as this study has shown) and costs. Indeed, the completion of a high school diploma is free if earned from a public school, while attending a for-profit college incurs both direct (e.g., tuition, interest on loans, etc.) and indirect (e.g., time spent out of the full-time labor force) costs.

At the same time, bachelor's degree holders who attended for-profit colleges earned generally higher wages than high school graduates and earnings that were not significantly

different from their equally educated counterparts who attended only public and private, nonprofit colleges. For for-profit bachelor's degree holders, then, vertical stratification appears to be operating largely as expected (in terms of higher earnings with more educational attainment) while horizontal stratification along the for-profit/nonprofit axis appears mostly absent. The difference in findings between the sub-baccalaureate and baccalaureate levels is potentially a function of the particular importance a bachelor's degree holds in today's economy. Since a growing list of occupations require college—and in particular bachelor's—degrees, the bachelor degree may serve as a kind of threshold at which point college sector becomes less important to employers in their hiring and compensation decisions than having a baccalaureate degree in general (Long 2010; Carnevale et al. 2010).

It is also important, however, to consider some of the disadvantages in pursing bachelor's degrees at for-profit colleges. Not only are individuals less likely to complete a bachelor's degree at a for-profit institution, the incurred cost of doing so in terms of sticker price and loan volume is also higher (Deming et al. 2012). In this way, while the early career earnings of for-profit bachelor's degree-holders may be statistically no different from their public and private, nonprofit educated counterparts, their tendency to take on higher levels of debt mean that they will have less disposable income, leading to potentially divergent qualities of life. It is also not the case that most for-profit students attend school part-time. In 2011, roughly 69.6% of students enrolled in four-year for-profit colleges were going to school full-time (National Center for Education Statistics 2012:Table 226),[16] and so a majority may not be offsetting the opportunity costs of full-time enrollment (e.g., in terms of sustained full-time labor market participation) that attending school part-time could offer.

While this study continues the work of documenting compelling evidence on the relationships between for-profit college attendance and educational attainment on the one hand

[16]The full-time enrollment rates of students at public and private, nonprofit four-year degree programs are 77.2% and 82.3%, respectively. Most students enrolled in any for-profit college attended classes full-time. Among all levels of enrollment, 71.4% of for-profit students were enrolled full-time; among two-year for-profit programs, 88.7% of students were enrolled full-time, and among post-baccalaureate degree-granting for-profit programs, 56.3% of students were enrolled full-time (National Center for Education Statistics 2012:Table 226).

and wages on the other hand, more can be done. For instance, future research might take a longer-term view of returns (as opposed to the cross-sectional analysis offered here). Given the restrictions placed on the sample (i.e., to be included in the sample, respondents had to be no longer enrolled in school), there is reason to believe that this study under– or over-estimates the negative effect of attending a for-profit college. For-profit colleges tend to serve on average an older student population (Morey 2004), and research shows that those who complete college at a later age receive a significantly lower earnings premium than those who graduate at a younger age (Elman and O'Rand 2004; Taniguchi 2005). Intuitively, earnings are lowest early in the career for all workers. Since earnings inequalities grow throughout a career, as some individuals are promoted or receive additional skill training (Rosenfeld 1992; Tomaskovic-Devey et al. 2005), a longitudinal approach could allow clearer identification of whether human capital or signaling are the primary drivers of the difference between for-profit and nonprofit college attendees or whether the difference dissipates over time. Due to the relative youth of the NLSY97 cohort, this is likely missed. While the NLSY97 is useful in that it includes individuals who advanced to college relatively recently and thus were more likely than older cohorts of other nationally representative datasets to have attended for-profit colleges, the young age of the NLSY97 respondents also means the study was able to look only at early life course earnings. Whether or not the wages of for-profit attendees and those who did not attend for-profit colleges converge, diverge, or march in step farther out than a few years from the traditional college age remains to be seen. Such longitudinal investigation will require data on more individuals who have attended college in this growing sector.

Relatedly, additional data is required on individuals who have attended for-profit colleges exclusively on their way to earnings a bachelor's degree. As noted previously, this group's small size in the NLSY97 necessitated combining individuals who attended a for-profit college at all on their way to a bachelor's degree into a single category to obtain reliable estimates. Future research that employs data that include larger numbers of individuals who obtained a bachelor's degree either exclusively or in part by attending college in the for-profit sector

may be able to unpack the effect of sector on wages by looking more closely at, for instance, the proportion of time spent in each sector or the institution from which a degree is earned.[17] Experimental methodologies that are able to more directly uncover and assess employers' attitudes toward the for-profit sector (such as audit studies) might provide further information as to the mechanism driving differences in earnings. Audit studies of associate's degree holders (Darolia et al. 2014; Deterding and Pedulla 2016) as well as Deming et al.'s (2016) investigation of business bachelor's degree holders provide models for what such studies could look like, and future research might consider looking at a broader spectrum of educational attainment and fields of study. Finally, earnings are not the only pertinent benefit to education. Other research has found positive relationships between education and improved life satisfaction, better health, and greater participation in community and political activities (Ross and Wu 1995; Milligan et al. 2003; Brand 2010). Investigation into whether and how attending a for-profit college impacts such non-pecuniary outcomes would thus be worthwhile.

As the for-profit postsecondary education sector continues to grow—both by picking up the slack in unmet demand resulting from the continued economic contracting of the public sector and by pushing into new geographic areas and student populations (Turner 2006; Barr and Turner 2013)—and be shaped by public discourse and governmental regulation, additional research will be necessary. The present study and others demonstrate that for-profit colleges provide educational opportunities to traditionally underserved populations, particularly students of color and from lower socioeconomic backgrounds (Deming et al. 2012). However, the challenge to for-profit colleges—and the researchers who study them—will be to critically examine whether they also constitute stratification generating institutions given their higher sticker price, the higher debt volume and default rates of their students, and, as the present study finds, the lower earnings garnered by certain segments of their students.

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[17] I thank an anonymous reviewer at *Social Science Research* for suggesting these possibilities for future research.

# Chapter 5

# Conclusion

The correlation between level of educational attainment and economic returns in the United States is at an all-time high (Goldin and Katz 2008). Attaining some college or an associate's degree is worth nearly $500,000 more in lifetime earnings than a high school diploma, and a bachelor's degree is worth about $1.6 million more (Carnevale et al. 2010). Earnings gains are especially important for those traditionally underrepresented in higher education, given what Brand and Xie (2010) identify as a "negative selection" effect, whereby those who are least likely to attend college are most likely to benefit from doing so. In short, as Gerber and Cheung (2008:300) have recently remarked, "One's level of education is the single most important factor shaping labor market opportunities in modern societies." Higher education is also related to non-economic benefits such improved life satisfaction, better health, more stable marriages, and greater participation in community and political activities (Brand 2010; Milligan et al. 2003; Ross and Wu 1995; Schwartz 2010).

At the same time, higher education is extremely varied. The popular blog *FiveThirtyEight* recently implored the media and the public to "shut up about Harvard."[1] By this, the post's author Ben Casselman meant that stories about the hyper-selective admissions processes of elite schools, so popular during the Spring when a small proportion of high school seniors are hearing from admissions committees, negatively impact our perception and understanding of the vast majority of college students. If we are to take at face value television shows, movies, and news stories, then college almost invariably means individuals in their late teens and early twenties arriving on "leafy campuses" and leaving four years later with a degree. But,

[1]See here: `http://fivethirtyeight.com/features/shut-up-about-harvard/` (March 30, 2016).

as noted in Chapter 1, over one-third of students attended two-year colleges in 2013, 38% were enrolled part-time, and 40% were over the age of 25. The college student of the media and popular perception is less common than we might be led to believe. Casselman goes on to contend that this "myopia has real consequences for educational policy." Issues that matter to the majority of college students—such as states' shrinking higher education allocations, the struggles of persisting to degree completion, and the perils of student loan debt[2]—are less likely to be widely covered or publicly discussed. In this dissertation, I endeavored to build on prior research that broadens our focus and understanding of the variation in when, how, and where individuals participate in postsecondary education.

Taken together, the analyses presented in the foregoing chapters advance our current understanding of the "changing ecology" of higher education (Kirst and Stevens 2015) and of the ways in which higher education remains stratified along both its vertical and horizontal dimensions. Despite the expansion of access to higher education, getting in and through degree programs (the vertical dimension), as well as when, how, and where students enroll (the horizontal dimension) continue to be patterned along racial and socioeconomic lines. For instance, a nontrivial portion of adults re-enrolls in higher education. Increases in such behavior over the past 30 years have been particularly strong among black women. While this development reflects the gains black women have made in more normatively timed educational attainment (McDaniel et al. 2011), their increases in enrollment have also occurred against the backdrop of eroding public sector work and union protections. In this way, black women's later-in-life enrollment may shine light on the perils of stopping short of a college degree earlier in the life course. Students also follow a myriad of pathways; indeed, as the analyses represented by Figure 3.1 illustrate, no one pathway is particularly dominant. At the same time, students are nonrandomly sorted to these pathways by race/ethnicity, in-

[2]While the media routinely reports on the skyrocketing student loan volume—which recently surpassed $1 trillion—the real crisis may be largely orthogonal to such reports. Default rates are concentrated among students who drop out prior to completing a degree, and who tend to have *lower* debt (Looney and Yannelis 2015; Dynarski 2015). Individuals with the highest debt are more likely to have completed at least a bachelor's degree (many have also completed, and taken out additional loans to finance, graduate degrees), to have higher post-schooling earnings, and to have less difficulty paying back their loans.

come, and other sociodemographic traits. Following particular pathways is also related to the likelihood of completing a college degree (at least within the first 10 years following the completion of high school). Just as the timing of educational transitions matters for whether adults return to school later in life (as earlier attainment is related to re-enrollment after the age of 29), when and for how long a student attends college part-time or full-time matters for eventual degree completion. This suggests both vertical and horizontal stratification: how far up the educational ladder one climbs is associated with the way in which one tries to climb that ladder. Similarly, a substantial portion of students is looking to the flexibility and open-access nature of for-profit institutions. Although one may find hope in the extension of access to students who have traditionally been left out of higher education—racial/ethnic minorities, those from lower-income backgrounds, and those with weaker prior academic achievement are particularly likely to attend for-profit schools—many encounter weaker wage returns for their sub-baccalaureate degrees compared to those earning degrees from public and private, nonprofit institutions.

