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The Educational Expansion and Persistent Inequality: The Effects of Extra-curricular Activities on Educational and Labor Market Outcomes.

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A dissertation submitted in partial satisfaction of the
requirements for the Degree Doctor of Philosophy
in Sociology

by

Yool Choi

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ABSTRACT OF THE DISSERTATION

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The Effects of Extra-curricular Activities on Educational and Labor Market Outcomes.

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Yool Choi

Doctor of Philosophy in Sociology

University of California, Los Angeles, 2015

Professor Jennie E. Brand, Chair

Sociology and social stratification researchers have long been concerned with the issue of educational inequality, as education is considered a key tool for achieving social mobility and has been shown to be a powerful determinant of an individual's opportunities and quality of life in modern society (Blau and Duncan 1967; Hout 1988; Fischer and Hout 2006). Given the significant role that education plays in determining social mobility, there has emerged a dynamic of competition between social classes for attaining higher education. While marginalized classes seek to overcome their disadvantaged status through education, thus allowing them greater social mobility, higher classes continuously enact social closure behavior through education to secure their advantaged status. Therefore, education is one of the most competitive endeavors in modern

society. In this dissertation, I explore the class dynamics of acquiring educational advantages given educational expansion in the United States and South Korea (hereafter Korea). Of key interest are strategies of securing social mobility through education that entail a move away from public education and increased reliance on resources outside of formal schooling. In this dissertation, I examine the effect of three extra-curricular activities on education and labor market outcomes, with a particular focus on the transitional periods of entry into and exit from postsecondary education, along with patterns of student retention and attrition during the years of college enrollment.

Specifically, the first chapter of my dissertation uses data from the Educational Longitudinal Survey of 2002 to look at the average and heterogeneous effects of shadow education on SAT scores. The data include extensive information on not only students' socioeconomic background, but also high school information such as GPA, educational aspirations and motivation, which is helpful in estimating the propensity to shadow education and the relationship between shadow education and SAT scores. I use PSM to examine the average relationship between shadow education and SAT achievement, paying attention to the issue of pretreatment heterogeneity. Also, using the stratification-multilevel and smoothing-differencing methods, I examine how the effects of shadow education vary according to likelihood of receiving shadow education. I find that shadow education has significant positive effects on SAT scores and that the effects vary by individual propensity to use shadow education. The pattern of treatment effect heterogeneity indicates positive selection, which indicates that those who are more likely to use shadow education—those who are socioeconomically advantaged—benefit more from shadow education than those who are less likely to use it. Also, public resources such as school prep courses, books,

and videos, neither alleviate the effects of private shadow education nor change the pattern of the treatment effect heterogeneity. My findings suggest that shadow education is an emerging mechanism that exacerbates educational inequality in the United States.

In the second chapter, using the National Longitudinal Survey of Youth from 1997, I examine the relationship between college student employment and dropouts. Since NLSY97 is surveyed annually and includes extensive information about students' educational backgrounds such as high school academic achievements, college financial aid, and the respondent's educational history, it is particularly useful to examine how student employment affects first year attrition and bachelor's degree completion. Using PSM, I estimate the average effects of treatment on the treated and I verify evidence of the treatment effect heterogeneity of student employment on college dropout by using the stratification-multilevel and smoothing-differencing methods. In this chapter, utilizing complex counterfactuals, (e.g., intense work [20 hours or more] vs. moderate work [less than 20 hours] vs. no work), I also examine variations in the effect of work intensity on dropout. In this study, I find that engaging in intense work has deleterious effects on first-year retention and on graduation within six years; however, the effects of intense work vary by likelihood of participation in intense work. The most advantaged students—who are least likely to engage in intense work—experience the most negative consequences from intense work, while such activity is less harmful to those from disadvantaged social backgrounds. I also find that this effect heterogeneity can be attributed to different financial situations and reasons for working between advantaged and disadvantaged students. This finding has two key implications. First, advantaged students should carefully consider engaging in intense work, as it can negatively affect bachelor's degree completion. Second, although the effect of intense work is less harmful for

disadvantaged students, providing sufficient financial aid to them is still an important task, as this could help them to balance the intensity of work and school life.

