PATHWAYS THROUGH EDUCATION:

THE EFFECT OF INDIVIDUAL AND STATE LEVEL FACTORS ON

POSTSECONDARY TRAJECTORIES AND ATTAINMENT

by

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(Under the Direction of Linda Renzulli)

ABSTRACT

Access to higher education has increased in recent decades; however, increased access has not led to parallel increases in degree completion among all types of students. Students of lower class backgrounds are consistently more likely to follow college paths associated with lower rates of degree completion. While scholars have examined the causes and consequences of short-term postsecondary enrollment patterns, or "transitions," they have yet to examine the long-term "trajectories" students experience. Moreover, this research does not fully address how local state level context may influence these trajectories and their effects. Building on status attainment theory and the literature on educational transitions, my dissertation extends our understanding of this stratification process. I ask: (1) What is the empirical reality of the postsecondary trajectories students experience? (2) How do academic and social background factors shape the likelihood of students following particular postsecondary trajectories? And (3) How do postsecondary trajectories affect the timing and likelihood of earning a

bachelor's degree, and does the state level sociopolitical context amplify or mitigate this effect? Combining the Education Longitudinal Study of 2002 with state level data sources, I create a unique dataset that situates individuals and their educational experiences within the local context in which they enroll. In my first empirical chapter, I utilize optimal matching sequence analysis techniques to uncover common educational trajectories. I find that there are five distinct postsecondary trajectories that students experience variants of: a traditional path, a lateral transfer path, a vertical transfer path, a two-year path and an unstructured path. I next use the trajectories as a dependent variable exploring what leads individuals on certain paths, and I find that the path one follows is shaped by both ascribed and achieved characteristics. Social class background has a particularly strong effect in shaping who follows which long-term postsecondary trajectory. The last two empirical chapters consider the consequences of trajectories, examining how they shape subsequent bachelor's degree and income attainment. Findings suggest some paths are associated with greater attainment than others and that this effect is moderated by individual level factors and the state context in which a student is enrolled.

INDEX WORDS: Educational Transitions; Higher Education; Status Attainment; Stratification; Optimal Matching Sequence Analysis

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CHAPTER 1

INTRODUCTION

Understanding how students move through postsecondary education and how that movement shapes their subsequent attainment is important, because today, more than ever before, a college degree has become an important marker of success. Long associated with a variety of benefits for individuals, including increased earnings, greater job stability, better working conditions, and better health (Baum, Ma, and Payea 2013; Ma, Pender, and Welch 2016; Perna 2003), the benefits of a bachelor's degree have been heightened by recent social and demographic changes. Income and wealth inequality continue to climb as many of the occupations traditionally held by those without a college degree are in decline or experiencing slower growth (BLS 2015). Meanwhile, the U.S. Bureau of Labor Statistics projects that occupations that require postsecondary education are expected to grow 14 percent by 2022, with those jobs that require a master's degree seeing the greatest percentage growth (Richards and Terkanian 2013). For individuals and the wider society, then, understanding what leads students to a degree is important.

However, understanding what route is most likely to lead to a degree is complicated by the growth in ways that students can move through postsecondary education. The U.S. educational system has long been characterized as having a high degree of permeability, offering multiple points of entry (Turner 1960), and today that trait is reflected in the variety of programs designed to bring back into the fold those students who are off the "traditional" four-year college or university track. Along with

standard community colleges, recent years have seen the expansion and dramatic growth of for-profit institutions, online education programs and "second-chance" programs aimed at getting dropouts back into the system (Allen and Seaman 2007; Bloom 2010; Cohen and Brawer 2008; Tierney and Hentschke 2007). And while choosing a college at the four-year level was once primarily a local search, students, particularly those in the upper class now pick and choose from institutions across the U.S. (McDonough 1997). Patterns in which students stopout of school only to later return or in which they attend multiple institutions over time have also become common (DesJardins, Ahlburg, and McCall 2002a; Goldrick-Rab 2006).

With more choices available, there is an increased need to understand how different enrollment patterns may be more or less likely to lead to successful degree completion. Students need to know which enrollment path will best allow them to achieve their educational and occupational goals. State policymakers need to know how to best encourage increased access and degree completion to maintain or improve their state's level of prosperity. Throughout the dissertation, I explore this issue, considering how different enrollment patterns are shaped and their consequences for attainment.

For social scientists and scholars of higher education, understanding how students experience higher education is also tied to wider concerns about the level of social stratification and mobility in our society. Questions about how individuals end up where they do in our hierarchical social system have motivated the work of sociologists for decades, and work in this area has found that the amount of education one attains is not a neutral process, but one that is strongly influenced by social background (Blau and Duncan 1967; Sewell, Haller, and Portes 1969). This is particularly pertinent when

considering postsecondary enrollment patterns, because while available paths through higher education have expanded, so too have the types of students taking advantage of those paths; however, increases in access have not led to parallel increases in degree attainment among all types of students. On one hand, having more routes through postsecondary education may be beneficial for students if this allows them to find a path or program that works best for their personal needs. However, if already disadvantaged students are disproportionately funneled into paths less likely to lead to degrees, then having more paths through college is likely to exacerbate rather than reduce inequality.

Contribution

Drawing on the insights of status attainment theory, my dissertation builds on the classic models of attainment developed by sociologists in the 1960s and 1970s as well as the more recent work on education in this area (Blau and Duncan 1967; Mare 1980; Sewell et al. 1969; Sewell and Hauser 1972). My dissertation contributes to this literature in several ways. First, my work expands our understanding of the process of attainment by examining how long-term educational trajectories are involved in this process. While education has long been recognized as an important factor in shaping later attainment, to date scholars have typically examined either the effect of one's ultimate educational attainment (e.g. total number of years of education completed) or of single steps in a long-term educational career (e.g. making the decision to attend a community college instead of a four-year school after high school). My dissertation uses a novel method, optimal matching sequence analysis, which allows me to explore the effect of long-term holistic educational careers rather than single transitions or ultimate educational attainment. The method allows me to uncover the extent and form of "ideal type" or

typical enrollment trajectories followed by students and to group individuals into a limited number of ideal types that best represent their experiences. These trajectories reflect the full series of educational transitions a student makes, including the timing, sequence and duration of the experiences involved. While this is a strictly exploratory rather than causal method, the sequence analysis is useful in and of itself, showing the number of different paths individuals in the sample experience and how common each is. While past work has relied on researchers categorizing enrollment patterns a priori, the use of sequence analysis lets the groupings emerge from the data itself.

After identifying the postsecondary trajectories followed by students, I use the resulting groups as the independent and dependent variables in subsequent analyses to explore the causes and consequences of following different postsecondary trajectories. By combining a new method, sequence analysis, with traditional statistical methods, I gain additional leverage in understanding the process of status attainment. Student experiences do not occur as disconnected steps, but as full careers with each enrollment decision affecting future decisions across the life course. By examining postsecondary trajectories rather than single enrollment decisions, I contribute to our understanding of the ways that *whole* educational careers influence later attainment in ways that have not yet been captured by research on educational transitions. Specifically, I explore the factors that lead students to follow particular postsecondary trajectories as they navigate their educational careers, and how postsecondary trajectories shape later attainment, providing a new dimension to our understanding of the process of status attainment.

Finally, I also contribute to our understanding of the status attainment process by exploring how the sociopolitical context may influence the effect of paths through

postsecondary attainment. The United States has a decentralized education system in which most of the control over the educational institutions falls to the state and local governments. Despite this, while the body of work that emerged from the traditional status attainment model has examined variations in education systems internationally, it has yet to consider how the local state level context influences this process. In contrast, scholars of higher education have explicitly drawn attention to state level variation, suggesting that social and political differences between states may significantly influence the educational outcomes of students within the states (Heller 2011a). In my dissertation, I conceptualize the traditional status attainment model as situated within local contexts, examining how state level sociopolitical factors shape educational pathways and later attainment. By integrating the insights of scholars of higher education with classic sociological models of attainment, I bridge the disciplines and shed light on the relationship between state educational policy and student outcomes.

I specifically ask: (1) What is the empirical reality of the postsecondary trajectories that students experience? (2) How do academic and social background factors shape the likelihood of students following particular postsecondary trajectories? And (3) How do postsecondary trajectories affect the timing and likelihood of earning a bachelor's degree, and does the state level sociopolitical context amplify or mitigate this effect? I address these questions using the Education Longitudinal Study of 2002 (ELS:2002). This nationally representative survey collected by the National Center for Education Statistics followed over 15,000 individuals for ten years between 2002 and 2012, or between the ages of 16 and 26, and includes an additional Postsecondary Education Transcript Study that reported the postsecondary enrollment experiences of

respondents up to spring of 2013. I combine this individual level data with various state level data sources to create a unique dataset that situates individuals and their educational experiences within the local context in which they enroll.

Organization of the Dissertation

My dissertation is divided into seven chapters. In this introduction, I describe why it is important to understand how students move through postsecondary education and the effect this has on their later attainment. I note the benefits that come from understanding this process for individuals, for society, and for broader concerns regarding equity, and suggest how my dissertation adds to existing work in this area. In Chapter 2, I describe the major theoretical foundations of my dissertation. I discuss Blau and Duncan's (1967) classic status attainment model, highlighting the ways it developed and how it continues to inform our understanding of stratification. I also discuss the work in higher education on state policy and educational transitions that has contributed to our knowledge of how social origins and social context shape enrollment choices. I then describe how my dissertation bridges these literatures adding to our theoretical understanding of the status attainment process. In Chapter 3, the first empirical chapter, I apply optimal matching sequence analysis techniques to the ELS:2002 data. The paths students take through postsecondary education are highly diverse, and in this chapter I use the method to uncover meaningfully similar groups based on the timing, sequencing and duration of students' enrollment patterns over nine years. After uncovering the trajectories that are experienced by students, I then go further and address the mechanisms by which these trajectories are formed in our education system. In Chapter 4, the results of the sequence analysis are used as the dependent variable, and I examine how social background factors

shape educational trajectories. In Chapters 5 and 6, I turn from how educational trajectories are formed to how they shape later outcomes. In Chapter 5, I examine how educational trajectories predict subsequent bachelor's degree attainment. In this chapter I also consider the role that larger structural and institutional arrangements may have on educational attainment, examining how state level context may moderate the influence of postsecondary trajectories. Chapter 6 is then a brief chapter in which I explore if postsecondary trajectories influence subsequent income attainment after accounting for educational attainment and work history. Finally, in Chapter 7 I conclude the dissertation, reflecting on my findings and highlighting the contribution of my results. I additionally note the limitations of my dissertation and suggest directions for future research.

CHAPTER 2

THEORY

Status Attainment and Stratification

Sociologists have long been concerned with questions of how people end up where they do in our stratified society (Blau and Duncan 1967; Haller and Portes 1973; Kerckhoff 1976; Lin and Yauger 1975; Sewell et al. 1969; Sorensen 1977). We ask, how likely are people to end up better off than their parents? How does a working-class child become a middle-class professional? Is education really the key to upward mobility? These questions motivate the body of work on status attainment, which refers to the process through which one achieves their place in the social hierarchy (Blau and Duncan 1967). Now a long-standing research tradition, work in this area examines the impact of background characteristics, like one's social class or parents' occupational status, and achievements, like years of educational completed, on attainment (Blau and Duncan 1967; Haller and Portes 1973; Sewell et al. 1969). In a truly open society with maximum opportunity for mobility, where one ends up in the social hierarchy would be determined strictly by achievements, with background or ascribed characteristics having little to no effect. Conversely, in a closed society with little to no mobility, where one ends up would be entirely determined by one's social beginnings. Research on status attainment seeks to determine the relative impact of ascribed versus achieved characteristics on attainment and thus the degree of mobility in society (Bielby 1981). Moreover, this body of work, and status attainment theory which emerged out of it, is concerned with

uncovering other factors that are correlated either positively or negatively with attainment, deepening our understanding of the process of attainment rather than simply the extent of it.

The foundations of this tradition stem from the publication of *The American Occupational Structure (AOS)* (Blau and Duncan 1967). Motivated by questions about how individuals end up where they do in our hierarchical system, the work altered the way that stratification and mobility were traditionally conceptualized and measured, and it inspired an extensive literature that that continues to extend our understanding of this process today. This piece laid the groundwork for future work on mobility and status attainment (see for example, Bozick et al. 2010; Kao et al. 2003; Kerckhoff, Campbell, and Trott 1982; Lin and Yauger 1975; Saltiel 1988; Tienda 1982; Treiman and Ganzeboom 1990; Treiman and Terrell 1975). Below I describe the basic path model developed by Blau and Duncan (1967) in some detail, noting its particular contribution to our understanding of status attainment. I then describe the Wisconsin model of status attainment, another early model which extended Blau and Duncan's model to include social psychological measures as additional predictors (Sewell et al. 1969; Sewell and Hauser 1972). I especially highlight the role of education in these foundational models.

The American Occupational Structure

Prior to the publication of *The American Occupational Structure*, work examining mobility within the U.S. and internationally typically consisted of a series of mobility matrix tables that reported the rates of inflow and outflow from respondents' origins to their later occupational destinations, either within a generation or across generations (Glass 1954; Goodman 1965; Rogoff 1953). By examining the degree to which

occupational status increased or decreased, such work allowed researchers to capture the extent of mobility in a given society. However, mobility matrix tables neglected to include other factors that may correlate with movement in the occupational hierarchy. As such, this work can tell us a great deal about the extent of mobility in a given time period or society, but does little to enhance our broader understanding of the causes of the mobility patterns seen in the tables. In contrast, Blau and Duncan (1967) were concerned not only with the *extent* of mobility, but also with *explanations* of mobility patterns. Through the novel use (at that time) of path modeling, the authors examined the influence of both ascribed and achieved factors on ultimate occupational attainment and the ways in which various factors mediate the influence of others. They were the first to statistically model factors that influence mobility, and in doing so they provided both a conceptual and methodological advancement in our understanding of the process by which individuals end up where they do in our occupational hierarchy.

The basic status attainment model developed by Blau and Duncan (1967) is a path model with five variables. Two social origin variables, (1) father's educational attainment and (2) father's occupational status are included; as well as two achieved statuses, (3) respondent's educational attainment and (4) status of respondent's first job. The final dependent variable in the model is the respondent's occupational status in 1962, for as the authors note, occupations form the "major foundation of the stratification system in our society" and thus where we end up in the status system (Blau and Duncan 1967:1). By utilizing a path model, the authors explore not just the effect of a given variable on an outcome, but also how that variable modifies the effects of other the variables in the model. For instance, the model reveals the direct contribution of education on one's

occupational attainment *and* how increasing levels of education modify the effect of social origins on occupational attainment. This permits the authors to both break down the distinct influence of each variable in the model and to trace connections between the variables. The authors find that the variables in the model have both direct and indirect effects on status attainment.

Notable is the primary role that education plays in the status attainment model. Blau and Duncan were certainly not the first to implicate education in the stratification and allocation process. Weber (1946) noted that education serves as a form of status, arguing that while educational credentials facilitate mobility, they also allow those who achieve it to maintain and monopolize desired social advantages. From a functionalist, rather than a conflict perspective, Durkheim (1956) and Sorokin (1959) also theorized on the role of education in shaping where individuals end up in the occupational ladder. Durkheim (1956) suggested that while the major role of education in modern society is socialization—inculcating youth with the common societal ideas, practices and values that collective life demands—schools serve a simultaneous allocation function. Different roles exist in society that must be filled, and it is through education that youth are taught to fulfill different functions later in life (Durkheim 1956).

The work of Blau and Duncan (1967), then, did not emerge spontaneously, but was preceded by work that expressed the role of education in our stratification system. They, however, were the first to systematically model the influence of education in this process. In the basic path model described above, the authors find that education influences occupational attainment through both direct and indirect means. First, social origins do indeed appear to influence occupational attainment, but much of this influence

is mediated through educational attainment. Blau and Duncan (1967) find a direct and positive relationship between both highest grade completed by one's father and father's occupational prestige and the respondent's educational attainment. In other words, having a father who is more educated or in a more prestigious occupation tends to increase the likelihood that one will gain more education themselves. Education then in turn has a direct effect on first job status and occupational status in 1962. Notably, while father's occupation has a direct effect on occupation in 1962, there is no such direct effect between father's education and respondent's occupation in 1962. This means that the full influence of father's educational attainment on child's occupation in 1962 is mediated through its influence on child's education. Ultimately then, the model suggests that both ascriptive and achieved characteristics influence where one ends up in the social hierarchy and that education is an important variable in this process.

The Wisconsin Model

The basic status attainment model developed by Blau and Duncan (1967) has been modified and elaborated upon by numerous scholars. Shortly after the publication of *The American Occupational Structure* (Blau and Duncan 1967), scholars at the University of Wisconsin extended the ideas of Blau and Duncan to create one of the best known elaborations of the basic model (Haller and Portes 1973; Sewell, Haller, and Ohlendorf 1970; Sewell et al. 1969; Sewell and Hauser 1972). This model, developed by William H. Sewell and colleagues, extended and refined the model with the addition of social psychological variables. Commonly referred to as the "Wisconsin model" this model, like that of Blau and Duncan, explores the effect of social origins in shaping later attainment, and in addition to the variables measuring socioeconomic background,

educational attainment and occupational attainment, the model includes variables that capture educational and occupational aspirations, the influence of significant others, academic performance and mental ability.

Sewell and colleagues found that the social psychological variables included in their model served as significant intervening variables between social origins and later attainment. Higher SES students have greater educational attainment, in part, because they receive greater encouragement from parents, teachers and peers and this in turn increases their level of educational aspirations. The Wisconsin model, like Blau and Duncan's model of status attainment is a path model with variables both directly influencing educational and occupational status and indirectly influencing these outcomes through their effect on other variables. Again, schooling is a key variable in the attainment process. Educational attainment shapes occupational status directly, but educational achievement and perceptions about the desired or appropriate level of education for oneself are important predictors in the process as well. Tests of the model found that educational aspirations strongly affect educational attainment, an effect that occurs independent of measured SES and mental ability. They also found that most of the effect of social origins on educational attainment was mediated by aspirations and the perceived level of support of significant others (Sewell and Hauser 1972).

Status Attainment Theory: Continued Extensions and Critiques

Since the development of these early models, then, education has been recognized as an important factor that is both shaped by social background and which has the power to shape later attainment. These models of status attainment formed the theoretical foundation of many empirical pieces, and over the past several decades scholars have

extensively tested, critiqued, and extended the basic models. For instance, Blau and Duncan's (1967) status attainment model has been criticized for its failure to include other ascribed characteristics, like gender, in the model. While Blau and Duncan use a sample that consists only of men, other scholars have included women in their analyses and examined the ways in which the status attainment process may vary by gender (Falk and Cosby 1975; Sewell, Hauser, and Wolf 1980; Tienda 1982; Treiman and Terrell 1975). And in contrast to Blau and Duncan, Sewell and colleagues did explore the effect of gender in subsequent research using the Wisconsin model (Sewell et al. 1980). Work in this area has largely found that the status attainment model is applicable to women as well as men. While tests of the basic status attainment process show subtle differences by gender, for instance, women tend to begin in slightly higher status initial jobs while men generally see greater increases in job status over time (Sewell et al. 1980), the general finding that social origins shape occupational outcomes both directly and indirectly through its effect on educational attainment holds for women as well as for men (Treiman and Terrell 1975). Thus the model can be effectively applied to women, though attention should be paid to any differences by gender that appear. Other critiques of the basic model called attention to the need to expand the measure of father's occupational prestige to additionally include measures of mother's occupational prestige (Plutzer and Zipp 2001; Sørensen 1994; Beller 2009), and to examine how the process of status attainment may vary by race or ethnicity (Winship 1992; Tienda 1982).

One of the major critiques of *AOS* was the lack of the inclusion of structural influence in the basic model. Critics charged that the model focused too heavily on the role of differences in individual attributes and achievements while neglecting the broader

structural influences that shape mobility patterns. And indeed, both the classic Blau and Duncan model and the basic Wisconsin model consist entirely of individual level variables (although the larger research project on attainment by the Wisconsin scholars did include measures of community and school context) (Blau and Duncan 1967; Haller and Portes 1973; Sewell et al. 1969; Sewell et al. 1980; Sewell and Hauser 1972). Missing from the models are variables that capture structural influence on status attainment or the ways in which individual level variables and their effects vary by institutional context.

Shortly after the development of the *AOS* model, this critique was leveled against the early status attainment scholars by scholars that came to be known as New Structuralists (Kerckhoff 1993). These scholars argued that Blau and Duncan failed to take into account the complexity of the occupational structure in the U.S. For instance, they highlighted the dual character of the occupational hierarchy, arguing that both a core and peripheral labor market exist in the American economy, or focused on the particular ways that labor flows are structured within unique industries (Baron and Bielby 1980; Beck, Horan, and Tolbert II 1978; Kalleberg, Wallace, and Althauser 1981; Kerckhoff 1976; Stolzenberg 1978). These scholars suggested that understanding the structural context was vital for accurately measuring mobility and that the individual level variables in the model may not show the same effects depending on which sector of the economy one was located.

While it is accurate that the basic status attainment model developed by Blau and Duncan lacked variables that captured the effect of structural level influences, structure was not entirely neglected from their work. In *AOS*, Blau and Duncan state that their

results may vary for different sub-populations in the U.S., and the authors attempt to examine some of this potential variation (across races, regions, etc.), although this contribution of the book was largely ignored compared to the attention received for the basic model (Burton and Grusky 1992). Moreover, in a later piece reflecting on the status attainment model he developed decades before, Blau suggests that the subsequent work on the dual economy, while it may be justified, is still based on crude dichotomy rather than a "penetrating structural analysis" (Blau and Duncan 1992:597), and reiterates that *AOS* is a case study of a single occupational structure. He suggests that to adequately understand the ways in which structural variation exists *within* societies and conditions mobility would require a much more complex, and essentially a different, study to address this.

In the mid-1990s a new wave of theoretical and empirical pieces emerged which combined individual and structural factors in the study of status attainment (Kerckhoff 1995). In his review piece, Kerckhoff (1995) suggests that this new body of work added two significant modifications to the status attainment process. First, mobility was understood as a series of moves between different structural locations, and second, structural locations were seen as hierarchically ranked, offering different opportunities for later attainment (Kerckhoff 1995). This body of work applied a conflict perspective approach to the theory of status attainment, highlighting the role of institutions in sorting individuals into hierarchical positions. Work in this area examined national variation and how societal arrangements influence the different steps of the status attainment process, as well as how more local variation within a society matters, including neighborhood context (Treiman and Ganzeboom 2000; Yaish and Andersen 2012). With regards to

educational context, much of this work focused on the sorting function of schools. Variations in education systems, including how highly stratified, how decentralized, and how specialized the school system is, were identified as key components in shaping the levels of stratification and mobility seen in different societies (Kerckhoff 1995).

My dissertation seeks to extend the work on status attainment by incorporating state level structural conditions that may influence the process of college-going, and ultimately of attainment. By incorporating how the sociopolitical context may amplify or mitigate the individual influence of social background on routes through college, I provide a deeper look at the role that larger structural and institutional arrangements may have on educational attainment and broader mobility processes. Doing so does not invalidate the classic status attainment models which provide a parsimonious dissection of the central elements that structure mobility. Rather it extends our understanding of how both structural and individual factors shape attainment through variation that exists within societies. My work builds on the work of scholars who called for structural complexity to be brought back into the models as well as the foundational status attainment scholars whose own work highlighted the existence of regional variation in the attainment process.

Structures are important when considering how students move through postsecondary institutions because the state and educational structures that one encounters may have a dramatic effect on the life chances of students. To stay competitive nationally and internationally, states are currently initiating many policies designed to promote student achievement and college completion. The diverse set of policies schools and states are enacting, from efforts to keep costs down to developing

stronger articulation agreements that aid in transfer between schools, reveal a story that reflects a variety of policy initiatives and changes in a relatively short period of time (Perna and Finney 2014).

Policies that promote educational attainment, however, are not necessarily engaging with the insights of the classic status attainment model. Indeed, while much of the policy that promotes K-12 or K-16 initiatives implicitly recognizes educational attainment as a process, its incorporation of status attainment theory remains on the margins. Policymakers target disadvantaged groups but often fail to adequately consider the complex interactions between social origins, educational attainment and structures. For instance, research has shown that much of the benefit of state merit-based rewards, like Georgia's HOPE scholarship, accrue to better-off students who would have been likely to attend or complete college already without such aid (Heller and Marin 2004; Sjoquist and Winters 2015). Such programs expend limited state funds on programs that have little to no meaningful impact on increasing college completion for the state. By understanding state level factors in relation to the status attainment process, we can better see how certain contexts are likely to differentially impact the effect of following certain paths on attainment, providing a major theoretical contribution to our understanding of the status attainment process.

Status Attainment and Developments in Educational Research

As noted above, educational attainment is a major component of the early status attainment models, and when it appeared in these models educational attainment was typically included as a measure of *ultimate* educational attainment, for instance the total number of grades completed (Blau and Duncan 1967). However, measuring only

ultimate educational attainment obscures the steps that must be completed along the way to get individuals to that state. Shortly after the development of the classic status attainment models, education scholars began to argue that to best understand the impact of social origins on attainment, educational attainment must be conceptualized not as a single accomplishment, but as a series of transitions (Mare 1980, 1981). This theoretical insight provided a fruitful direction for scholars interested in the role of education in the stratification process and gave rise to a large literature examining how patterns of educational enrollment shape later attainment. I refer to this body of work as the educational transitions literature or the educational pathways literature in the remainder of this dissertation.

In Blau and Duncan's model of status attainment and the Wisconsin model, ultimate educational attainment both directly shapes occupational attainment and carries some of the effect of social origins on occupational attainment. The models assume, however, that the effect of social origin variables on educational attainment is constant no matter the level of education one reaches. Mare (1980, 1981) called this assumption into question, arguing that the effect of social origins on educational attainment may be stronger or weaker depending on the level of education one is attempting. For instance, social background factors may have a strong effect on whether one successfully transitions from primary school to secondary school, but less of an effect on whether one subsequently graduates from high school. Building on the work of early mobility scholars, Mare (1980) suggested that to accurately understand the ways in which social origins effect educational attainment, and other outcomes, educational sequences need to be studied. Each step along an educational pathway is predicated upon the completion of

previous steps and the effect of social background depends on where one is in the sequence. One must generally complete high school, for instance, for higher education to enter the realm of possible options. Mare's education transitions model, which examined the effect of social origins on educational transitions by utilizing a series of logistic regressions, became the standard method for modeling educational stratification (Shavit and Blossfeld 1993). The major contribution of this research was to show how movement through educational institutions is integral to our understanding of how social origins shape educational attainment.

Later research further extended our understanding of how social origins affect educational attainment by providing a more nuanced conceptualization of pathways through education, considering the potential for students to be enrolled at the same level of education, but in qualitatively different tracks or institutions. Breen and Jonsson (2000) argued that understanding the effect of social origins on later outcomes demands that the one consider not just if transitions between levels of education occur (i.e. transitioning from high school to postsecondary), but also what *type* of transition occurs (i.e. transitioning into a four-year versus a two-year institution). These authors proposed the use of a multinomial logit model, which can account for parallel tracks of qualitatively different types of educational experiences (Breen and Jonsson 2000).

Educational Transitions Literature

Today, a large body of work has developed with its origins in the status attainment models of Blau and Duncan and the Wisconsin school, and which draws on the theoretical insights of the education transitions model. Motivated by similar questions of how social background affects stratification, this body of work extends our

understanding of the process of status attainment by examining one of the pathways of the classic status attainment models, namely the linkage between social background and educational attainment, in greater detail. Notably, the ways that educational pathways are conceived of and operationalized has expanded dramatically. As the number of pathways that are available to students have grown, so too have the ways of studying them. Pathways scholars now examine the ways that educational transitions vary in timing, type and duration at all levels of education. Research on educational transitions and pathways has examined the predictors and consequences of delayed entry into postsecondary institutions after high school completion (Bozick and DeLuca 2005; Cabrera and Nasa 2001; Hearn 1992; Roksa and Velez 2012; Rowan-Kenyon 2007), transfer between institutions (Goldrick-Rab and Pfeffer 2009), spells of non-enrollment (DesJardins, Ahlburg, and McCall 2006; Goldrick-Rab 2006), the type of higher education institution a student first attends (Cabrera et al. 2012), enrollment at multiple institutions over time (Goldrick-Rab 2006), and enrollment intensity (Hearn 1992). At the lower levels of education, scholars have looked at pathways relating to alternative degrees, like the GED (Murnane, Willett, & Tyler, 2000), school placements or tracking (Dauber, Alexander, & Entwisle, 1996) and school dropout (Chuang, 1997).

The results of this empirical work on educational pathways reveal that social origins affect educational transitions, which in turn influence later attainment. While the specific effect of social origins on educational pathways depends on the enrollment pattern under study, the general finding is that lower SES students are more likely to follow nontraditional paths that are associated with lower levels of degree and income attainment (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011; Hearn 1992; Rowan-

Kenyon 2007). Individuals from disadvantaged backgrounds are more likely to follow nontraditional educational paths such as attending school part-time or delaying college, and compared to those who follow more traditional pathways these students are less likely to graduate from college (Bozick and DeLuca 2005; Hearn 1992; Rowan-Kenyon 2007; Turley, Santos, and Ceja 2007).

From Transitions to Trajectories

Typically, event history and logistic or multinomial regression analyses methods are used to examine educational pathways (see for example, DesJardins, Ahlburg, and McCall 2002; DesJardins and McCall 2010; Goldrick-Rab 2006). Such methods have provided us with important insights into the process of educational attainment. The event history method, which models time until transition, is particularly useful for understanding longitudinal processes because the method can capture the effect of both the duration and the steps in a career on a given transition (Halpin and Chan 1998). However, such methods typically examine only unique transitions or enrollment patterns rather than whole sequences of educational steps. As a result, the educational transitions literature has largely captured "transitions" rather than "trajectories," a distinction that emerged from the life course perspective.

Popularized in the second half of the twentieth century and now widely accepted in the social sciences, the life course perspective emphasizes the multiplicity of paths an individual can take throughout the life span. It considers how paths in one aspect of life, like education, work, or family formation, may be influenced by institutional structures, the historical context, or by action in other spheres of life (Elder, Johnson, and Crosnoe 2003). The perspective highlights change in individuals' lives over extended periods of

time, rather than just short term status changes (Mayer 2009), distinguishing between "trajectories," the long-term paths or lines of development that characterize an individual's life course, and "transitions," life events embedded within a trajectory that occur over a shorter time period (Elder 1985). While work on educational pathways using traditional statistical methods has effectively modeled "transitions," thus far it has failed to capture the full "trajectories" experienced by young people and emphasized by life course scholars.

This is problematic theoretically, because we know that each step along an educational path is influenced by prior steps. When focusing on only a single transition, one loses sight of the full educational pathways or career lines and can fail to account for the ways that prior transitions influence later transitions. For instance, there may be some early transitions that set individuals on paths from which they cannot recover. Conversely, examining only single transitions may bias our estimates of the effects of certain transitions if our models do not allow for the possibility of students making transitions at later points in time. A student may drop out of school but then later return. If we were to study the effect of dropping out by examining the single transition only, this may lead us to overestimate the negative effect of exiting school early.

Additionally, from an empirical perspective, longitudinal datasets that track students over extended periods of time provide us with a valuable resource. Such datasets provide a wealth of information about patterns that occur over time, in particular, capturing the extent of uncommon and off-time patterns that may involve movement in and out of schools or attendance at multiple institutions. When we focus on single transitions our research discards much of the potentially meaningful information

contained in these datasets about educational pathways, and we are not accurately representing the status attainment process for those nontraditional individuals.

In this dissertation, I argue that to best understand the status attainment process and how educational experiences are shaped and shape later outcomes, long-term educational trajectories need to be incorporated into the status attainment framework. By examining holistic educational careers that can account for the timing, duration and sequencing of multiple moves, we gain a deeper insight into how the long-term process of status attainment is shaped. I uncover the typical postsecondary trajectories experienced by students using sequence analysis techniques. The next chapter explains the method in detail and describes how it is used to identify the postsecondary pathways commonly experienced by those in the sample.

CHAPTER 3.

UNCOVERING EDUCATIONAL TRAJECTORIES

Sequence Analysis Techniques: Introduction and Impetus

Sequence analysis techniques, as developed in the social sciences, grew out of a broader trend in the field that emphasized the need to study social events and actions within their context. Today, many areas of research, including education, concern events and actions that unfold over time, experienced as a series of successive and cumulative steps in an individual's life. However, part of the challenge faced by social scientists who examine these life experiences is the ability to adequately account for their truly temporal character. Most traditional methodological techniques are non-sequential and tend to simplify complex chains of actions into single variables. In contrast, sequence analysis represents a shift toward studying processes and understanding longitudinal events holistically (Abbott and Tsay 2000).

At its core, sequence analysis is interested in temporal patterns. It is a set of questions and techniques designed to uncover meaningful groups among heterogenous patterns of events. Widely used in the biological sciences to compare resemblances in DNA sequences (Kruskal 1983), the method was introduced to the social sciences by Abbott in the late 1980s to early 1990s (Abbott 1995; Abbott and Forrest 1986; Abbott and Hrycak 1990). Sequence analysis involves studying whole sequences of events rather than single events or transitions (Abbott 1995). Using techniques that compare

whole sequences, the method allows researchers to uncover meaningful groups and build typologies based on common temporal patterns that appear in the sequences.

The method is particularly suited to examining careers and other processes that unfold sequentially over time or space. "Careers" should be understood broadly. While work utilizing the method often examines occupational careers, it may also reflect patterns of health, family formation or education across the development of the life course of individuals or families, or the development of organizations (Abbott and Hrycak 1990). Indeed, any type of career that unfolds via a series of sequential states is potentially suited to the method. The method's application to the social sciences, then, developed out of a desire to better model and account for the longitudinal and sequential nature of careers experienced by individuals or organizations.

Applying the technique to educational careers should enhance our understanding of the broader status attainment process. To understand where people end up in the status attainment hierarchy necessitates research examining the ways individuals move through educational institutions over time. Educational careers are best thought of as series of steps or transitions that follow one after another. For instance, one person's school-to-work career might reflect a sequence in which the person completes high school, goes to college, earns a degree and then enters the workforce. Another individual might drop out of high school, enter the workforce, and then return to earn a GED at a later date. While the ordering of events (entering the workforce first or completing school first) or the states (completing high school or earning a GED) that these two individuals experience may differ, their movement through educational institutions and out of school occurs as a series of transitions in their life course. Thus, understanding careers, and specifically

understanding how students move through educational institutions and the effect of this movement on their later attainment, inherently demands a focus on the sequencing of events over time.