While this dissertation has explored three important dimensions of students' varied ways in which they attend and experience postsecondary education, I could not address every manifestation of heterogeneity in postsecondary attendance given the limits of time, space, and data availability. For instance, the analyses in this dissertation have focused on formal postsecondary education—that is, on enrollment in degree-granting institutions. Future research should more closely examine attendance in programs leading to non-degree certificates. The number of these certificates conferred each year is growing (nearly 1 million were conferred in 2013, up from just over half a million in 1999; see NCES 2014:Table 320.20), and likely offer a less expensive though still useful alternative to a two– or four-year degree. Relatedly, some students are returning to school to earn a second or third *undergraduate* credential. For example, of bachelor's degree earners in the 2014-15 academic year, 3.0% had previously earned a bachelor's degree; this represents a modest increase over the 2.7% in 2011-12 (NSCRC 2016:Table 1). The percentage of associate's degree earners who had already obtained a bachelor's or associate's degree has similarly ticked upwards in recent years. In

2014-15, 3.2% of associate's degree earners had already obtained a bachelor's degree and another 7.0% had obtained a prior associate's degree, compared to 2.7% and 5.8%, respectively, in 2011-12. Who these students are, why they choose to return to school for a certificate or an additional undergraduate degree, and how their educational pathways intersect with other events in their life course (e.g., family formation and labor market participation) very much remain open questions.

Additionally, one limitation of the developmental trajectory analyses presented in Chapter 3 is that it cannot identify students who move in and out of higher education. Some nuances of students' particular pathways are masked by aggregating credits to years and by assigning students to groups that best match their own trajectory, even if they might deviate from their group's overall trajectory. Examining when and why students stop-out from college, and whether, when, and why they eventually return, would add another useful dimension to the study of students' variation in postsecondary pathways. Surprisingly little literature has examined this pattern of withdrawal-and-return, as most studies of college student attrition assumes that that attrition is permanent (Stratton et al. 2008). This is likely not a rare event, as one study found that about 30% of all students interrupt their pursuit of a college degree for at least one term during the five years following initial enrollment (O'Toole et al. 2003). A related phenomenon is the case of students who have gotten very close to the finish line (in that they earned almost the number of credits needed to graduate with a degree) but exited just before actually crossing that line. Why? Do they return eventually? The analyses presented in Chapter 2 suggest that at least some do. However, the CPS data—while useful for tracking and describing long-term trends in enrollment among older adults—are unable to establish what individuals do during their stop-out period that might impact why they stopped out in the first place and how long it takes them to return.

It may also be useful to look earlier in the education pipeline. Much research—including the findings presented in this dissertation—show that high school achievement is an important predictor of postsecondary enrollment, achievement, and attainment. Anecdotally, policymakers are concerned about high school students taking less than a full course load,

particularly in their senior year—not only because such behavior has implications for school resources and funding (schools receive funds based on the number of students enrolled, and not on the full-time equivalence, or FTE, of those students), but also because this likely has implications for students' matriculation, persistence, and course-taking in college.[3] Research could contribute to a better understanding of the scope of this problem beyond anecdotes, as well as of the relationship between high school course-taking and students' ultimate educational trajectories and attainment.

Furthermore, additional research is needed on how employers view nontraditional or nonnormative educational pathways. Chapter 4 analyzed the wages of for-profit college students, and other prior research has found that the college degree premium is smaller for workers who complete a degree later in life compared to those who complete during a more normative timeframe (Elman and O'Rand 2004; Monks 1997; Taniguchi 2005). But this research does not consider many of the potential nuances in students' pathways through postsecondary education—whether nontraditional students are making an occupational change that necessitates or motivates a return to school, the field of their degree and job, and whether an adult returned to school in order to pursue a bachelor's degree, graduate degree, or other credential.

Finally, future research could examine how students pay for their heterogeneous pathways through postsecondary education. One might imagine a developmental trajectories analysis similar to what is presented in Chapter 3 that describes students' patterns in loan-taking and repayment. We know (a) that today's students are taking out a lot of debt to cover the increasing costs of college and (b) that how much debt one incurs has implications for degree attainment (whether they complete a degree at all and how much time it takes them to do so) and other outcomes later in the course of their lives. In this way, loan-taking is closely tied to students' pathways through postsecondary education. But we know less about the process of debt accrual. That is, are students taking out consistent amounts of debt over

[3]Personal communication with a state education agency officer in Louisiana.

time, are these amounts small or large, or are students taking out large amounts in the beginning and/or at the end? Do these patterns vary by institutional type or by a student's socioeconomic status? What are the implications of the particular loan trajectory on degree attainment or drop out? By relating loan-taking to students' attendance pathways, we might better understand for whom, and when, loan-taking is a help or a hindrance.

In sum, this dissertation contributes to our knowledge about when, how, and where students pursue their postsecondary education in an era characterized by growing numbers and increasing diversity of students as well as rising returns to education. At the same time, many more questions remain. Deep socioeconomic inequalities persist in higher education—from initial enrollment and completion to how students finance their education and what to expect in the labor market upon exiting. The ability of policymakers to continue to address these gaps will depend on an improved understanding of the varied ways in which individuals access and experience educational institutions and the barriers they face along the way.

# References

Adelman, Clifford. 1999. *Answers in the Toolbox: Academic Intensity, Attendance Patterns, and Bachelor's Degree Attainment*. Washington, DC: U.S. Department of Education.

Adelman, Clifford. 2003. "The story-lines of multi-institutional attendance." Paper presented at the Association for Institutional Research, Tampa, FL.

Allison, Paul D. 1999. "Comparing logit and probit coefficients across groups." *Sociological Methods and Research* 28:186–208.

Anderson, Gregory, Mariana Alfonso, and Jeffrey C. Sun. 2006. "Rethinking the cooling out at public community colleges: An examination of fiscal trends in higher education and the rise of statewide articulation agreements." *Teachers College Record* 108:422–451.

Andrews, Rodney, Jing Li, and Michael L. Lovenheim. 2014. "Heterogeneous paths through college: Detailed patterns and relationships with graduation and earnings." *Economics of Education Review* 42:93–108.

Andrews-Dyer, Helena. 2016. "Malia Obama is going to Harvard—but taking a year off first." *The Washington Post* (May 1).

Apollo Group, Inc. 2013. *Apollo Group, Inc., Reports Fourth Quarter and Fiscal Year Results*. Phoenix, AZ: Apollo Group, Inc.

Autor, David H. 2014. "Skills, education, and the rise of earnings inequality among the "other 99 percent"." *Science* 344:843–851.

Autor, David H. and David Dorn. 2013. "The growth of low-skill service jobs and the polarization of the U.S. labor market." *American Economic Review* 103:1553–1597.

Autor, David H., Lawrence F. Katz, and Melissa S. Kearney. 2006. "The polarization of the U.S. labor market." *American Economic Review* 96:189–194.

Bailey, Deborah Smith. 2003. "'Swirling' changes to the traditional student path." *American Psychological Association: APA Monitor* 34:36.

Bailey, Martha J. and Susan M. Dynarski. 2011. "Inequality in postsecondary education." In *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, edited by G.J. Duncan and R.J. Murnane. New York, NY: Russell Sage Foundation.

Bailey, Thomas R. and Mariana Alfonso. 2005. *Paths to Persistence: An Analysis of Research on Program Effectiveness at Community Colleges*. Indianapolis, IN: Lumina Foundation for Education.

Bailey, Thomas R. and Irina E. Averianova. 1998. *Multiple Missions of Community Colleges: Conflicting or Complementary?* New York, NY: Community College Research Center, Teachers College, Columbia University.

Bainbridge, Jay, Marcia K. Meyers, Sakiko Tanaka, and Jane Waldfogel. 2005. "Who gets an early education? Family income and the enrollment of three- to five-year-olds from 1968 to 2000." *Social Science Quarterly* 86:724–745.

Baker, Teresa L. and William Velez. 1996. "Access to and opportunity in postsecondary education in the United States: A review." *Sociology of Education* 69:82–101.

Barr, Andrew and Sarah Turner. 2013. "Down and enrolled: An examination of enrollment response to cyclical trends and job loss." Unpublished manuscript.

Barr, Andrew and Sarah Turner. 2015. "Out of work and into school: Labor market policies and college enrollment during the Great Recession." *Journal of Public Economics* 124:63–73.

Bauer, Daniel J. and Patrick J. Curran. 2003a. "Distributional assumptions of growth mixture models: Implications for overextraction of latent trajectory classes." *Psychological Methods* 8:338–363.

Bauer, Daniel J. and Patrick J. Curran. 2003b. "Overextraction of latent trajectory classes: Much ado about nothing? Reply to Rindskopf (2003), Muthen (2003), and Cudeck and Henly (2003)." *Psychological Methods* 8:384–393.

Becker, Gary S. 1964. *Human Capital: A Theoretical and Empirical Analysis*. New York, NY: Columbia University Press.

Becker, Sascha O. and Andrea Ichino. 2002. "Estimation of the average treatment effects based on propensity scores." *Stata Journal* 2:358–377.

Behrman, Jere R., Mark R. Rosenzweig, and Paul Taubman. 1996. "College choice and wages: Estimates using data on female twins." *Review of Economics and Statistics* 78:672–685.

Belley, Philippe and Lance Lochner. 2007. "The changing role of family income and ability in determining educational achievement." Technical report, Working Paper No. 13527, National Bureau of Economic Research, Cambridge, MA.

Bennett, Daniel L., Adam R. Lucchesi, and Richard K. Vedder. 2010. *For-Profit Higher Education: Growth, Innovation, and Regulation*. Washington, DC: Center for College Affordability and Productivity.

Bills, David B. 2000. "Social, Demographic, Economic, and Technological Trends Affecting Lifelong Learning." In *Lifelong Learning NCES Task Force Final Report*, volume II, pp. 62–89. Washington, DC: U.S. Department of Education.

Bills, David B. 2005. "Participation in work-related educaiton: Variations in skill enhancement among workers, employers, and occupational closure." *Research in Social Stratification and Mobility* 23:67–102.

Black, Dan A. and Jeffrey A. Smith. 2004. "How robust is the evidence on the effects of college quality? Evidence from matching." *Journal of Econometrics* 121:99–124.