The final chapter of my dissertation aims to examine the effects of English training abroad (hereafter ETA) on labor market outcomes in Korea. To examine how ETA affects employment and wages, I conduct survival analysis and quantile regression using data from the Korea Employment Information Service's 2007 Graduate Occupational Mobility Survey. The key finding of this study is that even though the average effects of ETA seem to be modest as most prior research has indicated, ETA does appear to have substantial positive effects on getting a good job and earning higher wages. ETA proved especially helpful for those who did not attend elite colleges. That is, ETA is a useful tool for non-elite students to supplement their weak formal education. Based on these findings, I conclude that ETA has a substantial impact on labor market outcomes in South Korea, and thus labor market opportunities are strongly determined by an socioeconomic background, as the cost of participation in ETA presents a barrier to entry for individuals from lower socioeconomic backgrounds.

The dissertation of Yool Choi is approved.

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Introduction

Sociology and social stratification researchers have long been concerned with the issue of educational inequality, as education is considered a key tool for achieving social mobility and has been shown to be a powerful determinant of an individual's opportunities and quality of life in modern society (Blau and Duncan 1967; Hout 1988; Fischer and Hout 2006). Given the significant role that education plays in determining social mobility, there has emerged a dynamic of competition between social classes for attaining higher education. While marginalized classes seek to overcome their disadvantaged status through education, thus allowing them greater social mobility, higher classes continuously enact social closure behavior through education to secure their advantaged status. Therefore, education is one of the most competitive endeavors in modern society. In this dissertation, I explore the class dynamics of acquiring educational advantages given educational expansion in the United States and South Korea (hereafter Korea). Of key interest are strategies of securing social mobility through education that entail a move away from public education and increased reliance on resources outside of formal schooling. In this dissertation, I examine the effect of three extra-curricular activities on education and labor market outcomes, with a particular focus on the transitional periods of entry into and exit from postsecondary education, along with patterns of student retention and attrition during the years of college enrollment.

The higher education system has undergone significant changes over the last several decades. The most notable change has been the expansion of postsecondary education. Both the United States and Korea are among those countries with the highest college enrollment rates in the world. In the United States, college enrollment rates among high school graduates have been

continuously increasing and reached about 70% in 2009 (U.S. National Center for Education Statistics); in that same year, the rate of advancement to college in Korea exceeded 80%, which is among the highest in the world (Korea National Statistical Office 2009). This drastic expansion in access to higher education has defined a new educational landscape that has altered the class dynamics of social mobility in both countries. Now that the great majority of the populace attends college, the value placed upon the college degree has decreased, and a college education alone no longer guarantees one's successful transition to the labor market. This has induced intense competition between classes to gain educational advantages by securing both quantitatively and qualitatively better educational outcomes in higher education. For example, people with privilege use their socioeconomic advantages to attend better schools and, furthermore, to acquire human capital beyond college credentials.

Such competition does not always take place within the formal education system. Many of the increasingly prevalent mechanisms that contribute to educational inequality exist outside of formal schooling. This situation has important implications for social stratification. If the competition for educational achievement takes place outside of schools, thus requiring private capital, then one's academic success would be heavily dependent on one's socioeconomic background, which disadvantages those with limited socioeconomic resources. In addition, government efforts toward educational equality for a fair, meritocratic society are undermined when educational achievement is heavily dependent upon the private sector. Therefore, if these increasingly important mechanisms of utilizing extra-school resources to acquire educational advantages have positive effects, then the class divide will expand, and such resources will become a crucial factor in preserving the status hierarchy.

In this dissertation, I investigate the relevance of extra-curricular activities to educational and labor market outcomes by examining the prevalence, purpose, and effects of three extra-curricular activities: shadow education, student employment, and English training abroad, which are among the most common activities for the purpose of successfully transitioning into, remaining enrolled in, and exiting from college, respectively. I first examine the effects of SAT preparation activities, defined as American-style shadow education, on SAT scores, which occur pre-college. Second, I assess the implications of student employment on college dropout rates in the United States. Lastly, I explore the effect of English training abroad on labor market outcomes upon the transition from college to the labor market in Korea. How prevalent are these activities? What attributes influence individual participation in these activities? Most importantly, what is the causal effect of these activities on educational or labor market outcomes, and how do these effects differ according to individuals' social backgrounds? Using large, nationally representative datasets, I examine these questions in order to understand how the pathway to social mobility through channels outside of formal education is affected by individuals' socioeconomic background. The remainder of this introduction is organized in the following order. First, I briefly summarize the key theoretical and analytical focus of this dissertation that constitutes the theoretical groundwork behind the three analytic chapters. Then, I summarize the key findings of each chapter.