In this chapter I ask, what are the empirical realities of the trajectories students experience as they move in and out of postsecondary educational institutions? I answer this question through the use of a methodology, sequence analysis, which has yet to be applied to the topic. In the following sections I explain the method in more detail. I first provide an overview of the sequence analysis technique and its application to social science research, highlighting the unique contributions of the method. I then review the body of empirical work that has utilized the technique. I additionally consider how use of the method has extended our understanding of educational trajectories, specifically school-to-work trajectories, and where gaps still remain, before turning to the application of the method to my own data.

Overview of the Method

While the specific steps and decisions I make in applying this method to my data will be covered in detail later in this chapter, in this section I provide a brief overview of the steps involved in the technique. Because this method is not as commonly seen as more traditional analytic methods, this overview should set the stage for the reader to gain a basic understanding of the method before I turn to its contributions and use in social science research.

There are many different techniques and methods under the umbrella of "sequence analysis." The most commonly used method among research examining careers and the life course in the social sciences is optimal matching sequence analysis

(Abbott and Tsay 2000). This is the method I employ in my own analysis and which I describe here. At its core, the technique involves a two-step process. First, data are coded into an ordered list of elements that expresses the states people experienced during the time period under study, and measures of dissimilarity are computed to quantify how similar/different each sequence is from all other sequences in the data. Second, a clustering technique is used to categorize individual sequences into substantively meaningful groups in which the members of a given group are more similar to each other than to members of other groups.

In the case of careers, Step 1 of sequence analysis could proceed as follows. We can think of all types of careers as a series of discrete states that people occupy over time. When placed together in chronological order, these states form a sequence. Thus, initially a finite set of categorical states of interest are defined and the experiences of each respondent (or other entity) are described by listing the occupied states one after the other to show that respondent's career. For instance, in a longitudinal dataset that measures educational status over ten years, individuals might occupy one of three states at any given time. They might be (A) enrolled in a two-year program; (B) enrolled in a four-year program; or (C) not currently enrolled. Two individuals might have sequences that look like this:

B B B B C C C C C C Individual 1

A A B B B C C C C C Individual 2

States:
A=enrolled in a two-year program
B=enrolled in a four-year program
C=not currently enrolled

In the example above, the different letters correspond to elements of an individual's educational career over the span of ten time periods (ten years). Each sequence of ten elements describes an individual's experiences during the ten-year period. Individual 1 has a sequence that reflects the "traditional" path through education. The individual enrolled in a four-year program for four years and then was not enrolled in a postsecondary program for the remaining six years. Individual 2 has a very different sequence that begins with two years in a two-year program, followed by three years in a four-year program, followed by five years in which they were not enrolled in any postsecondary program until the end of the survey period.

Step 1 also involves quantifying how similar or different each sequence is from the others. While the above examples are limited to three states over ten time periods, educational sequences could be considerably more complex, and the number of potential sequences grows exponentially as the number of states increases. Therefore, after coding the data into sequences, analysts rely on special algorithms to create a measure of distance between each pair of sequences, or to a reference sequence, by calculating the cost of transforming one sequence to match the other. Transformations are performed by either inserting or deleting elements of the sequence (collectively known as "indels") or substituting one element of the sequence for another until the two sequences match (Abbott & Tsay, 2000; Gauthier, Widmer, Bucher, & Notredame, 2014). In the example given above, the sequence of Individual 2 could be transformed to match the sequence of Individual 1 if we were to substitute the first and second elements of Individual 2's sequence with "B"s and the fifth element with a "C," such that **A**-**A**-B-B-**B**-C-C-C-C-C becomes **B**-**B**-B-B-**C**-C-C-C-C-C. A key part of this process involves the researcher

setting costs for the different operations used to transform the sequences (indels and substitutions) and there are different and somewhat controversial rationales for setting those costs. I will discuss this in greater depth in the methods section on this chapter. Next, the researcher applies an algorithm that generates a measure of dissimilarity between each pair of sequences in the data. Ultimately the distance between any two sequences is equal to the *minimum* number of substitutions and indels needed to transform the sequences to be identical (Abbott 1995; Halpin and Chan 1998; MacIndoe and Abbott 2004). The technique is commonly referred to as optimal matching analysis (OMA) because it seeks the optimal, or least costly, way to transform one sequence into another.

In the second step of the process, after calculating the sequence distances, some form of cluster analysis is used to group similar sequences. The challenge facing the researcher is to minimize the noise and chaos to uncover meaningfully similar sequences. To capture such patterns without being overwhelmed by individual variation, clustering procedures are used to uncover "typical careers" within the data. This allows one to find homogenous subpopulations among a larger heterogeneous population and to identify meaningful groups or classes of individuals (Halpin and Chan 1998). These groups can be thought of as "typical pathways" or trajectories experienced by respondents. Essentially, these identified groups represent "ideal types." The individual sequences within the groups will vary, but the goal is to draw group boundaries so that experiences of individuals within groups will be more similar to each other than to those of individuals in other groups (MacIndoe and Abbott 2004). Those who are close in distance should be closer in experience. Once these groups are defined, it is then possible to

answer a number of descriptive questions about the pathways that are experienced by respondents. One can identify how many ideal type trajectories exist and the proportion of the sample that follows each trajectory. Additionally, although this method is strictly descriptive rather than causal, the resulting categories may be used as independent or dependent variables in later analyses (Aisenbrey and Fasang 2010; MacIndoe and Abbott 2004). Later in this chapter when I describe my application of the method I will describe the clustering procedure in more detail, including different clustering algorithms commonly used to group sequences and the techniques used to identify the best cluster solution.

Contributions of the Method

As a method, sequence analysis is part of a larger shift from variable based analysis in which the entities in question are defined by a set of measurable characteristics, to process based analysis (Abbott 1995). While other methods, including event history analysis, also seek to capture aspects of the process in question, unlike traditional probabilistic methods used to study careers which typically examine one or more distinct transitions of interest, sequence analysis methods can take full trajectories into account by treating longitudinal sequences holistically (Anyadike-Danes and McVicar 2010). Thus, while event history models may be adjusted to account for prior history and concurrent events through the inclusion of time dependent variables, the method is nonetheless restricted in its ability to account for other characteristics that sequences preserve including the order, timing, and duration of states. Both the classic status attainment models and the more recent work on educational transitions fail to model the full educational trajectories experienced by individuals. In contrast, sequence

analysis is useful when examining different types of careers because rather than focusing on single transitions, the method utilizes *whole sequences*, allowing one to examine the type, number, duration and order of *multiple* transitions across the life course. Careers of all types, be they organizational, criminal, or educational, unfold sequentially, and this method allows one to capture the full complexity of those sequences, setting individual transitions within the wider context of the life course. As Aisenbrey and Fasang (2010) note, sequence analysis "can reduce the imbalance between the core concepts of transition and trajectory in life course research; sequence analysis can bring the trajectory, the actual 'course,' back into research on the life course" (421).

Thus, sequence analysis should be thought of as complimentary to traditional statistical methods. While probability based methods can address causality, sequence analysis, which is exploratory rather than causal, uses the data itself to uncover typical and atypical patterns actually experienced by respondents (Eerola and Helske 2012). The method is useful in and of itself, providing a wealth of descriptive information about the ways the life course unfolds for individuals. For instance, when considering educational trajectories, the method can reveal the number of different paths students in the sample follow and the prevalence of particular educational trajectories (i.e. how common is movement from a two-year school to a four-year school versus movement from a four-year school to another four-year school?). Additionally, the method also allows one to uncover the common, or ideal type, pathways followed by respondents in the sample and to group individuals into the trajectory that best fits their experience. Then utilizing the groups uncovered by the sequence analysis as the dependent and independent variables in subsequent analyses, we can identify the underlying mechanisms that produce the

patterns, as well as measure the effects of such patterns. We can see who is at risk for particular trajectories and how policy initiatives affect them, providing us with both theoretically and practically useful information that can be used to guide policy.

In my case, the method will allow me to see how youth move through educational institutions. Specifically, we can see the extent to which students are, or are not, following the traditional path through education. Uncovering these trajectories will provide a valuable contribution to the exiting literature because it will allow me to more accurately estimate the effect of social background on routes through educational institutions and the effect of trajectories on later attainment. By applying sequence analysis methods, I capture not just transitions but extended educational trajectories. Doing so will allow for a better understanding of the *ongoing* process of educational attainment.

Empirical Work Using Sequence Analysis

Although still a relatively new method, sequence analysis has seen numerous applications across a diverse set of topics and fields. Within the social sciences, the method has been used to study everything from individuals' career paths in the fields of finance (Blair-Loy 1999) and information technology (Joseph et al. 2012) to patient-doctor speech patterns (Piccolo et al. 2007). Much of the work however has focused in two broad areas, namely on occupational careers and family careers, and in the intersections between these life spheres. Bringing the life course perspective to bear, work in these areas has examined the degree of standardization or variation in family-life trajectories and occupational careers between different cohorts over time, different genders or different countries (Elzinga and Liefbroer 2007; Kogan 2007; Scherer 2001;

Simonson, Gordo, and Titova 2011). For example, Schoon et al. (2001) look at the occupational patterns of two British cohorts across the ages of 16 to 21. The authors examine the degree to which trajectories became more fluid or de-standardized over time and how the trajectories varied by gender within cohorts, and find that the later cohorts have more fluid patterns of occupational experiences in young adulthood.

Additionally, much of this empirical work uses the groups uncovered by the cluster analysis as the dependent and independent variables in further analyses (Anyadike-Danes & McVicar, 2005; Dorsett & Lucchino, 2013; Elzinga & Liefbroer, 2007; Halpin & Chan, 1998; Kogan, 2007; McVicar & Anyadike-Danes, 2002; Scherer, 2001). Such work allows researchers to uncover the social and economic conditions that give rise to or result from particular trajectories. Schoon et al. (2001), for instance, find that social origins matter and interact with gender in shaping occupational trajectories. Women from more advantaged backgrounds were more likely to be in the full-time employment pathway than women with less advantaged backgrounds. As can be seen in this example, the method allows one to consider who is most at risk for particular trajectories and can suggest factors or policies that may be effective in reducing that risk. Scholars have also considered the broader societal context in which these careers occur, looking at the effect of demographic changes in the society (Kogan 2007), specific policies that have been enacted (e.g. job training programs) (Brzinsky-Fay 2007; Schoon et al. 2001), and the political ideology of the country (Elzinga and Liefbroer 2007).

Other scholarship using the method has applied newer multiple sequence analysis (MSA) techniques to examine multiple life spheres at once. Such work has examined the way in which combinations of labor market, housing and relationship states

simultaneously interact with each other to shape trajectories across the life course (Pollock 2007; Wiggins et al. 2007). Thus, we can see that sequence analysis methods have been widely applied to the study of other "careers" commonly of interest to social scientists. However, despite the ordered and patterned nature of educational careers, little empirical work on educational trajectories exists. One exception to this is Baysu and de Valk's (2012) analysis of the educational trajectories of children of immigrants in four European countries. The authors examine how school segregation and mixed friendship groups affect the educational trajectories seen in different countries. While the specific states used in the sequences vary by country, they provide a high degree of nuance capturing different types of educational experiences. In Sweden, for instance, educational states in the sequences include enrollment in lower secondary; higher secondary academic; higher secondary vocational; adult secondary and folk high school; polytechnics; and university or higher. The authors find that certain broad trajectories are seen in all countries, while the exact routes that make up these trajectories vary by country. Immigrants are more likely to experience short trajectories, but this varies by the structure of the national school system. Apart from this exception, work examining educational sequences is rare, and where education does appear in empirical work using sequence analysis, it appears in a simplified form in the literature that examines school-to-work transitions.

School-to-Work Transitions Literature

In contrast to the educational transitions literature, sequence analysis techniques have been used extensively in research on the school-to-work transition (e.g. Anyadike-Danes and McVicar 2005, 2010; Brzinsky-Fay 2007; Dorsett and Lucchino 2013;

Quintini and Manfredi 2009; Scherer 2001). This body of research typically examines the smoothness of the transition from full-time schooling into employment for youth. Scholars have utilized sequence analysis techniques to study this transition as a process rather than a one-time transition, to better capture the variability and volatility of this period in the life course. Commonly used cross-sectional indicators of youth labor market success, like the youth unemployment rate, provide only a limited snapshot into this complex transition process. Sequence analysis techniques, in contrast, better allow researchers to capture the dynamic aspects of the transition process in which individuals may experience multiple moves in and out of the labor market, job changes, moves back into education and spells of unemployment over time. Research has examined numerous aspects of the school-to-work transition process, including the existence or duration of unemployment spells and the time to first job (McVicar and Anyadike-Danes 2002; Quintini and Manfredi 2009), and how patterns of labor force entry vary cross-nationally (Brzinsky-Fay 2007; Scherer 2001) and over time (Schoon et al. 2001). The resulting typologies have also been used in further analyses examining how individual and nation-level institutional factors shape the composition and frequency of particular school-to-work trajectories (Anyadike-Danes and McVicar 2005, 2010; Brzinsky-Fay 2007; Dorsett and Lucchino 2013; Quintini and Manfredi 2009; Scherer 2001), and how different trajectories are associated with different levels of labor market success in the future (Quintini and Manfredi 2009).

While "school" is a key component of research on the school-to-work transition period, the emphasis of this work, however, is clearly placed on employment patterns rather than upon educational patterns. While continued education often appears in such

works, it is typically captured by a single state in the sequence. In contrast, variable types of employment distinguish multiple potential states (Anyadike-Danes and McVicar 2010; Dorsett and Lucchino 2013; McVicar and Anyadike-Danes 2002; Scherer 2001). For instance, Scherer (2001) compares the school-to-work transitions of youth in Great Britain and West Germany. While her distinctions in employment states include self-employment, full-time employment, part-time employment, and unemployment, education is captured by the single state "return to full-time enrollment." Similarly, Anyadike-Danes and McVicar (2005) allow for six school-to-work states in their study of a British cohort, but group all educational patterns into one state. After conducting a sequence analysis, the authors find that the second largest cluster is made up of individuals who spend a long period of time in education before entering employment. This finding is not unique. Multiple scholars studying the school-to-work transition period have found that a continued education pathway is one of the most commonly experienced trajectories seen among their respondents (Brzinsky-Fay 2007; Schoon et al. 2001).

Clearly continued education is common among young adults; however, by representing the complex paths through higher education as simply "in education," this body of work fails to fully capture the variation in this aspect of the transition to adulthood. One of the more nuanced studies regarding the role of education in work trajectories is that of McVicar and Anyadike-Danes (2002), which allows for "still in school," "further education," and "higher education" in their analysis of Irish youth. This study, however, still fails to distinguish between meaningful differences in educational level and order that are emphasized by scholars of higher education.

To date, then, the theoretical focus on the *work* aspect of school-to-work transition has dominated with less attention paid to the role of education in this process. Little work using sequence analysis has been used to explicitly study educational trajectories across the transition to adulthood, and my dissertation seeks to fill this gap. My intention is to extend the school-to-work transitions literature by including more nuanced measures of education when determining trajectories. While I am interested in the way that work and schools jointly affect each other, my focus is more firmly upon pathways through educational institutions, rather than on career sequences.

Data

My sample is drawn from the Educational Longitudinal Study of 2002 (ELS:2002). Commissioned by the National Center for Educational Statistics, the study follows tenth grade students through high school and on to postsecondary attainment or work (Ingels et al. 2014). The study employed a multi-stage sampling process in which a nationally representative group of public, private, and charter schools serving tenth grade students in the U.S. were initially sampled, with students then sampled from within those schools. For 2002, the initial year of the study, this resulted in a sample of 15,362 tenth grade participants from 752 schools. These data provide information from multiple levels, with questionnaires completed by students, parents, teachers, school administrators and school librarians, and additional questionnaires completed by specific student populations including dropouts, early graduates and transfer students. These data also include academic measures for each student, including achievement test scores in reading and math. This sample is a nationally representative sample of youth who attended tenth grade in 2002.

Thus far, there have been four waves of data released for the ELS:2002. In the base year, student participants were all enrolled as 10th grade students in the Spring of 2002. The first follow-up was conducted two years later in 2004, when the majority of the sample was in 12th grade. A second follow-up was collected two years later in 2006, at which point the majority of the sample was two years out of high school. Finally, in 2012, a third follow-up was collected. At this point the respondents were eight years out from their original expected high school graduation date.

Additionally, two transcript studies were released by NCES for these students. The first is a record of transcript information about each student's high school experiences (grades, attendance, SAT/ACT scores, etc.). The second, the Postsecondary Education Transcript Study (PETS) released in 2015, contains transcript information for students in the ELS:2002 who attended at least one postsecondary institution. This restricted use file includes detailed information regarding respondents' postsecondary experiences, including how many postsecondary institutions the students attended, dates of enrollment at the institutions, and what, if any, degrees were earned at each. Additional variables report the type of institution that students attended—two-year or a four-year, public or private. The full dataset includes 23,700 transcripts for 11,620[1] individuals. This is the dataset I primarily draw on to create the variables for the sequence analysis.

These data are well suited to my research questions because their longitudinal nature allows me to capture a student's educational career over an extended period of time. At the beginning of the survey, the respondents are 16 years-old on average, and by

[1] All sample size numbers of samples of individuals, transcripts and sequences are rounded to the nearest 10 per NCES restricted data usage requirements.

the final wave, they are approximately 26 years-old. Thus, the ELS:2002 captures the period of time in which these youths are transitioning into adulthood. During these ten years, the respondents experience many of the major milestones on the road to adulthood: finishing secondary school, beginning and completing post-secondary school, entering the workforce, and beginning families of their own. Because my interest is in the educational careers that students follow, these data are ideal for the project as they provide a wealth of information about the educational experiences of the sample respondents. Sequence analysis requires one to generate a sequence of what a sample respondent was experiencing at a given time—in my case what type of educational institution they were enrolled in from 2004 to 2013. The detailed information provided by this dataset allows me to examine the respondents' educational pathways with a great deal of nuance.

Additionally, the use of transcript records to create the sequences, rather than student self-reports of enrollment, provides the fullest most accurate record of student enrollment patterns. This is because prior research has shown that students have a tendency to underreport the number of institutions previously attended (Adelman 1995). To reduce the effect of student underreporting, transcript records for the PETS were collected by NCES in a two-stage process. Initially NCES requested transcripts from all institutions which students reported attending in the ELS:2002 second and third follow-up surveys. After collecting a first wave of transcripts from these schools, the collected transcripts were then examined to reveal any additional schools attended by the students listed on the transcripts. When additional schools not previously reported by the students were found, student transcripts were subsequently requested from those schools. Students

in my sample attended between one and six institutions over the full nine year study period, with attendance at two institutions being the modal pattern.

Notably, transcripts were only solicited by NCES from institutions included in the Integrated Postsecondary Education Data System (IPEDS). IPEDS includes all institutions that are eligible for federal financial assistance programs, and thus includes the majority of degree granting public and private, for-profit and non-profit postsecondary institutions in the U.S. However, this does omit foreign schools and any student-reported postsecondary schools which NCES was unable to match to IPEDS institutions. While these institutions appear in the dataset if reported by the students, no transcripts were collected for them, and as such enrollment dates and other information on these schools is not available. Because students who attended such institutions are missing transcript information it is impossible to know their full postsecondary attendance experience. I therefore omit these students from my sample. Future work should consider the unique pathways of these students, particularly how foreign attendance, long-term or via study abroad programs, may affect student attainment; however this is beyond the scope of my dissertation. My ultimate sample consists of all individuals who participated in the base year ELS:2002 survey, who attended at least one undergraduate-level postsecondary school between August 2004 (on-time high school graduation) and June 2013, and for whom a complete transcript record is available. This results in a final sample of 14,410 transcripts for 8,490 individuals.

Sequence Analysis

The sequence analysis technique proceeds in four steps: (1) Define and create the sequence state object or "alphabet" of states experienced by each respondent; (2) Set

indel and substitution costs to be used when calculating distances between sequences; (3) Create a matrix of distances between each pair of sequences; and (4) Apply a clustering method. Below I discuss each of these steps in turn.

Creating the Sequence State Object

The first step of my analysis is to define the events of interest and create the sequence state object or the "alphabet" that tracks the postsecondary enrollment patterns that each respondent experiences over the course of approximately nine years. One of the challenges in conducting a sequence analysis is creating a variable from the data that represents the full sequence of educational experiences across time. While the availability of longitudinal datasets that measure educational experiences has grown significantly in recent decades, such data is rarely designed explicitly to be used for a sequence analysis, and the ELS:2002 is no exception. Therefore, my initial step is to utilize several variables from the PETS data to create a sequence state object to be used in the subsequent sequence analysis. Below I detail the process of creating the variable and the choices made in terms of which aspects of educational experiences that I choose to focus on for the creation of the states and my analysis.

Time Period Under Study

The primary PETS variable used to devise sequence states is a transcript-level variable that summarizes each student's monthly enrollment pattern at a given institution across a period of 114 months, from January 2004 through June 2013. For my analysis, I restrict the months to the 107 months from August 2004 to June 2013. For students in the ELS:2002 sample, spring 2004 represents the period of their expected on-time high school graduation. While the majority are still enrolled in high school in January 2004,

by August 2004 most have graduated from high school. I thus focus my sequences on post-high school enrollment experiences. Additionally, I choose to code states across months to best capture the possible diversity of pathways that students experience. One could reasonably summarize enrollment experiences across longer time spans (i.e. across six month "semester" periods), and indeed we often think of semesters of schooling as more substantively meaningful than months as additional semesters imply movement towards a degree. However, summarizing enrollment experiences over longer time periods could potentially obscure unusual enrollment patterns. For instance, doing so may fail to accurately capture the experiences of someone who attended postsecondary school only in the summer months. One of the great benefits of sequence analysis techniques is their ability to take advantage of the wealth of information contained in longitudinal datasets. I take fullest advantage of this information by examining student movement in and out of educational institutions month by month.

Institutional Enrollment

I next utilize the transcript variable summarizing each student's enrollment pattern to create the states over the 107 months. In the most basic form, one could simply code individuals as enrolled (or not) in any type of postsecondary institution in a given month. This would involve only two states: *enrolled* and *not enrolled*. On the opposite extreme, one could create states that focus on the full diversity of types of postsecondary educational institutions that one could be enrolled in, based on type of institution (research university, comprehensive university, four-year college, community college), the level of control (non-profit, for-profit) and selectivity (highly selective, non-selective). A given state in this case might be *enrollment at a highly selective, non-profit,*

research university. Doing so, however, would likely involve an extremely large number of states with relatively few people experiencing some of them. For my analysis, I choose to focus on two primary aspects of educational experiences which prior research has shown to be relevant to attainment: (1) *Level* - enrollment at a four-year vs. two-year (or less) institution; and (2) *Churning between institutions*- the number and ordering of the multiple institutions attended.

I distinguish between four-year and two-year institutions to capture the important divide between the more "traditional" four-year pathway through higher education and the larger and increasingly growing two-year route. Among the topology of higher education institutions, four-year schools in the U.S. typically consist of research universities, comprehensive universities and four-year colleges. Two-year schools primarily consist of community colleges, technical schools and two-year or less for-profit programs. The major distinction between the two types of institutions is that while most four-year institutions can award Bachelor's degrees this is not the case for two-year programs. Instead these schools offer other degrees, including Associate's degrees and various certificates. Thus, the level of school attended has important ramifications for potential attainment. Moreover, prior research suggests that entry into different levels of institutions varies systematically by social class background (Goldrick-Rab and Pfeffer 2009; Hearn 1992; Karen 2002).

The PETS dataset enrollment variable reports whether a student was enrolled in each institution they ever attended for undergrad, for undergrad and graduate school simultaneously, or for only graduate school in a given month. Because I am interested in pathways to the BA, I only code students as "enrolled" in months in which they attended

undergrad or undergrad and graduate school simultaneously. Months in which students were only in a graduate program are coded as "out," in other words, not currently enrolled in undergraduate studies. Using a variable that reports whether each institution is a four-year, two-year, or less-than-two-year school, I then add level distinction to the monthly enrollment variable. I choose to combine two-year and less-than-two-year school enrollment patterns into a single state. It is possible that attending a less-than-two-year school may not have the same effect on pathways and attainment as attending a two-year school—for instance, less-than-two-year schools are unlikely to offer the same transfer option that is available at two-year community colleges. However, these short-term institutions accounted for only a very small portion of the students' enrollment experiences.[2] Ultimately, I code the transcripts into a single monthly state for each individual such that they may be in one of three states: not enrolled, enrolled in a two-year, or enrolled in a four-year. This results in each respondent having one set of 107 monthly enrollment states, or 908,430 monthly enrollment states across the full dataset (8,490 respondents x 107 months per respondent).

Additionally, I account for attendance in multiple institutions over time and churning between institutions. Students' pathways through education have become increasingly complex and far less linear than those experienced in the past. Today students are more likely to enroll in multiple institutions over the course of their postsecondary career (Adelman 1995; Goldrick-Rab 2006; McCormick 2003). Sample respondents in the PETS data reflect these national trends, and indeed, transcripts reveal that a large proportion of the students attended multiple institutions over time. Sample

[2] Only 730, or 3% of the institutions attended by sample members are < 2-year schools. In contrast, 36% of the institutions attended by respondents are two-year schools.

members attended up to six institutions across the whole nine-year period, and in some cases attended more than one school in a given month.

To address this, I use initial enrollment dates for each institution and code each transcript as being a student's first, second or third or more four-year institution attended, or their first, second or third or more two-year institution attended. This distinction allows me to capture movement not just between levels of schools, but also movement from school to school via attendance at multiple institutions over time. While individuals attend up to six institutions over the full nine years, attendance at one to two schools is the most common pattern, while attending more than three schools is rare. I thus limit my focus on churning to the extent that individuals move between their first, second and third (or more) institutions[3].

In Figure 3.1, below, I provide an example of a hypothetical student who attended three postsecondary institutions over four months. The figure should help to exemplify the description above of how coding choices were carried out and how multiple transcript records were transformed into a single enrollment record for each sample member. As can be seen in Figure 3.1, in August 2004 when the sequences begin, this hypothetical student was enrolled in a two-year school. The "order" shows that this was the first postsecondary institution they attended, and thus the first element of their transformed sequence is coded as 4, "Enrolled in first 2-year-or-less school." The next month, September 2004, the student remained enrolled in their first two-year or less school, but also entered a four-year school. In my coding scheme, four-year school attendance takes

[3] Enrollment in multiple institutions in a single given month is rare, representing only 0.68% of the months (n=6,300 months). When these cases do occur, the state is coded as student's highest level of enrollment, with attendance at a four-year school considered "higher" than attendance at a two-year, and as the student's latest institution attended within the four-year and two-year level categories.

STUDENTID	SCHOOLID	ORDER	AUG04	SEP04	OCT04	NOV04
001	0001	1	2	2	0	0
001	0002	2	0	1	0	0
001	0003	3	0	0	1	0

➡

AUG04	SEP04	OCT04	NOV04
4	1	2	0

0=Not enrolled

1=Enrolled in a 4-year school

2= Enrolled in a 2-year-or-less school

0=Not enrolled

1=Enrolled in first 4-year school

2=Enrolled in second 4-year school

3=Enrolled in third+ 4-year school

4= Enrolled in first 2-year-or-less school

5= Enrolled in second 2-year-or-less school

6= Enrolled in third+ 2-year-or-less school

Figure 3.1: Example of Hypothetical Student to Illustrate Coding Choices

precedence over two-year school attendance, so they are coded as attending a four-year school in this month. Additionally, although this was the student's second institution attended, it was their *first* four-year school. Thus, September 2004 is coded as "Enrolled in first 4-year school." In this way, I capture churning within and between different levels of postsecondary education. In October 2004, the student has exited their first four-year school and entered a new four-year school, thus this month of the sequences is coded as "Enrolled in second 4-year school." Finally, in November 2004 the student is no longer enrolled in any institution according to their transcript records. Thus, they are coded as "Not enrolled" in this month. While useful for illustrating the data organization and coding process, the postsecondary experience of hypothetical Student 001 is highly unlikely. When dealing with actual individuals in the dataset we would expect to see far less change in states over four months as postsecondary institutional calendars put limits on when students can enroll and when they are likely to exit if they are on track to a degree.

Being "Out"

Finally, what it means to be not currently enrolled varies by student. I distinguish between three ways that students can be "out" of school, (1) Out, with no high school degree; (2) Out, with a high school degree; (3) Out, on summer break. The distinctions are important as the months in which one is out on summer break with plans to return in the fall are substantively different than months in which one is out of school entirely. To code both as "out" for the sequence analysis suggests that these are meaningfully identical states and could alter the results of the clustering algorithm. Similarly, being not currently enrolled because you have yet to earn a high school diploma or GED is

qualitatively different than being not currently enrolled with such a degree. In the first case, the potential to be enrolled in a postsecondary institution is far lower and as such this is a meaningfully different state than simply being out of school.

Students were coded as out of postsecondary with no high school degree if a given month in the state sequence object occurs before their reported date of high school or GED completion. Addressing the issue of summer breaks is complicated by the fact that the students attend colleges and universities with diverse institutional calendars, including schools that operate on semester, quarter and trimester schedules. The months included in summer break vary from school to school, and while most are likely to be out in June and July, some begin in August and some begin in September, and some end in April and some end in May, and no variable in the dataset reports which months were specifically "summer" months for each school. To address the issue of summer breaks I drew on a common understanding of higher education enrollment calendars as well as letting the data guide my coding decisions. Recognizing that postsecondary intuitions in the U.S. typically run on an approximately nine-month calendar with breaks between the months of May-August, I examined the data to confirm that the most common gaps in enrollment occurred in the months of May, June, July and August. I coded students as on "Break" if they showed a pattern in which they were not enrolled in any combination of the months of May, June, July and August, but were enrolled both before and after that gap. For instance, for a student who was unenrolled in June and July, these two months were coded as summer break if the student was enrolled in a postsecondary institution in the months on both sides of that gap—in this case, in May and August. Similarly, a student out in May, June and July was coded as on break for those months if records

show they were enrolled somewhere in April and August. All other students who were not currently enrolled in a given month are coded as out for that month.

Importantly, my sequence state alphabet focuses exclusively on *undergraduate educational* experiences. While individuals are in school they may also be experiencing events in other life course domains, including the work and family spheres. And indeed, it is likely that events in any one of these spheres affects experiences in the others (Roksa and Velez 2010, 2012). Entering the workforce, beginning family formation and attending graduate-level education may all be especially common for individuals after they exit their undergraduate education. I could have reasonably incorporated these other life spheres into my sequence state alphabet. For instance, rather than coding all individuals as "out" when not enrolled in a postsecondary institution at the undergraduate level, I could have distinguished between whether they were "out and unemployed," "out and employed," or "out and in graduate school."

I choose, however, to deliberately focus on undergraduate educational states rather than incorporating other non-enrollment possibilities. Thus, a person enrolled in graduate school and another person who graduated with a BA and is now unemployed will both be coded as "out" if they are not enrolled in an undergraduate program in a given month. What it means to be "out" may be personally different for each individual, however in each case these subsequent experiences do not reflect differences in terms of the student's current undergraduate enrollment experience. In contrast to the work and family spheres, very little research has used sequence analysis to consider the role of educational pathways using nuanced educational states. While incorporating other life course spheres into the analysis may be a fruitful future endeavor, I argue that examining

how individuals move through their undergraduate education with a focus on just educational experiences is an important first step. This allows me to uncover typical postsecondary careers, which have yet to be identified by researcher in this area. Additionally, I do not include in my states whether one is "out" with a college degree or without a degree. Doing so allows me to explore how paths through postsecondary predict educational attainment in Chapter 5, and specifically, if different paths may prove more or less successful for different types of people depending on their social backgrounds.

Ultimately then, the sequence state object codes each respondent as experiencing one of nine states across the 107 months:

1= Out-No HS Degree	(Not enrolled-does not hold high school degree)
2= Out	(Not enrolled-has a high school degree)
3= 1st 4-year	(Enrolled in first 4-year school)
4= 2nd 4-year	(Enrolled in second 4-year school)
5= 3rd+ 4-year	(Enrolled in third or more 4-year school)
6= 1st 2-year	(Enrolled in first 2-year-or-less school)
7= 2nd 2-year	(Enrolled in second 2-year-or-less school)
8= 3rd+ 2-year	(Enrolled in third or more 2-year-or-less school)
9= Summer Break	(Unenrolled on a summer break)

Visualizing the Full Sample

Having created the sequence state object, I analyze the sequences experienced by respondents. To do so I carry out the sequence analysis using the TraMinR package in the statistical program R (Gabadinho et al. 2011). Before carrying out the analysis, it is useful to graphically show the pathways that are experienced by respondents across the full sample. Across the full set of 8490 respondents there are 6060 unique sequences. The three figures below provide a graphic representation the postsecondary experiences of all sample respondents.