Bound, John, Michael L. Lovenheim, and Sarah Turner. 2012. "Increasing time to baccalaureate degree in the United States." *Education Finance and Policy* 7:375–424.

Bozick, Robert and Stefanie DeLuca. 2005. "Better late than never? Delayed enrollment in the high school to college transition." *Social Forces* 84:528–550.

Bradburn, Ellen M., Phyllis Moen, and Donna Dempster-McClain. 1995. "Women's Return to School Following the Transition to Motherhood." *Social Forces* 73:1517–1551.

Brand, Jennie. 2010. "Civic returns to higher education: A note on heterogeneous effects." *Social Forces* 89:417–434.

Brand, Jennie and Charles N. Halaby. 2006. "Regression and matching estimates of the effects of elite college attendance on educational and career achievement." *Social Science Research* 35:749–770.

Brand, Jennie and Yu Xie. 2010. "Who benefits the most from college? Evidence for negative selection in heterogeneous economic returns to higher education." *American Sociological Review* 75:273–302.

Brewer, Dominic J., Eric R. Eide, and Ronald G. Ehrenberg. 1999. "Does it pay to attend an elite private college? Cross-cohort evidence on the effects of college type on earnings." *Journal of Human Resources* 34:104–123.

Browne, Irene and Rachel Askew. 2005. "Race, ethnicity, and wage inequality among women: What happened in the 1990s and early 20th century?" *American Behavioral Scientist* 48:1275–1292.

Buchmann, Claudia and Thomas A. DiPrete. 2006. "The growing female advantage in

college completion: The role of family background and academic achievement." *American Sociological Review* 71:515–541.

Budig, Michelle and Paula England. 2001. "The wage penalty for motherhood." *American Sociological Review* 66:204–225.

Cabrera, Alberto F., Kurt R. Burkum, and Steven M. La Nasa. 2005. "Pathways to a four-year degree: Determinants of degree completion among socioeconomically disadvantaged students." In *College Student Retention: A Formula for Student Success*, edited by Alan Seidman, pp. 155–209. ACE/Praeger Series on Higher Education.

Carnevale, Anthony P., Nicole Smith, and Jeff Strohl. 2010. *Help Wanted: Projections of Jobs and Education Requirements through 2018*. Washington, DC: Center on Education and the Workforce, Georgetown University.

Cellini, Stephanie Riegg. 2009. "Crowded colleges and college crowd-out: The impact of public subsidies on the two-year college market." *American Economic Journal* 1:1–30.

Cellini, Stephanie Riegg. 2012. "For-profit higher education: An assessment of costs and benefits." *National Tax Journal* 65:153–180.

Cellini, Stephanie Riegg and Latika Chaudhary. 2014. "The labor market returns to a for-profit college education." *Economics of Education Review* 43:125–140.

Cellini, Stephanie Riegg and Claudia Goldin. 2014. "Does federal student aid raise tuition? New evidence on for-profit colleges." *American Economic Journal: Economic Policy* 6:174–206.

Charles, Maria and Karen Bradley. 2002. "Equal but separate? A cross-national study of sex segregation in higher education." *American Sociological Review* 67:573–599.

Chassin, L., D. B. Flora, and K. M. King. 2004. "Trajectories of alcohol and drug use

and dependence from adoloscence to adulthood: The effects of familial alcoholism and personality." *Journal of Abnormal Psychology* 113:483–498.

Cho, Donghun. 2007. "The role of high school performance in explaining women's rising college enrollment." *Economics of Education Review* 26:450–462.

Chung, Anna S. 2012. "Choice of for-profit college." *Economics of Education Review* 31:1084–1101.

Collins, Randall. 2002. "Credential inflation and the future of universities." In *The Future of the City of the Intellect: The Changing American University*, edited by Steven Brint, pp. 23–46. Stanford, CA: Stanford University Press.

Cooper, David, Mary Gable, and Algernon Austin. 2012. "The public-sector jobs crisis: Women and African Americans hit hardest by job losses in state and local governments." Technical report, Economic Policy Institute, Washington, DC.

Cruce, Ty M. and Nicholas W. Hillman. 2012. "Preparing for the Silver Tsunami: The Demand for Higher Educaiton Among Older Adults." *Research in Higher Education* 53:593–613.

Dale, Stacy B. and Alan B. Krueger. 2002. "Estimating the payoff of attending a more selective college: An application of selection on observables and unobservables." *Quarterly Journal of Economics* 107:1491–1527.

Damaske, Sarah and Adrianne Frech. 2016. "Women's work pathways across the life course." *Demography* 53:365–391.

Darolia, Rajeev, Cory Koedel, Paco Martorell, Katie Wilson, and Francisco Perez-Arce. 2014. *Do employers prefer workers who attend a for-profit college? Evidence from a field experiment*. National Center for Analysis of Longitudinal Data in Education Research, American Institutes for Research, Washington, DC, working paper no. 116 edition.

de los Santos, Jr., Alfredo and Irene Wright. 1990. "Maricopa's swirling students: Earning one-third of Arizona State's bachelor's degrees." *Community, Technical, and Junior College Journal* 60:32–34.

Dehejia, Rajeev H. and Sadek Wahba. 2002. "Propensity score matching methods for non-experimental causal studies." *Review of Economics and Statistics* 84:151–161.

del Rio, Coral and Olga Alonso-Villar. 2015. "The evolution of occupational segregation in the United States, 1940-2010: Gains and losses of Gender-race/ethnicity groups." *Demography* 52:967–988.

Deming, David J., Claudia Goldin, and Lawrence F. Katz. 2012. "The for-profit postsecondary school sector: Nimble critters or agile predators?" *Journal of Economic Perspectives* 26:139–164.

Deming, David J., Noam Yuchtman, Amira Abulafi, Claudia Goldin, and Lawrence F. Katz. 2016. "The value of postsecondary credentials in the labor market: An experimental study." *American Economic Review* 106:778–806.

Deterding, Nicole M. and David S. Pedulla. 2016. "Educational authority in the "open door" marketplace: Labor market consequences of for-profit, nonprofit, and fictional educational credentials." *Sociology of Education* Forthcoming.

DiPrete, Thomas A. and Claudia Buchmann. 2006. "Gender-specific trends in the value of education and the emerging gender gap in college completion." *Demography* 43:1–24.

DiPrete, Thomas A. and Markus Gangl. 2004. "Assessing bias in the estimation of causal effects: Rosenbaum bounds on matching estimators and instrumental variables estimation with imperfect instruments." *Sociological Methodology* 34:271–310.

Dohm, Arlene and Lynn Schniper. 2007. "Occupational employment projections to 2016." *Monthly Labor Review* pp. 86–125.

Donovan, Rebecca. 1984. "Path analysis of a theoretical model of persistence in higher education among low-income black youth." *Research in Higher Education* 21:243–259.

Dorn, David. 2009. *Essays on inequality, spatial interaction, and the demand for skills*. Ph.D. thesis, University of St. Gallen.

Downey, Douglas B. 1995. "When bigger is not better: Family size, parental resources, and children's educational performance." *American Sociological Review* 60:746–761.

Dozier, Raine. 2010. "The Declining Relative Status of Black Women Workers, 1980-2002." *Social Forces* 88:1833–1857.

Dynarski, Susan M. 2015. "We're frighteningly in the dark about student debt." *New York Times* March 20.

Eggleston, Elaine P., John H. Laub, and Robert J. Sampson. 2004. "Methodological sensitivities to latent class analysis of long-term criminal trajectories." *Journal of Quantitative Criminology* 20:1–26.

Elliott, J. and R. Smith. 2004. "Race, gender, and workplace power." *American Journal of Sociology* 69:365–386.

Elman, Cheryl. 2011. "The midlife years: Human capital and job mobility." In *Handbook of Sociology of Aging*, edited by Richard A. Settersten and Jacqueline Angel, pp. 245–261. New York, NY: Springer.

Elman, Cheryl and Angela M. O'Rand. 1998. "Midlife entry into vocational training: A mobility model." *Social Science Research* 27:128–158.

Elman, Cheryl and Angela M. O'Rand. 2002. "Perceived job insecurity and entry into work-related education and training among adult workers." *Social Science Research* 31:49–76.

Elman, Cheryl and Angela M. O'Rand. 2004. "The race is to the swift: Socioeconomic origins, adult education, and wage attainment." *American Journal of Sociology* 110:123–160.

Elman, Cheryl and Angela M. O'Rand. 2007. "The effects of social origins, life events, and institutional sorting on adults' school transitions." *Social Science Research* 36:1276–1299.

Elman, Cheryl and Felix Weiss. 2014. "Adult educational participation and implications for employment in the U.S. context." In *Adult Learning in Modern Societies: An International Comparison from a Life-Course Perspective*, edited by Hans-Peter Blossfeld, Elina Kilpi-Jakonen, Daniela Vono de Vilhena, and Sandra Buchholz, pp. 79–97. Cheltenham, UK: Edward Elgar.

Erosheva, Elena A., Ross L. Matsueda, and Donatello Telesca. 2014. "Breaking bad: Two decades of life-course data analysis in criminology, developmental psychology, and beyond." *Annual Review of Statistics and its Applications* 1:301–332.

Ewert, Stephanie. 2010. "Male and female pathways through four-year colleges: Disruption and sex stratification in higher education." *American Educational Research Journal* 47:744–773.

Fischer, Claude S. and Michael Hout. 2006. *Century of Difference: How America Changed in the Last One Hundred Years*. New York, NY: Russell Sage Foundation.

Flashman, Jennifer. 2013. "A cohort perspective on gender gaps in college attendance and completion." *Research in Higher Education* 54:545–570.

Gangl, Markus. 2004. "rbounds: Stata ado file to estimate Rosenbaum bounds for treatment effects established by nearest neighbor propensity score matching."

Gerber, Theodore P. and Sin Yi Cheung. 2008. "Horizontal stratification in postsecondary education: Forms, explanations, and implications." *Annual Review of Sociology* 34:299–318.

Gill, Andrew M. and Duane E. Leigh. 2000. "Community college enrollment, college major, and the gender wage gap." *Industrial Labor Relations Review* 54:163–181.

Goldin, Claudia and Lawrence F. Katz. 2008. *The Race between Education and Technology*. Cambridge, MA: The Belknap Press of Harvard University Press.