Economic perspective vs. Social stratification perspective

In this dissertation, all three chapters share two theoretical perspectives: the economic perspective and the social stratification perspective. While both economic and stratification

theories provide useful frameworks for studying the motivation behind and consequences of engaging in extra-curricular activities, the two perspectives differ somewhat in their emphasis.

According to the economic perspective, the three extra-curricular activities examined in this dissertation appear to be part of an important process of human capital acquisition during the transition to higher education and the labor market. Human capital theory explains that a large gradation in earnings according to level of education reflects returns to an individual's initial investment in education (Becker 1967). The basic premise of human capital theory is that individual investment in education is a rational behavior that is based on a cost-benefit strategy. Therefore, according to the economic perspective, understanding the cost-benefit strategy is key to understanding the motivations behind and consequences of individuals' investment in extra-curricular activities. The cornerstone of the cost-benefit strategy is that "individual decisions with regard to any form of activity can be analyzed in terms of the perceived costs and benefits of that activity relative to those perceived in alternative activities" (Tinto 1975:97). In other words, individuals assess the benefits that can be gained from extra-curricular activities, consider their investment and alternative options, and then rationally decide to participate in that activity. Therefore, an individual's investment in extra-curricular activities is rational behavior based on a utility-maximizing strategy. This approach provides a clear economic mechanism for participation in extra-curricular activities.

In contrast to the economic perspective, the stratification perspective emphasizes how multiple actors and factors influence participation in extra-curricular activities. While the economic perspective looked only at the individual pursing a utility-maximizing strategy, the stratification perspective views parents, siblings and significant others as important actors in the

decision to engage in extra-curricular activities. Social and cultural norms likewise play an important role in an individual's behavior. The stratification approach assumes a much more complex mechanisms behind these behaviors, which are enacted by highly stratified individuals in accordance with their socioeconomic resources. This perspective is concerned with how the motivation behind, process of, and consequences of engaging in extra-curricular activities are shaped by individual background, which is defined by not only economic but also social and cultural aspects. Thus, according to this perspective, one's investment in education is a result of active dynamics between stratified individuals to achieve social mobility and class reproduction through achieving educational advantage. Although I use more specific theoretical backgrounds for each chapter, these two perspectives guide my understanding of extra-curricular activities across this dissertation. From both perspectives, the causal effect of extra-curricular activities on subsequent education and labor market outcomes is a common and crucial question. However, these two perspectives suggest different analytical strategies and interpretations of the results.

Causal inference and effect heterogeneity

In terms of analytical focus, I am particularly interested in examining the causal effects and effect heterogeneity of shadow education, working while enrolled, and English training abroad. When examining the causal relationship between treatment and outcome, the key concern is how to deal with selection bias. Pretreatment heterogeneity bias occurs when there are preexisting conditions or attributes associated with both treatment and outcome (Brand and Xie 2010; Morgan and Winship 2007). The most conventional approach to addressing pretreatment heterogeneity bias is the use of OLS regression with various control variables. However, scholars using this approach

often fail to recognize issues of pretreatment heterogeneity that plague their research (Brand and Halaby 2006; Brand and Xie 2010; Rosenbaum and Rubin 1983). In chapters 1 and 2, I therefore use propensity score matching (hereafter PSM) to better conceptualize problems of selection bias to estimate the causal effect of extra-curricular activities. The key benefit of PSM is that this method provides an intuitive conceptual model for assessing the problem of pretreatment heterogeneity. As many studies have pointed out that the most critical concern in the study of extra-curricular activity is heterogeneity, and therefore this dissertation could provide useful points of comparison with prior studies that have used conventional regression methods.