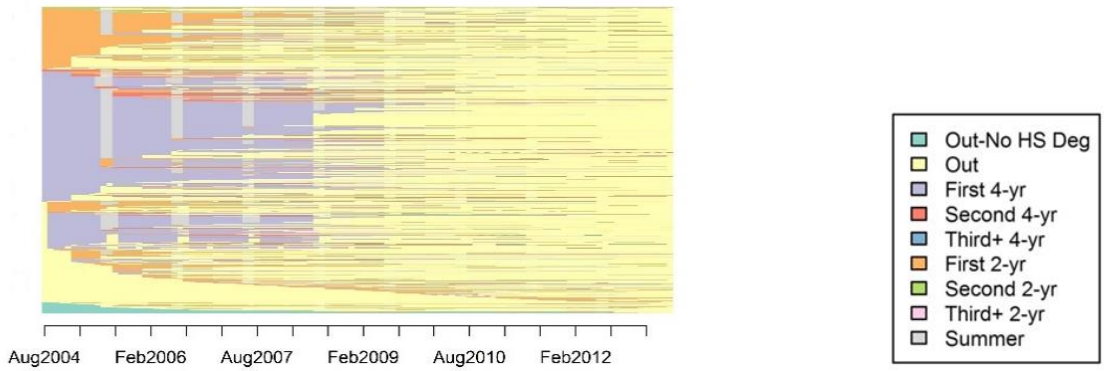

Figure 3.2: Index Plot of All Sequences, Sorted from Initial State

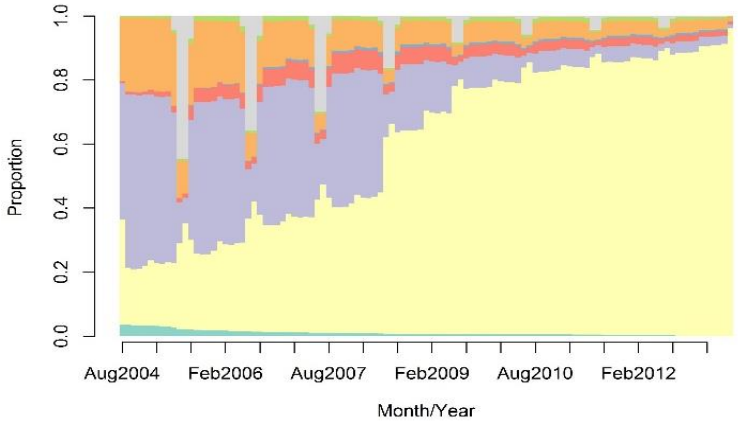

Figure 3.3: State Distribution Plot for the Full Sample

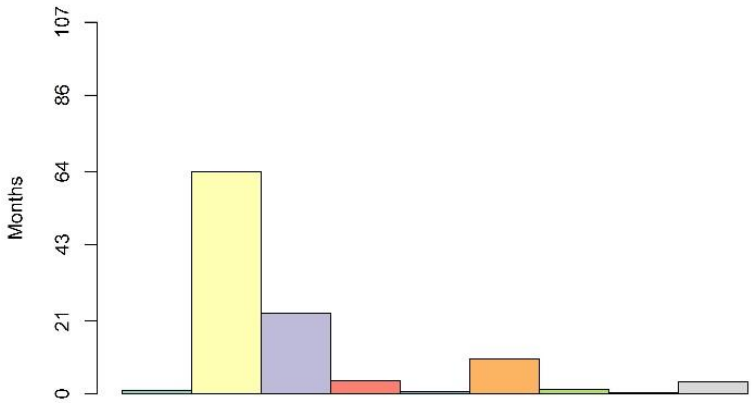

Figure 3.4: Mean Months Spent in Each State for the Full Sample

Figure 3.2 depicts the 6060 unique sequences across the 107 months. Each thin horizontal line represents a single unique sequence in the dataset and the figure is organized by the initial state of the sequences in August 2004. The 107 months are represented by the dashes along the x-axis. As can be seen in Figure 3.2, there is a high degree of variability in the paths that respondents follow. Some sequences we might expect from our understanding of the structure of higher education in the U.S. do appear visible in the data. For instance, a large number of unique sequences begin in a first four-year institution (purple shade) and appear to continue for approximately four years. However, identifying patterns in the data is difficult. While being "Out" appears more common later in the years, and the plot gradually shades to cream as this state becomes more dominant in the individual sequences, the right side of the plot is far from entirely cream. Patterns of postsecondary attendance in the U.S. are not orderly. Students do not simply enter, complete their education and then exit; rather we see many sequences with students entering and exiting over an extended period of time.

One way to see patterns in the data more clearly is by examining the proportion of individuals in each state at each time point. Figure 3.3 is a distribution plot showing not individual sequences over time, but the proportion of *all* individuals in each of the nine states at each of the months. The green portion at the bottom, for instance, shows the proportion of the sample that are out without a high school degree from August 2004 to June 2013. This is a relatively small proportion of the sample at the start (about 4%) and by June 2013 there is no longer anyone in this state. A few other patterns are worth mentioning. First, because I code summer months as their own state, patterns in enrollment become clear, with larger numbers of students enrolled in the approximately

nine to ten month school-year periods than in the summer months. This is evident in the large purple (1st 4-year attendance) and orange (1st 2-year attendance) "chunks" that are punctuated by summer enrollment states. While the data is shown across months, these segments can be used to approximate school-years when describing the figure.

The cream color represents those individuals who are "Out" of school, and we can clearly see how the proportion of individuals in this state shifts over time. Approximately 20% of students are "Out" during the first school year in the data. This number increases steadily, but gradually, over the first four years of the data, such that approximately 40% of individuals are out in May 2008. At this point, the number of students who are out then peaks dramatically, shifting to approximately 60% of the sample in the next school-year. The number of students who are out then continues to rise over the remaining five years with smaller and smaller proportions of the sample still enrolled in any type of postsecondary institution. Notably however, during the 2012-2013 school year (the set of months on the far right of the figure) approximately 10% of the sample is still enrolled in some type of postsecondary institution. This confirms the need to follow individuals and their educational experiences for an extended period. While fewer and fewer individuals are still enrolled at this point, this is still a nonnegligible group that is actively pursuing postsecondary education.

Finally Figure 3.4 shows the mean number of months spent in each state for the full sample. Overall, approximately 64 or 60.0% of the 107 months are spent "Out" for the full sample. Attendance at one's first four-year institution is the second most commonly experienced state (23 months), followed by attendance at one's first two-year institution (9 months). However, looking at these averages for the full sample tells us

relatively little about the actual experiences of individuals. Many individuals never attend a four-year school, concentrating their postsecondary attendance at the two-year or less level. We might ask, does the mean time spent "Out" vary depending on whether a student followed a four-year or two-year path? To answer this and similar questions we need turn to the sequence analysis and clustering algorithms to uncover meaningful groups within the data.

Setting Costs and Clustering

The next step of the analysis is to the reduce the complexity of the overall sample by running the optimal matching sequence algorithm. To do so, I first set the costs for substitutions and indels. The choice of costs is a key component of the optimal matching process and one which has generated a great deal of interest and debate. There is no one best practice when it comes to setting costs, rather, general suggestions and guidelines guide the researcher in choosing a strategy that best fits their data.

Transformation costs can be unitary, data driven, or theory driven (Aisenbrey and Fasang 2010). Unitary costs set a single cost for all indels and all substitutions. Data driven transformation costs are typically derived from calculating the transition rates between two states. For instance, this would calculate the likelihood of transitioning between states A and B in the data and weight the elementary transformations according to how often this transition appears. Transitions that are more common are weighted lightly, with low costs, while uncommon transitions in the data are weighted more heavily. The use of transition rate costs is appealing as the method allows the data to determine the costs. However, the method has been criticized (Gauthier et al. 2009; Studer and Ritschard 2016). The method assumes that the transition rate from A $\rightarrow$B is

equivalent to the transition rate from B→A, which is often a theoretically problematic assumption (Studer and Ritschard 2016). This issue arises for the purposes of my data as well. The likelihood of one transitioning from one's first four-year school to one's second four-year school is far more likely than the reverse. Indeed, moving from one's second four-year school to one's first four-year school is an extremely rare, though not impossible, transition. Other data based transformation costs include generalized Hamming (HAM) and dynamic Hamming distances (DHD) which use only substitutions (Gabadinho and Ritschard 2011; Lesnard 2010), setting costs according to the longest common subsequence which uses only indels to align long common subsequences within the full sequences (Abbott and Tsay 2000; Dorsett and Lucchino 2013), and future based costs, which set costs according to the likelihood of being in a particular state "x" time periods in the future given one's current state (Studer and Ritschard 2016). Costs may also be set with a custom user defined matrix, with costs based on a theoretical understanding of the transitions of interest (MacIndoe and Abbott 2004).

Additionally, how one sets transformation costs depends on which aspect of the sequences that the researcher is interested in prioritizing—timing, duration, or order of events—or some combination of all three. Substitutions emphasize whether the same state occurs at the same timepoint in different sequences, while indels are less concerned with exact timing, and instead focus on whether the same state occurs in two sequences, regardless of time (MacIndoe and Abbott 2004; Studer and Ritschard 2016). For my own purposes, timing, duration and order are all relevant to a degree. To understand how students move through postsecondary education and how this is shaped and shapes later attainment, it is important to understand how variation in the order and length of time

students spend in different institutions matters. While timing is relevant, it is important that costs are not set so high that the minute differences in timing related to schools' monthly calendars (i.e. an August vs. September semester start date) drive the sequence clusters.

Ultimately, I choose to use a unitary substitution cost of 1 and set the cost of insertions and deletions to .5. In doing so I essentially use unweighted costs which give priority to ordering rather than duration and timing (Scherer 2001). Setting the costs in this manner with unitary subcosts and indels set at half the cost of a substitution is relatively common in the empirical literature that utilizes optimal matching alignment techniques (Brzinsky-Fay 2007; Kogan 2007). This also serves as a sort of "baseline" set of costs which can be used to compare other cost setting methods. In addition to this cost scheme, I conducted numerous sensitivity analyses using different combinations of cost matrices (transition based, theory based, future based), indel levels and clustering methods to create the dissimilarity indexes and the clusters. Detailed information about this process and my results are included in Appendix A. Ultimately, I found that the different methods grouped specific individuals slightly differently, but that most cost choices and clustering methods identified the same underlying patterns in the data with no method standing out as clearly superior.

The next step of the sequence analysis is to calculate pairwise distances using an optimal matching algorithm and to cluster the results. The pairwise distances are used to create a distance matrix that contains the distances between every sequence and every other sequence in the data. The larger the distance, the more dissimilar two sequences are from each other. After creating the distance matrix, I use Ward's method to cluster the

results. This is a hierarchical cluster algorithm that optimizes local criteria to derive the clusters (Studer 2013). The results of the cluster analysis are then used to identify the best fitting number of groups. I selected the number of clusters using two criteria: 1) Quality statistics about the fit of the clusters; and 2) The construct validity and interpretability of the results.

I choose a five-cluster solution based on the Ward's method cluster results. This five group solution had the greatest average silhouette width (ASW), a measure of how similar objects in a cluster are to each other and of the underlying structure of the cluster solution. The five-cluster solution also appeared to create substantively meaningful groups that reflected patterns one would expect to see in postsecondary enrollment patterns. Below I report and interpret the results of this cluster process.

Sequence Analysis Results

The sequence analysis reveals five meaningful groups within the full set of sequences of postsecondary experiences. Below I present and describe the five clusters identified by the optimal matching sequence analysis. Table 3.1 provides descriptive information on each of the five clusters. Figures 3.5 and 3.6 on the following pages present the clusters graphically. This information is used to inductively assign names to the clusters. In this section and in the rest of the dissertation I refer to these clusters as "pathways" or "postsecondary trajectories." Each cluster represents an ideal type path students may experience as they move through postsecondary education. While the actual sequences experienced by individuals vary within each cluster (the number of sequences within each cluster ranges from 440 to 1900 unique sequences), these represent a typology of common enrollment trajectories.

Table 3.1: Cluster Descriptives

	Traditional	Lateral Transfer: Four-Year	Vertical Transfer: Two-Year	Two-Year	Unstructured	Full Sample
Percent of Full Sample	39.43	9.86	5.30	15.49	29.92	100.00
Mean Months in Each State						
No High School Degree	0.07	0.05	0.07	5.24	0.65	1.04
Out	55.43	46.86	40.64	56.47	88.47	63.84
First Four-Year	44.27	17.60	29.17	3.87	6.10	23.16
Second Four-Year	0.76	29.46	0.86	1.86	0.39	3.66
Third+ Four-Year	0.12	4.92	0.01	0.17	0.02	0.57
First Two-Year	1.51	2.88	30.36	31.16	8.89	9.97
Second Two-Year	0.17	0.36	0.66	4.05	1.60	1.25
Third+ Two-Year	0.03	0.07	0.11	0.86	0.09	0.18
Summer Break	4.64	4.80	5.12	3.32	0.79	3.32
Mean Months until Final Exit	58.71	74.29	78.30	71.88	50.97	61.01
% Enrolled in 2013	4.33	15.05	18.22	15.97	12.09	10.00
Number of unique sequences	1900	810	440	1150	1760	6060
N=	3,350	840	450	1320	2540	8490

Notes: Group and full sample sizes are rounded to the nearest 10, per NCES requirments.

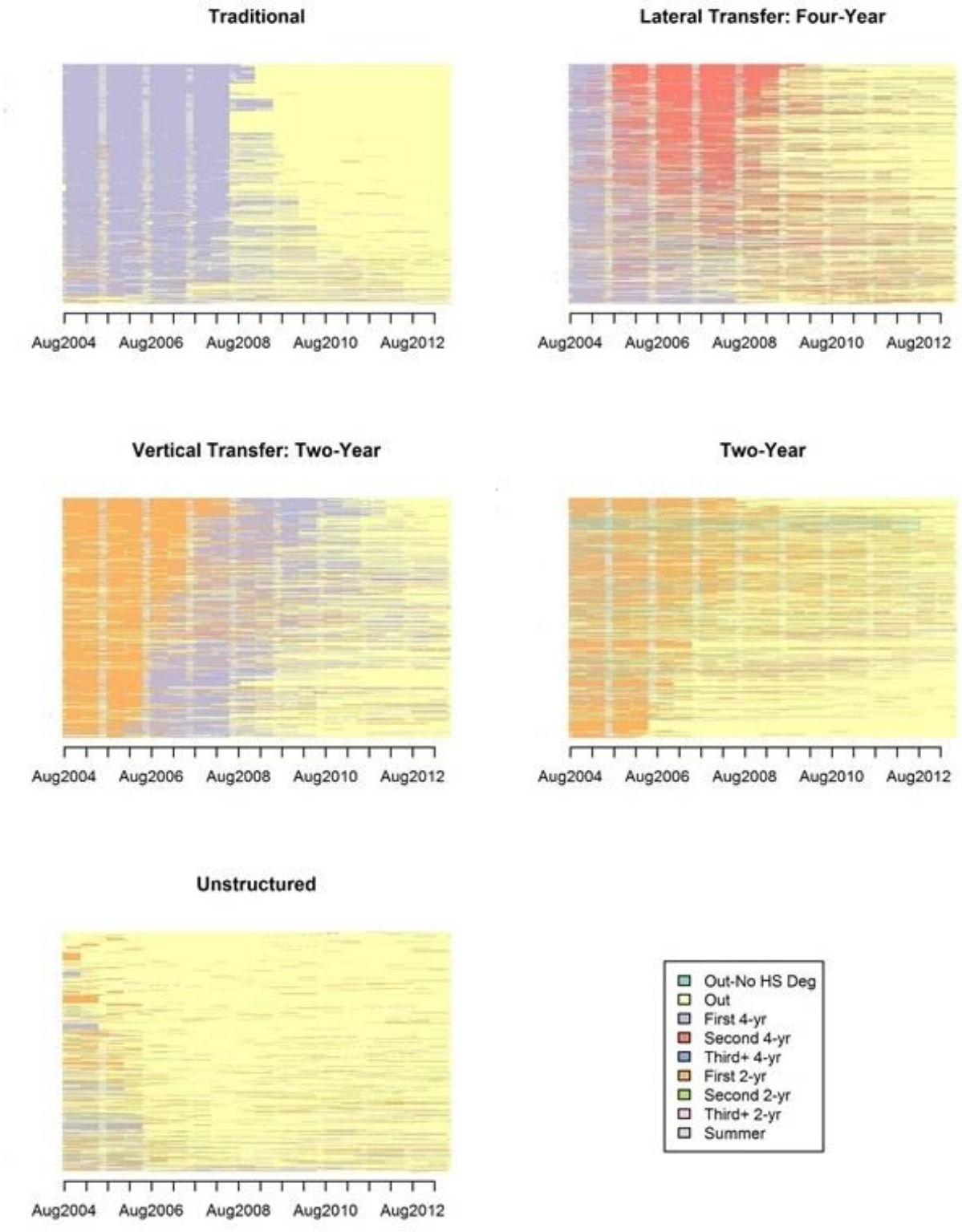

Figure 3.5: Index Plot of Individual Sequences, by Cluster

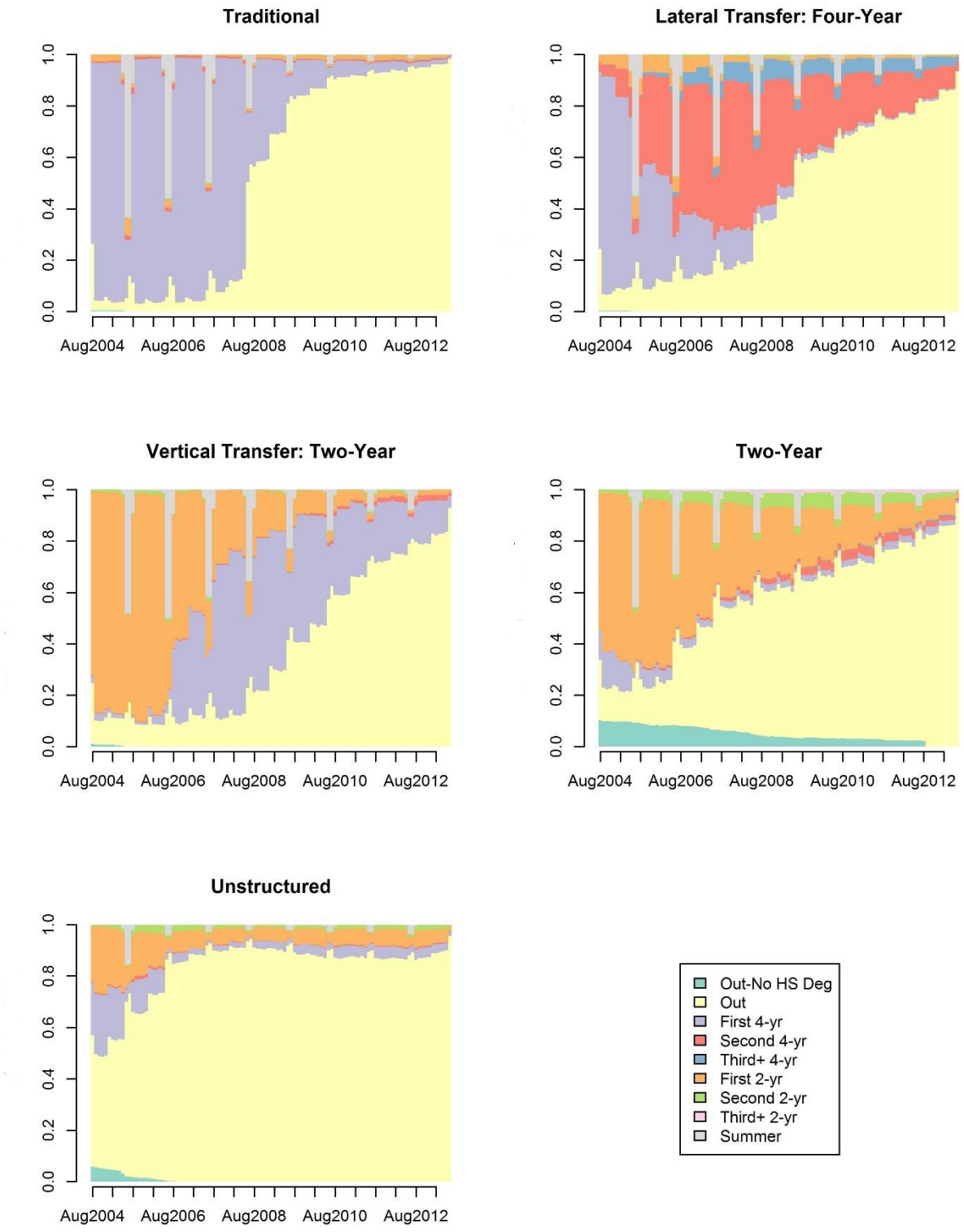

Figure 3.6: Distribution Plot of Proportion in each State Over Time

Cluster 1: Traditional Pathway

From the table and graphics above we can begin to discern patterns from the relative chaos that was the full sample of sequences. The first cluster most closely resembles what we commonly think of as the *traditional pathway* through education. Figure 3.5 shows that this cluster is dominated by sequences characterized by enrollment in one's first four-year institution.

In Figure 3.6 we can see that the pathway shows very large proportions (about 90%) enrolled in their first-four year over the first 4 years or 48 months. The proportion who are out then increases significantly, at which point these students have completed their "traditional" four years of undergraduate work. The pathway also captures a smaller number of sequences which depart from the usual timing of a "traditional" path. Individuals who remained in their first-four year longer than four years and those who entered later also appear in this pathway if their sequence was primarily characterized by enrollment in their first four-year school. On average individuals following this path exited postsecondary for the last time (within the timeframe of my study) after 58.72 months, or by May of 2009, approximately five years after beginning. In 2013, the final year in which transcripts were collected for the ELS:2002 respondents, approximately 4.3% of individuals in this cluster were still enrolled in postsecondary education at the undergraduate level. This is the largest cluster, and approximately 39.4% of the sample, or 3,350 individuals, followed this trajectory.

Cluster 2: Lateral Transfer: Four-Year Pathway

The second cluster shows sequences which are also dominated by four-year enrollment, but in which students appear more likely to exit their first school and enter

another institution at the same level. Figure 3.6 shows that while most individuals in this cluster begin in their first four-year school, over time the number enrolled in their first four-year declines as the proportion enrolled in their second and third four-year institutions grows. While students in the *traditional* pathway, on average, spend less than 1 month in their second or third four-year schools, students in the *lateral transfer: four-year* pathway spend 29 months and 5 months in their second and third four-year school, respectively. Because this cluster is characterized by four-year enrollment and enrollment between schools at the same level, I call it the *lateral transfer: four-year* pathway (hereafter referred to as just the *lateral transfer* pathway for brevity). Compared to the *traditional* pathway, students on this path also exit school later on average. Approximately 15% of the individuals in this cluster were still enrolled for at least one month in Spring 2013, and on average those following this path do not exit postsecondary until August 2010, or over a year later than those on the *traditional* path. This cluster contains 9.9% of the sample or 840 individuals.

Cluster 3: Vertical Transfer: Two-Year Pathway

In contrast to the first two clusters, clusters three and four show pathways in which students are more likely to begin in two-year schools. The distinction between the two groups reflects the way they combined enrollment in two-year schools with enrollment in other institutions. Cluster 3 most closely resembles what we might think of as the *vertical transfer* pathway. The sequences within this group largely begin at student's first two-year school, attendance at that school is then combined with later enrollment at a first four-year school. On average these students spend equal time in their first two- and four- year institutions, spending roughly 30 months in their first two-year

school, and 29 months in their first four-year school over the 107 months. They spend relatively little time, less than one month on average, in either their third or second two- or four- year schools. Individuals in this pathway exhibit the longest time to exit, spending 78 months enrolled on average before final exit. They are also the most likely to still be enrolled at the end of my timeframe, with 18% of individuals in this cluster still enrolled in Spring 2013. This cluster contains 5.3% of the sample or 450 individuals.

Notably, while students who followed what we think of as the traditional transfer route appear in this group—those who spent approximately two years in a two-year school, and then moved to their first four-year school—the cluster also captures a variety of paths that reflect combined two- and four-year enrollment but in which the timing does not correspond to this common two years to transfer pattern. Some students take longer than two years before moving to their first four-year, some spend time out or enter a second two-year school first, and some follow a traditional transfer pattern but do so later in their life course, remaining out directly after high school. Here we see the benefit of the sequence analysis technique. The method can identify individuals whose underlying patterns are similar even though it may not directly correspond to our definition of a typical "transfer transition" pattern.

Cluster 4: Two-Year Pathway

The fourth cluster, the *two-year* path, is made up of sequences dominated by attendance in two-year institutions with little time spent in four-year schools. Students in this cluster are more likely to have spent time out of school without a high school degree and less likely to continue to a four-year school compared to those on the *vertical transfer* path. On average, students in this path spent 5 months out of high school

without a diploma or GED, 31 months in a first two-year school and 4 months in a second two-year school. In contrast, they spent less than five months in their first four-year school. And although no group had students who spent more than a month in their third two-year school on average, those in the *two-year* pathway spent the most time in this state—0.86 months. On average, individuals following this trajectory exit postsecondary for the last time after 72 months, at approximately the same time as those on the *lateral transfer* path, and just slightly later than those on the *vertical transfer* path. In Spring 2013, approximately 16% of individuals in this cluster were still enrolled in postsecondary education. This cluster contains 15.5% of the sample and 1,320 individuals.

Cluster 5: Unstructured/Out Pathway

Finally, the fifth cluster reflects an *unstructured/mainly out* pattern. These sequences show no clear patterns in terms of the type or order of their enrollment. Rather, these sequences are defined by the large amount of time that they are out and by the chaotic and unstructured nature of their enrollment patterns. These sequences reflect large stopout gaps in enrollment, as well as enrollment sequences with short attendance periods at a variety of types of institutions. Figure 3.6 shows that for this pattern, the majority of the students are "out" at every time point. On average students who are part of this trajectory spend 88 months, or 82% of their time "out" and unenrolled. They also make their final exit the earliest on average and are more likely than the members of every path but the *traditional* path to be unenrolled at the end of the 107 months. This is the second largest group, with 30.0% of the full sample or 2540 individuals experiencing this trajectory.

Conclusion

In this chapter I asked, what are the empirical realities of how students move through postsecondary education? The sequence analysis that I conducted allowed me to answer this question. By focusing on not just transitions but on long term trajectories, the method provides several benefits that enhance our understanding of how individuals actually move through postsecondary education.

First, the method helps to confirm the existence of several paths that have traditionally or theoretically been deemed important by scholars of higher education. Because the method is exploratory, it allowed me to inductively identify distinct groups within the data rather than imposing categories a priori. In some ways the pathways uncovered in the sequence analysis may be familiar, even expected, by scholars with knowledge of the higher education system in the U.S. The finding of the *traditional* four-year path, *vertical transfer* path, and *two-year* school path is unlikely to be surprising to the reader. Indeed the broad patterns of enrollment in a four-year versus a two-year and of transfer from a two-year to a four-year have received extensive consideration by scholars interested in the role of the different sectors in shaping mobility and inequality within the U.S. (Clark 1960; Lavin and Dougherty 1995). The *lateral transfer* path, defined by movement across institutions at the same level has received comparatively less attention, but with approximately half of all students who begin in a four-year school later going on to attend at least one other school, this is a growing area of interest (Adelman 1999; Goldrick-Rab 2006; McCormick 2003). Through the use of the sequence analysis I was able to confirm the existence of these theorized paths among the sample respondents when examining their long-term enrollment patterns. I found that *a*

traditional, vertical transfer, lateral transfer and *two-year* paths all appeared in the data. That these broad overarching patterns appear in my analysis confirms that these are still relevant paths followed by students moving through higher education and that these paths deserve continued attention from scholars and policymakers.

Additionally, when examining educational transitions, scholars often must make complex and at times arbitrary choices about what "counts" as experiencing a given enrollment pattern or transition. Often, the individual experiences of students may not map perfectly onto what we theoretically consider a typical "transfer" enrollment pattern or "traditional" enrollment pattern. Is five years spent in a four-year school a "traditional" path? What about someone who attends a four-year school for four years, but also attends a community college in the summer to earn additional transferable credits? The challenge, then, is to determine how to code individuals with highly variable paths. Common solutions to this problem typically simplify the data, reducing enrollment patterns to yearly states, looking only at certain transitions of interest, or eschewing such labels altogether. In contrast, the sequence analysis technique allowed me to account for the full diversity of educational experiences, while also still identifying meaningful groups amid this complexity. By methodologically grouping people thought to be more similar to each other than to individuals outside of the cluster, the technique allowed me to identify five meaningful groups and classify people despite the high degree of variability in actual paths.

Finally, the method is also useful in revealing atypical paths. The second largest cluster seen in the data was made up of individuals whose postsecondary experiences did not fit the commonly examined paths described above. Rather these individuals had

educational trajectories in which a large proportion of their time was spent out of school or with movement in and out of multiple schools over an extended period. The initial sequence analysis is useful in highlighting the existence and extent of this group, while later analyses can then examine the experiences of individuals in this group more closely. Having identified unique pathways students follow through educational institutions, the results of the optimal matching sequence analysis can be turned into a categorical variable. This is the step I turn to next, as I consider how these postsecondary trajectories are shaped by social background examining the individual level predictors of the five groups.

CHAPTER 4.

PREDICTING POSTSECONDARY PATHWAYS: THE EFFECT OF SOCIAL BACKGROUND AND ACADEMIC FACTORS ON ROUTES THROUGH SCHOOL

The sequence analysis method employed in the last chapter revealed how students move through postsecondary education. However, my findings in the previous chapter were strictly descriptive. Sequence analysis methods allowed me to uncover five distinct postsecondary trajectories and showed the extent of each, but the method is exploratory and tells us little about the predictors or consequences of these trajectories. Therefore, in the remaining chapters of the dissertation I build upon the results of the last chapter and use the clusters derived from the sequence analysis as the independent and dependent variables in additional analysis. In doing so, I move beyond solely describing and classifying student patterns of postsecondary movement to uncovering the mechanisms by which these trajectories are formed and examining the consequences of these patterns on student attainment. In this chapter I answer my second research question: How do academic and social background factors shape postsecondary trajectories?

Today, access to higher education is widespread with over 7,000 postsecondary institutions operating in the U.S. (NCES 2016a) and many of them providing open access. For most students it has become relatively easy to enter the postsecondary system in some form; however rates of completion and returns to education vary widely between different types of institutions. As a result, researchers have suggested that as access to higher education has increased, attention should focus less on *whether* or not one attends

but rather on *where* and *how* they attend (Brint and Karabel 1989). The type of institution students enter and their enrollment patterns after entry will be more relevant to understanding stratification patterns in the U.S. going forward.

In recent years, scholars have taken up this call, examining the causes and consequences of the different ways students move through higher education (for example see, Bozick & DeLuca, 2005; Goldrick-Rab, 2006; Roksa & Velez, 2012). As noted previously, this body of literature analyzes steps in the educational process and the predictors and consequences of different patterns of educational progression. Work in this area has considered a large variety of ways that paths through postsecondary may vary, including the type of school one initially enrolls in, delays in enrollment after completing high school, transfer, stopout, and multi-institutional enrollment (Bozick and DeLuca 2005; DesJardins et al. 2002a; Goldrick-Rab 2006; Goldrick-Rab and Pfeffer 2009; Hearn 1992; Roksa and Velez 2012; Rowan-Kenyon 2007). Empirical findings have largely supported the broad contention that disadvantaged students are more likely to depart from traditional paths through higher education (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011; Hearn 1992; Rowan-Kenyon 2007).

Thus, we know a great deal about what shapes specific educational transitions, but little about what shapes long term educational careers. Today young people experience diverse educational careers that may lead them in, out, and among multiple institutions over time (Adelman 2006; Goldrick-Rab 2006). But using methods that typically examine predictors of only one or two major transitions in this process provides only a partial picture of the full influence of social background and other factors on educational experiences. Individual educational transitions, like choosing to delay college after high

school (i.e. taking a gap year) or transferring from a four-year to a two-year school, do not occur in a vacuum. Rather they are linked as part of a string of prior and subsequent educational experiences in a person's life that may be analytically meaningful in its entirety. While traditional statistical methods allow for the incorporation of variables that reflect prior educational experiences as controls or predictors, sequences analysis methods extend this idea by allowing long-term educational careers to be captured, including the timing, duration and ordering of multiple educational transitions.

In this chapter, I ask, how does an individual's social background and academic orientation shape their long-term educational trajectories? Using the groups uncovered in the sequence analysis, I analyze how social background factors including socioeconomic status, race and gender, as well as educational expectations, educational achievement and peer and family influence shape students' paths through postsecondary education. By considering how different factors shape not just specific educational transitions or decisions but long-term sequences of educational movements, I contribute to our understanding of who follows certain paths and why.

Educational Pathways Literature

Work on educational pathways considers how individuals experience postsecondary education, and two questions primarily motivate this work. First, researchers are interested in who follows what pathway through education, with a focus on how social origins structure educational transitions. And second, how particular transitions or pathways shape later attainment, particularly whether or not one earns a bachelor's degree. If the "traditional" path through education is conceived of as a student entering a four-year residential college directly after high school and continuing until

graduation without time out, this body of research examines the causes and consequences of variation from this traditional path. Many nontraditional enrollment patterns have been studied extensively, including delays in college entry after high school (Bozick and DeLuca 2005; Cabrera and Nasa 2001; Hearn 1992; Roksa and Velez 2012; Rowan-Kenyon 2007), transfer at the same level and between levels of higher education (Goldrick-Rab and Pfeffer 2009), the type of institution one initially enrolls in (Hearn 1992; Karen 2002), attendance at multiple institutions (Goldrick-Rab 2006), discontinuous enrollment (DesJardins et al. 2006; DesJardins and McCall 2010; Goldrick-Rab 2006) and enrollment intensity (Cabrera et al. 2012; Hearn 1992).

Students who follow nontraditional paths differ from those who follow more traditional paths in meaningful ways. Notably, students who follow nontraditional paths tend to come from less advantaged social backgrounds. Socioeconomic status and academic preparation prior to college entry appear to be the strongest predictors of nontraditional pathways (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011; Hearn 1992; Roksa and Velez 2012; Rowan-Kenyon 2007). These factors influence both when and where a student initially enrolls, as well as the way they move through postsecondary after entering. Low SES students and those who exhibited poor academic performance are more likely to delay entry into college after high school compared to their more academically prepared and advantaged peers (Bozick and DeLuca 2005; Goldrick-Rab and Han 2011), and they are more likely to enroll in two-year or non-degree granting programs initially (Cabrera et al. 2012; Hearn 1992; Karen 2002). After entry, they are more likely to attend only part-time (Cabrera et al. 2012; Carroll 1989; Hearn 1992), to transfer downward, moving from a four-year school into a two-year school (Carroll 1989;

Goldrick-Rab and Pfeffer 2009), and to stopout (DesJardins et al. 2006; Goldrick-Rab 2006). Thus, pathways through postsecondary are not random but occur in patterned and predictable ways.

Work on educational pathways thus far has primarily utilized traditional statistical methods that, as noted in the last chapter, capture only educational transitions not long-term trajectories. Much of this work relies on logistic regression, predicting the odds that one will make a particular enrollment choice (DesJardins and McCall 2010; Goldrick-Rab and Pfeffer 2009; Rowan-Kenyon 2007), or event history analysis, predicting the effect of timing to a given transition on later transitions or on ultimate attainment (DesJardins and McCall 2010; Roksa and Velez 2012). For instance, Hearn (1992) utilized logistic regression techniques and found that students who are less academically gifted and those from lower social class backgrounds are more likely to be consistently "nontraditional," exhibiting patterns of part-time enrollment, delayed entry, and enrollment in non-degree granting institutions. Logistic regression has also been used to examine predictors of whether students will enroll immediately, delay enrollment, or not enroll within eight years (Rowan-Kenyon 2007), whether one will experience a lateral transfer or a reverse transfer (Goldrick-Rab and Pfeffer 2009), and how the number and length of stopout spells predicts the likelihood of future stopout and dropout of college (DesJardins and McCall 2010).