Goldrick-Rab, Sara. 2006. "Following their every move: An investigation of social-class differences in college pathways." *Sociology of Education* 79:67–79.

Goldrick-Rab, Sara and Seong Won Han. 2011. "Accounting for socioeconomic differences in delaying the transition to college." *Review of Higher Education* 34:423–445.

Goldrick-Rab, Sara and Fabian T. Pfeffer. 2009. "Beyond access: Explaining socioeconomic differences in college transfer." *Sociology of Education* 82:101–125.

Government Accountability Office. 2011. *Postsecondary Education: Student Outcomes Vary at For-Profit, Nonprofit, and Public Schools*. Government Accountability Office, Washington, DC, report to congressional requesters no. 12-143 edition.

Goyette, Kimberly A. 2008. "College for some to college for all: Social background, occupational expectations, and educational expectations over time." *Social Science Research* 37:461–484.

Grubb, W. Norton. 1991. "The decline of community college transfer rates: Evidence from the National Longitudinal Surveys." *Journal of Higher Education* 62:194–222.

Hagelskamp, Carolin, David Schleifer, and Christopher DiStasi. 2014. *Profiting Higher Education? What Students, Alumni, and Employers Think about For-Profit Colleges*. New York, NY: Public Agenda.

Hagland, Rick. 2013. "Survey finds Granholm's "No Worker Left Behind" program worked." *MLive* August 13.

Hamil-Luker, Jenifer. 2005. "Women's Wages: Cohort Differences in Returns to Education and Training over Time." *Social Science Quarterly* 86:1261–1278.

Hannon, Kerry. 2015. "Over 50 and back in college, preparing for a new career." *New York Times* (April 3).

Harmon, Colm, Hessel Oosterbeek, and Ian Walker. 2003. "The returns to education: Microeconomics." *Journal of Economic Surveys* 17:115–155.

Haveman, Robert and Timothy Smeeding. 2006. "The role of higher education in social mobility." *Future of Children* 16:125–150.

Health, Education, Labor and Pensions Committee. 2012. *For-Profit Higher Education: The Failure to Safeguard the Federal Investment and Ensure Student Success*. Washington, DC: United States Senate.

Hearn, James C. 1992. "Emerging variations in postsecondary attendance patterns: An investigation of part-time, delayed, and nondegree enrollment." *Research in Higher Education* 33:657–687.

Heckman, James J. and Sergio Urzua. 2009. "Comparing IV with structural models: What simple IV can and cannot identify." *Journal of Econometrics* 156:27–37.

Hirsch, Barry T. and Edward J. Schumacher. 2004. "Match bias in wage gap estimates due to earnings imputation." *Journal of Labor Economics* 22:689–722.

Hodges, Melissa J. and Michelle J. Budig. 2010. "Who gets the daddy bonus? Organizational hegemonic masculinity and the impact of fatherhood on earnings." *Gender and Society* 24:717–745.

Holland, Kelley. 2014. "Older Americans head back to college." *The Fiscal Times* (August 28).

Horn, Laura. 1996. "Nontraditional undergraduates: Trends in enrollment from 1986 to 1992 and persistance and attainment among 1989-90 Beginning Postsecondary Students." Technical Report NCES 97-578, U.S. Department of Education, NCES, Washington, DC.

Horn, Laura, Emily Forrest Cataldi, and Anna Sikora. 2005. *Waiting to Attend College: Undergraduates Who Delay Their Postsecondary Enrollment (NCES 2005-152)*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Hostetler, Andrew J., Stephen Sweet, and Phyllis Moen. 2007. "Gendered career paths: A life course perspective on returning to school." *Sex Roles* 56:85–103.

Hout, Michael. 2012. "Social and economic returns to college education in the United States." *Annual Review of Sociology* 38:379–400.

Huffman, Matt and Philip N. Cohen. 2004. "Racial wage inequality: Job segregation and devaluation across U.S. labor markets." *American Journal of Sociology* 109:902–936.

Jackson, Maggie. 2009. "Taking the next step: The face of the classroom is changing as sour economy prompts more older adults to return to school." *Boston Globe* (September 13).

Jacob, Brian A. 2002. "Where the boys aren't: Non-cognitive skills, returns to school, and the gender gap in higher education." *Economics of Education Review* 21:589–598.

Jacob, Marita and Felix Weiss. 2011. "Class origin and young adults' re-enrollment." *Research in Social Stratification and Mobility* 29:415–426.

Jacobs, Jerry A. and Rosalind Berkowitz King. 2002. "Age and College Completion: A Life-History Analysis of Women Aged 15-44." *Sociology of Education* 75:211–230.

Jacobs, Jerry A. and Scott Stoner-Eby. 1998. "Adult enrollment and educational attainment." *Annals of the American Academy of Political and Social Science* 559:91–108.

Jaeger, David A. 1997. "Reconciling the old and new Census Bureau education questions: Recommendations for researchers." *Journal of Business and Economic Statistics* 15:300–309.

Jepsen, Christopher and Mark Montgomery. 2009. "Miles to Go Before I Learn: The Effect of Travel Distance on the Mature Person's Choice of Community College." *Journal of Urban Economics* 65:64–73.

Jepsen, Christopher, Kenneth Troske, and Paul Coomes. 2014. "The labor market returns to community college degrees, diplomas, and certificates." *Journal of Labor Economics* 32:95–121.

Jones, Bobby L. and Daniel S. Nagin. 2013. "A note on a Stata plugin for estimating group-based trajectory models." *Sociological Methods and Research* 42:608–613.

Kalleberg, Arne L. 2000. "Nonstandard employment relations: Part-time, temporary, and contract work." *Annual Review of Sociology* 26:341–365.

Kalleberg, Arne L. 2011. *Good Jobs, Bad Jobs: The Rise of Polarized and Precarious Employment Systems in the United States, 1970s-2000s*. New York, NY: Russell Sage Foundation, American Sociological Association Rose Series in Sociology.

Kane, Thomas and Cecilia Rouse. 1995. "Labor market returns to two- and four-year college." *American Economic Review* 85:600–614.

Kane, Thomas and Cecilia Rouse. 1999. "The community college: Educating students at the margin between college and work." *Journal of Economic Perspectives* 13:63–84.

Kao, Grace and Jennifer S. Thompson. 2003. "Racial and ethnic stratification in educational achievement and attainment." *Annual Review of Sociology* 29:417–442.

Keele, Luke and David K. Park. 2006. "Difficult choices: An evaluation of heterogeneous choice models." Unpublished manuscript.

King, Jacqueline. 2003. "Nontraditional attendance and persistence: The cost of students' choices." *New Directions for Higher Education* 121:69–83.

Kirst, Michael W. and Mitchell L. Stevens. 2015. *Remaking College: The Changing Ecology of Higher Education*. Palo Alto, CA: Stanford University Press.

Kleykamp, Meredith. 2013. "Unemployment, earnings, and enrollment among post 9/11 veterans." *Social Science Research* 42:836–851.

Kmec, Julie. 2003. "Minority job concentration and wages." *Social Problems* 50:38–59.

Knapp, Laura G., Janice E. Kelly-Reid, and Scott A. Ginder. 2011. *Postsecondary Institutions and Price of Attendance in the United States: 2010–11, Degrees and Other Awards Conferred: 2009–10, and 12-Month Enrollment: 2009–10*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Laird, Jennifer. 2015. "Still an equal opportunity employer? Public sector employment inequality after the Great Recession." Unpublished manuscript.

Lang, Kevin and Russell Weinstein. 2012. "Evaluating student outcomes at for-profit colleges." Technical report, Working Paper No. 18201, National Bureau of Economic Research, Cambridge, MA.

Laub, John H., Daniel S. Nagin, and Robert J. Sampson. 1998. "Trajectories of change in criminal offending: Good marriages and the desistance process." *American Sociological Review* 63:225–238.

Lemieux, Thomas. 2006. "Increasing residual wage inequality: Composition effects, noisy data, or rising demand for skill?" *American Economic Review* 96:461–498.

Leuven, Edwin and Barbara Sianesi. 2003. "psmatch2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing."

Lichter, Daniel T. 2013. "Integration or fragmentation? Racial diversity and the American future." *Demography* 50:359–391.

Light, Audrey. 1995. "The effects of interrupted schooling on wages." *Journal of Human Resources* 30:472–502.

Light, Audrey. 1996. "Hazard Model Estimates of the Decision to Reenroll in School." *Labour Economics* 2:381–406.

Light, Audrey. 2004. "Gender differences in the marriage and cohabitation income premium." *Demography* 41:263–284.

Lockard, C. Brett and Michael Wolf. 2012. "Occupational employment projections to 2020." *Monthly Labor Review* pp. 84–108.

Long, J. Scott. 2009. "Group comparisons in logit and probit using predicted probabilities." Unpublished manuscript.

Long, Mark C. 2008. "College quality and early adult outcomes." *Economics of Education Review* 27:588–602.

Long, Mark C. 2010. "Changes in the returns to education and college quality." *Economics of Education Review* 29:338–347.

Looney, Adam and Constantine Yannelis. 2015. "A crisis in student loans? How changes in the characteristics of borrowers and in the institutions they attended contributed to rising loan defaults." Brookings Papers on Economic Activity.

Lucas, Samuel R. 2001. "Effectively maintained inequality: Education transitions, track mobility, and social background effects." *American Journal of Sociology* 106:1642–1690.

Machin, Stephen and John van Reenen. 1998. "Technology and changes in skill structure: Evidence from seven OECD countries." *Quarterly Journal of Economics* 113:1215–1244.

Mangino, William. 2014. "The negative effects of privilege on educational attainment: Gender, race, class, and the bachelor's degree." *Social Science Quarterly* 95:760–784.

Maralani, Vida. 2011. "From GED to college: Age trajectories of nontraditional eductional paths." *American Educational Research Journal* 48:1058–1090.

Marcotte, Dave E., Thomas Bailey, Carey Barkoski, and Greg S. Kienzl. 2005. "The returns of a community college education: Evidence from the National Education Longitudinal Survey." *Education Evaluation and Policy Analysis* 27:157–175.

Marti, C. Nathan. 2008. "Latent postsecondary persistence pathways: Educational pathways in American two-year colleges." *Research in Higher Education* 49:317–336.

McCormick, Alexander C. 2003. "Swirling and double-dipping: New patterns of student attendance and their implications for higher education." *New Directions for Higher Education* 121:13–24.