While the interpreting the average effects of extra-curricular activities is the most conventional and simplest way to understand the relevance of extra-curricular activities, average effects can mask important implications of extra-curricular activities from the social stratification perspective. If the effect of a given extra-curricular activity varies significantly by social background, interpreting the average effect will not be enough to understand how these activities play an important role in widening or reducing educational inequality in the society. Thus, this dissertation is particularly interested in examining the effect heterogeneity of these three extra-curricular activities.

In the first and second chapter, I extend the PSM framework to attend to treatment effect heterogeneity. Treatment effect heterogeneity refers to an estimation of the interaction between the treatment and the propensity of treatment (Brand and Davis 2011; Brand and Xie 2010; Brand and Simon-Thomas 2013). In other words, the treatment effect heterogeneity approach assumes that individual responses to certain treatments are not identical and examines variation in the effects of treatment on subsequent outcomes for those with different probabilities of selection into

treatment. A better understanding of treatment effect heterogeneity can yield important insights into social stratification and policies. The pattern of treatment effect heterogeneity can indicate "who is most likely to receive a desired social good and whether they are the optimal beneficiaries under the given circumstances" (Brand and Simon-Thomas 2013:5). In my dissertation, these questions could yield crucial insight into extra-curricular activities from the vantage point of social stratification. For example, who is more likely to utilize shadow education and who benefits most from it? Also, who needs to engage in employment during college and who has to bear the negative effects of intense work? Since the propensity to participate in both activities is dependent on socioeconomic background, the treatment effect heterogeneity approach could provide a critical understanding of how extra-curricular activities play an important role in maintaining educational inequalities.

In the last chapter, I investigate how the effect of English training abroad differs based on how prestigious an individual's college is. By examining effect heterogeneity according to school prestige, I examine how competition for achieving educational advantage extends not only to postsecondary education but also to sources of outside formal schooling. This has important implications in that if students from wealthier families fail to attend highly selective, elite schools, they can try to offset their weak formal education by achieving additional human capital or credentials from an overseas educational institution. This has important implications for labor market outcomes in Korea, as both elite schooling and English experience are highly desired skills in the workforce. Thus one's job success may be determined by socioeconomic background, and the competition for achieving educational advantages continues even after entering college.

In sum, the main analytical focus of this dissertation is an estimation of the causal relationships between extra-curricular activities and educational and labor market outcomes with careful consideration of pretreatment heterogeneity. Also, in addition to estimating average effects, I particularly focus on examining effect heterogeneity to reveal the masked aspects of extra-curricular activities that exacerbate or ameliorate the educational inequality of current society.

Chapter introduction

This dissertation consists of three standalone chapters. Although each of the three chapters explores a specific extra-curricular activity, the overall theme of each chapter hinges on how socioeconomic background affects educational opportunities and inequalities in higher education. The chapters also relate to each other in terms of the timing of each extra-curricular activity. Shadow education affects college entrance, student employment affects college completion, and lastly English training abroad is utilized for successful exit from college into the labor market. That is, these three extra-school activities are common behaviors among those pursuing advantages related to postsecondary education.

Chapter 1

The first chapter of my dissertation uses data from the Educational Longitudinal Survey of 2002 to look at the average and heterogeneous effects of shadow education on SAT scores. The data include extensive information on not only students' socioeconomic background, but also high school information such as GPA, educational aspirations and motivation, which is helpful in estimating the propensity to shadow education and the relationship between shadow education and

SAT scores. I use PSM to examine the average relationship between shadow education and SAT achievement, paying attention to the issue of pretreatment heterogeneity. Also, using the stratification-multilevel and smoothing-differencing methods, I examine how the effects of shadow education vary according to likelihood of receiving shadow education. I find that shadow education has significant positive effects on SAT scores and that the effects vary by individual propensity to use shadow education. The pattern of treatment effect heterogeneity indicates positive selection, which indicates that those who are more likely to use shadow education—those who are socioeconomically advantaged—benefit more from shadow education than those who are less likely to use it. Also, public resources such as school prep courses, books, and videos, neither alleviate the effects of private shadow education nor change the pattern of the treatment effect heterogeneity. My findings suggest that shadow education is an emerging mechanism that exacerbates educational inequality in the United States.