While the use of such methods has significantly informed our understanding of how enrollment patterns are shaped, to date, work in this area has largely examined specific educational transitions, rather than long-term educational paths. Full educational trajectories may involve multiple transitions over time, in which the timing, order, and

duration of those transitions all matter for an individual's educational attainment and with background factors influencing the complex shape of the trajectory. To capture how these long-term pathways are shaped, scholars must conceptualize individuals' enrollment patterns as long-term holistic experiences.

Conceptualizing Long-Term Pathways

While little research on the factors that shape postsecondary enrollment patterns has examined long-term pathways rather than individual transitions, one notable exception is Goldrick-Rab's (2006) study of the how social background influences educational careers. In contrast to the studies described above which focus on predicting the odds that an individual will experience a certain event, Goldrick-Rab (2006) examines how longer-term enrollment patterns are shaped, following students over eight years and across schools. She classifies student experiences into a typology of four possible postsecondary paths depending on whether the student attended multiple institutions or experienced periods of discontinuous enrollment over the eight years. She then examines how social background influences the likelihood that a student will follow a more traditional versus a more complex pathway and the effect of different pathways on later attainment, including postsecondary completion rates and subsequent earnings. This study is one of the first to examine not just a single transition that a student may make into or out of a single institution, but on the students' "full range of movement" with multiple potential transitions across schools and over time (Goldrick-Rab 2006). However, while her work represents a significant step forward in modeling not just transitions but whole educational trajectories, it remains limited in certain respects. First, her typology is based on only two aspects—multi-institutional enrollment and

discontinuous enrollment—of the wide range of enrollment patterns a student may experience. Second, it does not to account for the timing of institutional moves or the duration of stopout spells. And finally, the typology was theoretically defined a priori.

To date, to the best of my knowledge, no work on educational pathways has used inductive empirical methods that allow educational trajectories to emerge from the data itself. By using the sequence analysis results from the last chapter to generate an empirical typology of postsecondary trajectories, I allow the data to reveal how students experience pathways through education. I am then able to track students not just across schools but in and out of educational institutions across their educational careers, thereby getting at their full range of educational experiences and capturing "trajectories" as emphasized by life course scholars.

Theoretical Predictors

The empirical research on educational pathways shows that the path one follows through higher education is not random but is shaped by a host of background factors both ascribed and achieved. These factors shape educational choices in complex ways. My analysis draws on this research to examine how these factors shape postsecondary trajectories.

Social Background and Pathways through Education

As noted above, one of the strongest predictors of how individuals move through higher education is socioeconomic status. While no work has yet considered how social class background shapes *holistic* postsecondary trajectories, pathway research has consistently found that SES shapes students' initial transitions into higher education and their experiences once they enroll (Carroll 1989; Hillmert and Jacob 2010; Rowan-

Kenyon 2007). This is because socioeconomic status encompasses both direct financial resources and a more elusive set of dispositions and knowledge useful for navigating the college-going process. With state appropriations declining and an increasing share of the costs of college placed on students and their families (Heller 2011; Hamilton 2013), the path a student chooses to follow through postsecondary may be shaped by financial constraints. Two-year schools, particularly public community colleges, are typically less expensive than traditional four-year schools (Heller 2011a). For low SES students who lack of familial resources the cost of college is an influential factor in the college choice process (McDonough 1997; Paulsen and St. John 2002), and these students may opt to minimize costs by choosing to enroll in a two-year rather than a four-year school initially, even if they aspire to a bachelor's degree (Baker and Velez 1996; Renzulli and Barr 2017). These students may also be more likely to reverse transfer, to experience stopout spells in enrollment and to dropout if the costs of college appear to outweigh the benefits of a postsecondary education.

Measures of socioeconomic status also reflect the educational background of a student's parents. Enrolling in and progressing successfully through college involves many steps, from choosing a college and applying for admission, to navigating the financial aid process, choosing a major, and developing effective study habits. For students whose parents did not attend college themselves, their parents may be less likely to have the necessary knowledge to help their children through this process (Cabrera and Nasa 2001; Lamont and Lareau 1988; McDonough 1997), and in general, compared to their higher SES counterparts, lower SES parents are less likely to take an active role in shaping their children's education (Cabrera and Nasa 2001). Moreover, today many

students attend more than one institution over the course of their college career (Goldrick-Rab 2006). For higher SES students with more highly educated parents, their parents may be more likely and able to step in at these crucial transition points helping their children to successfully transfer rather than dropping out of school. Lower SES parents who lack such knowledge often have high expectations for their children but less ability to help them craft a successful college career (Renzulli and Barr 2017). Finally, social class in and of itself shapes students' perceptions on what sort of educational career path is right for them. Cultural expectations and habitus influence where a student expects to attend college and how they experience it once they have enrolled (Armstrong and Hamilton 2013; McDonough 1997). Therefore,

Hypothesis 4.1: Individuals from higher socioeconomic status backgrounds will be more likely that those of lower class backgrounds to experience the traditional and lateral transfer paths that involve four-year enrollment. The highest SES students will be most likely to follow a traditional path through education, while lower SES students will be more likely to experience two-year and unstructured pathways.

The effect of other social background factors, like race and gender, on educational trajectories is less clear. These ascribed characteristics did not appear in the earliest status attainment models (Sewell and Hauser 1972; Blau and Duncan 1967), and the educational pathways work suggests gender may play a role in shaping educational trajectories but that race has little significant influence after socioeconomic status is accounted for. Much of the growth in college enrollment over the past half century was tied to increasing access to higher education for women and minority students. Originally barred from most institutions, women began to gain access in the late 1800s (Thelin 2011) and it was not until the passage of the 1964 Civil Rights Act that the doors opened to minorities in large numbers (Geiger 2005). Today, women make up the majority of

students enrolled in postsecondary education (Buchmann and DiPrete 2006; Peter and Horn 2005) and minority students account for approximately 38% of those enrolled (NCES 2016b).

However, among those who enter postsecondary, different demographic groups exhibit different enrollment patterns. For instance, compared to women, men appear more likely to delay their enrollment and to interrupt their schooling (Goldrick-Rab 2006; Goldrick-Rab and Han 2011; Rowan-Kenyon 2007). Wider labor market conditions may partially shape men and women's different educational experiences and explain the dearth of men in higher education. Women appear to be more disadvantaged in the labor market with fewer well-paying female-typed occupational positions open to them if they exit postsecondary without a degree (Dwyer, Hodson, and McLoud 2013). In contrast, for young men, jobs in construction, manufacturing and transportation may lure them away from completing their education. For such men, the costs of staying in college may not compete with the benefits of exiting directly into the workforce. For women who find that the jobs generally available to them are in the low-paying service and care industries, the cost of forgone income during school may be worth the long-term potential pay increases that accompany a more prestigious job. In this climate women attend college at higher rates and take on more debt to finance their education, while men be more likely to exit school early or spend a more of their time out of postsecondary (Bobbitt-Zeher 2007; Dwyer et al. 2013).

Hypothesis 4.2: Men will be more likely to follow the unstructured path, defined by large portions of time spent unenrolled, compared to women, who will be less likely to follow this path.

While the early models of status attainment did not include race (Blau and Duncan 1967; Sewell et al. 1969; Sewell and Hauser 1972), understanding the persistent inequalities around race and attainment has been a major area of study among scholars of higher education. Minority students are consistently underrepresented in both undergraduate enrollment and bachelor's degree attainment (Perna 2000). While much of the gap is attributable to the lower levels of socioeconomic status and academic preparation that black and Hispanic students possess on average, these factors do not entirely account for the racial differences seen in college going and completion (Kao et al. 2003). Work on educational pathways examines how race may affect patterns of enrollment and how those patterns may in turn shape latter attainment; however findings in this area have shown mixed effects for race depending on the transition or enrollment pattern under study. Some scholars have found no significant race effects for the enrollment patterns under study after accounting for socioeconomic background, prior academic preparation, and other relevant controls. For instance, multi-institutional and discontinuous enrollment do not appear to be shaped by race (Goldrick-Rab 2006). In contrast, other enrollment patterns appear sensitive to race with underrepresented minorities less likely to experience positive transitions. Crisp and Nuñez (2014) found the existence of a "racial transfer gap" with black and Hispanic students less likely to transfer from community college to a four year school. Still other work suggests mixed or even positive race effects on different patterns of enrollment for minority students (Bozick and DeLuca 2005; Rowan-Kenyon 2007). Bozick and DeLuca (2005) found that in contrast to their descriptive bivariate findings, after controlling for SES, academic achievement and other sociodemographic factors, black and Hispanic students were *more* likely to

enroll on-time than to delay or to not enroll in postsecondary compared to whites. Because the literature presents a complex and mixed picture of race effects on specific transitions, I propose a nondirectional hypothesis of the effect of race on postsecondary trajectories.

Hypothesis 4.3: Race will have a significant effect in shaping students' postsecondary pathways.

Academic Achievement

Apart from socioeconomic background, academic achievement and academic ability generally appear as the next strongest predictors of whether one follows particular educational trajectories (Goldrick-Rab 2006; Hearn 1992; Rowan-Kenyon 2007). While student expectations for college attendance are high across the board (Goyette 2008), attending a four-year college requires that a student achieve the minimum qualifications necessary to apply (Cabrera and Nasa 2001). Prior academic achievement in high school is an important predictor of college enrollment patterns because those who did better in high school are more likely to have achieved the grades and test scores required to be admitted a four-year postsecondary program. Moreover, the extent to which students demonstrated academic success in the past may partially predict the extent to which they will successfully persist through college rather than dropping out. High school grades, and standardized test scores to a lesser extent, have been shown to be correlated with first-year college performance (Geiser and Santelices 2007; Zwick and Sklar 2005). For students who did poorly in high school, pathways involving enrollment in two-year schools may be more common. Such schools typically have open access policies which

allow anyone to enroll, regardless of prior high school performance (Bragg and Durham 2012; Shannon and Smith 2006).

Hypothesis 4.4: Compared to those with lower achievement, students who exhibit greater academic achievement in high school will be more likely to follow the traditional and lateral transfer paths that involve four-year institutions and especially unlikely to follow the unstructured pathway.

Expectations

Educational expectations may also be relevant in shaping students' postsecondary trajectories. Educational expectations reflect students' assessment of the probability of their achieving their educational goals, in contrast to educational aspirations, which reflect long-term desires for how far they want to go in school (Goyette 2008; Kao and Tienda 1998; Morgan 1998; Museus, Harper, and Nichols 2010; Reynolds et al. 2006). Educational expectations are typically conceived of as a more direct reflection of one's intentions and have been found to be stronger predictors of educational outcomes than aspirations (Hanson 1994). Expectations may influence postsecondary trajectories because how far you expect to go in school should determine, to some degree, the path you choose and the steps you take to get there. Where to apply, where and when to initially enroll, how long to remain in school and whether to transfer or not may all be influenced by one's intended level of educational attainment.

While youth expectations may have risen to unrealistic levels in recent years with the majority of students now expecting to earn a bachelor's degree or more (Goyette 2008; Reynolds et al. 2006), nonetheless expectations remain a powerful predictor of later attainment (Kao and Tienda 1995; Mortimer 1996; Reynolds and Burge 2008). Educational expectations influence when and where students enroll in college (Morgan

2005) and their likelihood of vertical transfer (Crisp and Nuñez 2014; McCormick and Carroll 1997), among other pathways. With expectations generally high across the board, the stability of one's expectations appears to be particularly influential. Maintaining high expectations over time is a stronger predictor of subsequent college enrollment than expectations measured at the end of high school (Bozick et al. 2010).

Hypothesis 4.5a: Students who maintain high expectations over time will be more likely to follow the traditional, lateral transfer and vertical paths that involve four-year institutions, and less likely to follow the unstructured pathway.

Additionally, the expectations that students perceive from their parents may also influence their college pathways. Parents who expect their children to earn a college degree are likely to support and encourage their children's plans to enroll in and persist in college. In particular, parents who hold high expectations may encourage their child to attend a four-year over a two-year school. Empirical work has found parental expectations to be associated with entering postsecondary institutions (Hossler et al. 1992) and following traditional paths (Goldrick-Rab and Han 2011).

Hypothesis 4.5b: Having parents who expect college right after high school will be positively associated with following the traditional and lateral transfer paths that involve enrollment in four-year institutions.

Occupational Aspirations

Occupational aspirations were one of the core predictors of educational attainment in the Wisconsin models (Sewell et al. 1969; Sewell and Hauser 1972). Like educational expectations, occupational aspirations are likely to shape pathways by influencing the type of educational institution in which students enroll and the academic program or degree they pursue (Goyette 2008). However, as with educational expectations, student's

occupational aspirations have risen dramatically in recent decades and may be becoming increasingly unrealistic (Reynolds et al. 2006).

Hypothesis 4.6: Students who hold higher occupational aspirations will be more likely to follow the traditional and lateral transfer paths involving four-year institutions and less likely to follow the unstructured pathway, compared to those with lower aspirations.

Peer Influence

The academic orientation of one's peer group may influence their postsecondary pathways if the values and intentions of more academically oriented friends rub off on their peers. Empirical research has found that the academic orientation of one's peer group influences their college aspirations, plans and enrollment behavior (Holland 2011; Sokatch 2006). For example, Sokatch (2006) found that high school students' likelihood of attending college is increased if their friends report postsecondary plans. However, Hossler and Stage (1987) suggest that peer influence may be more important for those not planning to attend college, finding that those without postsecondary intentions are more likely to report checking in with their peers about post-high school plans than those who expect to attend college.

Hypothesis 4.7: Compared to those whose peers are less academically oriented, students whose peers are more academically oriented will be more likely to follow the traditional and lateral transfer paths that begin in four-year institutions and less likely to follow the unstructured pathway.

Data

Using the Education Longitudinal Study of 2002, which I used in Chapter 3 to create the trajectories via sequence analysis, I examine individual predictors of trajectories. The variables for the individual level analysis come primarily from the first two waves of the survey, the base year and first follow-up. During the base year students

in the sample were enrolled in 10th grade in the spring of 2002. The first follow-up was conducted two years later in 2004, in which the majority of the sample was in the spring of their senior year. The National Center for Education Statistics (NCES) specifically includes additional questionnaires for dropouts, early graduates and transfer students. Thus, these students remain in the sample even if they failed to make on-time transitions between tenth and twelfth grade. Additional academic measures taken from school records are also available for each student in the base-year and first follow-up, including GPA, high school courses taken, and standardized math and reading scores from NCES administered tests.

Because the ELS:2002 is a longitudinal survey, these data allow me to accurately capture the effect of social background and other individual level variables on educational trajectories. The base-year and first follow-up variables are all measured prior to August 2004 when I begin tracking the postsecondary enrollment patterns, which thus prevents causal order problems when the individual level variables are used to predict trajectories. Additionally, the wide variety of background, achievement, aspiration and social capital measures included in the data allow me to capture the full array of concepts that have been shown in the literature to be meaningful for educational outcomes.

My sample is restricted to the same set of students I analyzed for the sequence analysis. It includes all individuals who completed the base year survey, who attended at least one postsecondary school between August 2004 and June 2013, and for whom complete transcript information was available. I first examined the data for rates of missingness. I found that 35% of the data was missing on at least one relevant

independent or control variable. I thus employ multiple imputation techniques to deal with the issue of missing data. This technique has seen widespread use in the fields of education and social science in recent years (Alon 2009, 2010; Kalogrides and Grodsky 2011; Kim and Schneider 2005; Reynolds and Baird 2010), and has been routinely used by authors working with the ELS:2002 (Boylan and Renzulli 2017; Carbonaro and Covay 2010; Engberg and Allen 2011; Klasik 2012; Peguero 2009; Sutton 2017; Wells et al. 2011). Traditional techniques used to deal with missing data like list-wise deletion have the potential to bias our results if any systematic differences exist between cases with full data and those with missing information. In contrast, multiple imputation techniques have been shown to provide unbiased estimates when data are assumed to be missing at random (MAR) (Allison 2001; Croninger and Douglas 2005; Schafer and Graham 2002). I imputed the missing data using the multiple imputation chained equations method in STATA with 40 imputations. This method uses regression techniques to fill in the gaps using the other variables in the dataset (Van Buuren, Boshuizen, and Knook 1999; Royston 2009). After imputation this results in a full sample of 8,490 individuals.

Dependent Variable

Educational Trajectories

The dependent variable in these analyses is postsecondary trajectory as identified empirically through the sequence analysis. I found that the data suggested students followed one of five distinct postsecondary trajectories. While detailed information can be found on each trajectory in the text and tables of the previous chapter (specifically, see Table 3.1 and Figures 3.5 and 3.6), below I briefly describe each to remind the reader.

The first trajectory, the *traditional* pathway, contained individual sequences most similar to what we envision as the "traditional" route through education. These individuals typically had sequences characterized by enrollment in one's first four-year institution. The majority of individuals on this path remained in their first four-year institution for approximately four years before exiting postsecondary. This was the largest of the trajectories, with 39 percent of the sample following this trajectory. The *lateral transfer* trajectory contained sequences also characterized by enrollment in four-year schools but which show evidence of movement between schools at the same level, with students often entering a second or third four-year institution. In contrast to the *traditional* pathway in which on average only 0.8 percent of the group's time was spent in a second or third four-year institution, this enrollment pattern comprised 32 percent of the *lateral transfer* group's time. About 10 percent of the sample experienced the *lateral transfer* pathway. The third trajectory, *vertical transfer*, contained sequences which exhibited initial enrollment in a two-year institution with later enrollment in a four-year school. About 5 percent of the sample followed this trajectory. The fourth trajectory, *two-year*, contained sequences with two-year school enrollment but in which little or no time was typically spent in a four-year institution. On average, students who followed the *vertical transfer* path spent 30 months in a four-year institution, compared to only 6 months for those who followed the *two-year* path. About 16 percent of the sample followed this path. The fifth trajectory, the *unstructured* path, contained sequences with late initial enrollment or attendance at multiple institutions with long stopout gaps between enrollment spells. Students who followed this path tended to spend large

proportions of their time unenrolled over the course of the 107 months. This is the second largest group, with approximately 30.0 percent of respondents following this path.

Independent Variables

My dissertation builds upon classic status attainment models and more contemporary understandings of educational transitions by examining the role of educational trajectories on educational attainment. I therefore incorporate individual level variables in my models that reflect the predictors used by early mobility scholars (Blau and Duncan 1967; Sewell et al. 1969; Sewell and Hauser 1972) and which have been shown to still be meaningful in more recent work on educational transitions (Goldrick-Rab 2006; Hearn 1992; Rowan-Kenyon 2007). To test my hypotheses, I include variables that capture demographic factors, educational ability and academic performance, occupational aspirations, educational expectations and family and peers' impact. Variables are described in detail below, and Table 4.1 provides a concise overview of the independent variables.

Social Background

Social background is captured in the models with three variables that measure socioeconomic status, race, and gender. Below I describe the construction of the variables and the survey instrument used for each.

Socioeconomic Status. The measure of socioeconomic status used in my analysis comes from an existing composite variable in the ELS:2002 data which reports each respondents' SES. The NCES generated SES variable is a based on five equally weighted and standardized items: father's education, mother's education, family income, father's occupation and mother's occupation. These measures are derived primarily from parent

reports at the base year and from student reports when parent data is missing. The variable is split into quartiles.

Race/Ethnicity. The measure of a respondent's race comes from the base year student survey. In the ELS:2002 this measure includes seven racial/ethnic categorizations: white, non-Hispanic; American Indian/Alaskan Native, non-Hispanic; Asian, Hawaiian/Pacific Islander, non-Hispanic; Black or African American, non-Hispanic; Hispanic-no race specified; Hispanic-race specified; and Multi-racial, non-Hispanic. Due to small sample sizes, I collapse the American Indian and Multi-racial categories into an "Other" category. Additionally, I create a category that reflects Hispanic origins. While Hispanic refers to an ethnic group rather than a

racial category, I utilize it in my models as its own category because prior research has shown that having Hispanic origins may have independent effects on college enrollment choices (Perna 2000; Perna and Titus 2006). This results in a five-category indicator variable: white, non-Hispanic; Black, non-Hispanic; Asian, Hawaiian/Pacific Islander; Hispanic (any race) and Other. The white, non-Hispanic group serves as the reference category.

Female. The sex of the respondent is reported by students in the base year. Male is the reference category.

Academic Achievement.

Two variables are used to measure academic achievement in high school prior to the start of the postsecondary sequences: grade point average and tenth grade test scores.

GPA. Grade point average is a continuous measure of the student's cumulative GPA for

Table 4.1: Description and Coding of Variables

Variable	Description and Coding	Source
Dependent Variable		
Postsecondary Trajectory	Categorical variable of postsecondary trajectories that is derived from the results of the sequence analysis in the previous chapter. Five trajectories: Traditional; Lateral Transfer; Vertical Transfer; Two-year; Unstructured.	PETS
Independent Variables		
Social Background Factors		
Socioeconomic Status (SES)	Categorical composite of father's education, mother's education, father's occupation, mother's occupation, family income. In quartiles. Lowest quartile=Ref.	First Follow-Up
Race/Ethnicity	Five category indicator of student self-reported race/ethnicity: White, non-Hispanic; Black, non-Hispanic; Asian; Hispanic; Other. White, non-Hispanic=Ref.	Base Year
Female	Dichotomous indicator of student self-reported gender. Female = 1	Base Year
Academic Achievement and Ability		
Grade Point Average (GPA)	Continuous measure of cumulative grade point for all courses taken on a 4.0 scale.	Transcript
10th Grade Test Score	Standardized composite of reading and math scores on NCES administered test. Lowest quartile=Ref.	Base Year
Expectations		
Steady High Expectations	Dichotomous indicator of the level and steadyness of students educational expectations between survey waves. Expect to attend college in base-year *and* first follow-up = 1	Base Year & First Follow-Up
Mother's Expectations	Dichotomous indicator of whether mother thinks that it is most important for respondent to attend college after high school. Attend college = 1	First Follow-Up
Father's Expectations	Dichotomous indicator of whether father thinks that it is most important for respondent to attend college after high school. Attend college = 1	First Follow-Up
Aspirations		
Occupational Aspirations	Continuous measure of the prestige of the job the respondent wants to hold at age 30. Open-ended answers from students were coded into 17 occupational categories by NCES. Prestige scores come from the 1989 GSS occupational prestige scores, consistent with NCES coding used in SES measures	First Follow-Up
Influence of Friends		
Peer Influence	Five item scale. It is important to my friends to attend classes regularly; study; get good grades; finish high school; continue education past high school. Range: 1-3. $\alpha = .82$	Base Year
Pre-August 2004 Path Controls		
Ever dropped out	Dichotomous indicator of if the student ever reported experiencing a high school dropout spell between 2002 and 2004. Evidence of a dropout episode=1	Composite
Early Graduate	Dichotomous indicator of if the student graduated from high school prior to fall 2003 term. Early graduate=1	Composite
Early Post-Secondary	Dichotomous indicator of if the student reported attending at least one post-secondary institution prior to July 2004. Attended Post-secondary before July 2004=1	Composite

Note. N = 8490. Following NCES convention, I round sample size numbers to the nearest 10 to protect the identities of respondents.

all courses taken, measured on a 4.0 scale. The variable is derived from student transcripts from the last year of high school they completed up to spring 2004.

Tenth Grade Test Scores. Academic achievement is also captured by students' scores on NCES administered math and reading tests taken in the base-year. Math and reading tests scores are standardized and combined into a composite measure and reported in quartiles. This is a norm-referenced percentile measurement which reflects student achievement relative to the population of spring 2002 10^{th} graders. The reference category is the lowest quartile, those scoring in the $0\text{-}25^{th}$ percentile.

Educational Expectations

Students' educational expectations are included in the model and measured through three variables. An educational expectations variable focuses on how much education the student expects to attain, while two other variables reflect respondents' perceptions of their parents' educational expectations for them.

Steady high expectations. Students' educational expectations were measured in both the base year and the first follow-up. Students were asked "As things stand now, how far in school do you think you will get?" Eight possible answers were provided, with options ranging from "Less than high school graduation" to "Obtain a Ph.D., M.D., or other advanced degree," as well as the option of answering "Don't know." A composite variable was created by NCES that reflected the change, if any, in those responses between the two survey waves. I create a dichotomous variable that distinguishes those who had consistently high expectations over time from those who did not, with those who reported expecting to earn a BA or more in *both* waves coded as 1 and those whose expectations were lower or changed between waves coded as 0.

*Mother's Expectations***.** Students were asked "What do the following people [mother/father/friends] think is the most important thing for you to do right after high school?" in the first follow-up and given eight possible options for post-high school activities, including going to college, getting a full-time job, and getting married. Mother's expectations is a dichotomous indicator of whether the respondent's mother believes attending college is the most important thing for them to do right after high school, according to the respondent. Expectations for college are coded as 1 in the model, with all other responses combined into a non-college expectations indicator that serves as the reference group.

*Father's Expectations***.** Father's expectations reflect whether the respondent's father believes attending college is the most important thing for the respondent to do after high school, according to the respondent. Non-college expectations are the reference group.

Occupational Aspirations

Occupational aspirations are measured at the base-year. Students were asked "Write in the name of the job or occupation that you expect or plan to have at age 30." Students answered the open-ended question and coders from NCES coded these occupations into one of 17 occupational categories. I added prestige scores to the occupational types using the 1989 GSS occupational prestige scores. The use of these scores is consistent with NCES, as the GSS scores are also used to rank parents' occupations for the composite family SES measures.

Significant Others' Impact

To capture the effect of peer influence, I created a five-item scale variable that reflects the respondents' friends' orientations towards school. Respondents were asked if

it is “Important to their friends to”: 1) attend classes regularly; 2) study; 3) get good grades; 4) finish high school; 5) continue education past high school. Responses were measured on a three point Likert scale with answers, “Not important,” “Somewhat important,” or “Very important.” The peer influence scale variable is calculated from the means of each respondent’s answers for those who answered at least 4 of the 5 items (80%). The scale ranges from 1 to 3 and shows strong internal consistency with an alpha of .82.

Educational Path Controls: Pre-August 2004

The educational sequences used to create the trajectories begin in August 2004, however certain enrollment statuses that may have occurred before this, including whether the student dropped out, graduated high school early or began college early, have the potential to accelerate or delay students’ movement through higher education. Because these enrollment patterns are not captured by my sequences but have the potential to influence students’ postsecondary trajectories, it is important to control for them in my model. I therefore include a set of three dummy variables that serve as controls for these non-normative high school pathways.

Ever Dropped Out. Some students experienced dropout spells between the base year and first follow-up. This control variable is a dichotomous indicator of if a student ever experienced a dropout spell as of spring term 2004. Never dropped out is the reference category.

Early Graduate. Because all students in the sample were initially sampled in the spring of their sophomore year in 2002, spring 2004 represents an “on-time” graduation for these students. I create a dichotomous indicator variable that indicates if the respondent

graduated at least one academic year early and thus completed high school prior to the fall 2003 term. This variable only includes those who graduated high school early and does not include GED earners. Not an early graduate is the reference category.

*Early Postsecondary***.** Some students had already attended at least one postsecondary institution prior to August 2004 when I begin coding the sequences. These are primarily students who were dual enrolled while in high school, as well as some who graduated early. I include a dummy variable in the analysis coded as 1 if the student ever attended a postsecondary institution prior to August 2004. Did not attend pre-August 2004 is the reference category. Table 4.2 presents the means or proportions of all independent variables for the full sample and for each of the postsecondary trajectories.

Analytic Strategy

My analytic strategy proceeds in three steps. First, I run a nested logistic model predicting the odds that one will follow a *traditional* path (as opposed to all other paths). It is important to look specifically at the traditional path as an outcome because this path both receives a great deal of academic and political interest and is commonly considered the best route to later attainment. However at the same time, this is a route that a decreasing proportion of the college-going population is choosing (Deil-Amen 2011). The nested model allows me to assess the impact of adding additional variables to the model as I step in the hypothesized social background and other individual level factors. I next examine how the social background and academic factors differentially influence educational trajectories with greater nuance by examining the odds that individuals will fall into each of the five pathways uncovered in the sequence analysis. I utilize a multinomial logistic regression in which the five postsecondary trajectories form the

Table 4.2: Proportions and Means of the Independent Variables for the Full Sample and by Trajectory

		Post-Secondary Trajectory				
	Full Sample	Traditional	Lateral Transfer	Vertical Transfer	Two-Year	Unstructured
Independent Variables						
Social Background Factors						
Female	.53	.54	.58	.54	.56	.48
Race/Ethnicity						
(White, non-Hispanic=Ref.)	.64	.73	.70	.70	.59	.56
Black, non-Hispanic	.13	.09	.12	.10	.14	.18
Asian	.04	.06	.04	.05	.04	.02
Hispanic	.14	.08	.09	.12	.19	.18
Other	.05	.04	.04	.04	.04	.06
Socioeconomic Status						
(Lowest quartile=Ref.)	.20	.10	.10	.20	.28	.28
Second quartile	.24	.16	.17	.22	.29	.32
Third quartile	.27	.29	.30	.30	.25	.25
Highest quartile	.29	.45	.44	.28	.18	.15
Academic Achievement						
GPA	2.83	3.28	3.15	2.89	2.54	2.41
10th Grade Test Score						
(Lowest quartile=Ref.)	.17	.04	.05	.15	.28	.29
Second quartile	.24	.13	.19	.28	.32	.31
Third quartile	.28	.30	.35	.33	.27	.25
Highest quartile	.31	.53	.41	.24	.13	.15
Expectations						
Steady High Expectations	.65	.89	.86	.68	.49	.41
Mother's expectations	.76	.85	.83	.84	.76	.41
Father's expectations	.74	.85	.83	.83	.73	.59
Aspirations						
Occupational Aspirations	57.14	60.51	60.24	59.11	54.63	53.83
Influence of Friends						
Peer influence	2.45	2.53	2.54	2.39	2.42	2.37
Pre-August 2004 Path Control						
Ever drop out	.04	.01	.01	.02	.08	.07
Early graduate	.02	.01	.01	.04	.02	.03
Early post-secondary	.04	.08	.07	.04	.01	.01
N	8490	3350	840	450	1320	2540

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Descriptive coefficients are averaged across the 40 multiply imputed data sets.

dependent variable. This method is appropriate when examining the odds that individuals will fall into distinct but unordered categories. Thus, this method is well suited to my research question as I am interested in examining the odds that respondents will be in each of the five categories of the dependent variable given their individual level characteristics. Finally, I explore the results of the multinomial logistic regression further by examining the average marginal effects (AMEs) of the independent variables and by computing the predicted probabilities of following each path depending a set of values of the independent variables. Predicted probabilities and average marginal effects are useful in assessing the magnitude of the effects of the independent variables and how different combinations of independent variables predict the likelihood of a given outcome. I specifically consider how the probability of following each path may vary for students with different social background profiles.

Results

Table 4.3 presents the results of the nested logistic regression model predicting the *traditional* path. Model 1 of Table 4.3 contains just the social background factors—sex, race and socioeconomic status—and the controls as predictors. In the subsequent models, the variables capturing academic achievement, expectations, aspirations and peer influence are added. The results are presented as odds ratios for ease of interpretation. Numbers greater than one represent increased odds of following a given path as opposed to the reference pathway, while numbers less than one indicate lower odds of having followed a given path as opposed to the reference path.

Readily seen in Model 1 of Table 4.3 is the strong influence of socioeconomic background on following the *traditional* pathway. As socioeconomic status increases, so

Table 4.3: Nested Logistic Regression of the Odds of Following the Traditional Path

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Social Background Factors					
Female	1.188*	0.956	0.919	0.912	0.897
Race/Ethnicity					
(White, non-Hispanic=Ref.)					
Black, non-Hispanic	0.660***	1.903***	1.567***	1.540***	1.533***
Asian	1.815***	1.919***	1.775***	1.764***	1.758***
Hispanic	0.597***	1.031	0.995	0.980	0.982
Other	0.921	1.377	1.334	1.320	1.328
Socioeconomic Status					
(Lowest quartile=Ref.)					
Second quartile	1.246*	1.021	0.964	0.965	0.959
Third quartile	2.229***	1.610***	1.438**	1.434**	1.425**
Highest quartile	4.181***	2.512***	2.050***	2.040***	2.014***
Academic Achievement					
GPA		3.956***	3.401***	3.337***	3.317***
10th Grade Test Score					
(Lowest quartile=Ref.)					
Second quartile		1.853***	1.543**	1.521**	1.523**
Third quartile		2.765***	2.138***	2.076***	2.085***
Highest quartile		4.355***	3.230***	3.100***	3.110***
Expectations					
Steady High Expectations			2.624***	2.466***	2.430***
Mother's expectations			1.135	1.126	1.123
Father's expectations			1.440**	1.420**	1.411**
Aspirations					
Occupational Aspirations				1.015**	1.015**
Influence of Friends					
Peer influence					1.151
Pre-August 2004 Path Controls					
Ever drop out	0.137***	0.360**	0.432*	0.442*	0.445*
Early graduate	0.288***	0.473*	0.627	0.595	0.598
Early post-secondary	3.491***	1.741**	1.741**	1.634*	1.621*
N= 8490					

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Data comes from the ELS:2002. Restricted to base-year participants for whom postsecondary transcripts are available. Missing data has been multiply imputed. Models have been adjusted to account for clustering within schools and weighted with student weight F3BYPNLPSWT.
*** p<0.001, ** p<0.01, * p<0.05

do one's odds of following a *traditional* path. Someone in the top SES quartile has 4.2 times greater odds of following the *traditional* path than someone in the bottom quartile. The other variables in Model 1 are also largely significant in the expected directions. Compared to men, women are more likely to follow a *traditional* path, and Asian students are more likely than white students to follow this path as well. In contrast, Hispanic and black students are less likely than their white counterparts to follow the *traditional* path.

However, when the variables related to academic achievement are added in Model 2, some of the social background coefficients become insignificant or even switch direction. Being female and being Hispanic no longer significantly affect the likelihood of following a *traditional* path, nor does being in the second as opposed to the lowest SES quartile. The coefficient for being black remains significant but changes directions after taking academic achievement into account. Thus, while black students are less likely to follow a *traditional* path based on social background characteristics alone, once academic achievement is added to the model they appear *more* likely to follow this path than their white counterparts. Similarly, while women may initially exhibit an advantage in enrollment patterns, this disappears when they are compared to equally achieving male peers.