McDaniel, Anne, Thomas A. DiPrete, Claudia Buchmann, and Uri Shwed. 2011. "The black gender gap in educational attainment: Historical trends and racial comparisons." *Demography* 48:889–914.

Mettler, Suzanne. 2014. *Degrees of Inequality: How the Politics of Higher Education Sabotaged the American Dream*. New York, NY: Basic Books.

Milligan, Kevin, Enrico Morreti, and Philip Oreopoulos. 2003. "Does education improve citizenship? Evidence from the U.S. and U.K." Technical report, Working Paper No. 9584, National Bureau of Economic Research, Cambridge, MA.

Mincer, Jacob. 1974. *Schooling, experience, and earnings*. Cambridge, MA: National Bureau of Economic Research.

Monks, James. 1997. "The impact of college timing on earnings." *Economics of Education Review* 16:419–423.

Monks, James. 2000. "The returns to individual and college characteristics: Evidence from the National Longitudinal Study of Youth." *Economics of Education Review* 19:279–289.

Moore, Thomas S. 2010. "The locus of racial disadvantage in the labor market." *American Journal of Sociology* 116:909–942.

Morey, Ann L. 2004. "Globalization and the emergence of for-profit higher education." *Higher Education* 48:131–150.

Mouw, Ted. 2005. "Sequences of early adult transition: A look at variability and consequences." In *On the Frontier of Adulthood: Theory, Research, and Public Policy*, edited by Jr. Frank F. Furstenberg, Ruben G. Rumbaut, and Richard A. Settersten, pp. 256–291. Chicago, IL: University of Chicago Press.

Mouw, Ted and Arne L. Kalleberg. 2010. "Occupations and the structure of wage inequality in the United States, 1980s to 2000s." *American Sociological Review* 75:402–431.

Muthén, Bengt and Linda K. Muthén. 2000. "Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes." *Alcoholism: Clinical and Experimental Research* 26:882–891.

Nagin, Daniel S. 2005. *Group-Based Modeling of Development*. Cambridge, MA: Harvard University Press.

Nagin, Daniel S. and Kenneth C. Land. 1993. "Age, criminal careers, and population heterogeneity: Specification and estimation of a nonparametric, mixed Poisson model." *Criminology* 31:327–362.

Nagin, Daniel S. and Candice L. Odgers. 2010. "Group-based trajectory modeling in clinical research." *Annual Review of Clinical Psychology* 6:6109–6138.

Nagin, D. S. and R. E. Tremblay. 2001. "Analyzing developmental trajectories of distinct but related behaviors: A group-based method." *Psychological Methods* 6:18–34.

Nagin, Daniel S. and Richard E. Tremblay. 2005. "What has been learned from group-based trajectory modeling? Examples from physical aggression and other problem behaviors." *Annals of the American Academy of Political and Social Science* 602:82–117.

National Center for Education Statistics. 2005. *Waiting to Attend College: Undergraduates Who Delay Their Postsecondary Enrollment (NCES 2005-152)*. Washington, DC: National Center for Education Statistics, U.S. Department of Education.

National Center for Education Statistics. 2012. *Digest of Education Statistics*. Washington, DC: National Center for Education Statistics.

National Center for Education Statistics. 2014. *Digest of Education Statistics*. Washington, DC: U.S. Department of Education.

Navera, Tristan. 2013. "Clark State gets money to retrain Baby Boomers." *Dayton Business Journal* (December 26).

NSCRC. 2016. *2014-15 Undergraduate Degree Earners Report: First-time Graduates and Graduates with Prior Awards*. National Student Clearinghouse Research Center.

Obama, Barack. 2014. *Remarks by the President on opportunity for all and skills for America's workers*. The White House.

O'Rand, Angela M. 2011. "2010 SSS Presidential Address: The Devolution of Risk and the Changing Life Course in the United States." *Social Forces* 90:1–16.

Oreopoulos, Philip and Uros Petronijevic. 2013. "Making college worth it: A review of the returns to higher education." *Future of Children* 23:41–65.

O'Toole, Dennis M., Leslie S. Stratton, and James N. Wetzel. 2003. "A longitudinal analysis of the frequency of part-time enrollment and the persistence of students who enroll part-time." *Research in Higher Education* 44:519–537.

Pallas, Aaron M. 1993. "Schooling in the course of human lives: The social context of education and the transition to adulthood in industrial society." *Review of Educational Research* 63:409–447.

Pascarella, Ernest T. and Patrick T. Terenzini. 2005. *How College Affects Students: A Third Decade of Research*, volume 2. San Francisco, CA: Jossey-Bass.

Pérez-Pẽna, Richard. 2014. "Federal lawsuit accuses for-profit schools of fraud." *The New York Times* (February 19).

Perna, Laura. 2000. "Differences in the decision to attend college among African Americans, Hispanics, and whites." *Journal of Higher Education* 71:117–141.

Pettit, Becky and Stephanie Ewert. 2009. "Employment Gains and Wage Declines: The Erosion of Black Women's Relative Wages since 1980." *Demography* 46:469–492.

Piquero, Alex R. 2008. "Taking stock of developmental trajectories of criminal activity over the life course." In *The Long View of Crime: A Synthesis of Longitudinal Research*, edited by A. M. Liberman, pp. 23–78. New York, NY: Springer.

Psacharopoulos, George and Harry A. Patrinos. 2004. "Returns to investment in education: A further update." *Education Economics* 12:111–134.

Raftery, Adrian E. and Michael Hout. 1993. "Maximally maintained inequality: Expansion, reform, and opportunity in Irish education, 1921-1975." *Sociology of Education* 66:41–62.

Randall, David. 2009. "Back to school: How to pay for college as an adult." *Forbes* (August 25).

Reid, Lesley Williams and Beth A. Rubin. 2003. "Integrating economic dualism and labor market segmentation: The effects of race, gender, and structural location of earnings, 1974-2000." *Sociological Quarterly* 44:405–432.

Rindfuss, Ronald R. 1991. "The young adult years: Diversity, structural change, and fertility." *Demography* 28:493–512.

Rivera, Carla. 2015. "Many black adults in educational limbo: Some college credit, but no degree." *Los Angeles Times* (June 2).

Robinson, Rosalie. 2004. "Pathways to completion: Patterns of progression through a university degree." *Higher Education* 47:1–20.

Roksa, Josipa, Eric Grodsky, Richard Arum, and Adam Gamoran. 2007. "United States: Changes in higher education and social stratification." In *Stratification in Higher Education: A Comparative Study*, edited by Yossi Shavit, Richard Arum, and Adam Gamoran. Stanford, CA: Stanford University Press.

Roksa, Josipa and Melissa Velez. 2012. "A late start: Delayed entry, life course transitions, and bachelor's degree completion." *Social Forces* 90:769–794.

Rosenbaum, James E. 2001. *Beyond College-for-all: Career Paths for the Forgotten Half*. New York, NY: Russell Sage Foundation.

Rosenbaum, Paul R. and Donald B. Rubin. 1983. "The central role of the propensity score in observational studies for causal effects." *Biometrika* 70:41–55.

Rosenfeld, Jake and Meredith Kleykamp. 2012. "Organized labor and racial wage inequality in the United States." *American Journal of Sociology* 117:1460–1502.

Rosenfeld, Rachel A. 1992. "Job mobility and career processes." *Annual Review of Sociology* 18:39–61.

Ross, Catherine E. and Chi-ling Wu. 1995. "The links between education and health." *American Sociological Review* 60:719–745.

Rowan-Kenyon, Heather T. 2007. "Predictors fo delayed college enrollment and the impact of socioeconomic status." *Journal of Higher Education* 78:188–214.

Royston, Patrick. 2004. "Multiple imputation of missing values." *Stata Journal* 4:227–241.

Rubin, Donald B. 1987. *Multiple Imputation for Non-Response in Surveys*. New York, NY: John Wiley and Sons.

Rumberger, Russell and Scott L. Thomas. 1993. "The economic returns to college quality, major, and performance." *Economics of Education Review* 12:1–19.

Schwartz, Christine R. 2010. "Pathways to educational homogamy in marital and cohabiting unions." *Demography* 47:735–753.

Shanahan, Michael J. 2000. "Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective." *Annual Review of Sociology* 26:667–692.

Shavit, Yossi, Richard Arum, and Adam Gamoran. 2007. *Stratification in Higher Education: A Comparative Study*. Stanford, CA: Stanford University Press.

Simpson, Eric. 2013. "Confessions of an aging student: Returning to college in my 40s." *Huffington Post* (April 1).

Skardhamar, Torbjorn. 2010. "Distinguishing facts and artifacts in group-based modeling." *Criminology* 48:295–320.

Spence, Michael. 1973. "Job market signaling." *Quarterly Journal of Economics* 87:355–374.

Stephan, Jennifer L., James E. Rosenbaum, and Ann E. Person. 2009. "Stratification in college entry and completion." *Social Science Research* 38:572–593.

Stevenson, Betsey and Andrew Langan. 2011. "Comment on the labor market in the Great Recession – An update to September 2011." *Brookings Papers on Economic Activity* pp. 372–384.

Stratford, Michael. 2012a. "For-profit colleges' marketers generate leads, and controversy." *The Chronicle of Higher Education* (October 22).

Stratford, Michael. 2012b. "Senators call for investigation of for-profit colleges' tactics on default rates." *The Chronicle of Higher Education* (December 14).

Stratton, Leslie S., Dennis M. O'Toole, and James N. Wetzel. 2008. "A multinomial logit model of college stopout and dropout behavior." *Economics of Education Review* 27:319–331.

Taniguchi, Hiromi. 2005. "The influence of age at degree completion on college wage premiums." *Research in Higher Education* 46:861–881.

Tomaskovic-Devey, Donald, Melvin Thomas, and Kecia Johnson. 2005. "Race and the accumulation of human capital across the career: A theoretical model and fixed-effects applications." *American Journal of Sociology* 111:58–89.

Turley, Ruth N. Lopez, Martin Santos, and Cecilia Ceja. 2007. "Social origin and college opportunity expectations across cohorts." *Social Science Research* 36:1200–1218.

Turner, Sarah. 2004. "Going to college and finishing college: Explaining different educational outcomes." In *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*, edited by Caroline M. Hoxby, pp. 13–61. Chicago, IL: University of Chicago Press.