Chapter 2

In the second chapter, using the National Longitudinal Survey of Youth from 1997, I examine the relationship between college student employment and dropouts. Since NLSY97 is surveyed annually and includes extensive information about students' educational backgrounds such as high school academic achievements, college financial aid, and the respondent's educational history, it is particularly useful to examine how student employment affects first year attrition and bachelor's degree completion. Using PSM, I estimate the average effects of treatment on the treated and I verify evidence of the treatment effect heterogeneity of student employment on college dropout by using the stratification-multilevel and smoothing-differencing methods. In

this chapter, utilizing complex counterfactuals, (e.g., intense work [20 hours or more] vs. moderate work [less than 20 hours] vs. no work), I also examine variations in the effect of work intensity on dropout. In this study, I find that engaging in intense work has deleterious effects on first-year retention and on graduation within six years; however, the effects of intense work vary by likelihood of participation in intense work. The most advantaged students—who are least likely to engage in intense work—experience the most negative consequences from intense work, while such activity is less harmful to those from disadvantaged social backgrounds. I also find that this effect heterogeneity can be attributed to different financial situations and reasons for working between advantaged and disadvantaged students. This finding has two key implications. First, advantaged students should carefully consider engaging in intense work, as it can negatively affect bachelor's degree completion. Second, although the effect of intense work is less harmful for disadvantaged students, providing sufficient financial aid to them is still an important task, as this could help them to balance the intensity of work and school life.

Chapter 3

The final chapter of my dissertation aims to examine the effects of English training abroad (hereafter ETA) on labor market outcomes in Korea. To examine how ETA affects employment and wages, I conduct survival analysis and quantile regression using data from the Korea Employment Information Service's 2007 Graduate Occupational Mobility Survey. The key finding of this study is that even though the average effects of ETA seem to be modest as most prior research has indicated, ETA does appear to have substantial positive effects on getting a good job and earning higher wages. ETA proved especially helpful for those who did not attend elite

colleges. That is, ETA is a useful tool for non-elite students to supplement their weak formal education. Based on these findings, I conclude that ETA has a substantial impact on labor market outcomes in South Korea, and thus labor market opportunities are strongly determined by an socioeconomic background, as the cost of participation in ETA presents a barrier to entry for individuals from lower socioeconomic backgrounds.

In conclusion, my dissertation aims to investigate how the dynamics for achieving educational advantages have expanded outside of formal schooling by examining three prominent extra-curricular activities in the United States and Korea. By utilizing several statistical methods, I focus on examining causal effects of extra-curricular activity on educational and labor market outcomes; and investigate the evidence of effect heterogeneity of the three extra-curricular activities. My findings suggest that these three extra-curricular activities have a significant impact on educational and labor market outcomes and that their effects vary by individual social background. Given the drastic expansion in formal education, my findings suggest that the relevance of extra-curricular activities is crucial for understanding educational stratification in the United States and Korea.

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Chapter 1. Who benefits most from shadow education? The heterogeneous effects of SAT preparation activities on SAT scores

Introduction

This chapter aims to understand the impact of shadow education on educational inequality by examining the heterogeneous effects of shadow education on SAT scores. Stevenson and Baker (1992) defined shadow education as a "set of educational activities outside formal schooling that are designed to improve a student's chances of successfully moving through the allocation process" (p. 2). For example, commercial coaching, cram schools, and one-on-one tutoring are the most prevalent forms of shadow education. In the past, the extensive use of shadow education was only observed in a few countries, especially in several East Asian countries. However, recent research has shown that shadow education has become a worldwide phenomenon and that shadow education is one of the fastest growing industries in many countries (Baker and LeTendre 2005; Bray 2001; Buchmann, Condron and Roscigno 2010; Byun 2014).

The prodigious growth of shadow education has caused much concern over educational quality and equality among policymakers (Bray 2009; Mori and Baker 2010). This is because in most cases shadow education completely relies upon private investment and is less feasible for families with limited socioeconomic capital (Baker and LeTendre 2005; Dang and Rogers 2008; Mori and Baker 2010; Stevenson and Baker 1992). Moreover, it is more difficult to control for the pervasiveness and repercussions of shadow education compared to other factors that affect educational consequences, since it takes place outside of formal schooling (Barry 2001; Grodsky 2010). Given these factors, if shadow education does make a difference in academic achievement, it then carries important implications concerning educational opportunity and social stratification.