In Models 3-5 the variables related to educational expectations, occupational aspirations and peer influence are added to the model. Having steady and high expectations for college after high school, perceiving strong expectations from one's father, and having high occupational aspirations all appear to increase one's odds of following the *traditional* route. In contrast, mother's expectations and peer influence do

not appear to significantly affect whether one follows the *traditional* route. Notably, even after adding these additional factors into the model the variables measuring SES and race remain significant. Those in the top SES quartile are more than twice as likely as those in the bottom quartile to follow the *traditional* path, and Asian and black students have a 76 percent and 53 percent greater likelihood, respectively, of following this path than any other path compared to their white peers with similar levels of academic achievement, expectations and aspirations.

I next carry out the multinomial logistic regression, the results of which are presented in Table 4.4. In this table I present the results of the model for all comparisons across the trajectory groups. When conducting a multinomial logistic regression examining the odds of being in one group of a categorical outcome, the regression is modeled with one of the categories of the dependent variable omitted and serving as a reference group. The results, then, depict the likelihood of being in each of the other groups (in my case four other groups) as opposed to being in the reference group. The model must then be rerun with the base outcome switched to see all the comparisons.

In Table 4.4, I present the results of running the model with alternating base outcomes in Models 1-4. In Model 1, the *traditional* pathway serves as the reference group. In Model 2, the *lateral transfer* pathway serves as the reference group. In Model 3, the *vertical transfer* pathway serves as the reference group. And finally, in Model 4, the *two-year* pathway serves as the reference group. Only the reference group changes in each model and the independent variables remain the same. In each subsequent model there is one less column of output. This is because that comparison already appears in the table in the previous models. Thus, I do not run the model with *unstructured* as a

Table 4.4: Multinomial Logistic Regression of the Odds of Experiencing Different Postsecondary Trajectories: All Comparisons

	Model 1				Model 2			Model 3		Model 4
Independent Variables	Lateral Transfer vs. Traditional	Vertical Transfer vs. Traditional	Two-Year vs. Traditional	Unstructured vs. Traditional	Vertical Transfer vs. Lateral Transfer	Two-Year vs. Lateral Transfer	Unstructured vs. Lateral Transfer	Two-Year vs. Vertical Transfer	Unstructured vs. Vertical Transfer	Unstructured vs. Two-Year
Social Background Factors										
Female	1.188	1.102	1.232*	0.983	0.928	1.037	0.828	1.118	0.892	0.798*
Race/Ethnicity										
(White/Non-Hispanic=Ref.)										
Black	1.168	0.427***	0.454***	0.627**	0.365***	0.389***	0.537***	1.063	1.469	1.382*
Asian	0.846	0.699	0.560***	0.367***	0.826	0.661	0.433***	0.801	0.525**	0.655*
Hispanic	1.074	0.732	1.017	1.041	0.682	0.948	0.969	1.390	1.422	1.023
Other	0.837	0.543	0.644	0.865	0.649	0.769	1.033	1.186	1.593	1.344
Socioeconomic Status										
(Lowest quartile=Ref.)										
Second quartile	1.219	0.936	1.011	1.075	0.768	0.830	0.882	1.081	1.149	1.063
Third quartile	1.281	0.785	0.605**	0.588***	0.613*	0.472***	0.459***	0.770	0.749	0.973
Highest quartile	1.308	0.542**	0.375***	0.296***	0.415***	0.287***	0.226***	0.692	0.545**	0.788
Academic Achievement and Ability										
GPA	0.721**	0.448***	0.240***	0.184***	0.622**	0.333***	0.255***	0.535***	0.410***	0.766**
10th Grade Test Score										
(Lowest quartile=Ref.)										
Second quartile	1.398	0.702	0.605**	0.630*	0.502*	0.433**	0.450**	0.861	0.897	1.041
Third quartile	1.240	0.478**	0.396***	0.467***	0.385**	0.319***	0.377***	0.829	0.978	1.179
Highest quartile	0.889	0.251***	0.204***	0.341***	0.283***	0.229***	0.383***	0.812	1.357	1.671**
Expectations										
Steady High Expectations	0.889	0.526***	0.379***	0.325***	0.591**	0.426***	0.366***	0.720*	0.619**	0.859
Mother's expectations	0.928	1.235	0.993	0.762	1.331	1.071	0.821	0.805	0.617*	0.767
Father's expectations	0.905	1.046	0.809	0.547***	1.156	0.893	0.604**	0.773	0.523**	0.677**
Aspirations										
Occupational Aspirations	1.001	1.003	0.978***	0.977***	1.002	0.977**	0.976**	0.975***	0.974***	0.999
Influence of Friends										
Peer influence	1.062	0.571**	0.933	0.835	0.538**	0.879	0.786	1.633*	1.460*	0.894
Pre-August 2004 Path Controls										
Ever drop out	0.749	1.312	3.412**	2.172*	1.751	4.556***	2.900*	2.601*	1.656	0.637*
Early graduate	1.085	3.979**	1.441	1.619	3.667*	1.328	1.492	0.362*	0.407*	1.123
Early post-secondary	1.023	0.827	0.278**	0.297***	0.809	0.272**	0.291***	0.337*	0.359*	1.068
N=	8490				8490			8490		8490

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Data comes from the ELS:2002. Restricted to base-year participants for whom postsecondary transcripts are available. Missing data has been multiply imputed. Models have been adjusted to account for clustering within schools and weighted with student weight F3BYPNLPSWT. ***p<0.001, **p<0.01,*p<0.05

base outcome since that pathway already appears in comparison to each of the other pathways in the Models 1-4 (albeit as the predicted, rather than the reference group). Additionally, for ease of interpretation I again presents the results as odds ratios in the table.

In Model 1 of Table 4.4 the *traditional* path serves as the reference group, and we can observe that the individual factors do indeed have significant effects in shaping paths through higher education. First, examining the social background variables of race, gender and socioeconomic status, each affects pathways, although to varying degrees and in different ways. Socioeconomic status appears to have the most pronounced effect on postsecondary trajectories. While there is no significant difference in pathways experienced between those in the lowest and the second lowest SES quartiles, students in both the third and fourth SES quartiles are more likely to follow a *traditional* path than either a *two-year* or *unstructured* path. And those in the highest SES quartile are more likely to follow a *traditional* path than to experience *vertical transfer*. As SES increases, particularly above a certain level, so too do one's odds of following the *traditional* route through education. There are no significant differences by SES in one's likelihood of experiencing the *traditional* pathway as opposed to the *lateral transfer* path due to SES, however.

Turning to the other comparisons, in Model 2 in which *lateral transfer* is the reference group, the model shows similar results. Students in the third and fourth SES quartiles are more likely to follow a *lateral transfer* path than the *vertical transfer*, *two-year* or *unstructured* paths. Socioeconomic status appears to operate similarly for the *traditional* and *lateral transfer* paths. Indeed, even the coefficients appear quite close in

the models. Someone in the highest SES quartile has a 70 percent greater likelihood of experiencing the *traditional* pathway than the *unstructured* pathway, while someone in the highest SES quartile has a 77 percent greater likelihood of experiencing the *lateral transfer* pathway as opposed to the *unstructured* pathway. Model 3 shows the additional comparisons between *vertical transfer* and both the *two-year* and *unstructured* paths, and in this case SES only matters at the highest quartile and only for the *vertical transfer* and *unstructured* comparison. Those who are in highest SES quartile have lower odds of experiencing the *unstructured* path than experiencing the *vertical transfer* trajectory. Finally, Model 4 shows that SES appears to have no significant effects on following the *unstructured* versus the *two-year* path.

Because the interpretation of multinomial logistic models requires each of the coefficients to be understood relative to the base category in each model, it can be challenging to understand the overall effect of each independent variable on the probability of following the different paths. Average marginal effects (AMEs) can be useful for putting the results of the regression into perspective by providing actual, rather than relative, probabilities. Average marginal effects show the degree of difference in the predicted probabilities of following a particular trajectory between values of an independent variable, holding the other independent variables constant.

Table 4.5 reports the average marginal effects of each of the independent variables on the probability of observing each trajectory. The first column of Table 4.5 shows that those in the highest SES quartile's probability of experiencing the *traditional* route is about 11 percentage points higher than for individuals in the lowest quartile with

Table 4.5: Average Marginal Effects (AME) from MLM Regression Predicting Postsecondary Trajectory

	Traditional	Lateral Transfer	Vertical Transfer	Two-Year	Unstructured
Independent Variables					
Social Background Factors					
Female	-0.015	0.011	0.002	0.025 *	-0.023
	(0.012)	(0.008)	(0.007)	(0.011)	(0.012)
Race/Ethnicity					
(White/Non-Hispanic=Ref.)					
Black	0.059 **	0.034 *	-0.027 **	-0.055 ***	-0.012
	(0.022)	(0.014)	(0.009)	(0.014)	(0.018)
Asian	0.090 ***	0.010	0.005	0.001	-0.106 ***
	(0.019)	(0.014)	(0.012)	(0.020)	(0.022)
Hispanic	0.000	0.006	-0.017	0.002	0.010
	(0.019)	(0.014)	(0.009)	(0.017)	(0.019)
Other	0.042	-0.004	-0.023	-0.037	0.021
	(0.027)	(0.016)	(0.013)	(0.022)	(0.028)
Socioeconomic Status					
(Lowest quartile=Ref.)					
Second quartile	-0.009	0.010	-0.006	-0.006	0.011
	(0.019)	(0.010)	(0.010)	(0.016)	(0.020)
Third quartile	0.049 **	0.031 **	0.001	-0.026	-0.056 **
	(0.018)	(0.010)	(0.010)	(0.017)	(0.020)
Highest quartile	0.115 ***	0.054 ***	-0.003	-0.037 **	-0.129 ***
	(0.020)	(0.012)	(0.011)	(0.018)	(0.021)
Academic Achievement and Ability					
GPA	0.178 ***	0.023 **	0.003	-0.046 ***	-0.158 ***
	(0.012)	(0.007)	(0.007)	(0.010)	(0.012)
10th Grade Test Score					
(Lowest quartile=Ref.)					
Second quartile	0.045	0.038 *	-0.009	-0.037	-0.037
	(0.025)	(0.015)	(0.014)	(0.019)	(0.021)
Third quartile	0.093 ***	0.042 **	-0.021	-0.067 **	-0.047 *
	(0.025)	(0.014)	(0.014)	(0.021)	(0.022)
Highest quartile	0.168 ***	0.031 *	-0.041 **	-0.114 ***	-0.043
	(0.028)	(0.014)	(.015)	(0.022)	(0.025)
Expectations					
Steady High Expectations	0.125 ***	0.027 *	-0.003	-0.037 **	-0.113 ***
	(0.015)	(0.011)	(0.008)	(0.014)	(0.016)
Mother's expectations	0.016	-0.002	0.015	0.018	-0.048 *
	(0.019)	(0.012)	(0.010)	(0.017)	(0.020)
Father's expectations	0.048 **	0.006	0.015	0.020	-0.088 ***
	(0.018)	(0.011)	(0.010)	(0.017)	(0.019)
Aspirations					
Occupational Aspirations	0.002 *	0.001	0.001 **	-0.001 *	-0.002 **
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Influence of Friends					
Peer influence	0.022	0.011	-0.026	0.009 **	-0.016
	(0.015)	(0.009)	(0.009)	(0.015)	(0.016)
High School Controls					
Ever drop out	-0.090	-0.041 *	-0.012	0.120 **	0.023
	(0.047)	(0.019)	(0.018)	(0.035)	(0.036)
Early graduate	-0.082	-0.017	0.096 *	-0.011	0.014
	(0.050)	(0.034)	(0.045)	(0.037)	(0.044)
Early post-secondary	0.111 ***	0.037	0.024	-0.066	-0.106 **
	(0.032)	(0.022)	(0.027)	(0.037)	(0.040)
N=	3350	840	450	1320	2540

Note. Following NCES convention, sample size numbers are rounded to the nearest 10 to protect the identities of respondents. Model accounts for clustering within schools.

the same values on the other independent variables. Similarly, those in the third quartile have a 5 percent higher probability of experiencing the *traditional* route. In contrast, these groups have a 13 percent and 6 percent lower probability of experiencing the *unstructured* route, respectively.

Together, these results provide support for Hypothesis 4.1 that as ones' socioeconomic status increases so does their probability of experiencing the *traditional* and *lateral transfer* paths that involve four-year enrollment, with the highest SES students most likely to follow a *traditional* path through education. Both the upper two socioeconomic quartiles had higher odds of following the *traditional* and *lateral transfer* paths than the *two-year* and *unstructured* paths compared to the lowest SES quartile. Socioeconomic status, particularly above a certain level, appears to encourage movement into four-year institutions and away from two-year institutions, and especially away from *unstructured* paths.

Gender has a slight effect on educational pathways. Compared to men, women are more likely to experience the *two-year* trajectory as opposed to the *traditional* path and the *unstructured* path. However, this does not mean that men are more likely than women to follow the *traditional* path in general. As seen in the AMEs table, there is no significant difference between the genders in the actual probability of following the *traditional* path or of following the *unstructured* path, all other variables held equal. Rather, this finding is driven by women's increased odds of following the *two-year* path compared to men. Thus, I do not find support for Hypothesis 4.2, that compared to men, women will be less likely to follow the *unstructured* path.

Race also appears to have significant effects on the trajectory one takes through postsecondary. Compared to their white peers, black students appear more likely to follow paths that involve four-year enrollment. They have greater odds of following both the *traditional* route and the *lateral transfer* route than the other three paths, as seen in Models 1 and 2. But at the same time Model 4 shows that black students have approximately 38 percent greater odds of experiencing the *unstructured* pathway as opposed to the *two-year* pathway. The average marginal effects help to clarify these relationships. When compared to white students with the same values on the other independent variables, black students are not significantly more likely to follow the *unstructured* trajectory but are six percent more likely to experience the *traditional* path and three percent more likely to experience the *lateral transfer* path.

Asian students also experience different postsecondary trajectories than white students. The average marginal effects show that being Asian increases one's probability of following the *traditional* route by 9 percent and decreases the probability of following the *unstructured* route by 11 percent.

Turning to the measures of academic achievement, GPA has significant effects across all the comparisons in Table 4.4. As grade point average increases, one is more likely to follow a traditional route than to laterally transfer, more likely to laterally transfer than vertically transfer, more likely to vertically transfer than attend two-year schools with no four-year enrollment, and more likely to attend mainly two-year institutions than follow unstructured paths. While the five trajectories are distinct and unordered and thus should not be thought as ordinal categories ranging from *traditional* to *unstructured*, nonetheless GPA does appear to promote paths that are closer to the

traditional route and potentially more likely to lead to degree attainment. Later analyses in this dissertation that examine the effect of trajectories on attainment will shed greater light on this (see Chapter 5).

Tenth grade standardized test scores also significantly predict postsecondary trajectories. Models 1 and 2 show that students with greater academic achievement in high school are more likely to follow paths that begin in four-year institutions. Students who scored in the third and highest test score quartiles are more likely to experience the *traditional* or *lateral transfer* paths than the *vertical transfer*, *two-year* and *unstructured* paths. In each case as test scores increase, so to do the odds of following these paths. For instance, an individual's likelihood of following the *traditional* path rather than the *unstructured* path increases from .37, to .53, to .65 as test score quartile increases. However, while GPA positively predicts *vertical transfer* as opposed to following the *two-year* and *unstructured* paths, test scores do not appear to have a significant effect on this trajectory.

The GPA and test score findings provide strong support for Hypothesis 4.4 that students who displayed greater academic achievement in high school will be more likely to follow the *traditional* and *lateral transfer* paths that involve initial enrollment in four-year institutions. However, an unexpected finding in the model is that students of the highest test score quartile are actually more likely to experience the *unstructured* pathway as opposed to the *two-year* path, compared to those with lower test scores. Compared to the lowest scoring quartile, individuals in the highest quartile are 67% more likely to follow an *unstructured* path than a *two-year* path. This suggests that when high ability students do not follow a four-year route through higher education, rather than falling back

on more traditional two-year enrollment type patterns, they are more likely to experience highly unstructured paths characterized by attendance at multiple institutions, long stopout gaps, or late initial enrollment.

Next I turn to the role of educational expectations and orientations—a long standing concern of status attainment scholars. Model 1 shows that compared to those with lower expectations or whose expectations changed between survey waves, having steady and high expectations between tenth grade and twelfth grade significantly predicts following the *traditional*, as opposed to the *vertical transfer, two-year* and u*nstructured* routes. Models 2 and 3 show that high educational expectations also increase the odds of *lateral transfer* and *vertical transfer* relative to following *unstructured* or *two-year* paths. The influence of others' expectations does not appear as pronounced on educational trajectories. Across the four models, respondents' perceptions of their mothers holding high expectations for them only positively predicted one trajectory: *vertical transfer* as opposed to *unstructured.* Fathers' expectations are slightly more meaningful, positively predicting the other four paths as opposed to the *unstructured* path, relative to those whose fathers do not expect them to go on to college immediately after high school. Thus, I find strong support for Hypothesis 4.5a that students who maintain high expectations over time will be more likely to follow the *traditional*, *lateral transfer*, and *vertical transfer* paths that involve four-year institutions and less likely to follow the *unstructured* pathway, and partial support for Hypothesis 4.5b that having parents who expect college directly after high school will be positively associated with following the *traditional* and *lateral transfer* paths.

Having high occupational aspirations appears to have a small effect, leading individuals away from *two-year* and *unstructured* routes. Respondents' odds of experiencing these routes declined relative to the *traditional, lateral transfer* and *vertical transfer* pathways as their occupational aspirations increased, providing support for Hypothesis 4.6. Notably occupational aspirations do not predict any significant differences between the likelihood of following the *traditional, lateral transfer* and *vertical transfer* pathways. Holding high occupational aspirations leads people on pathways that tend to involve enrollment in four-year institutions but apparently does not affect the specific four-year route that is followed.

Finally, I do not find support for Hypothesis 4.7 that students whose peers are more academically oriented will be more likely to follow the *traditional* and *lateral transfer* paths that begin in four-year institutions and less likely to follow the *unstructured* trajectory. There were no significant differences between the *traditional* or *lateral transfer* paths and the *two-year* or *unstructured* paths with regards to peer influence. However, perceiving one's peer group as positively valuing schools and acting in ways that promote educational attainment appears to have the strongest effect in relation to vertically transferring. Students who perceive a more academically oriented peer group are more likely to *vertically transfer* than follow the *two-year* or *unstructured* paths, but also more likely to follow the *traditional* and *lateral transfer* paths than to follow the *vertical transfer* path. This suggest that having peers who value education may be particularly important for students who are on the cusp of entering a four-year school, rather than for those who begin there or who follow *unstructured* paths.

Predicted Probabilities

Figure 4.1 shows the predicted probabilities of individuals following each of the five paths by SES, race and gender combinations (with all other independent variables set at their means). The figure reveals the broad trends in how pathways are shaped by combinations of social background factors. Immediately clear is how similar the pattern of probabilities is across the racial groups (Plots A-E). Individuals have higher probabilities of being in the *traditional* group, especially if they are in the highest (SES Q4) or next highest (SES Q3) socioeconomic quartiles. They have lower probabilities of following the *lateral transfer*, *vertical transfer* and *two-year* paths and then a greater probability of being in the *unstructured* group, particularly if they are in the lowest two SES quartiles. One interesting race effect stands out, however. In Table 4.4 the multinomial logistic regression discussed previously, the results indicated that Asian students were significantly less likely to follow the *unstructure*d path than any other path. In Plot C of Figure 4.1, we can see this effect in the predicted probabilities. Compared to the other racial groups, individuals who are Asian have the lowest probability of following the *unstructured* path. For instance, while a low SES white woman has a 42% probability of following the *unstructured* path, an Asian woman who is otherwise similar on all characteristics has only a 26% probability of following this same educational path.

Additionally, SES affects the likelihood of following each path. As SES decreases, individuals generally have lower probabilities of following the *traditional* and *lateral transfer* paths compared to their higher SES peers and higher probabilities of following the *two-year* and *unstructured* paths. Surprisingly, compared to those who are in the second lowest quartile, individuals who are in the lowest SES quartile have a

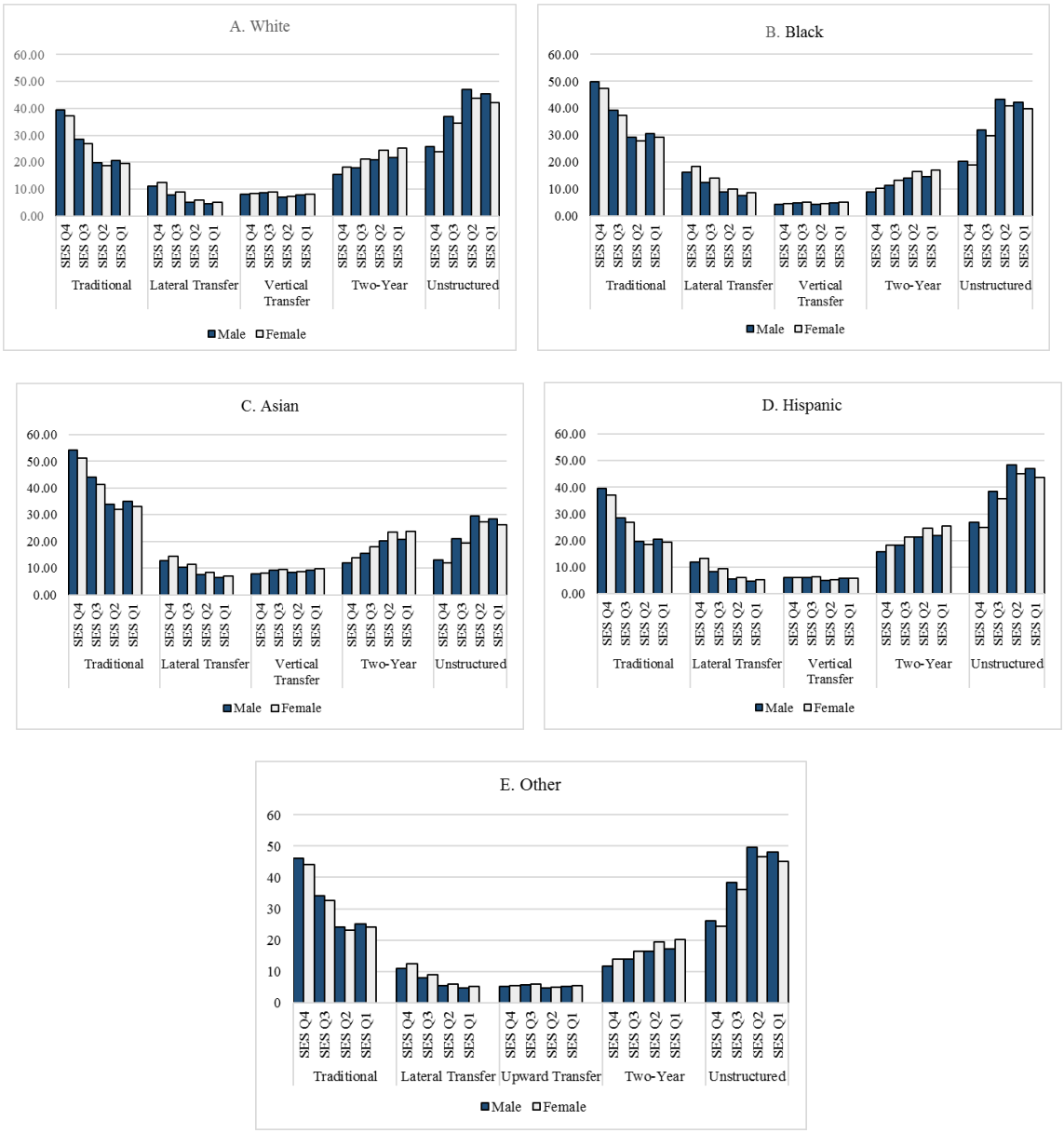

Figure 4.1 Probability of Following Each Path by Gender, SES and Race

Note. Created using margins suite of command in Stata 14.0. All other variables set at means. SES in quartiles from 1 (Low) to 4 (High).

slightly higher predicted probability of following the *traditional* path and a slightly lower probability of following the *unstructured* path. This is counter to expectations which would lead us to assume that those in the lowest SES quartile would be least likely to follow a traditional path.

The figure also allows us to see how facing disadvantage on multiple levels influences pathways. As socioeconomic status declines, so does one's likelihood of being in the *traditional* and *lateral transfer* paths compared to their higher SES peers, however the race effects do not appear to magnify this. Hispanic individuals do not differ significantly from whites in their predicted probabilities of belonging to each group. And for Asian and black students, their race actually conveys a slight advantage after accounting for academic achievement and other relevant factors. Being Asian increases the probability of experiencing the *traditional* path and reduces the probability of experiencing the *unstructured* path. Similarly, while black individuals are typically considered at risk for negative educational outcomes, the AMEs and Figure 4.5 show that they have greater probabilities of following the paths involving four-year enrollment—the *traditional* and *lateral transfer* paths, and reduced probabilities of following the paths involving two-year enrollment—the *vertical transfer* and *two-year* paths compared to white, Hispanic and "other" individuals.

To put this into perspective I consider the probability of students following each of the five paths given a set of substantively interesting background characteristics. Below I provide a table of nine hypothetical individuals who vary in terms of their race, socioeconomic status, and GPA. The multinomial model showed SES and test scores as two of the more influential variables on pathways but the marginal effects cannot tell us

if having a high GPA operates equally for individuals of all class levels. I therefore use these predicted probabilities to gain a greater understanding of the way that these variables shape the pathways of advantaged students.

The nine hypothetical students are all male students of Hispanic, Asian and white origins[4]. I vary their level of SES and GPA and use the margins commands to explore how this affects their probabilities of following the *traditional* and *unstructured* pathways. In the models all other independent variables are set at the local means for the Asian, Hispanic and white subpopulations. Figure 4.2 provides a graph of the predicted probabilities and Table 4.6 provides the student profiles.

We can see that Chen, the Asian student in the highest SES group with a high GPA, has a probability of .76 of following the *traditional* path and only a .03 probability of following the *unstructured* path. His low SES counterpart, Hikaru, is still considerably more likely to follow the *traditional* path than the *unstructured* path, but the probability of this is reduced. His low SES background reduces the predicted probability of following the traditional path to .66 and triples his likelihood of following the unstructured path (.09). Here we can see the degree to which SES serves as a protective factor, encouraging *traditional* routes through education. For Zhiyuan, the student with an advantaged social class background but who is a low-achiever, despite being in the bottom 10th percentile in GPA rank, he is still more likely to follow the *traditional* route than the *unstructured* route, although the odds of following each path are relatively close.

The next set of columns show the predicted probabilities for a student who has the same combinations of SES and GPA, but who is white. Figure 4.2 reveals that Jakes's

[4] I identify students with names shown to be associated with a given race in prior research on racial stereotyping and implicit bias (Holbrook, Fessler, and Navarrete 2016; Levitt and Dubner 2009).

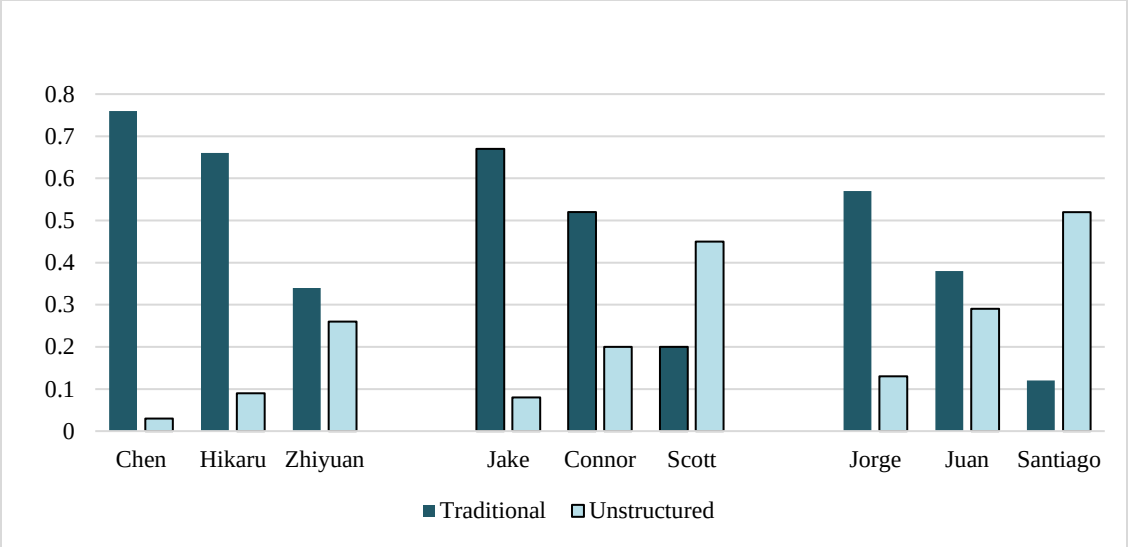

Figure 4.2: Predicted Probabilities of Hypothetical Students

Table 4.6: Predicted Probabilities of Hypothetical Students, by Race and SES

	Student Profile	Traditional	Unstructured
Chen	Asian male, highest SES quartile, GPA at top 10th percentile (3.75)	0.76	0.03
Hikaru	Asian male, lowest SES quartile, GPA at top 10th percentile (3.75)	0.66	0.09
Zhiyuan	Asian male, highest SES quartile, GPA at bottom 10th percentile (2.00)	0.34	0.26
Jake	White male, highest SES quartile, GPA at top 10th percentile (3.75)	0.67	0.08
Connor	White male, lowest SES quartile, GPA at top 10th percentile (3.75)	0.52	0.20
Scott	White male, highest SES quartile, GPA at bottom 10th percentile (2.00)	0.20	0.45
Jorge	Hispanic male, highest SES quartile, GPA at top 10th percentile (3.75)	0.57	0.13
Juan	Hispanic male, lowest SES quartile, GPA at top 10th percentile (3.75)	0.38	0.29
Santiago	Hispanic male, highest SES quartile, GPA at bottom 10th percentile	0.12	0.52

probabilities of being in the *traditional* and *unstructured* groups are nearly equivalent to Hikaru's (.67 & .08 vs. .66 & .09), despite Jake being in the top SES quartile and Hikaru being in the bottom SES quartile. Also, in contrast to the high SES/low GPA Asian student Zhiyuan, his white counterpart Scott is more likely to follow the *unstructured* path than the *traditional* path. Being Asian confers a protective advantage leading a student towards the *traditional* and away from the *unstructured* path.

Turning to the set of Hispanic students, we can see that for Juan, a high achieving but low SES Hispanic student, his probability of following the *unstructured* path is .29, close to his probability of following a *traditional* path (.38). While his high GPA still gives him the greatest probability of following a *traditional* path, being low SES and Hispanic presents barriers that reduce this considerably. Compared to Hikaru, and even Scott, he is less likely to follow the *traditional* route. Similarly, Santiago who scored in the bottom 10^{th} percentile of the GPA distribution has a probability of .52 of following the *unstructured* path, double that of Zhiyuan (.26) and 7 percent higher than Scott (.45). Despite coming from an advantaged background in terms of SES, he does not see the same positive effect on following the *traditional* path. If a true meritocracy existed, students' probabilities of following different paths would be based on their achievement and ability and not on their race and SES. However, as can be seen in the figure and table above, this is not the case.

Conclusion

In this chapter I examined the predictors of the educational pathways uncovered in the sequence analysis, asking, how do social background and academic factors shape postsecondary trajectories? First, finding that many of the individual-level variables have

significant effects on the trajectory one follows through postsecondary confirms that the educational paths I uncovered in the last chapter are analytically meaningful. Notably, by using sequence analysis to uncover the pathways in the analysis, I am modeling the effect of these independent variables on students' long-term educational trajectories over nearly nine years. While the paths are named for the common transition or dominant enrollment pattern that characterizes them, it is important to remember that the actual experiences of those who follow each path are quite diverse. Those who follow the *traditional* path are not simply individuals who entered a four-year immediately and then attended for four or five years. As was seen in the figures in the last chapter, actual students' experiences are far more complex. By grouping those whose sequences show less distance from each other over the multiple years and multiple transitions, I can see how social background and academic factors shape educational *careers*. The proof of the classificatory scheme of the sequence analysis is in the "pudding" of its explanatory value in subsequent analysis (Abbott and Tsay 2000), and my significant results in this chapter shed light on what generates certain enrollment patterns while also confirming the need to study not just educational transitions, but long-term educational trajectories as well.

One of the major contributions of the analysis in this chapter is to confirm and extend prior work on educational transitions as the predictors of different enrollment patterns. Prior work on educational pathways has shown that in general, those who are more advantaged and academically prepared are more likely to follow traditional enrollment patterns. My work largely supports this finding. I found that socioeconomic status and GPA are both highly relevant in shaping postsecondary trajectories. My other hypotheses were also largely supported, with a few exceptions. I did not find gender

effects on trajectories, nor did I find any effect due to peer influence. While my race hypothesis was unidirectional, I found that Asian and black students were more likely to follow a *traditional* or *lateral transfer* path than white students. This was not the case for Hispanic students who had the lowest predicted probability of following the *traditional* path, though they did not significantly differ from white students in the multinomial model. For Asian students, my finding is not necessarily surprising. This group often shows academic achievement on par or above that of their white peers. For black students who are typically underrepresented in four-year schools, however, the finding may seem counterintuitive. The nested logistic model sheds light on this showing that being black is associated with reduced odds of experiencing the *traditional* pathway in the reduced model, but that this finding switches directions after additional variables are incorporated into the model. This is similar to Bozick and DeLuca's (2005) finding regarding race in their study of predictors of delayed postsecondary entry. In their descriptive statistics the authors find that being black has a negative effect in immediate enrollment, but in their full model being black is associated with more traditional enrollment patterns, increasing the likelihood that one will enroll immediately (Bozick and DeLuca 2005). My findings suggest that the negative effect of being black in the descriptives and reduced model is largely due to their lower levels of prior academic achievement. However, after accounting for academic achievement, the positive effect of being black remains even after additionally accounting for educational expectations which have been shown to be uncharacteristically high for black students relative to their socioeconomic background (Kao and Tienda 1998). Future work should examine this more closely.

Additionally, up to this point I have only considered what shapes student pathways through postsecondary, not whether those pathways lead to a degree or not. It will also be important to consider how following different paths shapes later attainment and if the positive effects of following certain paths on attainment are seen uniformly across all types of students. For instance, *unstructured* paths could be potentially beneficial to some students. For low SES students who lack the resources to attend a four-year college or university, following a less structured path may be a strategic move that allows them to work and save money before entering college. The degree to which the different paths serve as a successful way to move through higher education however is unknown. I will address this question in the next chapter of the dissertation.