Turner, Sarah. 2006. "For-profit colleges in the context of the market for higher education." In *Earnings from Leaning: The Rise of For-Profit Universities*, edited by David W. Breneman, Brian Pusser, and Sarah Turner. Albany, NY: State University of New York Press.

U.S. Census Bureau. 2014. "Educational Attainment." http://www.census.gov/hhes/socdemo/education/.

Velez, William. 1985. "Finishing college: The effects of college type." *Sociology of Education* 58:191–200.

von Hippel, Paul T. 2007. "Regression with missing Ys: An improved strategy for analyzing multiply imputed data." *Sociological Methodology* 37:83–117.

Wasik, John F. 2015. "Managing student loan debt as an older adult." *New York Times* (March 19).

Weinberg, Cory. 2013. "Senators condemn for-profit colleges' use of military tuition aid." *The Chronicle of Higher Education* (June 12).

Weiss, Felix and Josipa Roksa. 2016. "New dimensions of educational inequality: Changing patterns of combining college and work in the U.S. over time." *Research in Social Stratification and Mobility* 44:44–53.

Wells, Ryan S. and Cassie M. Lynch. 2012. "Delayed college entry and the socioeconomic gap: Examining the roles of student plans, family income, parental education, and parental occupation." *Journal of Higher Education* 83:671–697.

Western, Bruce and Jake Rosenfeld. 2011. "Unions, norms, and the rise in U.S. wage inequality." *American Sociological Review* 76:513–537.

Williams, Ian. 2013. "'You can sleep here all night': Video games and labor." *Jacobin* (November 8).

Williams, Richard. 2009. "Using hetergeneous choice models to compare logit and probit coefficients across groups." *Sociological Methods and Research* 37:531–559.

Wilson, George, Vincent J. Roscigno, and Matt Huffman. 2015. "Racial income inequality and public sector privatization." *Social Problems* 62:163–185.

Yakusheva, Olga. 2010. "Return to college education revisited: Is relevance relevant?" *Economics of Education Review* 29:1125–1142.

# Appendix A

## Supplemental Material for Chapter 2

Table A.1: Summary statistics, 1978–2013

| | Full sample | Black women | White women | Black men | White men |
|---|---|---|---|---|---|
| Enrolled | 0.037 | 0.057 | 0.043 | 0.034 | 0.028 |
| Female | 0.512 | | | | |
| White | 0.736 | | | | |
| Black | 0.113 | | | | |
| Hispanic | 0.103 | | | | |
| Other racial group | 0.048 | | | | |
| Age | 43.65 | 43.06 | 44.15 | 43.01 | 44.00 |
| *Demographic factors* | | | | | |
| Did not complete high school | 0.145 | 0.195 | 0.097 | 0.208 | 0.107 |
| Completed high school | 0.333 | 0.353 | 0.357 | 0.376 | 0.324 |
| Some college | 0.250 | 0.275 | 0.270 | 0.249 | 0.250 |
| At least 4 years of college | 0.272 | 0.177 | 0.276 | 0.167 | 0.319 |
| Family income: 1st quartile | 0.214 | 0.408 | 0.177 | 0.335 | 0.153 |
| Family income: 2nd quartile | 0.207 | 0.204 | 0.204 | 0.222 | 0.202 |
| Family income: 3rd quartile | 0.207 | 0.129 | 0.220 | 0.160 | 0.232 |
| Family income: 4th quartile | 0.212 | 0.083 | 0.236 | 0.108 | 0.252 |
| Family income: missing | 0.160 | 0.177 | 0.163 | 0.175 | 0.162 |
| Never married | 0.133 | 0.265 | 0.089 | 0.251 | 0.131 |
| Married | 0.683 | 0.396 | 0.712 | 0.538 | 0.730 |
| Separated | 0.042 | 0.113 | 0.030 | 0.077 | 0.025 |
| Divorced or widowed | 0.142 | 0.226 | 0.169 | 0.134 | 0.115 |
| No children under 18 | 0.540 | 0.519 | 0.552 | 0.599 | 0.561 |
| Oldest child: 0–5 years | 0.177 | 0.166 | 0.156 | 0.166 | 0.173 |
| Oldest child: 6–12 years | 0.260 | 0.283 | 0.252 | 0.232 | 0.240 |
| Oldest child: 13 to 17 years | 0.212 | 0.255 | 0.213 | 0.185 | 0.193 |
| Veteran | 0.131 | 0.016 | 0.011 | 0.246 | 0.290 |
| *Labor market factors* | | | | | |
| Employed full-time | 0.585 | 0.498 | 0.453 | 0.621 | 0.736 |
| Employed part-time | 0.180 | 0.173 | 0.243 | 0.130 | 0.135 |
| Unemployed | 0.037 | 0.058 | 0.028 | 0.068 | 0.032 |

| | | | | | |
|---|---|---|---|---|---|
| Not in labor force | 0.198 | 0.270 | 0.277 | 0.181 | 0.096 |
| Private sector | 0.605 | 0.525 | 0.532 | 0.618 | 0.683 |
| Missing sector | 0.191 | 0.262 | 0.266 | 0.175 | 0.091 |
| Union | 0.024 | 0.026 | 0.018 | 0.036 | 0.030 |
| Missing union | 0.853 | 0.854 | 0.863 | 0.846 | 0.845 |
| Log hourly earnings[a] | 3.004 | 2.762 | 2.902 | 2.902 | 3.210 |
| *N* | 2,135,841 | 116,063 | 848,908 | 85,475 | 807,459 |

*Notes:* Data come from the CPS October supplements, 1978-2013. Weighted means and proportions are presented. Sample is restricted to men and women between the ages of 29 and 61. [a]Samples for log earnings are restricted to those who are employed and have non-zero, non-imputed earnings (total $N$=252,402, black women=12,470, white women=95,902, black men=9,668, white men=102,576).

Table A.2: Odds ratios from logistic regressions predicting enrollment among adults aged 29–61, by time interval, 1978–2013

| | 1978–1982 | 1983–1987 | 1988–1992 | 1993–1997 | 1998–2002 | 2003–2007 | 2008–2013 |
|---|---|---|---|---|---|---|---|
| Female | 1.449*** | 1.209*** | 1.277*** | 1.303*** | 1.284*** | 1.169*** | 1.253*** |
| | (0.051) | (0.038) | (0.039) | (0.041) | (0.042) | (0.038) | (0.037) |
| Black (ref. is white) | 1.335*** | 1.174* | 0.833* | 1.256*** | 1.383*** | 1.245*** | 1.305*** |
| | (0.084) | (0.077) | (0.064) | (0.083) | (0.089) | (0.080) | (0.072) |
| Hispanic | 1.314** | 1.306** | 1.317*** | 1.320*** | 1.487*** | 1.102 | 1.275*** |
| | (0.110) | (0.108) | (0.107) | (0.094) | (0.097) | (0.074) | (0.070) |
| Other racial group | 1.964*** | 1.791*** | 1.699*** | 1.578*** | 1.363*** | 1.329*** | 1.137* |
| | (0.164) | (0.129) | (0.120) | (0.112) | (0.105) | (0.088) | (0.070) |
| Female × Black | 0.814** | 0.863 | 1.149 | 0.925 | 1.125 | 1.231** | 1.390*** |
| | (0.063) | (0.069) | (0.102) | (0.072) | (0.086) | (0.093) | (0.090) |
| Female × Hispanic | 0.802* | 0.844 | 0.770* | 0.782** | 0.827* | 1.032 | 0.829** |
| | (0.086) | (0.088) | (0.079) | (0.070) | (0.068) | (0.084) | (0.056) |
| Female × Other racial group | 0.606*** | 0.585*** | 0.572*** | 0.647*** | 0.700*** | 0.705*** | 0.915 |
| | (0.068) | (0.061) | (0.056) | (0.062) | (0.070) | (0.062) | (0.071) |
| Age | 0.931*** | 0.924*** | 0.926*** | 0.926*** | 0.921*** | 0.920*** | 0.918*** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) |
| *Educational attainment* | | | | | | | |
| Completed high school (ref.= no HS) | 0.947 | 0.862* | 0.752*** | 1.015 | 1.076 | 1.170* | 1.450*** |
| | (0.051) | (0.051) | (0.053) | (0.067) | (0.077) | (0.087) | (0.099) |
| Completed some college | 7.306*** | 7.319*** | 9.334*** | 6.511*** | 6.052*** | 6.131*** | 7.420*** |
| | (0.352) | (0.382) | (0.577) | (0.389) | (0.394) | (0.423) | (0.473) |
| Completed at least 4 years of college | 5.729*** | 5.773*** | 6.873*** | 4.954*** | 5.234*** | 4.819*** | 5.387*** |
| | (0.301) | (0.324) | (0.448) | (0.314) | (0.359) | (0.349) | (0.360) |
| *Demographic factors* | | | | | | | |
| Family income: 2nd quartile (ref.=1st) | 0.808*** | 0.787*** | 0.781*** | 0.832*** | 0.848*** | 0.882*** | 0.903*** |
| | (0.036) | (0.027) | (0.028) | (0.033) | (0.031) | (0.033) | (0.028) |
| Family income: 3rd quartile | 0.812*** | 0.754*** | 0.800*** | 0.796*** | 0.806*** | 0.773*** | 0.822*** |
| | (0.036) | (0.027) | (0.030) | (0.033) | (0.032) | (0.031) | (0.027) |
| Family income: 4th quartile | 0.746*** | 0.697*** | 0.688*** | 0.741*** | 0.694*** | 0.664*** | 0.704*** |
| | (0.034) | (0.027) | (0.027) | (0.033) | (0.029) | (0.029) | (0.026) |
| Family income: missing | 0.781*** | 0.697*** | 0.775*** | 0.838*** | 0.737*** | 0.720*** | 0.741*** |
| | (0.029) | (0.044) | (0.042) | (0.031) | (0.034) | (0.030) | (0.038) |
| Married (ref.=never married) | 0.767*** | 0.925* | 0.844*** | 0.833*** | 0.899** | 0.935 | 0.887*** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | (0.030) | (0.035) | (0.032) | (0.031) | (0.033) | (0.033) | (0.027) |
| Separated | 1.115 | 1.167* | 1.123 | 1.022 | 1.035 | 1.073 | 0.938 |
| | (0.067) | (0.071) | (0.068) | (0.062) | (0.067) | (0.064) | (0.051) |
| Divorced or widowed | 1.033 | 1.171*** | 1.223*** | 1.215*** | 1.053 | 1.099* | 1.134*** |
| | (0.045) | (0.049) | (0.051) | (0.049) | (0.045) | (0.045) | (0.040) |
| Oldest child: 0–5 years (ref.=none <18) | 0.668*** | 0.604*** | 0.618*** | 0.653*** | 0.611*** | 0.634*** | 0.708*** |
| | (0.024) | (0.021) | (0.022) | (0.024) | (0.023) | (0.023) | (0.023) |
| Oldest child: 6–12 years | 0.944 | 0.913** | 0.992 | 1.028 | 0.904** | 0.985 | 0.916** |
| | (0.030) | (0.030) | (0.032) | (0.034) | (0.031) | (0.033) | (0.028) |
| Oldest child: 13 to 17 years | 1.040 | 1.106** | 1.177*** | 1.315*** | 1.213*** | 1.053 | 1.110** |
| | (0.039) | (0.042) | (0.047) | (0.051) | (0.050) | (0.044) | (0.042) |
| Veteran | 1.275*** | 1.016 | 1.048 | 1.276*** | 1.524*** | 1.641*** | 1.996*** |
| | (0.045) | (0.038) | (0.044) | (0.053) | (0.067) | (0.072) | (0.079) |
| *Labor market factors* | | | | | | | |
| Employed part-time (ref.=full-time) | 1.328*** | 1.446*** | 1.533*** | 1.508*** | 1.434*** | 1.576*** | 1.572*** |
| | (0.039) | (0.042) | (0.045) | (0.044) | (0.043) | (0.048) | (0.044) |
| Unemployed | 1.102 | 1.212** | 1.172* | 1.339*** | 1.382*** | 1.223** | 1.703*** |
| | (0.073) | (0.077) | (0.081) | (0.091) | (0.104) | (0.090) | (0.079) |
| Not in labor force | 0.552* | 2.763*** | 2.856*** | 3.190*** | 2.652*** | 2.793*** | 3.025*** |
| | (0.144) | (0.185) | (0.195) | (0.303) | (0.320) | (0.315) | (0.354) |
| Private sector (ref.=public/other) | 0.789*** | 0.860*** | 0.801*** | 0.823*** | 0.741*** | 0.742*** | 0.809*** |
| | (0.022) | (0.024) | (0.023) | (0.024) | (0.023) | (0.023) | (0.024) |
| Missing sector | 3.104*** | 0.210*** | 0.189*** | 1.789 | 0.380 | 0.530 | 0.296** |
| | (0.831) | (0.083) | (0.084) | (1.243) | (0.312) | (0.364) | (0.130) |
| Union | | 0.947 | 1.128 | 0.928 | 1.199* | 1.075 | 0.935 |
| | | (0.073) | (0.080) | (0.070) | (0.086) | (0.081) | (0.074) |
| Missing union | | 0.992 | 1.004 | 1.005 | 0.985 | 0.986 | 0.993 |
| | | (0.037) | (0.035) | (0.034) | (0.034) | (0.034) | (0.031) |
| *N* | 292,212 | 295,265 | 302,208 | 286,365 | 290,239 | 311,687 | 357,570 |