Depending on its impacts, shadow education could serve as a mechanism for maintaining and increasing social stratification by conferring educational advantages on students who are already advantaged in terms of their economic, social, and cultural capital.

Given the importance of shadow education, I examine the causal effects of shadow education on academic outcomes in the United States. This chapter aims to not only to understand how advantaged families utilize their economic resources to access the educational advantages that shadow education can provide, but also suggests how policymakers might approach the issue of shadow education to diminish educational stratification in the United States.

I build on and augment prior research on shadow education and on coaching effects on SAT scores in several important ways. First, using propensity score matching, I examine the causal relationship between shadow education and SAT achievement by carefully attending to issues of preexisting heterogeneity. Many prior studies have emphasized that selection bias is a major concern when examining the causal effect of shadow education on SAT scores, and only a few studies have tried to address this issue in the U.S. context by utilizing more advanced methods (Briggs 2001; Byun and Park 2012; Domingue and Briggs 2009; Hansen 2004; Powers and Rock 1999).

Second, in addition to examining the average effects of shadow education, I analyze variation in the effects on SAT scores based on the likelihood of receiving shadow education. Using semi- and non-parametric methods based on propensity scores, I summarize the systematic trend of heterogeneous effects across propensity scores. This approach could potentially reveal some aspects of the educational stratification effects of shadow education that have previously been masked. For example, although the average effects of shadow education are moderate, some

part of the population might benefit significantly more than others from shadow education. If socioeconomically advantaged students who are also more likely to use shadow education benefit most from it, then shadow education is an important factor in widening the educational gap between social classes, as it advances advantaged students' educational achievement. However, if students less likely use shadow education benefit more from it, the impact of shadow education on educational inequality is limited and it could in fact serve as a tool to diminish the educational gap between advantaged and disadvantaged students.

Third, considering various forms of shadow education, I use a multiple counter-factual approach to examine the impact of shadow education more precisely. As prior studies have noted, shadow education includes both private (commercial coaching and one-on-one tutoring) and public (school prep courses, books, videos, and computer materials) resources (Buchmann, Condron and Roscigno 2010). Therefore, examining the causal effects of shadow education on SAT scores can be quite complex, depending on the particular counterfactual. In this study, I examine not only how private shadow education affects SAT scores differently depending on the alternative SAT preparation activities, but also whether the public preparation resources effectively allay the stratification effects of private shadow education.

By attending to the effect heterogeneity of private shadow education with multiple counterfactual scenarios, this study mainly focus on examining how the effects of shadow education differ based on individual social position and how it affects educational stratification in the United States. I use the Educational Longitudinal Survey of 2002 (ELS) for this, which followed a nationally representative sample of U.S. high school students from 2002 through 2006. The key finding of this study is that the effects of shadow education are not only significant for

academic outcomes but are also substantively different across propensity strata and increase as the propensity to partake in shadow education increases. That is, those who are more likely to use shadow education—those who are socioeconomically advantaged—benefit more from shadow education than those who are less likely to use it. Moreover, the use of public resources neither alleviates the effects of private shadow education nor changes the pattern of the heterogeneous effects of shadow education based on likelihood of use. My results indicate that shadow education is an emerging mechanism of educational stratification in the United States and could be a critical hindrance to the development of a meritocratic educational system.

Contextual Background: *Shadow education in the United States*

Despite its important implications on social stratification, shadow education in the United States has received far less attention compared to other factors that are thought to contribute to educational inequality. This is due in part to the nature of the U.S. educational system. In general, shadow education is prevalent in countries that place heavy emphasis on formal examinations—particularly centrally administered examinations—and have tight linkages between educational achievement and later occupational and social status (Baker and LeTendre 2005; Dang and Rogers 2008; Stevenson and Baker 1992). For example, shadow education is extremely prevalent in most East Asian countries where great emphasis is placed on the importance of college entrance exams (Baker and LeTendre 2005; Bray 2001). In contrast, in the United States, in addition to formal exams, various non-cognitive factors such as extracurricular activities are also important in the college admissions process (Bray 2001; Buchmann, Condron and Roscigno 2010; Byun and Park 2012).