CHAPTER 5

PATHWAYS TO SUCCESS?: HOW POSTSECONDAY TRAJECTORIES PREDICT COLLEGE COMPLETION AND THE EFFECTS OF STATE LEVEL CONTEXT ON ATTAINMENT

Over the past half century, access to postsecondary education has grown tremendously. In spite of rising costs and a shifting financial burden that places more of the cost of college attendance on students and their families, students continue to enroll in college in large numbers (Heller 2011b). Today, more diverse types of students are entering higher education. The typical student is no longer who we think of when we envision the "traditional" college student. They are older, more likely to be independent and more likely to have dependents of their own compared to the student body of the past (Deil-Amen 2011). Although variation in college-going rates still exist by social background, in many ways the story of access has been a story of relative success. However, access is only one half of the story. In recent years politicians, school administrators and scholars studying higher education have all called attention to the growing need to focus not just on access but on college *completion* (Braxton et al. 2014; Perna and Finney 2014; Rosenbaum, Deil-Amen, and Person 2007; Tinto 2012). Increasing college attainment is important for higher education institutions to maintain and justify their state funding, for states to stay competitive in the increasingly global and knowledge based economy, and for broader social concerns that seek a more equitable society (Perna and Finney 2014).

The need to focus on completion has come to light, in part, because the increases seen in access have not led to parallel increases in degree attainment among "nontraditional" students (Brock 2010). This is problematic because the ability of our educational institutions to educate both "traditional" and "nontraditional" students equally speaks to broader issues relating to the role of social background on status attainment. While increased access is a step towards equality, true equality remains elusive if students of lower class backgrounds are entering postsecondary institutions but leaving without a degree.

Understanding how college students move through postsecondary is key to understanding how educational attainment is shaped. As noted in the introduction of this dissertation, as the types of students entering postsecondary have changed, we have seen a parallel shift in the type of institutions and programs in which they can enroll. Today, in conjunction with the classic four-year college or university, students may choose from an array of community colleges (Cohen and Brawer 2008), for-profit institutions (Tierney and Hentschke 2007), online programs (Allen and Seaman 2007), and "second-chance" programs aimed at getting dropouts back into the system (Bloom 2010). Indeed, only about 26% of first-year undergraduates begin their postsecondary education in a four-year college or university (Deil-Amen 2011). This growth in new postsecondary options developed in response to both economic conditions and a growing demand from consumers; however, the degree to which such growth in postsecondary options has been beneficial for students is contested.

On one hand, for nontraditional students who are older, have children or are currently in the workforce, the traditional college experience of four-plus-years in a

residential campus setting is often ill-suited to their life circumstances. Having options like the ability to earn an online degree, to attend part-time or to attend community college classes at night, may provide them with greater flexibility in shaping the postsecondary experience that will work best for them. For such students, more postsecondary options provide greater choice and may keep them enrolled when they would otherwise drop out. Additionally, these programs often provide less costly routes to a degree. For a lower income student looking to earn a bachelor's degree, the choice to spend the first two years at a community college and then transfer to a four-year school could be a cost effective strategy as two-year schools are considerably less expensive than four-year schools, on average (NCES 2016a). In this sense, the growth of postsecondary options may be seen as higher education responding to consumer demands. Students are provided with a variety of ways to move through school and choose the one that best fits their educational goals and needs. And if students have the ability to effectively "shop around" for the program or school that fits them best, this could lead to higher attainment overall.

Conversely, if research shows that some postsecondary paths are consistently more likely to lead to a degree than others, the existence of a wide variety of paths may prove detrimental to students. Having multiple options which do not effectively lead students to the degrees they desire is unlikely to increase overall attainment. Research has suggested that this may be the case. Delaying postsecondary entry, interrupting one's attendance, and attending a two-year rather than a four-year school have all been shown to lower educational attainment (Adelman 1999; Bozick and DeLuca 2005; Cabrera et al. 2012; Carroll 1989; DesJardins et al. 2006; Roksa and Velez 2012). In fact, following

these less successful postsecondary pathways may set students further back due to tuition costs, accrued debt and foregone income (Schneider and Yin 2011). This is particularly problematic if certain students are funneled towards more or less successful pathways based on their social background characteristics. As was evident in Chapter 4, not all students are equally likely to follow all paths, and if some students have less opportunity due to their socioeconomic status, having multiple routes through postsecondary schooling is likely to exacerbate issues of inequality rather than relieve them.

In the last chapter I examined how social background shapes paths through postsecondary and in this chapter I extend this question to examine how routes through postsecondary shape later attainment. Using the five pathways uncovered in Chapter 3 with the sequence analysis, I examine how different trajectories affect the likelihood and timing of educational attainment, specifically of earning a bachelor's (BA) degree. It may be that the different paths, particularly the *traditional*, *lateral transfer*, and *vertical transfer* paths, simply provide alternative routes to a BA. However, if certain paths are associated with greater or lesser attainment, this is problematic.

Additionally, larger sociopolitical and opportunity structures affect individual opportunity at the same time. While much attention has been paid to the institutional characteristics of postsecondary schools and their effects, the broader institutional context related to the labor market, enrollment ecology, school financing and political geography of the state has received comparatively less attention (Braxton et al. 2014). Despite this, state level factors are also likely to influence attainment, both directly and by influencing the ways in which pathways operate on attainment. The effect of certain trajectories on attainment may be made worse or mitigated by state level sociopolitical factors. For

instance, states vary in how they choose to finance their public higher education institutions. Attending school in a state with lower tuition and where less of the cost of college is placed on students may encourage them to remain in school and complete their degrees. In this chapter I introduce state level contextual factors to my analysis to bridge the micro and macro gap. I examine the role that larger structural and institutional arrangements have on student's educational attainment and if certain state level factors moderate the effects of paths on attainment.

Finally, the effect of different paths on attainment may also vary by a student's background characteristics. All paths may not operate equally for all students. Some students may be successful despite following an *unstructured* path, while for others this is likely a dead-end path from which they are unlikely to earn a degree. And if a given path is better suited to some students than others based on social background characteristics, this may further exacerbate inequality.

Research Questions

The goal of this chapter is to examine how pathways shape attainment and how individual-level background characteristic and state level sociopolitical factors may moderate this relationship. Specifically, I address three primary research questions:

1) How do postsecondary trajectories affect attainment, specifically the timing and likelihood of earning a bachelor's degree?
2) How does the state level sociopolitical context amplify or mitigate the effect of postsecondary trajectories on attainment?
3) To what extent do these pathways operate equally for students with different social backgrounds?

The Importance of College Completion

College completion is important for individuals and our wider society as it is associated with a variety of both public and private benefits. For individuals, greater education is associated with increased earnings as it qualifies people for more prestigious and better paying jobs; but the benefits to individuals are much broader than this (Baum et al. 2013). Individuals with more education report higher savings, less time spent unemployed, better job satisfaction and working conditions, better health, and lower divorce rates (Baum et al. 2013; Pascarella and Terenzini 2005; Perna 2003). For the wider society, a more educated populace results in increased tax revenue, lower dependence on government support, reduced crime rates, greater rates of civic engagement and a more productive and adaptable work force (Bloom, Hartley, and Rosovsky 2007; Ma et al. 2016). This is particularly important due to current demographic and economic shifts facing the U.S. The baby boomer generation is retiring while at the same time traditional manufacturing industries in the U.S. are shuttering and the country is moving in the direction of an increasingly global and knowledge based economy. For individuals to successfully find employment in the future and to maintain our country's level of prosperity, the U.S. will need a more highly educated work force going forward (Perna and Finney 2014).

Despite this, while educational attainment grew rapidly during the 20th century, this growth has largely stalled in recent years. Currently approximately 33 percent of adults in the U.S. hold a bachelor's degree (Ryan and Bauman 2016). The attainment of a bachelor's degree is a particularly important marker in the quest for attainment, and earning a degree, rather than simply spending additional years in school, is associated

with the greatest payoff (Jaeger and Page 1996; Pascarella and Terenzini 2005). Earning a bachelor's degree accrues greater benefits than earning an associate's or lesser certificate or degree. Compared to full-time workers with only an associate's, those with a bachelor's earn an additional $15,400 in average median annual income and $19,700 more than those with some college, but no degree (Ma et al. 2016). Because of the significant benefits that accompany the bachelor's, I focus my analysis on the attainment of this degree in this chapter.

Routes to a BA

While earning a bachelor's degree is associated with a variety of social and individual benefits, not all students are completing college at the same rates. Educational attainment appears to be shaped by the path one follows through postsecondary. While the option of following nontraditional paths may be neutral or even beneficial if following different pathways has no effects on later attainment, most empirical research has not shown this to be the case. Nontraditional paths generally lead to lower attainment. Students who delay college enrollment after high school complete fewer years of schooling and are less likely to attain a BA (Bozick and DeLuca 2005; Carroll 1989; Featherman and Carter 1976; Jacobs and King 2002; Roksa and Velez 2012), as do those who experience non-continuous enrollment or multi-institutional attendance (DesJardins et al. 2006; Goldrick-Rab 2006). Similarly, students who attend two-year schools are more likely to dropout and less likely to get a BA (Alfonso 2006; Dougherty 1994; Lockwood Reynolds 2012; Monaghan and Attewell 2015; Rouse 1995). While race, socioeconomic background and gender all influence levels of attainment (Dougherty and Kienzl 2006), the effect of different routes through school remains even

after controlling for relevant background characteristics. For instance, Monaghan and Attewell (2015) found that among otherwise similar students who expected to earn a bachelor's degree, simply enrolling in a community college lowered their probability of earning a BA by 17-21 percent compared to those who began their college career in a four-year school. This effect remained after controlling for a student's likelihood of self-selecting into a two-year as opposed to a four-year school due to a host of background factors. Thus, pathways themselves appear to have independent effects on student success, with some enrollment patterns more effective than others in leading students to a BA. As a result, some scholars have suggested that following a particular path may be detrimental to a student regardless of their social class background (Roksa and Velez 2012), and there may be something wrong with the paths themselves (Dougherty 1994; Dougherty and Kienzl 2006).

To date, this research has largely focused on single transitions, or paths defined by a single enrollment pattern (e.g. delay or starting in a two-year school), rather than considering the effect of long-term educational trajectories on later attainment. However, students have the ability to "stopout," moving in and out of multiple educational institutions over time in ways that are not captured by single transitions. Examining the effect of the trajectories uncovered in the sequence analysis on BA attainment will allow me to see the extent to which long-term trajectories of postsecondary enrollment matter. While the five paths—*traditional, lateral transfer, vertical transfer, two-year* and *unstructured*—are defined by familiar and much studied transitions, like transferring between a two-year and a four-year school, they simultaneously reflect the complex timing, duration, and ordering of long-term enrollment patterns and multiple moves

across institutions that result in their group assignment. I add to the literature on the effects of nontraditional routes through postsecondary by examining how educational trajectories shape the timing and likelihood of earning a bachelor's degree. I am particularly interested in whether students who follow alternative paths are as likely as those who follow more traditional paths to earn a BA. The *traditional, lateral transfer*, and *vertical transfer* paths are all characterized by some amount of time spent in a four-year school. However, it remains to be seen if these trajectories have the same effect on degree attainment. While work has yet to consider how long-term sequences of enrollment patterns shape attainment, I draw on the literature reviewed above about the effect of specific nontraditional enrollment paths to generate following hypothesis:

Hypothesis 5.1: Educational trajectories will shape later attainment, with those who follow the traditional path most likely to have completed a bachelor's degree by 2013.

The States: The Role of Sociopolitcal Context on Attainment

The effect of educational trajectories on attainment may also be shaped by larger institutional factors. The United States has a decentralized education system in which much of the control over public educational institutions falls to the state and local governments (Bok 2013). Because of this, a large degree of variability exists in how states choose to organize and support their educational institutions. States vary in the number and type of public institutions that exist in the state, how they financially support the students and schools, and in how they oversee and enact higher education policy (Hauptman 2011; Lopez Turley 2009; Perna and Finney 2014). State policy is a mix of statewide and campus level initiatives which reflect the states' history, budgets, economy and current levels of attainment of both secondary and postsecondary students. While

many goals are shared amongst the states, for instance increasing BA attainment, others are state specific reflecting unique challenges a state may experience due to its demographics or economic needs (Perna and Finney 2014).

States also vary significantly in terms of student outcomes. For instance, when considering the percent of adults twenty-five and older that have earned a bachelor's degree, states range from Massachusetts with 55 percent of the state's population educated at this level, to only 19 percent in West Virginia (Ma et al. 2016). While the source of these differences is complex, including the demographics of the state's population and the likelihood that better labor market opportunities are luring more educated workers to states like Massachusetts, nonetheless there is a recognition among state policymakers and scholars that states play a significant role in shaping the level of attainment in a state. States are viewed as key stakeholders and leaders in improving educational outcomes (Heller 2011a; Perna and Finney 2014). Their ability to set policy related to student aid, institutional appropriations, student transfer, and secondary education allow them to shape elements of how students enter, progress through, and experience higher education.

Among the research on higher education, there is a sizeable and growing body of work on the role that states play in shaping students' postsecondary attainment. Looking at state-by-state variation, this literature has examined the spread and adoption of certain policies (Doyle 2006; McLendon, Hearn, and Deaton 2006; McLendon, Hearn, and Mokher 2009), and the effects of state policies on student enrollment and attainment (Anderson, Sun, and Alfonso 2006; Cornwell, Mustard, and Sridhar 2006; Domina 2014; Dynarski 2003; Heller 1999; Ness and Tucker 2008; Perna and Titus 2004; Toutkoushian

and Hillman 2012). For those crafting policy, it is important to know what works. State leaders need clear and empirically generated knowledge about the likely effect of different policies (Braxton et al. 2014) and this research facilitates this. Work in this area has considered the effect of a variety of specific state policies on student outcomes, including state financing for higher education, student aid, including the balance and form of merit and need based aid, articulation agreements, and the populations of schools in a given state (Anderson et al. 2006; Domina 2014; Doyle 2010; Lopez Turley 2009). This body of work has generated a great deal of knowledge about the effectiveness of certain policies.

Underlying much of the literature examining the role of state policies on student outcomes is the recognition of attainment as a complex and often long-term process. When the effect of state policy factors on individual outcomes are studied, variables commonly included as controls in the models (e.g. social background and prior academic ability measures) reflect foundational ideas about the stratification process that emerged from the status attainment literature. However, most of the work on state higher education policy is not explicitly tied to the status attainment process literature. In contrast status attainment work has looked at the role of structural context extensively in some areas, but has largely failed to account for the ways in which state level factors may influence enrollment patterns and ultimately later attainment. A large body of work has extended our understanding of status attainment by examining social stratification internationally, considering the extent of mobility and changes in the extent of mobility over time and across different countries (Bar Haim and Shavit 2013; Breen and Jonsson 2005; Menés 2017; Solon 2002). Such international research has found that context

matters, with the extent of mobility tied to variations across countries in the costs for education and in the age at which educational decisions must be made (Breen and Jonsson 2005). Less work however, has examined how more local contexts may similarly shape the extent of mobility experienced by individuals within them. Individuals' educational experiences are embedded in local contexts, and their educational experiences and levels of attainment are likely to be affected by the ways in which a state organizes and supports its educational institutions (Hearn and Holdsworth 2002). I therefore draw on the insights of both the state policies literature and the status attainment literature and bridge the gap between the two.

In this chapter, I argue that our understanding of the way that social origins affect later attainment must be conceptualized as occurring within local contexts. I therefore conceptualize the traditional status attainment model as situated within local contexts and examine how state level sociopolitical factors shape educational attainment. By examining the interplay of individual and state level factors on postsecondary trajectories, I contribute to our understanding of the ways in which larger sociopolitical and opportunity structures affect individual opportunity and advance our understanding of the broader status attainment process.

State Policies Under Study

In my dissertation, I examine three categories of state level factors—the population of institutions in a state, the level of educational financing and affordability of schools, and the broader institutional context related to the labor market conditions in a state—and examine how they influence student postsecondary attainment. All have been shown in previous research to be linked to state or student outcomes, and in my

dissertation, I am particularly interested in how such state level sociopolitical factors may interact with postsecondary trajectories to jointly influence the likelihood of attainment. Theoretically, examining interactions between state level factors and postsecondary trajectories will provide a better understanding of how state level factors shape educational attainment. Practically, doing so may also suggest policy changes that could promote educational attainment. Certain state environments may make educational attainment easier or harder even for individuals of the same social background and who follow the same path. My dissertation will shed light on how states can modify their educational or economic policy to promote greater educational attainment among their students. Below I describe each of the three categories of state contextual factors and hypothesize about their potential to moderate the effect of postsecondary trajectory on BA attainment.

Population of Institutions

Educational attainment may be affected by the population of higher education institutions that exist in a state, or the "enrollment ecology" of the state (Braxton et al. 2014). At the broadest level, more postsecondary institutions per state resident means there is greater potential for access. Particularly important for student pathways may be community colleges, as they are likely to be attended by students off the traditional track. Many students leave high school unprepared for the rigors of a four-year school (Venezia and Jaeger 2013). For these students, community colleges provide an avenue through which they may continue their education. With their low admissions standards and relatively low costs, community colleges provide access to higher education for students who would otherwise end their education after high school (Bok 2013).

Empirical research has found that the composition of the population of higher education institutions has an impact on both enrollment decisions and overall levels of attainment within a state. The existence of community colleges particularly increases the proportion of men who attend postsecondary (Rouse 1998). States that saw the greatest gains in their student graduation rates from four-year institutions were those states with the greatest number of open-access institutions (Braxton et al. 2014). Although debate remains about the degree to which community colleges have a positive impact on educational attainment (Dougherty 1994; Monaghan and Attewell 2015), nonetheless, the existence of a large community college system may provide greater educational opportunity for students and positively influence educational attainment.

The existence of all these institutions may provide students with greater access to postsecondary institutions and may make certain paths more successful than if fewer such institutions existed in the state. Or alternatively, their existence may lead students down less successful paths that result in more debt without a degree. At a basic level, more schools provide students with more options as they attempt to craft the college experience that best suits their personal needs. This may facilitate more successful movement for those who follow trajectories that are characterized by enrollment in more than one school and may be particularly true for those who attend two-year schools. For instance, if a state has more open-access schools, students who follow an *unstructured* path may find it easier to return to school after exiting, and thus be more likely to subsequently earn a degree.

Hypothesis 5.2: The negative effect of the vertical transfer, two-year and unstructured pathways on BA attainment will be reduced among those who enroll in states that have more postsecondary institutions per person in the state.

Hypothesis 5.3: The negative effect of the vertical transfer, two-year and unstructured pathways on BA attainment will be reduced among those who enroll in states with a larger community college system.

Financing and Affordability

The educational attainment of students is also likely to influenced by the level of financial support for educational institutions within the state. Although students make choices about their individual trajectories as they move through or exit schooling, these choices are made within a broader context that may shape the direction of their choices. Particularly important may be the level of support for education that states offer.

First, states retain primary responsibility for K-12 education and they vary in how they fund this level of education. While on average states spent $11,066 per pupil for elementary and secondary education in the 2013-2014 school year (NCES 2016), this number varied dramatically from state to state. Amounts spent on education ranged from the high of $20,577 per pupil in the District of Columbia to a low of $6,546 in Utah (although these numbers are not adjusted to reflect the cost of real estate or cost of living in the respective states) (NCES 2016). States that provide greater support for education have the potential to affect student attainment, as support may be tied to better learning experiences for students. For instance, greater per pupil funding, particularly per pupil funding spent on instructional expenses has been shown to promote student outcomes (Baker 2012; Hedges, Laine, and Greenwald 1994; Jackson, Johnson, and Persico 2016), although other research has suggested that these findings are largely due to selection effects (Hanushek 1997, 2003). Greater spending on education may also provide an overall message that education is valued within the state.

States also differ in how they choose to fund higher education. While in all fifty states public institutions of higher education receive a significant proportion of their support from the states, the level of this support and the form it takes varies (Tandberg and Griffith 2013). State funding for higher education can take the form of direct appropriations of public tax dollars to higher education institutions, state funded student aid programs, and through setting the costs of tuition at public institutions (Hauptman 2011). The balance through which states use each of these methods to support schools and to encourage access differs, as does the specific form the policies take. For instance, direct student aid may reflect a blend of merit-based and need-based aid, and while in some states tuition dollars are retained by the institutions enrolling the students, in others this money returns to the state to then be reallocated as state leaders see fit (Hauptman 2011).

At the postsecondary level, greater financial support for education may provide greater access to education, either by supporting students directly or by reducing the costs indirectly. For instance, tuition rates have been shown to rise when states reduce support for public higher education (Heller, 2002). And because different pathways are associated with different costs (i.e. two-year vs. four-year school paths), greater levels of support may make certain pathways more or less successful for students. For instance, if students are expected to shoulder less of the costs of college within a state, those on the *unstructured* path may find themselves more likely to return to education after a stopout period.

Hypothesis 5.4: The negative effect of the vertical transfer, two-year and unstructured pathways, compared to the traditional pathway, will be reduced in states which provide greater support for education.

Labor Market Conditions

In addition to issues of support and access, the economic conditions in the state are also likely have an impact on student attainment. Labor market conditions have been shown to impact educational decisions. When students make their decisions to pursue or not pursue education, they do so in relation to the other opportunities that might be available to them, and labor market conditions partially shape the demand for college enrollment (Hillman and Orians 2013; Kienzl, Alfonso, and Melguizo 2007; Rusk, Leslie, and Brinkman 1982). A poor labor market with high levels of unemployment may suggest to these youth that the other options available to them, namely work, are limited. Thus, while some postsecondary trajectories may be less likely to result in a BA compared to the traditional path, poor market conditions may encourage youth on these paths to remain in, or even return to, schooling. Poor employment opportunities have been shown to encourage enrollment at the secondary and postsecondary levels (Hillman and Orians 2013; Rees and Mocan 1997; Warren, Jenkins, and Kulick 2006) and to lead students who are less academically prepared to pursue higher education (Rivkin 1995).

Hypothesis 5.5: Poor economic conditions in a state will reduce the negative effect of the nontraditional pathways for students enrolled in the state.

Individual Level Moderation

While certain pathways may be associated with lower attainment, socially advantaged students may be able to more successfully transverse these paths. The effect of postsecondary trajectories may vary depending on the social background of the students following them, I therefore additionally examine how postsecondary trajectories may interact with individual level factors to jointly influence the likelihood of attainment. For more advantaged individuals, following paths that typically result in a lower

likelihood of earning a BA may not be so detrimental to them compared to their lower-class peers if their background characteristics, particularly socioeconomic status, provide a protective effect when it comes to following nontraditional paths. Those who are of higher socioeconomic backgrounds may be able to take advantage of the new variety of postsecondary options to successfully craft a college career that suits them best, or they may be able to navigate nontraditional paths successfully in ways that their lower-class peers cannot. Women and white students also generally have higher rates of BA completion compared to men and to minority students who are black and Hispanic (NCES 2016b). These factors may similarly influence the effect of path on BA attainment. Therefore, I examine moderation between pathways and social background suggesting that,

Hypothesis 5.6: The negative effect of nontraditional pathways will be reduced for students of more advantaged backgrounds.

Data

The data used for this analysis comes from a unique longitudinal dataset I created by combining the ELS:2002 data, described in the previous chapters, with state level data from multiple sources. Individual-level variables come from the ELS:2002. The state-level variables come from the U.S. Census Bureau, the Bureau of Economic Analysis (BEA), the Bureau of Labor Statistics (BLS), the Integrated Postsecondary Education Data System (IPEDS), the NCES *Digest of Education Statistics* annual reports, and the State Higher Education Executive Officers Association's State Higher Education Finance (SHEF) reports. Specific sources of all data are included in the variable descriptions below and in Table 5.1. State data was assigned to individuals according to the state in

which they were enrolled in postsecondary in a given year. The full dataset spans 8 years following students from 2006-2013[5].

My sample is derived from the subset of students included in the sequence analysis in Chapter 3. This includes all students who participated in the base year survey, attended at least one postsecondary school between July 2004 and June 2013, and for whom complete transcript information was available. I also restrict the sample to those with full information on the geographical state in which they attended school, including their last high school, and to those whose enrollment was limited to the 50 U.S. states, excluding D.C. and Puerto Rico. A basic descriptive check suggests little bias in terms of the dependent variable with my restricted sample. While 46.99 percent of the full ELS:2002 PETS respondents earned a BA, 46.40 percent of my restricted sample did so. My unit of analysis is person-years. Individuals attain their degrees (if they do so) at different times over the study period, and as a result not all individuals are represented across all years. Ultimately my sample consists of 51,160 person-years representing 8450 individuals.

Dependent Variable

The occurrence and timing of attainment is captured with variable that reports when and if a student in the sample earned their bachelor's degree. This is a time-varying variable that is equal to 1 in the year that a student earned their BA and 0 for all else.

[55] The NCES annual data (*Digest of Education Statistics* & IPEDS) is commonly organized by school-years rather than calendar-years. For instance, the *Digest of Education Statistics, 2006* variables reflect data from the 2005-2006 school year. In each case I assign year in my dataset according to the Spring semester. Thus, 2005-2006 school year data is coded as occurring in 2006.

Primary Independent Variable of Interest

Each individual's postsecondary trajectory, as uncovered in the sequence analysis, serves as the primary independent variable of interest in the analysis. This is a categorical variable with paths: *traditional*, *lateral transfer*, *vertical transfer*, *two-year*, and *unstructured*. The *traditional* path serves as the reference group.

Individual and State Level Independent Variables

In this analysis, I additionally include a set of individual level and state level predictors. The individual level variables measure differences in social background, in college academic achievement, and in life course events that may have an effect on BA attainment. The state variables reflect the three domains of state policy and internal conditions described above.

Social Background

The effect of social background factors is measured using three variables from the ELS:2002 that report the individual's socioeconomic status, race, and gender.

Socioeconomic Status. The measure of socioeconomic status is derived from an existing ELS:2002 composite variable. This variable is calculated using five equally weighted and standardized items: father's education, mother's education, family income, father's occupation and mother's occupation. The variable is continuous and has been standardized.

Race/Ethnicity. The race/ethnicity variable is a five-category indicator variable, with categories: (1) white, non-Hispanic; (2) Black, non-Hispanic; (3) Asian, Hawaiian/Pacific Islander; (4) Hispanic (any race); and (5) Other. White, non-Hispanic serves as the reference category.

Female. The sex of the respondent is reported by students in the base year. Male is the reference category for my analysis.

Family and Work Experiences

Life course experiences outside of education may also influence students' likelihood of earning a BA. As young people come of age in early adulthood they are also commonly entering the workforce, forming relationships and beginning families during this same time period (Pallas 1993). Although not included in the traditional status attainment models, these variables are in line with other factors that have been theorized by scholars to influence attainment, and I include them in my model to account for their possible influence on BA attainment.

Children. A dichotomous time-varying variable reports if the respondent had one or more biological or adopted children in a given year, versus having no children. For those who reported having children, the variable is coded as 1 in the year the child was born or adopted, and remains coded as 1 in subsequent years. No children is the reference category.

Married. Marital status is captured with a dichotomous time-varying variable that reports if the respondent has ever been married. While the ELS:2002 reports the year respondents married, it does not include a variable that captures whether they remain married or later divorced. Therefore, the variable is coded as 1 in the year the respondent reported their first marriage occurring and remains coded as 1 in subsequent years, reflecting if they have ever been married. Never married is the reference category.

Early Work Intensity. The work intensity variable reports the hours the student worked per week during 2004-2005 school year. This non-time-varying variable captures the

degree to which the student was heavily involved in work at the start of the period under study, the point at which the sample was beginning their initial transition into postsecondary education.

Educational Performance

While pathway is the primary variable measuring college experiences, I also include two measures of grade point average (GPA) that reflect a student's college-level academic performance.

Low GPA. The low GPA variable reports if a student ever had a GPA below 2.0 while enrolled in postsecondary. It is non-time varying and reflects the student's performance across all postsecondary institutions attended.

High GPA. The high GPA variable reports if the student ever had a GPA above 3.75 at any postsecondary institution attended.

State Level Sociopolitical Variables

The effect of sociopolitical factors on educational attainment is captured using three aspects of state policy or state level conditions that have the potential to influence educational trajectories: the population of institutions of higher education, the state educational policy and financing, and the labor market conditions in the state. The variables are all time-varying and are measured from 2006 to 2013. Because the effect of the financial variables is likely to be multiplicative rather than linear, the natural log of the variable is used for all variables measured in dollars. All continuous variables have additionally been standardized.

Population of Institutions

Total Postsecondary Institutions. This variable is a measure of the number of degree granting postsecondary institutions per capita for the state population aged 15 to 29. The variable is created by dividing annual NCES *Educational Digest* state institution counts by 100,000 in state population of the select age group.

Public Two-Year Institutions. The *Educational Digest* divides postsecondary institutions into two vs. four years schools and private/for-profit vs. public schools. To capture the strength of the state supported community college system in a state, I include a variable which measures the number of public two-year schools in the state, per capita.

State Educational Financing/Affordability

Elementary and Secondary Expenditures. The measure of elementary and secondary expenditures comes from the Common Core of Data via the *Educational Digest*. The variable reflects the total state expenditures on elementary and secondary education per pupil enrolled in the fall of a given year. The variable is originally measured in current dollars, and the natural log of the variable is used in the analysis.

Higher Education Appropriations. The measure of state funding for higher education comes from the State Higher Education Executive Officers Association's (SHEEO) State Higher Education Finance (SHEF) annual reports. The data reflect the level of state and local support allotted to public higher education operating expenses per full-time enrolled student. Additionally, SHEF adjusts the raw numbers to account for the cost of living and enrollment mix in the state. The SHEF data is measured in constant 2016 dollars, and the natural log of this variable is used in the analysis.

Student Share. Student share reflects the affordability of college in the state, capturing the share of the cost of higher education that is placed on the student and their family. This variable comes from SHEEO's State Higher Education Finance (SHEF) reports, and is a measure of the percent of the total public higher education revenue that is derived from net tuition revenue.

Labor Market Conditions

Per Capita Income. Per capita income is a measure of the total personal income of the residents of a state divided by the total midyear population of the state. The data comes from the U.S. Bureau of Economic Analysis. All estimates are in current dollars, not adjusted for inflation, and the natural log is used in the analysis.

Female Labor Force Participation. The measure of female labor force participation reflects the percent of women aged 20 to 64 who are in the labor force. The data comes from the U.S. Census' American Community Survey.

Unemployment Rate. The unemployment rate is the percent of people who are unemployed in a given state. Unemployed persons include all those ages 16 and older who are not working, but are actively seeking a job. The data come from the American Community Survey of the U.S. Census.

Percent Poverty. The percent poverty variable reports the percent of state residents below the federal poverty level. The data for this variable come from the American Community Survey of the U.S. Census.

Assigning State Variables

To assign the state level variables to individuals in the dataset, a time-varying state variable is first created for each person. This is necessary because not all individuals

attend postsecondary school in the same state they graduated from high school, and some individuals (17.6 percent) attend postsecondary in multiple states. This variable is based on transcript data and individuals are coded as belonging to a given state if they were enrolled in that state at any point during the year. In this way, I account for the policy that will be most relevant to individuals in the dataset, as they are currently attending school in that state. For years in which the student was not enrolled in any postsecondary institution, they are coded as belonging to the most recent state in which they attended school, including where they graduated from high school if they have yet to enter any postsecondary institution. Notably, the state variable is based on where one is attending or last attended postsecondary school, not on where one is currently living. While I do not have full information on the residential state of the respondents over the nine years to check this, it is likely that in most cases students will attend postsecondary in the state in which they currently live; however, this may not be the case for individuals involved in distance education or an online program.

A Note on Missing Data

As with the analysis in the previous chapter, I impute missing data for the individual level independent variables using multiple imputation. I impute the missing data using the chained equations method in STATA. Doing so, I create 35 imputed datasets that are used for the final analysis. This method uses regression techniques to fill the gaps using the other variables in the dataset and has been shown to be a valid method of dealing with missing data (see earlier chapters for details) (Van Buuren et al. 1999; Royston 2009). State data was not missing for any variables after restricting the sample as described above; thus, state data was not imputed.

Analytic Strategy

My analysis proceeds in three steps. First, I report the descriptive statistics and assess the number of students that earned their BA in each year. Next, I conduct a discrete-time proportional odds event history analysis to examine the role of individual and state level factors on bachelor's degree attainment. The method, also referred to as survival or duration analysis, allows one to examine both the occurrence and timing of the event under study and is the primary analysis in this chapter. This is the most appropriate method for my analysis because while a traditional logit model can be used to predict the likelihood of someone earning a BA, event history methods allow one to more accurately account for the effect of time in this process (Allison 1984; Singer and Willett 2003). The method models time to event, in my case years to bachelor's degree attainment, and allows me to easily incorporate time-varying independent variables into the analysis.

The method also allows one to examine the extent and issue of censoring in the data. Censoring refers to incomplete information on whether the event of interest occurred (Singer and Willett 2003). Researchers may encounter right censoring, left censoring, or random censoring within their data. Left censoring occurs when the event of interest occurs prior to the start of the study period for some individuals. For my purposes left censoring is not an issue, as no respondents earn their BA prior to 2006. Right censoring occurs when the study period does not last long enough to observe the event of interest for all individuals. My data collection period ends in 2013, however, not all students have obtained a bachelor's degree at this point and some students may earn their degree after this date. This is a recurring problem for event history analysis as the

Table 5.1: Description of Variables

Variable	Description and Coding	Source
Dependent Variable		
BA Attainment	Time-varying indicator of when/if the respondent earned their BA. 1 in the year BA was awarded, 0 for all else.	ELS2002: PETS
Independent Variables		
Individual Level Variables		
Pathway	Categorical indicator of the student's educational trajectory as uncovered by the sequence analysis: *traditional, lateral transfer, vertical transfer, two-year, unstructured . Traditional* path=Ref.	ELS2002:PETS. *Sequence Analysis Results.*
Social Background Factors		
Socioeconomic Status (SES)	Continuoous composite of father's education, mother's education, father's occupation, mother's occupation, family income.	ELS2002: First Follow-Up
Race/Ethnicity	Five category indicator of student self-reported race/ethnicity: White, non-Hispanic; Black, non-Hispanic; Asian; Hispanic; Other. White, non-Hispanic=Ref.	ELS2002: Base Year
Female	Dichotomous indicator of student self-reported gender. Female = 1	ELS2002: Base Year
Family and Work Expeiences		
Married	Dichotomous time-varying indicator of if the student has ever been married. Coded as 1 in the year the respondent first married, and 1 thereafter. Never married=Ref.	ELS2002: Third Follow-Up
Children	Dichotomous time-varying indicator of if the student had a child in a given year. Coded as 1 in the year the child was born or adopted, and 1 thereafter. No children=Ref.	ELS2002: Third Follow-Up
Early Work Intensity	Continuous variable of the avg. hours worked per week during the 2004-2005 school year.	ELS2002: Second Follow-Up
College Performance		
Low GPA	Dichotomous indicator of if student's transcripts ever reported a GPA of below 2.0 across all college transcripts.	ELS2002: PETS
High GPA	Dichotomous indicator of if student's transcripts ever reported a GPA of above 3.75 across all college transcripts.	ELS2002: PETS

Table 5.1 cont.