*Notes:* Data come from the CPS October supplements, 1979-2013. Estimates are weighted. Results of logistic regression models presented as odds ratios. Models in this table are the same as model 7 in Table 2.3, re-estimated separately for each of seven roughly five-year time intervals; all models also include region, metro/non-metro, and occupation fixed effects. Sample restricted to adults aged 29–61 with non-missing values for dependent and independent variables. Models in which the sample is further restricted to employed adults with non-zero, non-imputed earnings yield substantively similar results (results available upon request). Constant not shown. Statistical significance is indicated by: *$p$<0.05, **$p$<0.01, ***$p$<0.001.

# Appendix B

# Supplemental Material for Chapter 3

Table B.1: Summary statistics of sample

| | Mean/Percent | SE |
|---|---|---|
| *Background* | | |
| White (%) | 69.88 | 0.89 |
| Black (%) | 12.19 | 0.56 |
| Hispanic (%) | 11.67 | 0.56 |
| Other (%) | 6.26 | 0.55 |
| Family income (in $1k) | 86.09 | 1.38 |
| Quintile 1 (mean=$18,766) | 0.16 | 0.01 |
| Quintile 2 (mean=$42,289) | 0.19 | 0.01 |
| Quintile 3 (mean=$66,728) | 0.20 | 0.01 |
| Quintile 4 (mean=$94,986) | 0.22 | 0.01 |
| Quintile 5 (mean=$175,413) | 0.23 | 0.01 |
| Female (%) | 50.76 | 1.06 |
| Parent with at least 4 years of college (%) | 40.02 | 1.05 |
| *Academic preparation* | | |
| ASVAB | 58.26 | 0.58 |
| High school GPA | 3.01 | 0.01 |
| Exit HS with diploma (%) | 92.85 | 0.53 |
| Completed high school at normative age (%) | 93.27 | 0.51 |
| Expects to complete a 4-year college degree (% chance) | 75.98 | 0.65 |
| *Family formation* | | |
| Parent prior to first term in college (%) | 12.35 | 0.66 |
| Married prior to first term in college (%) | 5.59 | 0.48 |
| *College experiences* | | |
| Level - first enrolled in 4-year inst. (%) | 52.85 | 1.05 |
| Level - first enrolled in 2-year inst. (%) | 45.92 | 1.05 |
| Level - first enrolled in less than 2 or other inst. (%) | 1.23 | 0.22 |
| Type - first enrolled in public inst. (%) | 68.54 | 0.98 |
| Type - first enrolled in private, nonprofit inst. (%) | 13.68 | 0.74 |
| Type - first enrolled in for-profit inst. (%) | 4.66 | 0.43 |
| Type - first enrolled in unknown inst. (%) | 13.12 | 0.70 |
| % of courses in 1$^{st}$ year that were remedial | 8.14 | 0.40 |
| % of courses in 1$^{st}$ year student failed | 28.05 | 0.69 |
| % of courses in 1$^{st}$ year in major field of study | 37.58 | 0.91 |

| | | |
|---|---|---|
| College GPA in 1st year | 2.43 | 0.02 |
| Average hours worked per week in 1st year | 18.33 | 0.31 |
| Number of institutions attended | 1.49 | 0.02 |
| Attained college degree by age 25 (%) | 43.23 | 1.06 |
| Attained bachelor's degree by age 25 (%) | 34.43 | 1.02 |
| Attained college degree by age 29 (%) | 52.84 | 1.06 |
| Attained bachelor's degree by age 29 (%) | 42.31 | 1.06 |
| *N* | 2,576 | |

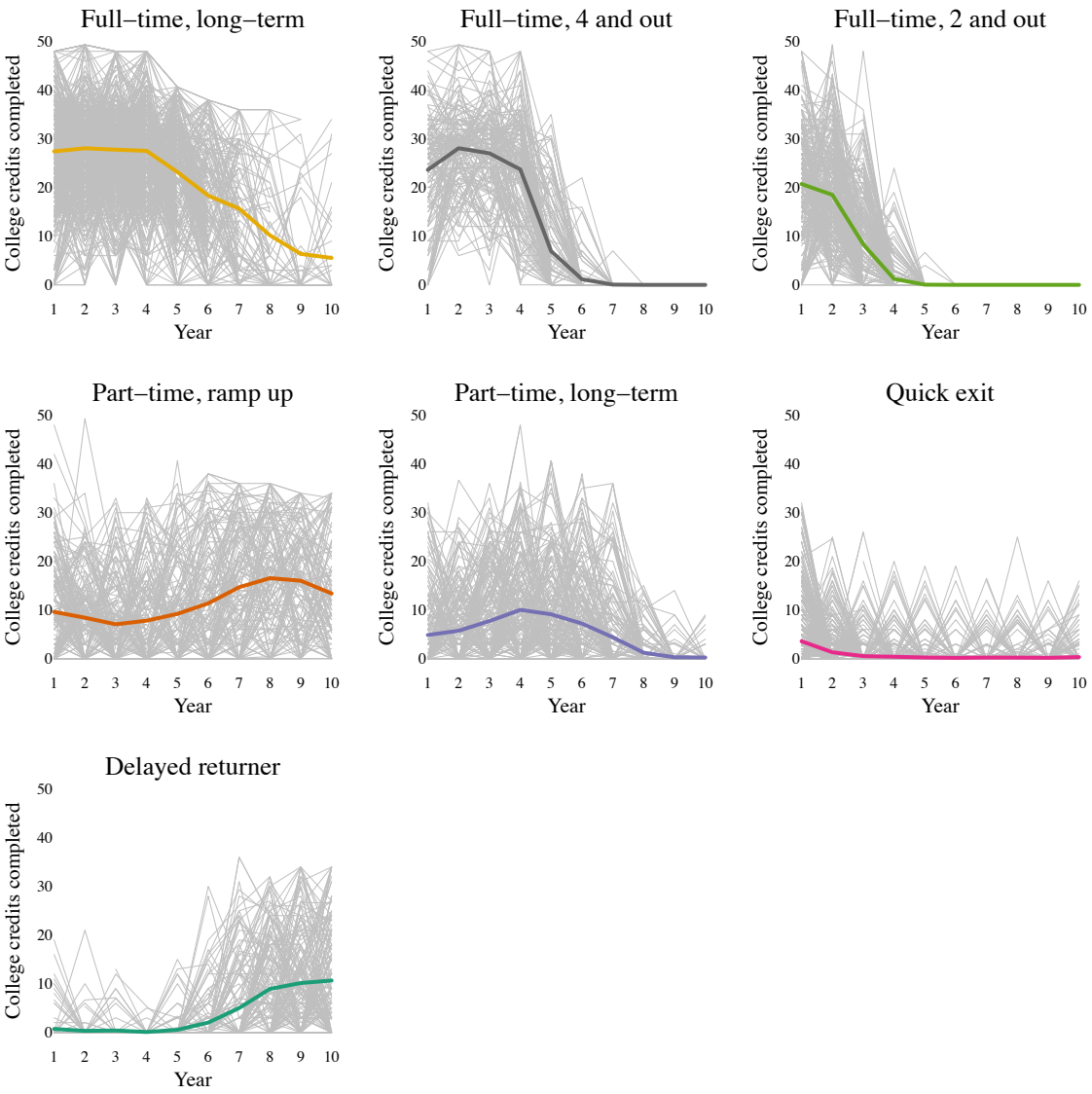
*Notes:* All percentages and means are weighted by the NLSY97 Post-Secondary Transcript Study weights; *N* value is not weighted. Sample size for degree attainment variables is 2,549 (these variables were not imputed; see text for more information).