However, in accord with the recent expansion in secondary and post-secondary education in the United States, the importance of standardized tests has been growing (Alon 2009; Alon and Tienda 2007; Grodsky, Warren and Felts 2008). The growing importance of standardized testing in the U.S. admissions process is perhaps a major factor in pushing students to score better on high-stakes tests, which fosters the development of shadow education (Buchmann, Condron and Roscigno 2010; Byun and Park 2012). The increased profitability of commercial coaching companies in the United States, such as the Princeton Review and Kaplan, is indicative of this growing trend (Buchmann, Condron and Roscigno 2010; Davies and Aurini 2006). For example, the Princeton Review earned $110.4 million in revenue for its test preparation services in 2009 (Princeton Review 2010) and it is one of the fastest growing industries in the United States.

Despite its low profile, there are U.S. scholars who have called attention to the impact of shadow education on educational stratification (Buchmann, Condron and Roscigno 2010; Byun and Park 2012; Domingue and Briggs 2009). For example, Buchmann et al. (2010) referred to the variety of SAT/ACT test preparation services the American style of shadow education. Compared to other nations, the most apparent and parallel forms of shadow education in the United States are those activities that prepare students for SAT/ACT tests. In many countries, preparing for college entrance exams is the most extensive and important form of shadow education (Bray 2001; Stevenson and Baker 1992). Therefore, examining the effects of SAT test preparation activities could lead to a thorough discussion of the implications of shadow education in the United States.

Methodological Issues

Pretreatment heterogeneity issues in the study of shadow education

Even though the effects of shadow education on educational achievement have been widely investigated in various countries, the empirical evidence is somewhat mixed. Generally, there is thought to be some positive relationship between shadow education and academic achievement; however, whereas some studies have found strong positive effects (Jacob and Lefgren 2004; Stevenson and Baker 1992; Buchman 2002; Dang 2007; Tansle and Bircan 2005), other studies have found modest positive or null effects (Domingue and Briggs 2009; Ha and Harpham 2005; Suryadarma et al. 2006; Kuan 2011; Cheo and Quah 2005; Kim 2010). One major factor contributing to these varied findings is the issue of selection bias in estimating the causal relationship between shadow education and its outcome (Byun 2014; Dang and Rogers 2008). That is, most of the research on this topic is limited when it comes to addressing pretreatment heterogeneity. Using OLS regression with various control variables is the most common approach to address this limitation; however, OLS regression cannot fully address the issue of pretreatment heterogeneity (Brand and Xie 2010; Rosenbaum and Rubin 1983). Among many studies on the effects of shadow education and coaching, only a few studies have dealt with this problem and used several advanced statistical models such as propensity matching estimation, fixed-effects, and a difference-in-difference approach (Dang and Rogers 2008; Domingue and Briggs 2009; Lavy and Schlosser 2004). In this study, I use propensity score matching estimation to address pretreatment heterogeneity in examining the causal effects of shadow education.

Heterogeneous effects of shadow education

Although some prior studies have recognized pretreatment heterogeneity in the relationship between shadow education and academic achievements, most studies have not attended to effect

heterogeneity in examining the impact of shadow education on academic achievements. While most prior studies have focused on homogeneous shadow education effects, which assumes that the effects of shadow education are equal for each student, it is reasonable to suppose that individual responses to shadow education differ based on social background. That is, individuals differ not only in preexisting background attributes but also in their behavioral responses to shadow education.

Among various factors that attribute effect heterogeneity, this study is particularly interested in examining treatment effect heterogeneity. Treatment effect heterogeneity refers to an estimation of the interaction between treatment and propensity of treatment (Brand and Davis 2011; Brand and Xie 2010; Brand and Simon-Thomas 2013; Xie). This approach addresses two sources of selection bias simultaneously in estimating the causal relationship between shadow education and academic outcomes. That is, by using propensity score matching, this study effectively attends to the pretreatment heterogeneity issue, and by examining how the effects of shadow education differ based on the propensity of using shadow education, the study can address systematic trend of effect heterogeneity of shadow education.

In terms of shadow education, treatment effect heterogeneity can answer such questions as is shadow education particularly beneficial for already advantaged students who are also more likely use shadow education, or do students from less privileged backgrounds, considering their poor counterfactuals, benefit from a diminished the educational gap? If we understand these patterns of treatment effect heterogeneity, we can grasp the more profound implications of shadow education from a social stratification perspective. In so doing, we can also provide suggestions for effective policymaking geared toward assisting specific sub-populations.