State Level Variables		
Population of Institutions		
Postsecondary Institutions	Number of degree granting institutions and branches per capita, for 100,000 in state population aged 15-29.	IPEDS "Institutional Characteristics" Survey and U.S. Census "American Community Survey"
Public Two-Year Institutions	Number of public two-year schools per capita, for 100,000 in state population aged 15-29.	IPEDS "Institutional Characteristics" Survey and U.S. Census "American Community Survey"
Private/For-Profit Two-Year Institutions	Number of private two-year schools per capita, for 100,000 in state population aged 15-29.	IPEDS "Institutional Characteristics" Survey and U.S. Census "American Community Survey"
Financing/Affordability		
Elementary and Secondary Expenditures	Expenditures on elementary and secondary education per pupil enrolled in fall	NCES Common Core of Data via the *Educational Digest*
Higher Education Appropriations	Total state and local educational appropriations per full-time enrollment	State Higher Education Finance (SHEF) annual reports
Student Share	Percent of higher education total educational revenue that is derived from net tuition revenue	State Higher Education Finance (SHEF) annual reports
Labor Market Conditions		
Per Capita Income	Total personal income of residents of a state divided by the total midyear population of the state	U.S. Bureau of Economic Analysis
Female Labor Force Participation	Percent of women aged 20 to 64 who are in the labor force	U.S. Census "American Community Survey"
Unemployment Rate	Percent of people who are age 16 or older, not working and currently seeking a job	U.S. Census "American Community Survey"
Percent Poverty	Percent of state residents below the federal poverty level	U.S. Census "American Community Survey"

study period must inevitably end at some point. Finally, random censoring occurs when cases exit the data early for a variety of different reasons. Because my data was previously restricted to individuals with full transcript data for the sequence analysis, individuals do not drop out over the time period and random censoring is not an issue in my data.

For the event history analysis, I use nested models to examine the impact of adding additional predictors to the model. First, I examine just the effect of pathways on bachelor's degree attainment. Next, I incorporate the variables measuring social background, life-course experiences and state level factors to see if the addition of these variables reduces the effect of the pathways on degree attainment. Finally, I examine the effect of interactions between the state and pathways variables and the pathway and social background variables to explore how each may moderate the effect of paths on later attainment.

Descriptives

Table 5.2 reports the descriptive statistics for the independent variables. Means and proportions are provided for the full sample and for the subsample of individuals who earned their bachelor's degree by 2013. For the state variables in the "Earned BA" column, the means represent the average variable values amongst those who earned a BA for the state in which they were enrolled when their degree was earned. Ranges are also included in the table for all continuous variables.

Below I provide the results of two bivariate comparisons of interest. Figure 5.1 shows the percent of individuals who earned a bachelor's degree in each year. Over time as students graduate and earn their bachelor's degree the number of student still eligible

Table 5.2: Proportions, Means and Ranges of the Independent Variables

	Full Sample Mean/Proportion	Earned BA	Minimum	Maximum
Individual-Level				
Pathway				
(Traditional=Ref.)	0.27	0.72		
Lateral Transfer	0.08	0.16		
Vertical Transfer	0.05	0.08		
Two-Year	0.20	0.02		
Unstructured	0.39	0.01		
Social Background Factors				
Female	0.52	0.56		
Race/Ethnicity				
(White, non-Hispanic=Ref.)	0.58	0.68		
Black, non-Hispanic	0.13	0.08		
Asian	0.09	0.13		
Hispanic	0.14	0.07		
Other	0.05	0.04		
Socioeconomic Status	0.06	0.43	-1.97	1.97
Family and Work Experiences				
Children	0.21	0.05		
Married	0.17	0.09		
Early Work Intensity	0.06	-0.14	-0.89	6.10
Academic Achievment				
Low GPA	0.34	0.06		
High GPA	0.11	0.18		
State-Level				
Population of Institutions				
Postsecondary Institutions	7.06	7.19	3.58	20.02
Public Two-Year Institutions	1.69	1.66	0.00	6.23
Private/For-Profit Two-Year Institutions	0.97	0.94	0.00	3.64
Financing/Affordability				
Elementary and Secondary Expenditures	11369.22	11873.42	6543.00	22410.00
Higher Education Appropriations	7576.68	7906.73	1973.00	17362.00
Student Share	0.39	0.38	0.10	0.85
Labor Market Conditions				
Per Capita Income	40122.49	40442.34	27711.00	66595.00
Female Labor Force Participation	72.32	73.31	62.00	82.30
Unemployment Rate	8.21	7.98	2.60	15.10
Percent Poverty	14.52	13.99	7.10	24.20
N=	8450	3860		

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Data comes from the ELS:2002. Missing data has been multiply imputed. Means and proportions averaged across the imputed datasets. Ranges come from the original data, and are included for continuous predictors. Means reflect values prior to standardizing and logging the continuous/finacial variable. For state level variables, "Earned BA" column refers to the average state-level variable value for the state in which the BA was earned.

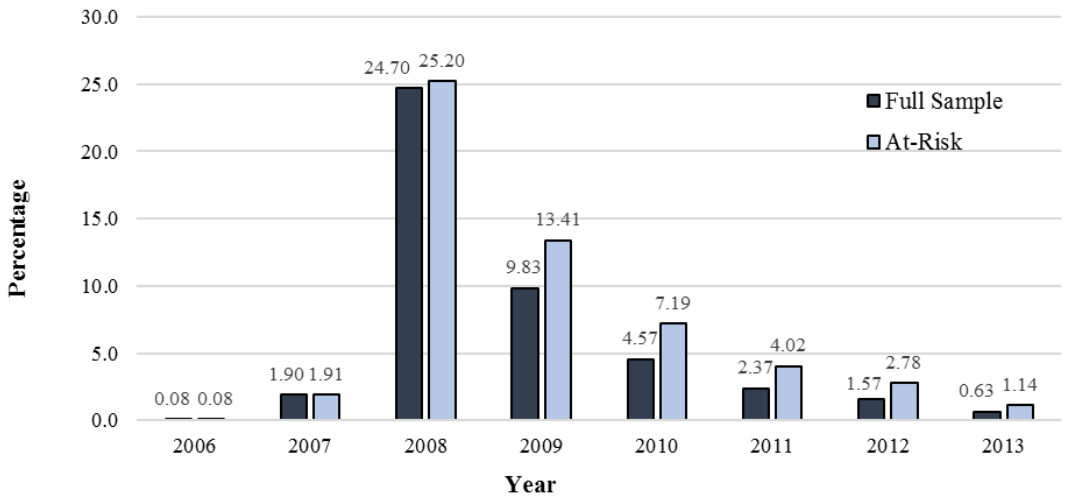

Figure 5.1: Percent of Students Earning a BA in Each Year

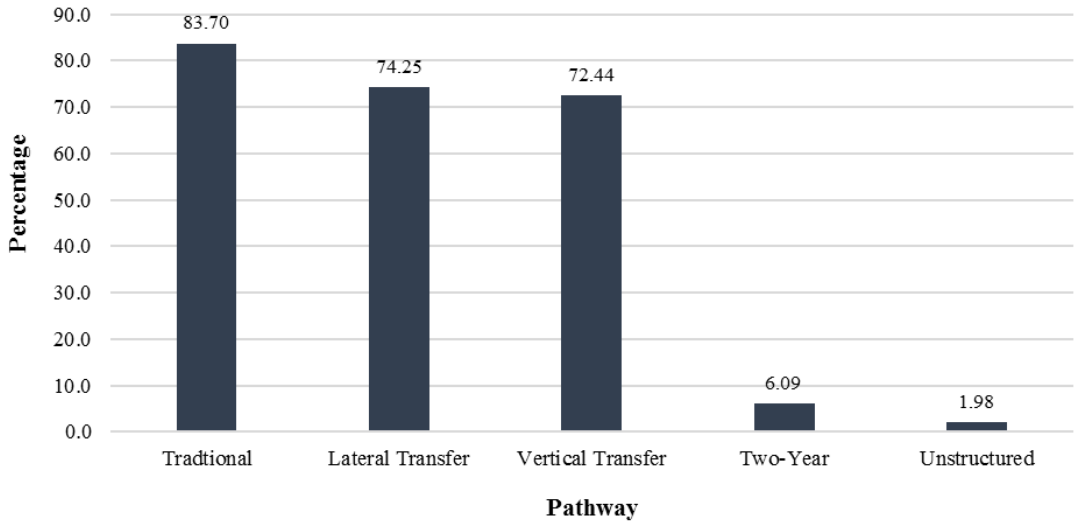

Figure 5.2: Percent Earned a BA by Path

to earn the degree, or "at-risk" for the BA, declines. Figure 5.1 shows the percent of the full sample and of the smaller group still at-risk who earned their BA in each year. The percent of students earning a BA is highest in 2008. Students in the ELS:2002 graduated from high school in 2004 if they were "on-time" graduators. Therefore, it is unsurprising that the largest proportion of students earn a bachelor's degree in 2008, approximately four years after their high school graduation. About ten percent of the full sample earn a degree in 2009, and the percent that earn a degree continues to decline in each subsequent year. Notably, 0.63 percent of the full-sample or 1.14 percent of those at-risk earned a bachelor's degree in 2013 the last year of my study. While this represents only approximately 50 sample members, or less than one percent of the full sample, it suggests that students continue to earn the degree after the conclusion of my study period. However, this is likely to be a smaller and smaller percent of individuals over time even after accounting for the reduced number at risk.

Figure 5.2 shows the percent of students who earned a BA, by path. This table presents the results of the bivariate comparison between educational trajectory and BA attainment. As expected, the *traditional* path appears most likely to lead to the BA. Approximately 84 percent of individuals who followed this path earned a bachelor's degree by 2013. The *lateral transfer* and *vertical transfer* paths appear similar to each other. Seventy-four percent of those on the *lateral transfer* path ever earned a bachelor's degree by 2013, compared to seventy-two percent for those on the *vertical transfer* path. In contrast, far fewer people on the *two-year* and *unstructured* paths earned a bachelor's degree by 2013. It is notable, though, that these paths did lead to BA attainment for some individuals. Some students whose paths were dominated by time spent in a two-year

school, or by a large proportion of time spent out of school with gaps or multi-institutional enrollment were successful despite their unconventional paths. However, the bivariate comparison does not account for any other factors that may shape BA attainment and does not allow me to see who is most likely to be successful on these paths. I therefore turn next to the event history analysis, exploring the effect of individual and state level factors on bachelor's degree attainment.

Event History Analysis

Table 5.3 presents the results of the event history analysis. Model 1 shows the effect of postsecondary trajectory on bachelor's degree attainment. The model also includes time dummies to summarize the pattern of duration dependence or the effect of time in the model. The choice of how to incorporate time into the analysis is based on the expected shape of the baseline hazard. I choose a piecewise constant baseline and therefore include one dummy variable per year, with 2008 as the omitted reference year. I also explored other forms for the baseline hazard, including a quadratic, polynomial, logged time and fully non-parametric form. However, the fit statistics for the models confirmed the piecewise constant baseline was the best fitting functional form for the hazard. The table results are presented in odds ratios. Numbers greater than one represent an increase in the odds of earning a bachelor's degree, while numbers smaller than one represent a decrease in the odds of earning a bachelor's degree.

Model 1 reveals that, as expected, educational trajectories appear to shape bachelor's degree attainment. All four of the paths in the model are significant at the .001 level, suggesting that following any of the four paths decreases one's odds of earning a BA relative to following the *traditional* path. No surprise, the *traditional* path

Table 5.3: Discrete-Time History Analysis of the Odds of Earning a BA

Independent Variables	Model 1	Model 2	Model 3
Individual-Level			
Pathway			
(Traditional=Ref.)			
Lateral Transfer	0.572***	0.685***	0.866
Vertical Transfer	0.464***	0.476***	0.506***
Two-Year	0.024***	0.033***	0.023***
Unstructured	0.008***	0.013***	0.017***
Social Background Factors			
Female		1.262***	1.330***
Race/Ethnicity			
(White, non-Hispanic=Ref.)			
Black, non-Hispanic		0.756***	0.662***
Asian		1.036	0.966
Hispanic		0.770**	0.818
Other		0.865	0.802
Socioeconomic Status		1.210***	1.243***
Family and Work Experiences			
Children		0.578***	0.598***
Married		0.863	0.867
Early Work Intensity		0.865***	0.868***
Academic Achievment			
Low GPA		0.198***	0.190**
High GPA		1.583***	1.603***
State-Level			
Population of Institutions		0.983	0.973
Postsecondary Institutions		1.037	1.05
Public Two-Year Institutions		0.998	1.006
Private/For-Profit Two-Year Institutions			
Financing/Affordability			
Elementary and Secondary Expenditures		0.920*	0.932
Higher Education Appropriations		1.120*	1.250***
Student Share		1.269***	1.260***
Labor Market Conditions			
Per Capita Income		1.262***	1.057
Female Labor Force Participation		1.068	1.059
Unemployment Rate		0.951	0.947
Percent Poverty		1.342***	1.062
Time			
(2008=Ref.)			
2006	0.002***	0.002***	0.002***
2007	0.041***	0.039***	0.036***
2009	0.643***	0.815*	0.856
2010	0.400***	0.520***	0.524***
2011	0.237***	0.279***	0.258***
2012	0.172***	0.188***	0.158***
2013	0.070***	0.073***	0.064***

TABLE 5.3 Cont.

Interactions	Model 1	Model 2	Model 3
State Context Interactions			
Lateral x HiEd. Appropriations			0.744***
Vertical x HiEd. Appropriations			0.614***
Two-Year x HiEd. Appropriations			0.593***
Unstructured x HiEd. Appropriations			0.600***
Lateral x Per Capita Income			1.571***
Vertical x Per Capita Income			2.130***
Two-Year x Per Capita Income			2.372***
Unstructured x Per Capita Income			1.359
Lateral x Percent Poverty			1.705***
Vertical x Percent Poverty			2.460***
Two-Year x Percent Poverty			2.383***
Unstructured x Percent Poverty			1.165
Lateral x Female			1.062
Vertical x Female			0.889
Two-Year x Female			0.910
Unstructured x Female			0.399**
Lateral x Black			1.585*
Lateral x Asian			1.055
Lateral x Hispanic			0.809
Lateral x Other			1.590
Vertical x Black			1.345
Vertical x Asian			0.884
Vertical x Hispanic			0.742
Vertical x Other			1.145
Two-Year x Black			1.326
Two-Year x Asian			2.650*
Two-Year x Hispanic			1.405
Two-Year x Other			0.682
Unstructured x Black			0.873
Unstructured x Asian			2.137
Unstructured x Hispanic			1.134
Unstructured x Other			0.743
Lateral x SES			0.834**
Vertical x SES			0.833*
Two-Year x SES			1.423**
Unstructured x SES			1.564**

N= 8450

Sample size has been rounded per NCES resticted use data requirements. Results are presented in odds ratios.

is associated with the highest likelihood of earning a bachelor's degree. The *lateral transfer* path, while still less likely than the *traditional* path to lead to a BA has the next highest likelihood, while the *unstructured* path has the lowest likelihood compared to the *traditional* path of leading to a BA. To put this into perspective I use marginal effects to calculate the change in predicated probabilities of earning BA depending on the postsecondary trajectory one experiences. The predicted probability of earning a bachelor's degree is .56 times greater for someone who followed the *traditional* path than for someone who followed a *lateral* transfer path. For the *unstructured* path, compared to the *traditional* path the effect is much larger. The probability of earning a BA is 4.86 times greater for the *traditional* path versus the *unstructured* path. However, this model includes only educational trajectory and the time effect, and does not account for any other factors that may be relevant to BA attainment.

Model 2 adds the variables measuring the effect of individual characteristics and state level factors. Here the primary finding of interest is the remaining significance of the educational trajectories. Even after accounting for individuals' differences in social background, college performance and life experiences, as well as variation in the state context in which they enrolled, I find that postsecondary trajectories remain highly significant. Different paths through school are associated with different odds of earning a BA. Because path is a categorical variable the resulting odds ratios are in reference to the omitted category, in this case the *traditional* path; therefore I altered the omitted category to examine the difference in odds between the other categories. In each comparison, the postsecondary trajectory variables remain significant at least at the .01 level. Thus, I find

support for Hypothesis 5.1, that educational trajectories shape later attainment, and that those who follow the *traditional* path are most likely to earn a bachelor's degree.

While my primary interest is in how the additional independent variables moderate the effect of path, I briefly note the findings with regard to their direct effects as seen in Model 2. First, with regards to the social background variables, the independent variables are largely in the expected directions based on prior research. Women are more likely to earn a BA, as are those from higher SES backgrounds. Black, non-Hispanic and Hispanic students are less likely than white student to earn a BA, though there were no significant differences between white and Asian students or between white students and students of multiracial or other racial backgrounds. The variables capturing family and work experiences and academic achievement are also largely significant. The one exception is "married," as I did not find that getting married had a significant effect on BA attainment. Overall the addition of these variables contributes to a better fitting model.

Turning to the state level context variables, I find that increases in higher education appropriations, student share of net tuition, per capita income and percent in poverty are all associated with increased odds of earning a BA. Additionally, greater spending on elementary and secondary expenditures is associated with a decrease in the likelihood of someone enrolled in the state earning a BA. Thus, while at times additional spending on education by the state increases the odds of those enrolled in that state of getting their BA, it matters where the money is directed and not all increases are associated with greater BA attainment.[6]

[6] I ran an additional analysis to see if these state level factors predict postsecondary trajectories. Details on the analytic strategy and the model results are included in Appendix B.

Model 3 includes the interactions between the state level variables and paths and the individual level variables and the paths. This allows me to address my remaining hypotheses regarding whether the effect of path on BA attainment depends on the state context or the social background of the respondent. With regards to the state level factors, Model 3 includes interactions for higher education appropriation, per capita income and percent in poverty by path. The interactions for the other state level variables by path were not significant and are omitted from the final model. Thus, I did not find support for Hypotheses 5.2 or 5.3 that the number of postsecondary institutions overall or the number public two-year schools per capita influence the effect of postsecondary trajectories on educational attainment.

Turning to Model 3, I find that higher education appropriations significantly moderate the effects of postsecondary trajectory on attainment. The significant interaction coefficient tells us that the slopes for the dependent variable, earning a BA, on higher education appropriations are significantly different for each path. The results are presented as odds ratios and thus the coefficient of higher educational appropriations by each path reveal a negative effect as the odds ratio is less than one for each interaction. Because I am dealing with a categorical variable (path) it is easiest to understand the effect of the interaction through the use of the margins commands. I calculate the ratio effects (the ratio by which the effect of educational appropriations changes as path changes between the omitted and predicted categories). Below I graph the results of the effect of higher educational appropriations by path on BA attainment at one standard deviation above and below the mean (this is equal to 1 and -1, as all continuous variables

were standardized for the model). I additionally set the binary variables at zero and all other variables in the model at their means for the figure.

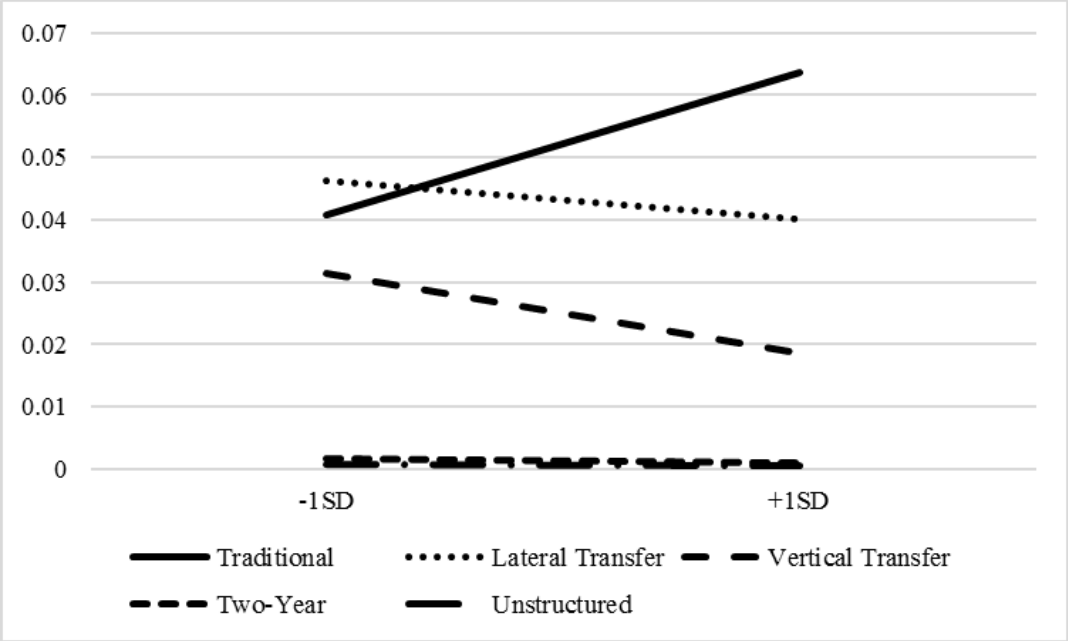

Figure 5.3: Effect of Higher Education Appropriations on Attainment, by Path

While the effects are relatively small, the table shows that increased appropriations encourage greater BA attainment for those on the *traditional* path, but that this effect is not seen for the other four paths. Most notably, for the *lateral transfer* and the *vertical transfer* path, increasing appropriations have a negative effect. In contrast, percent in poverty and per capita income both reduce the negative effects of the *lateral transfer*, *vertical transfer* and *two-year* paths on BA attainment, compared to the *traditional* path. Thus with regards to state level hypotheses, the results show a more complicated picture than expected. In contrast to Hypothesis 5.4, greater support does not reduce the negative effect of certain paths, rather it positively reinforces the already

greater likelihood of the *traditional* path leading to a BA relative to the other paths. And while I do find that poor economic conditions, namely percent in poverty, reduces the negative effect of the paths suggesting that poor economic conditions encourage students to stay in school and earn a BA, I also find that favorable economic conditions (per capita income) have a similar effect.

Turning next to the interactions between the social background factors and paths on BA attainment, I consider how more or less advantaged structural positions may moderate the effect of paths on BA attainment testing Hypothesis 5.6. Here, I find several significant interactions. First, I find that gender significantly interacts with the *unstructured* path. While the odds of earning a BA are small for both genders, they are smaller for women who follow this path than for men. For women, the negative effect of following the *unstructured* path on BA attainment is exacerbated. Two interactions concerning race are also significant. Lateral path x black is significant, however the positive odds ratio of the interaction tells us the ratio by which the odds ratio changes, suggesting that the negative effect of the *lateral* path is weaker for black students. The most influential of the social background factors appears to be SES. All of the SES x path interactions are significant. Figure 5.3 below displays the effect of the interaction graphically, showing the linear probabilities of earning a BA for each pathway for individuals whose socioeconomic background is one standard deviation above the mean, and one standard deviation below the mean. Overall being from a higher SES background does provide a protective effect towards earning a degree. Those who are higher SES are more successful on the *lateral transfer* and *vertical transfer* paths than those of lower SES groups. Indeed, high SES people who follow the *lateral transfer* path have slightly

higher rates of BA completion than the low SES group on the *traditional* path. However, this effect is largely absent for the *two-year* and *unstructured* groups. The difference in SES provides only a very slight increase in their linear odds of earning a BA and does not in any way approach the odds of the other three paths.

Additionally, while I include only the main effect of time in my final model, I also explored the effect of time to BA attainment by pathway through the inclusion of additional interactions of path x a continuous year variable in an analysis not shown. I found that compared to the *traditional* route, following the other routes results in a delay in postsecondary attainment among those who earn BAs. The addition of even more interactions to an already extensive model led considerations regarding overfitting the model, however in future work I intend to examine this effect more closely, exploring the extent to which following a nontraditional path slows time to degree and thus increases the costs of following such routes.

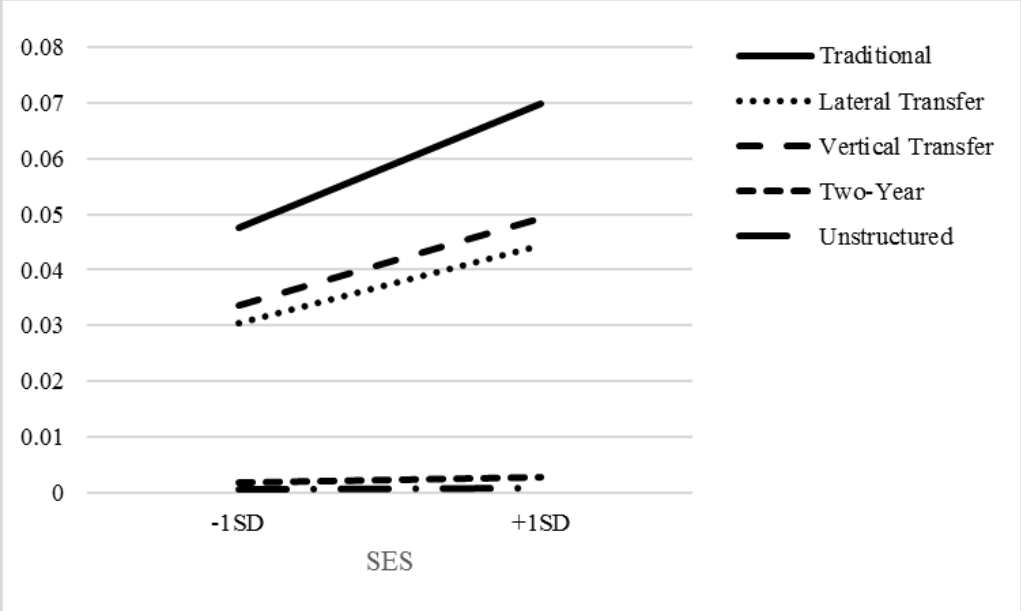

Figure 5.4: Effect of SES on BA Attainment, by Path

Conclusion

This chapter confirms that the educational trajectory one follows matters when it comes to attainment. Those on the *traditional* path are most likely to earn a bachelor's degree and those on the *unstructured* path are the least likely to do so, with the other three trajectories falling in between. Different postsecondary trajectories do not represent neutral alternatives for students seeking a degree. Notably, in Chapter 4, the odds of following the *traditional* and *lateral transfer* paths appeared to be largely predicted by the same factors with few significant differences in what predicted each. Thus, in terms of who enrolls in each, these two trajectories appear largely the same. However, in this analysis I show that these paths are not the same in their consequences. Those who follow the *lateral transfer* path are less likely to earn a BA, all else held equal.

I also found that the effect of paths on attainment is moderated by state and individual level factors, though the effect of the state level factors largely did not align with my hypotheses. While higher educational appropriations did moderate the effect of paths, it did so not by reducing the negative effect of the nontraditional paths, but by enhancing the positive effect of following the *traditional* path. Enrolling in a state with more money spent on higher education increases the chance that one will successfully earn a BA if they are on the *traditional* path. Of course, this could be interpreted as an optimistic finding. The *traditional* path is the most likely to lead to a BA, so a state taking steps to encourage this path is a positive sign. However, the decreased likelihood of BA attainment among those on the other paths is troublesome, because as I showed in Chapter 4, who follows which path is strongly shaped by social background with less advantaged students less likely to follow traditional routes. Additionally, while percent in

poverty reduced the negative effect of three of the pathways compared to the *traditional* path, unemployment was not significant in any interactions and per capita income also reduced the negative effect of those pathways. Overall this suggest that the levels of advantage or disadvantage in a state have variable effects on the effect of path on BA attainment.

With regards to the individual level factors, socioeconomic status was particularly important. For those at higher SES levels on the *lateral* and *vertical transfer* path, their BA completion rates are nearly on par or above those on the *traditional* path who are lower SES. This suggests that the transfer pathways, and particularly the *lateral transfer* pathway may be a viable alternative for higher SES students. However, positive effect of SES in moderating the effect of path do not extend to the *two-year* and *unstructured* paths. These paths are largely detrimental to BA attainment no matter who follows them.

This chapter confirms the need to understand the status attainment process in context. The process of attainment is not a unitary process but differs depending on which postsecondary trajectory one follows. Individuals in the five postsecondary trajectories vary in how they move through school, in their likelihood of attainment, and in how this process is shaped by the wider context, with state level factors moderating the effect of paths on attainment. Thus, the process of status attainment is not the same for someone on the *traditional* path as it is for someone on the *unstructured* path. By incorporating educational trajectories and state level sociopolitical factors into the model I gain new insight into the process of attainment showing how the process differs depending on the trajectory one follows and the context in which they are situated.

CHAPTER 6

THE EFFECT OF TRAJECTORIES ON INCOME ATTAINMENT

For individuals, the true benefit of increased education is not the degree itself, but the broader benefits they are likely to experience later in life in response to holding the degree. Earning a bachelor's degree is associated with a wide variety of individual benefits (Baum et al. 2013; Ma et al. 2016; Perna 2003), and as noted earlier in Chapter 5, one of the most notable of these benefits is an increase in income. Individuals who earn a bachelor's degree see sizeable gains in median income compared to those with only a high school diploma or an associate's degree (Ma et al. 2016).

In the classic status attainment models, educational attainment is a predictor of occupational attainment (Blau and Duncan 1967; Sewell et al. 1969) and though the intention of my dissertation is not to examine earnings, the findings in the last chapter beg the question of whether paths shape not just educational attainment but income attainment as well. Thus, in this chapter I briefly explore the degree to which postsecondary trajectories shape subsequent earnings, asking if different paths through school are associated with different income levels later in life. In doing so I consider if the degrees earned by following different pathways are "equivalent" on the labor market. In other words, does a BA earned via the *traditional* route have the same effect on later income as a BA earned via the *lateral transfer* route, after controlling for other relevant variables? This chapter allows me to extend our knowledge of how long-term educational trajectories shape attainment on multiple dimensions.

How Degrees Shape Income

At a basic level, a bachelor's degree is associated with increased income because the credential, on average, leads to better jobs that are higher paying. The reasons why degrees lead to improved occupational positioning and earnings are complex (Pascarella and Terenzini 2005). From a functionalist perspective, greater income is associated with a bachelor's degree because the degree holder has gained the knowledge and skills necessary for the more prestigious jobs that require it. In this sense, postsecondary institutions are seen as serving a vital role, imparting students with the human capital that will make them attractive to employers (Becker 1962).

Research in sociology of education has called this into question, however. Individuals who hold a degree see greater earnings than students with the same number of years of schooling but no degree. Thus degrees offer "sheepskin effects" in which it is not the actual content learned or skills acquired that lead a degree to be more highly valued on the job market but its role as a convenient signaling mechanism to employers about the holder's productivity or other interpersonal traits (Jaeger and Page 1996). Credentialist theory (Collins 1979), a conflict perspective, further implicates this signaling function of degrees in the stratification of society, suggesting the primary purpose of credentials is to enable elites to maintain their position through social boundary maintenance. If degrees on average are associated with higher incomes, it is not due to skills acquired but to the extent to which they signal the social status of the holder.

The Role of Postsecondary Trajectories in the Process

In either case, different postsecondary trajectories are likely to lead to different levels of income attainment because the paths themselves are associated with different likelihoods of earning a degree, as I showed in Chapter 5. Essentially, paths differentially lead to degree attainment, and those degrees are then associated with higher or lesser paying jobs. However, this assumes that the effect of path is mediated through degree, and that once a degree is earned how you earned it should have no effect. Those with BAs should be as likely to be employed, and should be getting the same quality of jobs no matter what path they followed. And thus, a BA earned via the *vertical transfer* path is the same as a BA earned via the *traditional* path. Alternatively, different paths may be associated with different levels of income attainment later in life. I explore this possibility examining if following a nontraditional path may be detrimental even if one attains a BA, asking how different educational pathways shape subsequent income attainment.

Hypothesis 6.1: Individuals who follow trajectories other than the "traditional path" will report lower incomes even after controlling for highest degree attained, work history and other life-course experiences.

Data and Variables

The data for the analysis again come from the ELS:2002. The sample is restricted to the same sample used for the sequence analysis, consisting of those individuals for whom a full postsecondary transcript record between 2004 and 2013 was available. The sample is additionally restricted to remove those with missing values on the dependent variable, hourly wage. Missing cases on the independent variables are multiply imputed. The final sample consists of 7,210 individuals.

Dependent Variable

Hourly wage. The dependent variable is a standardized measure of the hourly wage for each respondent's current or most recent job. This is NCES generated variable that is derived from respondents' reports of their earnings at their current or most recent job and their reports of the hours worked weekly. The variable is standardized to dollars per hour and ranges from $0 to $119.

Independent Variable of Interest

Postsecondary Trajectory. The independent variable of interest is the postsecondary trajectory followed by individuals in the sample. The five pathways uncovered in the sequence analysis reflect each individual's trajectory: *traditional, lateral transfer, vertical transfer, two-year* and *unstructured*.

Sets of Control Variables

I include three sets of control variables measuring factors that may also be relevant to individuals' level of earnings: social background, educational attainment/experience, and work experience. Table 6.1 below presents means or proportions and descriptions for all independent and control variables.

Analytic Strategy

I utilize ordinary least squares (OLS) regression to examine the effect of postsecondary trajectory on hourly wage. This is an appropriate strategy as I am modeling a continuous dependent variable. I first examine the effect of pathway on hourly income with only demographic information included in the model as controls. I then control for highest degree earned, college experience, and current and past

employment experiences to see if the postsecondary trajectories remain significant after accounting for these relevant variables. Table 6.2 shows the results of the regression.