Table B.2: Parameters for students' group-based trajectories of credits earned

| | Full-time, long-term (25.1%) | Full-time, 4 and out (12.6%) | Full-time, 2 and out (10.9%) | Part-time, ramp-up (7.2%) | Part-time, long-term (9.5%) | Quick exit (27.4%) | Delayed returner (7.3%) |
|---|---|---|---|---|---|---|---|
| Intercept | 24.61*** | 13.98*** | 17.75*** | 4.87* | -6.66** | 3.25** | -20.64*** |
| | (0.85) | (1.74) | (2.64) | (1.91) | (2.21) | (1.11) | (4.69) |
| Year since HS | 2.60*** | 14.48*** | 5.49* | -0.02 | 6.59*** | -7.73*** | 0.41 |
| | (0.47) | (1.25) | (2.60) | (0.81) | (1.12) | (0.58) | (1.56) |
| Year, squared | -0.58*** | -3.09*** | -3.16*** | 0.11 | -0.85*** | 0.55*** | 0.27* |
| | (0.06) | (0.21) | (0.55) | (0.07) | (0.12) | (0.05) | (0.12) |

*Notes:* Table provides the parameter estimates for the preferred seven-group developmental trajectory model. Standard errors are in parentheses. Statistical significance is indicated by: *$p<0.05$; **$p<0.01$; ***$p<0.001$.

Figure B.1: Predicted group means and observed individual trajectories




*Notes:* Figure illustrates the predicted group means (reproduced in color from Figure 3.1) and the observed individual trajectories (in gray) by the trajectory shape for each of the seven group.

Table B.3: Fields of study

| Constructed categories | College Course Map (CCM) names | CCM codes |
|---|---|---|
| Science & math | Agriculture, agriculture operations, and related services | 01 |
| | Natural resources and conservation | 03 |
| | Architecture and related services | 04 |
| | Computer and information sciences and support services | 11 |
| | Engineering | 14 |
| | Engineering technologies and engineering-related fields | 15 |
| | Biological and biomedical sciences | 26 |
| | Mathematics and statistics | 27 |
| | Physical sciences | 40 |
| | Science and technology/technicians | 41 |
| Social sciences & humanities | Area, ethnic, cultural, gender, and group studies | 05 |
| | Communication, journalism, and related programs | 09 |
| | Foreign languages, literatures, and linguistics | 16 |
| | Family and consumer sciences, human sciences | 19 |
| | English language and literature, letters | 23 |
| | Liberal arts and sciences, general studies, and humanities | 24 |
| | Multi/interdisciplinary studies | 30 |
| | Philosophy and religious studies | 38 |
| | Theology and religious vocations | 39 |
| | Psychology | 42 |
| | Public administration and social service professions | 44 |
| | Social sciences | 45 |
| | Visual and performing arts | 50 |
| | History | 54 |
| Business | Business, management, marketing, and related support services | 52 |
| Education | Education | 13 |
| Health | Health-related knowledge and skills | 34 |
| | Health professions and related programs | 51 |
| Pre-professional | Legal professions and studies | 22 |
| | Residency programs | 60 |
| Vocational | Communications technologies/technicians, and support services | 10 |
| | Personal and culinary services | 12 |
| | Library science | 25 |
| | Military science, leadership and operational art | 28 |
| | Military technologies and applied sciences | 29 |
| | Parks, recreation, and leisure studies | 31 |
| | Homeland security, law enforcement, firefighting, and related protective services | 43 |
| | Construction trades | 46 |
| | Mechanic and repair technologies/technicians | 47 |

| | | |
|---|---|---|
| | Precision production | 48 |
| | Transportation and materials moving | 49 |
| Other | Basic skills and developmental/remedial education | 32 |
| | Citizenship activities | 33 |
| | Interpersonal and social skills | 35 |
| | Leisure and recreational activities | 36 |
| | Personal awareness and self-improvement | 37 |
| | High school/secondary diplomas and certificates | 53 |
| | Other courses | 90 |
| Missing | Missing, uncodeable, unknown | N.A. |

# Appendix C

## Supplemental Material for Chapter 4

Table C.1: Results of the effects of an individual's educational attainment, college type attended, and background on their logged hourly wages in 2009, retaining three college sector categories for bachelor's degree recipients

| | Model 5, Table 4.4 | Column 1, Table 4.5 | Column 2, Table 4.5 |
|---|---|---|---|
| Referent: completed high school | | | |
| Some college, attended FP only | 0.03 | | |
| | (0.05) | | |
| Some college, both sectors | -0.01 | | |
| | (0.11) | | |
| Some college, attended NP only | 0.08*** | | |
| | (0.03) | | |
| Associate's degree, attended FP only | -0.06 | | |
| | (0.07) | | |
| Associate's, both sectors | -0.10 | | |
| | (0.19) | | |
| Associate's degree, attended NP only | 0.16*** | | |
| | (0.05) | | |
| Bachelor's degree, attended FP only | 0.10 | | |
| | (0.16) | | |
| Bachelor's, both sectors | 0.23*** | | |
| | (0.08) | | |
| Bachelor's degree, attended NP only | 0.19*** | | |
| | (0.04) | | |
| Referents: attended only public or private, nonprofit for given education level | | | |
| Some college, attended FP only | | -0.05 | 0.01 |
| | | (0.05) | (0.05) |
| Some college, both sectors | | -0.09 | -0.09 |
| | | (0.11) | (0.11) |
| Associate's degree, attended FP only | | -0.22** | -0.25*** |
| | | (0.08) | (0.08) |
| Associate's, both sectors | | -0.26 | -0.25 |
| | | (0.20) | (0.20) |
| Bachelor's degree, attended FP only | | -0.08 | -0.07 |
| | | (0.16) | (0.16) |
| Bachelor's, both sectors | | 0.04 | 0.07 |

| | | | |
|---|---|---|---|
| | | (0.07) | (0.07) |
| Age at college entry | | | -0.03** |
| | | | (0.01) |
| Deviation from college entry to completion | | | -0.14*** |
| | | | (0.04) |
| *N* | 4027 | 2908 | 2908 |

*Notes:* This table reproduces the results from model 5 in Table 4.4 and models 1 and 2 in Table 4.5, using the three-category college sector coding scheme for sub-baccalaureate as well as baccalaureate degree holders. The core results of the paper—that for-profit college-goers earn no more per hour than high school graduates and significantly less than similarly educated nonprofit college-goers at the associate's degree level, but that bachelor's degree holders earn more than high school graduates regardless of college sector, and that the introduction of pathway variables do not attenuate the difference in wages between for-profit and nonprofit associate's degree holders—remain unchanged. In these results, the coefficients for "bachelor's degree, attended FP only" need to be interpreted with caution, as only 10 individuals make up this group. Note that in column 1 of this table the referent education category is "high school graduate." In columns 2 and 3, each cell displays the coefficient obtained from a regression model in which the referent is the "attended only public or private, nonprofit college" category at the given educational level; in other words, each coefficient in the table compares logged hourly wages for those who attended or earned a degree from a for-profit college to those who attended or earned that same degree or educational level exclusively from a nonprofit college. All models also include the same set of controls as in model 5 from Table 4.4 (not shown). Standard errors are in parentheses. Intercept is not shown. Coefficients and standard errors were estimated separately for each of the ten multiply imputed datasets I created; the results, which are presented here, are then pooled using Rubin's rule (Rubin 1987). Data are weighted. Statistical significance is indicated by: *$p<0.05$, **$p<0.01$, ***$p<0.001$.

Table C.2: Fields of study in study sample

| Constructed categories | NLSY major codes included in the newly constructed category | Percentage of sample |
|---|---|---|
| Science & math | Agriculture/natural resources; archaeology; architecture/environmental design; biological studies; computer/information science; engineering; mathematics; physical sciences; sciences/applied sciences | 12.68 (0.58) |
| Social sciences & humanities | Anthropology; area studies; communications; criminology; economics; English; ethnic studies; fine and applied arts; foreign languages; history; home economics; interdisciplinary studies; philosophy; political science and government; psychology; sociology; theology/religious studies; liberal arts; human services, general; social work; geography; international relations and affairs | 21.54 (0.71) |
| Business | Business management; hotel/hospitality management | 15.01 (0.62) |
| Education | Education | 5.49 (0.39) |
| Health | Nursing; nutrition/dietetics; other health professions | 8.19 (0.46) |
| Pre-professional | Pre-dental; pre-law; pre-medical; pre-veterinarian | 0.71 (0.14) |
| Other | None (includes those who did not have to declare a major at their school); automobile/automotive mechanics technology/technician; electrical/electronics maintenance and repair technology; transportation and materials moving; security and protective services; legal support services; other field (includes those listed as other or uncodable in the raw data) | 4.33 (0.35) |
| Missing/unknown | N.A. | 32.06 (0.80) |

*Notes:* All means are weighted by NLSY97 sample weights. Standard deviations in parentheses. Percentages may not add up to 100.0 due to rounding.

Table C.3: Occupations in study sample

| Constructed categories | 2002 Census codes included in this category | Percentage of sample |
|---|---|---|
| Management, business, finance, and professional occupations | 0010–0950; 1000–3540 | 30.64 (0.80) |
| Service occupations | 3600–3950; 4000–4160; 4200–4650 | 19.86 (0.67) |
| Sales occupations | 4700–4960 | 12.36 (0.56) |
| Office and administrative support occupations | 5000–5930 | 14.75 (0.60) |
| Blue collar occupations (including construction, extraction, installation, maintenance, production, transportation, and material moving) | 6000–6940; 7000–7620; 7700–8960; 9000–9750 | 21.57 (0.71) |
| Missing/unknown | N.A. | 0.82 (0.15) |

*Notes:* All means are weighted by NLSY97 sample weights. Standard deviations in parentheses. Percentages may not add up to 100.0 due to rounding.