Table 6.1: Variable Coding and Descriptives

Variable Name	Description and Coding	M	SD
Dependent Variable			
Hourly wage	Standardized dollars per hour in current/most recent job	15.98	9.64
Independent Variable			
Postsecondary Trajectory			
(Traditional=Ref.)			
Lateral Transfer	1=Followed lateral transfer path, 0=other	0.09	
Vertical Transfer	1=Followed vertical transfer path, 0=other	0.06	
Two-Year	1=Followed two-year path, 0=other	0.17	
Unstructured	1=Followed unstructured path, 0=other	0.34	
College Attainment/Experience			
Highest Postsecondary Degree			
(Less than bachelor's=Ref.)			
Associate's	1=Highest degree is associate's, 0=other	0.10	
Bachelor's	1=Highest degree is bachelor's, 0=other	0.32	
More than bachelor's	1=Highest degree is more than bachelor's, 0=other	0.08	
Selective	1=1st degree earned at a highly selective 4-year, 0=other	0.17	
Low GPA	1=Ever reported GPA below 2.0 at all postsecondary schools attended , 0=other	0.27	
High GPA	1=Ever reported GPA above 3.75 at all postsecondary schools attended, 0=other	0.13	
Employment Experiences			
Past earnings	Logged annual earnings for 2005	7.60	2.68
Heavy workload (2004)	1=Worked 35+ hours a week in 2004, 0=other	0.07	
Heavy workload (2009)	1=Worked 35+ hours a week in 2009, 0=other	0.70	
Full-time	1=Currently employed full-time, 0=other	0.69	
Time-on-job	Number of months employed in current job	29.30	26.62
Social Background			
Female	1=Female, 0=other	0.53	
Race/Ethnicity			
(White, non-Hispanic=Ref.)			
Black, non-Hispanic	1=Black, non-Hispanic, 0=other	0.13	
Asian	1=Asian, 0=other	0.04	
Hispanic	1=Hispanic--any race, 0=other	0.14	
Other	1=Multiracial or other race, 0=other	0.05	
Socioeconomic Status			
(Lowest quartile=Ref.)			
Second quartile	1=Second lowest socoeconomic quartile, 0=other	0.24	
Third quartile	1=Third lowest socoeconomic quartile, 0=other	0.27	
Highest quartile	1=Highest socoeconomic quartile, 0=other	0.29	
N= 7210			

Table 6.2: Ordinary Least Squares Regression Predicting Hourly Wage

Variables	Model 1 (SE)	Model 2 (SE)	Model 3 (SE)
Postsecondary Trajectory			
Lateral Transfer	-1.925*** (.467)	-0.710 (.448)	
Vertical Transfer	-3.004*** (.523)	-1.256* (.525)	
Two-Year	-4.067*** (.403)	-0.574 (.550)	
Unstructured	-4.633*** (.343)	-0.893 (.536)	
College Attainment/Experience			
Highest degree associate's		1.577*** (.443)	
Highest degree bachelor's		3.237*** (.573)	
Highest degree more than bachelor's		5.322*** (.775)	
Selective		2.737*** (.548)	
Low GPA		-0.403 (.340)	
High GPA		1.308** (.459)	
Employment Experiences			
Past earnings		0.177*** (.051)	
Heavy workload (2004)		0.264 (.484)	
Heavy workload (2009)		0.956** (.326)	
Full-time		3.873*** (.293)	
Time-on-job		0.023*** (.005)	
Social Background			
Female	-2.433*** (.295)	-2.013*** (.278)	
Black, non-Hispanic	-2.122*** (.379)	-0.997** (.346)	
Asian	0.551 (.595)	1.091 (.565)	
Hispanic	-0.843* (.343)	-0.216 (.327)	
Other	-0.779 (.564)	0.005 (.540)	
SES Second quartile	0.745* (.318)	0.487 (.301)	
SES Third quartile	1.179*** (.348)	0.755* (.332)	
SES Highest quartile	2.630*** (.440)	1.980*** (.424)	
N= 7210			

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Data comes from the ELS:2002. Missing data has been multiply imputed.
*** p<0.001, ** p<0.01, * p<0.05

Results

In Model 1, I model the effect of postsecondary trajectory on hourly wage. This model also controls for demographic and social background characteristics. Results show that pathways influence income attainment. Following the *traditional* path results in the highest hourly wage at the end of the study period. In contrast, following the *unstructured* path results in the lowest wage. Those on the *unstructured* path earn $4.63 less per hour than their peers who followed the *traditional* path. Model 2 adds the

controls measuring college attainment, college experience and employment history. After accounting for highest degree earned and other factors, postsecondary trajectory is largely no longer a significant predictor of hourly wage. Only one of the pathways, *vertical transfer*, remains significant at the .05 level. This suggests that there is something about the *vertical transfer* path or those who follow it that reduces income even after accounting for other differences that are likely to shape income.

Conclusion

I find that for the most part a BA is a BA, and the degree confers the same economic rewards no matter what postsecondary trajectory one followed to achieve it. My results show that *how* one attained their education largely does not matter after accounting for one's education and employment experiences. Following the *unstructured* path is not detrimental in and of itself on income attainment but results in lower income due to other factors associated with following this path, including the lower likelihood of earning a BA. Thus, I find little support for Hypothesis 6.1 that individuals who follow nontraditional trajectories will report lower incomes after accounting for other relevant factors.

The one exception to this, however, is the *vertical transfer* path. Even after controlling for a set of relevant factors, this path is associated with lower earnings compared to the traditional path. Unlike with race, a visible characteristic that employers can relatively easily discern and which has been shown to be associated with lower returns to the BA (Gaddis 2014), employers are unlikely to know the postsecondary trajectory followed by a student. Therefore, how do we explain this finding? One explanation is that there may be selection issues in which there are unaccounted for

factors that distinguish those who follow the *vertical transfer* path from those who follow the other paths. Factors such as levels of motivation or of soft skills may vary by path, even after accounting for social background. However, with the other pathways, the effect of path on income loses significance after adding the educational background variables to the model. This suggests that it is not just a matter of unmeasured selection; paths *do* matter, but they matter because they shape the level and type of education one receives.

CHAPTER 7

CONCLUSION

Understanding how postsecondary enrollment patterns are shaped and the consequences of those patterns is relevant to individuals and the wider society. College degrees confer a broad array of benefits for individuals, and once a leader in educational attainment, the United States now ranks below many other advanced industrial nations in academic achievement and degree attainment (PEW 2016). Understanding what it takes to get students degrees and how this process unfolds will be important for the continued economic success of the U.S.

Moreover, the process of degree attainment is tied to broader concerns related to social inequality and is essential to understanding how and why people end up where they do in our social class system. In theory, individuals who work hard, do well in school, and go to college can overcome any initial disadvantage. However, scholars have called this optimistic assumption into question (Alexander, Entwisle, and Olson 2014). Our educational system has been implicated in the continued stratification of society, and has instead been seen as a mechanism through which those in power restrict valued degrees and positions to maintain their elite status.

The desire to understand how social origins are translated into later success and the relative influence of ascribed versus achieved characteristics in this process gave rise to the theory of status attainment, with education identified as a key component in the status attainment process. Since the early work of Blau and Duncan and the Wisconsin

school, the level of education received has been recognized as one of the elements that determine future occupational status. While one's social origins, particularly one's socioeconomic status, shape future success, much of this effect is mediated through the level of education one receives. Since those early models, scholars have extended our understanding of this process generally and with regards to education specifically. We now know a great deal about how other social background characteristics like gender and race shape occupational success, and how the social context, including variation in national policy and neighborhood differences, shapes the attainment process. Work in education has explored how the effect of social origins varies at different levels of education and how social background affects specific enrollment transitions.

However, scholars have yet to explore how long-term educational trajectories are involved in this process, both shaped by social background and shaping later attainment. My dissertation adds to the literature on status attainment exploring the causes and consequences of postsecondary trajectories. I find that how one moves through college is not neutral. While students may have more possible routes through postsecondary, certain students are more, or less, likely to follow certain paths depending on their background characteristics—following a social reproduction model of education (Blau and Duncan 1967; Bowles and Gintis 1976). Postsecondary trajectories then, in turn, shape future attainment and this process is moderated by the social context in which one enrolls.

Contribution

Empirical/Methodological Contribution

My dissertation has wide ranging theoretical, methodological and practical significance. First, my dissertation provides an empirical and methodological

contribution by a using a method, sequence analysis, which captures not simply educational transitions but full educational trajectories. Empirically, this is a contribution because I let the data reveal the typical paths experienced by students in my sample. In the past, different groups were assigned a priori based on theoretical considerations. While a productive strategy in some instances (see Goldrick-Rab 2006), this is also potentially problematic for two reasons. First, when using theory and common understandings of how students move through education to assign groups, we may neglect to account for atypical paths. As my findings reveal, a large number of individuals follow unstructured paths through postsecondary. The sequence analysis and my subsequent results suggest that this is a meaningful group in and of itself, though the experiences of these individuals are likely to be missed if labels assigned to the individuals are based on already well-theorized paths through college. Second, students' actual experiences are chaotic and complex and often do not map onto predetermined paths or transitions. This creates issues if the researcher wishes to determine what "counts" as a traditional college experience. Researchers often must make relatively arbitrary decisions about what enrollment patterns are and are not relevant to their study, but this may potentially discount variation in enrollment patterns that is meaningful. By utilizing sequence analysis, I overcome these issues and provide a fuller and more precise depiction of the enrollment patterns students in the sample experience. The number and form of the groups is determined by the data, not by the researcher ahead of time, and the method allows me to identify meaningful groups whose underlying experiences are similar.

Using the sequence analysis, I discovered that students in my sample commonly followed one of five typical postsecondary trajectories: the *traditional, lateral transfer, vertical transfer, two-year* or *unstructured* paths; and this is an important empirical finding in and of itself. I was able to show the existence of these ideal type routes through school as well what characterizes each path, including time spent out of school and number of students still enrolled at the end of the study period. My findings both confirm the continued relevance of the extensively studied *traditional, vertical transfer* and *two-year* trajectories, while also suggesting that more attention should be paid to the *unstructured* and *lateral transfer* paths going forward.

Methodologically, my work also represents one of the first attempts to use sequence analysis techniques to study educational sequences, and the first, to my knowledge, to study postsecondary enrollment patterns. The technique has been productively applied to the examination of other types of patterned life experiences or "careers," including criminal careers and work and family formation patterns. Yet despite education often being conceptualized as a career in which movement occurs sequentially from one level to the next, the technique has been largely absent—a notable omission. Part of this may reflect the challenge of transforming data not designed for sequence analysis into the appropriate form, however, my dissertation shows how this can be done and my significant findings in Chapters 4-6 suggest the utility in doing so.

Theoretical Contribution

Theoretically, my dissertation bridges the status attainment literature with literatures on educational transitions and state policy effects and fills two gaps in the literature: first, the role of long-term educational trajectories in the status attainment

process, and second, the effect of contextual state level variation on this process. I add to our understanding of the status attainment process by exploring how postsecondary trajectories are shaped and how they then shape later attainment. A great deal is known about how ultimate educational achievement and how individual educational transitions shape this process, but work has yet to consider the effect of holistic educational careers. And it is important to do so, because the life course is shaped not just by individual moves in and out of school, but by long-term educational experiences. Looking only at individual transitions in isolation fails to show how these are situated within a string of other transitions, and how their effects may depend on the transitions that come before them.

My results suggest that educational trajectories have an important place in the status attainment process. First, my work shows that the individual factors theoretically and historically linked to the status attainment process generally remain relevant to educational trajectories specifically. Social background, educational expectations and achievement, occupational aspirations and income and educational attainment all shape or are shaped by postsecondary trajectories. My results suggest that social origins continue to have a strong effect on where one ends up in the social hierarchy. While academic factors, including educational expectations and high school academic achievement influence the path one follows, accounting for these factors does not eliminate the effect of social background, specifically of socioeconomic status. Students from more advantaged backgrounds, who come from higher income families and whose parents are more educated and in higher prestige occupations, are more likely to follow a traditional path through college. This finding is consistent with prior work on status

attainment and social reproduction (Blau and Duncan 1967; Sewell et al. 1970; Sewell, Haller, and Portes 1969), and my dissertation shows that social background affects not just educational transitions, but long-term trajectories as well.

Using the sequence analysis technique in conjunction with more traditional statistical methods also provided greater insight into the status attainment process allowing some interesting finding to emerge. Work in the educational transitions literature has shown mixed effects with regards to race. Depending on the enrollment pattern under study, black students may be more likely to follow a traditional path, less likely to do so, or being black may have no significant effects after controlling for other factors. In Chapter 4 of my dissertation, I found that being black makes one more likely to follow routes involving four-year school attendance. Compared to white students, black students in my sample were more likely to follow both the *traditional* and the *lateral transfer* paths. However, in Chapter 5 I find that the same sample of black students experiences lower bachelor's degree attainment, even after accounting for other relevant factors, though the interaction shows the negative effect of the *lateral* path is weaker for black students. Thus, while something is depressing the attainment of back students, my work confirms that this is not attributable to them following less successful trajectories through school. Future work must explore the mechanisms of this moderation.

The second major theoretical contribution of my dissertation is the incorporation of state level sociopolitical factors into this process. I argue that understanding how students move through school and the effect of that movement cannot be divorced from the contexts in which they are enrolled. Trajectories occur within contexts, and by

examining several state level factors I show that these factors influence the trajectories students follow and the effect of paths on later attainment. Ultimately, I found that states have the ability to temper the effects of pathways on attainment through higher education appropriations. Notably, higher levels of educational appropriations tend to increase the positive effect of following a *traditional* path, but exacerbate the negative effect following a nontraditional path.

Overall my finding that the effect of paths is moderated by state level factors suggests a need for continued work on the college attainment process that incorporates both trajectories and the social context in which those trajectories are formed. As the social landscape shifts, so too may the trajectories that emerge from the data. If this type of work had been conducted sixty years ago the trajectories that appeared and they ways social origins shaped them may have been considerably different. Between the dramatic expansion of the community college system and the increased access afforded to minorities and women, the postsecondary landscape is vastly different today and this is reflected in how students move through school. In the future, we may see similar shifts in trajectories if the social and political landscape in which they are formed is altered. Perhaps the *unstructured* path will grow as more individuals are afforded more opportunities to return to school with the rise of short term vocational and career oriented programs. Or as ways to move through postsecondary expand we may see the paths themselves alter, with more or fewer ideal type postsecondary trajectories emerging from the data. My dissertation highlights the need to understand this process in context—individual transitions occur within long-term trajectories, and educational trajectories are shaped by the broad societal conditions in which they occur.

Below, I suggest a conceptual model that refines the classic Wisconsin model of attainment based on my findings. In Figure 7.1 the status attainment process is elaborated upon to include the influence of educational trajectories and the social context in which the process occurs. Educational trajectories exist in the model as an intervening variable,

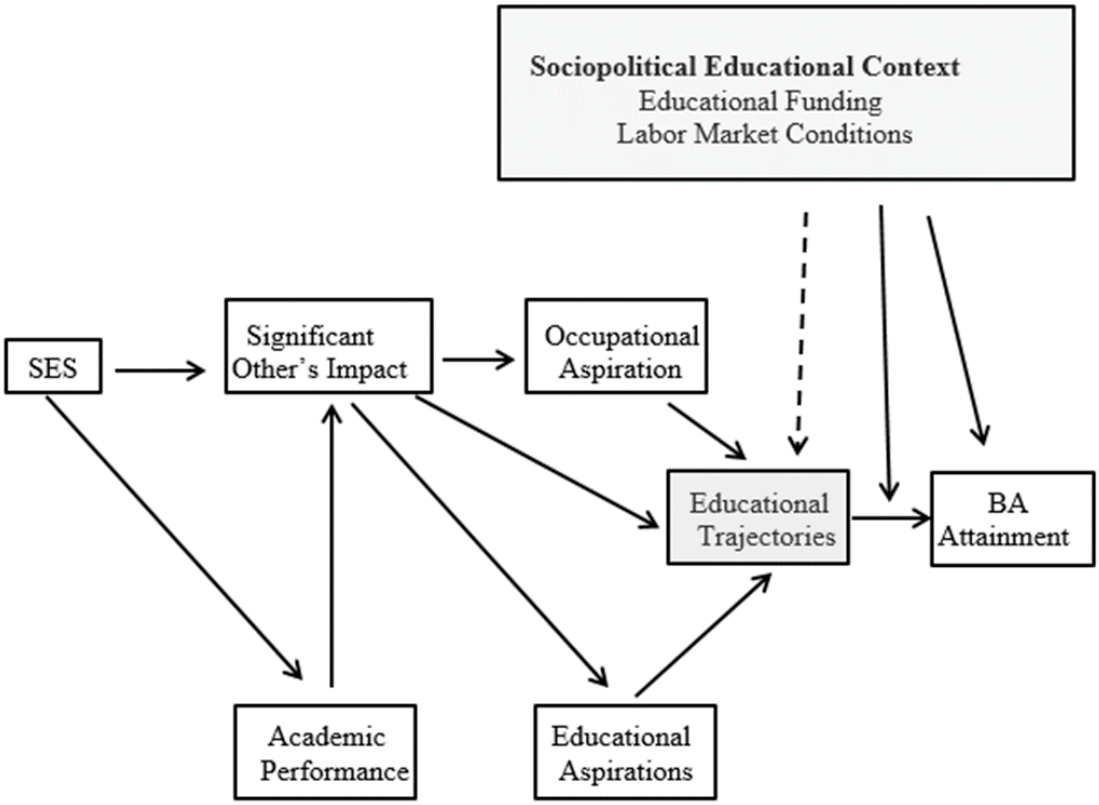

Figure 7.1: Extension of the Status Attainment Model

influenced by social origins, academic achievement, expectations and significant others, and influencing BA attainment. And overarching this individual level process is the broad sociopolitical context in which it occurs. Funding for education as well as the economic conditions within the state shape BA attainment directly, as well as moderating the effect of trajectories on attainment. Ultimately by including educational trajectory

and social context in the model I provide a fuller picture of the status attainment process. The model captures the effect of long-term educational careers, showing how the process will vary depending on the trajectory one follows or the context in which they are enrolled. This allows us to better understand why some individuals who enter postsecondary attain college degrees and why others do not.

Practical Contribution

Finally, with regards to the practical implications of my dissertation, my findings tentatively suggest that more postsecondary options may not translate into better educational outcomes. From a consumer choice perspective, it is useful for students to have a variety options when pursuing a college degree. More options potentially means more possibilities to find the path that is best for each student. If after enrolling, one institution is not a great fit, an option to enroll somewhere else is possible. And if different trajectories were equally likely to result in a degree this would suggest the benefits of having numerous routes through school, however this is not what I find. Across the board the *traditional* trajectory is the most likely to lead to a bachelor's degree. While it is not surprising that the *two-year* and *unstructured* paths were associated with lower odds of BA attainment as these paths generally involve minimal time in a four-year school, the *traditional* route was revealed to be better than the *lateral transfer* and *vertical transfer* paths as well, both paths that involve enrollment in a four-year school and in which most of the students on those paths likely intend to earn a BA.

One interesting finding was that there were few differences in what predicted following *traditional* versus a *lateral transfer* path. After controlling for background, achievement, aspirations and other relevant factors, students appear equally as likely to

follow this path as the *traditional* path. However, following the *lateral* path results in lower degree attainment. While coming from high SES background reduces this effect, the attainment of these individuals is still below their equivalent counterparts who follow the *traditional* path.

Practically then, for individuals who are choosing where to enroll or for the parents or counselors guiding them, understanding which paths are most likely to lead to future degree attainment is of vital importance. My work suggests that if possible these students should be guided to the traditional path and informed of the risks of diverging from it, and those social groups at risk for following less successful trajectories should receive extra counseling or assistance in the transition to college. At a broader level, my dissertation speaks to how states can organize their sociopolitical environment to best support student attainment. When students were enrolled in states with higher appropriations for higher education, this increased the likelihood of those on the traditional route earning a BA. While this is a positive outcome from one perspective, it also made the effect of following nontraditional paths worse, lowering their rates of BA attainment. States will need to balance where and how much money to spend to achieve their desired outcomes, however my dissertation speaks to why we must look to such factors when trying to understand and improve student attainment.

Data Limitations

While my dissertation represents the first attempt to examine long-term educational trajectories and their place in the status attainment model, certain data limitations restrict my findings. First, I follow students for approximately nine years from August 2004 to June 2013, however at the end of the study period some students are still

currently enrolled in undergraduate education. My dissertation cannot speak to whether these students will go on to earn a degree, however it is likely that at least some of them will. Recent work has shown long gaps and reentry to the educational system (Deutsch and Schmertz 2011; Kennamer and Campbell 2011) does occur. True long-term trajectories would include the entirety of the educational career. Additionally, my data is restricted to those individuals who attended at least one postsecondary institution by June of 2013. However, open access institutions are widespread and some nontraditional students may enter postsecondary education for the first time after that date. The trajectories of these students are not captured in my dissertation, but bear investigation. If we had access to more years of data I would be better able to speak to the full extent of educational trajectories followed by individuals. There may be paths that cannot be captured within the time frame of my study. For instance, economic downturns may lead adults who have been in the workplace for decades to return to school to upgrade their skills after widespread layoffs. Thus, while my work can speak to early postsecondary trajectories in the present, future work should examine educational patterns and the sociopolitical influences that shape them over longer time frames or historically.

Additionally, while I examine three categories of state level factors, there are many more contextual factors or state policies that could be examined to assess the impact of sociopolitical context on postsecondary trajectories. For instance, future work should theoretically and empirically explore the form of state aid to schools or students, exploring how the balance of merit and need-based aid matters. However, the challenge in this case is accurately capturing the effect of programs that often vary widely in their implementation across states and thus requires precise theorizing and data collection

beyond the scope of this dissertation. Policies and programs encompassed under the same broad category, like "state merit aid program" may differ dramatically from state to state in terms of the students eligible for the program or the type of institutions where it can be applied, and such variation has meaningful effects on student outcomes (Domina 2014). While I used measures capturing the broad social context in which students enroll, more work should consider other state policies, perhaps with a focus on a specific state level policy allowing one to examine its effects on trajectories with greater nuance.

More work should also consider how social context shapes the routes students follow through school. In Appendix B, I conduct a preliminary analysis that explore this, however the issue of time-ordering with my data prevents me from making definitive claims about the effect of these state level factors on the postsecondary trajectory students follow. However, the preliminary analysis is suggestive of the fact that these factors may have an effect. Future work should gather data prior to the start of the sequences to examine this effect.

Future Directions and Policy Considerations

Additionally, while my work speaks to policy indicating that a traditional path is best for students and most likely to lead them to a degree, it is impossible to know from my analysis if the students who attended two-year schools and other nontraditional routes would have been successful if they had initially entered a four-year institution. It may be the case that these students would have dropped out from a four-year. And if that were the case, these students would then endure greater opportunity costs and this would lead to greater social reproduction overall. Thus, while my work is in line with prior work showing the reduced attainment among those who follow a nontraditional path and begin

in a community college, there is still a degree of uncertainty in the policy recommendations that should emerge from this dissertation. Two-year schools serve a purpose for the many students who choose them, and in many states these institutions play a major role in the strategies designed to increase college completion at the state level. If we were to eliminate all routes other than the traditional route, would this increase or decrease overall attainment? Clearly these schools are believed to produce something of value by many stakeholders, and I am not ready to conclude from my results that the nontraditional paths should be abandoned entirely. However, while we cannot create the counterfactual in which other routes through postsecondary are eliminated, we can better address issues of selection through the use of quasi-experimental methodological techniques. Future work should utilize methods such as propensity score matching to more accurately model the effect of following different postsecondary trajectories on ultimate attainment.

Finally, my second largest trajectory was made up of those individuals who followed *unstructured* paths. This route involves those who attended at least *one* institution even though for most individuals who followed this trajectory the largest portion of their time was spent out of school. However, if the *unstructured* route reflects those who just dipped their toes into postsecondary education, entirely missing from my analysis are those who sit entirely on the sidelines. My work explores the postsecondary trajectories followed by individuals who entered higher education, but many individuals never attend college in any form. While these individuals do not have a postsecondary "career" to be uncovered by the sequence analysis, they are still highly relevant to state

goals related to increasing college completion. Any policy suggestions must also consider these individuals and the implications of the educational system for them.

Despite these limitations and the need for future consideration in some areas, this dissertation represents the first attempt at applying a novel method to gain greater leverage on the process of status attainment. I find that sequence analysis techniques can be productively applied to the study of educational enrollment patterns with meaningful groups emerging from the data each with their own unique characteristics and likelihood of earning a BA. These groups then play a significant role in the status attainment process. My revised model, which incorporates trajectories and state level context, provides a more accurate depiction of how the status attainment process occurs in the lives of individuals. It sheds greater light on how people end up where they do in our stratified society, the degree to which social background is still relevant to one's future success, and ultimately why some individuals successfully move through postsecondary while others fail to do so.

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APPENDIX A. COST MATRICES

I explore the use of different cost structures through the four cost matrices listed below.

1) Unitary Costs: All substitutions set to 1.

	H	O	A	B	C	a	b	C	S
H	0	1	1	1	1	1	1	1	1
O	1	0	1	1	1	1	1	1	1
A	1	1	0	1	1	1	1	1	1
B	1	1	1	0	1	1	1	1	1
C	1	1	1	1	0	1	1	1	1
a	1	1	1	1	1	0	1	1	1
b	1	1	1	1	1	1	0	1	1
c	1	1	1	1	1	1	1	0	1
S	1	1	1	1	1	1	1	1	0

2) Transition Based Costs: Costs defined by likelihood of transitioning between one state and another.

	H	O	A	B	C	a	b	C	S
H	0	1.97	2	2	2	1.99	2	2	2
O	1.97	0.00	1.95	1.95	1.94	1.92	1.92	1.93	2.00
A	2.00	1.95	0.00	1.99	2.00	1.99	1.99	1.99	1.67
B	2.00	1.95	1.99	0.00	1.99	2.00	2.00	2.00	1.99
C	2.00	1.94	2.00	1.99	0.00	2.00	2.00	2.00	1.98
a	1.99	1.92	1.99	2.00	2.00	0.00	1.99	2.00	1.87
b	2.00	1.92	1.99	2.00	2.00	1.99	0.00	1.99	1.97
c	2.00	1.93	1.99	2.00	2.00	2.00	1.99	0.00	1.97
S	2.00	2.00	1.67	1.99	1.98	1.87	1.97	1.97	0.00

3) Future Based Costs: Based on the likelihood of being in another state four months in the future based on one's current state (Studer and Ritschard 2016).

	H	O	A	B	C	a	b	c	S
H	0.00	1.60	1.62	1.80	1.86	1.71	1.82	1.84	1.45
O	1.60	0.00	1.28	1.46	1.50	1.35	1.44	1.47	1.18
A	1.62	1.28	0.00	1.49	1.56	1.41	1.51	1.53	0.68
B	1.80	1.46	1.49	0.00	1.72	1.60	1.70	1.72	1.21
C	1.86	1.50	1.56	1.72	0.00	1.66	1.76	1.78	1.36
a	1.71	1.35	1.41	1.60	1.66	0.00	1.61	1.64	1.05
b	1.82	1.44	1.51	1.70	1.76	1.61	0.00	1.73	1.30
c	1.84	1.47	1.53	1.72	1.78	1.64	1.73	0.00	1.34
S	1.45	1.18	0.68	1.21	1.36	1.05	1.30	1.34	0.00

4) Theoretically Defined Costs: Self-defined costs designed to reflect knowledge about the structure of higher education. The costs are defined so that it is equally as costly to move between schools of the same level, but more costly to move into or out of a four-year school initially, than into a two-year school. This is because two-year schools with their open access policies, flexible class schedules and often less comprehensive student services may allow students to enter and exit more easily. Other costs are set in relation to the likely transitions rates. For example, it should be easier for someone coming out of high school to enter their first four-year school than to enter their second four-year school.

	H	O	A	B	C	a	b	C	S
H	0	1.1	1.3	1.5	1.7	1.3	1.5	1.7	2
O	1.1	0	1.5	1.5	1.5	1.3	1.3	1.3	2
A	1.3	1.5	0	1.7	1.9	1.8	1.8	1.8	1
B	1.5	1.5	1.7	0	1.7	1.8	1.8	1.8	1
C	1.7	1.5	1.9	1.7	0	1.8	1.8	1.8	1
a	1.3	1.3	1.8	1.8	1.8	0	1.7	1.9	1
b	1.5	1.3	1.8	1.8	1.8	1.7	0	1.7	1
c	1.7	1.3	1.8	1.8	1.8	1.9	1.7	0	1
S	2	2	1	1	1	1	1	1	0

Process

Dissimilarity measures are created using each of the cost matrices (as well as a longest common subsequence matrix) with indels ranging from .1 to .7. The resulting distance matrices are then clustered using Ward's method, weighted average linkage clustering, and the Partitioning Around the Medoids (PAM) clustering algorithms. Best solutions for different combinations of these costs and clustering methods are identified using cluster quality statistics, and then compared.

Results

Overall the results of this process did not reveal one vastly better method. The highest average silhouette width (ASW) appears to be about .40 when the best solution for each combination of costs matric, indels, and clustering algorithm is selected. For the best solutions, it generally ranges from .34 - .40, and the resulting clusters both make intuitive sense and prove statistically significant in later analyses, providing support for the cluster solutions identified.

When examining the clusters, notably the least common squares method did not produce acceptable results. It consistently suggested an overly simply two cluster solution. In every other cost/cluster combination the *traditional, lateral transfer, unstructured* and *two-year* pathways each appeared. Ward's hierarchical clustering method generally suggested a four- or five-cluster solution, while the iterations of the PAM method suggested a four-cluster solution. When using the Ward's method, the two-year path way split between those on a *vertical transfer* pathway and the mainly *two-year* pathway. This distinction was not seen in the PAM cluster results. Because this appears to be a meaningful distinction I ultimately choose Ward's method over the PAM method.

APPENDIX B. EFFECTS OF STATE FACTORS ON PATHS

Another interesting empirical question is the degree to which state-level contextual factors predict which postsecondary trajectory one follows. Attempting to answer this question, however, generates issues with time ordering. The five pathways were identified in the sequence analysis using respondents' information on the timing and ordering of their postsecondary enrollment from August 2004 to June 2013, and to best respect the issue of time ordering all independent predictors should be measured before the sequences begin. However, this presents problems in that (1) conceptually, the degree to which state level factors in 2004 have an effect on someone's college enrollment choices years later is questionable, particularly if the student moved states, and (2) practically, I did not collect state level information prior to 2005, and because the *American Community Survey* did not begin until 2005 would not easily be able to add comparable data for earlier years to my dataset.

Nonetheless, while not ideal for the reasons mentioned above, I run a preliminary analysis to examine the effects of state-level context on shaping pathways. I ran a multinomial logistic regression in which the dependent variable is postsecondary trajectory, with the *traditional* path serving as the omitted category. The independent variables are the same as those used in Chapter 4, but now additionally include the state level contextual factors from Chapter 5 as predictors. State-level predictors are measured in 2005 and are matched to students based on the state in which they completed high school. While these do not occur prior to the start of the sequences, they are measured early in the long-term process of students' postsecondary experience and will show how

state-level context at the start of one's educational career influences their ultimate pathway.

Results are presented in Table 1 below and suggest that state level context may have an effect on the postsecondary trajectories one follows. First, while the total number of postsecondary institutions in a state has no effect, the size of the public and two-year sectors appear to matter. Attending high school in a state with more public two-year schools decreases the odds that one will follow the *lateral transfer* path, as opposed to the *traditional* path. Similarly, when there are more private two-year schools the odds that one will follow the *vertical transfer* and the *unstructured* route relative to the *traditional* route decrease. The financing of education also appears to matter, and as elementary and secondary expenditures increase, students are less likely to follow the *unstructured* path, relative to the *traditional* path. And as higher education appropriations increase, students are more likely to follow the *traditional* as opposed to the *lateral transfer* path. Finally, the higher the unemployment rate in a state, the higher the odds that one will follow a *two-year* path.

Though this analysis is limited given the data restrictions mentioned above it nonetheless suggests that state factors influence student enrollment decisions. Future work should investigate the question of how this process occurs with a focus on the state level factors identified above as potentially meaningful.

Table B.1: Multinomial Logistic Regression of the Odds of Experiencing Different Postsecondary Trajectories: With State Level Predictors

Independent Variables	Lateral Transfer vs. Traditional	Vertical Transfer vs. Traditional	Two-Year vs. Traditional	Unstructured vs. Traditional
Individual Level				
Social Background Factors				
Female	1.201	1.107	1.258*	1.000
Race/Ethnicity				
(White/Non-Hispanic=Ref.)				
Black	1.154	0.361***	0.382***	0.566***
Asian	0.877	0.675	0.547***	0.390***
Hispanic	0.967	0.603*	0.900	0.973
Other	0.862	0.545	0.623	0.902
Socioeconomic Status				
(Lowest quartile=Ref.)				
Second quartile	1.243	0.936	1.014	1.093
Third quartile	1.293	0.800	0.601**	0.606***
Highest quartile	1.302	0.529**	0.361***	0.290***
Academic Achievment and Ability				
GPA	0.675***	0.423***	0.216***	0.160***
10th Grade Test Score				
(Lowest quartile=Ref.)				
Second quartile	1.375	0.709	0.608**	0.645*
Third quartile	1.246	0.474**	0.407***	0.495***
Highest quartile	0.922	0.257***	0.214***	0.369***
Expectations				
Steady High Expectations	0.921	0.523***	0.376***	0.332***
Mother's expectations	0.929	1.227	1.003	0.779
Father's expectations	0.907	1.036	0.812	0.545***
Aspirations				
Occupational Aspirations	1.001	1.004	0.978***	0.977***
Influence of Friends				
Peer influence	1.094	0.574**	0.940	0.852
Pre-August 2004 Path Controls				
Ever drop out	0.732	1.271	3.075**	1.810
Early graduate	1.053	3.667**	1.365	1.504
Early post-secondary	0.991	0.818	0.286**	0.309***

Table B.1 Cont.

State-Level				
Population of Institutions				
Postsecondary Institutions	1.000	0.971	0.993	1.029
Public Two-Year Institutions	0.827*	0.900	1.105	0.965
Private/For-Profit Two-Year Institutions	0.863	0.717*	0.872	0.833*
Finanacing/Affordability				
Elementary and Secondary Expenditures	0.718	0.838	0.461	0.175***
Higher Education Appropriations	0.256*	0.801	0.762	0.730
Student Share of Tuition	0.984	0.996	1.000	1.005
Labor Market Conditions				
Female Labor Force Participation	1.039	1.021	0.966	0.966
Unemployment Rate	0.895	1.154	1.186*	1.127
Percent Poverty	1.059	1.063	0.948	0.951
N=	8460			

Note. Following NCES convention, I round group size numbers to the nearest 10 to protect the identities of respondents. Data comes from the ELS:2002. Restricted to base-year participants for whom postsecondary transcripts are available. Missing data has been multiply imputed. Models have been adjusted to account for clustering within schools and weighted with student weight F3BYPNLPSWT. ***p<0.001, **p<0.01,*p<0.05