Despite many prior studies on shadow education, only one study has shown some evidence of treatment effect heterogeneity. Domingue and Briggs (2009) estimated the effects of coaching on SAT scores using propensity score matching with the Educational Longitudinal Survey of 2002. They utilized one independent variable (commercial courses) among various variables related to shadow education. In this analysis, they estimated propensity score stratum–specific coaching effects on SAT score using linear regression models. While they did not explicitly summarize the trend in the variation of effects by propensity score strata, they found some evidence of effect heterogeneity and argued that effects are highest in higher subclasses (Domingue and Briggs 2009:19). In my analysis, I build on their research and expand on it by using more complex counterfactuals and testing for systematic trends in the treatment effect heterogeneity using stratification-multilevel (hereafter SM) and smoothing-differencing (hereafter SD) models. I discuss these two methods in more detail in the analytical strategy section.

What is shadow education?

Along with methodological issues, how one defines shadow education a key factor in analyzing its effects. The operational definitions of shadow education are diverse and controversial. Buchmann et al. (2010) constructed an indicator of highest level test preparation in their research, which includes four kinds of test preparation activities: (1) books, computer software, and/or videos; (2) high school prep courses; (3) private courses; and (4) private tutor. They included all four activities as a form of shadow education and did not make a public vs. private distinction. However, Grodsky (2010) criticized these operational definitions of shadow education and emphasized that the distinction between public and private resources is particularly important in

understanding the implications of shadow education. Thus, the private sources such as private courses and private tutoring should be seen as the only form of shadow education in the United States. Alon (2010) similarly emphasized the importance of the distinguishing between private and public sources in her comments and supplementary analysis on Buchman et al.'s work. Although she considered both private and public sources to be aspects of shadow education, she argued that distinguishing private vs. public is analytically important for its economic aspects and effectiveness.

In this study, I distinguish between public test preparation sources, which includes books, computer software, videos, and high prep school courses, and private sources, such as private courses and private tutors. Since private resources represent an apparent economic barrier for those with limited economic capital (Buchmann, Condron & Roscigno 2010; Byun & Park 2012), its implications for stratification are substantially different from those of other resources. Therefore, the dichotomous definition of shadow education between private and public aims to understand the degree to which shadow education contributes to educational inequality and to examine whether public resources that are relatively easy to access for everyone could be an alternative to private resources. More detailed information on how shadow education is measured and on counterfactual scenarios will be introduced in the measurement section below.

Hypothesis

The key interest of this study is how the effects of shadow education differ according to likelihood of using shadow education. There are two competing theoretical models for interpreting the patterns of treatment effect heterogeneity of shadow education. The first is positive selection,

in which individuals who are most likely to use shadow education also benefit most from shadow education. This can be explained by the economic rational–behavioral model, which posits that individuals who think that they will have the highest returns from shadow education are most likely to use shadow education. Their utilization of shadow education is thus rational behavior based on a utility-maximizing strategy. Also, we can consider the quantity and quality aspects of shadow education. Since the quantity and quality of shadow education varies by cost, there is a possibility that those who are most likely to use shadow education use shadow education longer and that their shadow education is of higher quality than others based on their advantaged socioeconomic backgrounds.

The second theoretical model is negative selection, in which individuals who are less likely to use shadow education benefit more from shadow education. One of the possible explanations for negative selection is that while students from affluent families might be enrolled in shadow education, they may not be strongly motivated to improve their test scores, while students who are less likely to use shadow education may be more strongly motivated, given that they would have to overcome significant barriers to use shadow education. This indicates that the use of shadow education might be driven by cultural and social reasons, rather than by solely economic reasons, which is based on a utility maximizing strategy. Also, we should consider the different counterfactuals between high propensity and low propensity goers. If shadow education is an effective tool to increase SAT scores, then extremely poor achievements of low propensity non-shadow education goers will reflect a larger difference than high-propensity goers. Since high propensity non-shadow education goers have diverse social and cultural capital, and thus

potentially alternative means for securing high test scores, they can diminish the gap to their counterfactuals.

The implications of these two competing hypotheses on educational stratification are quite different. If the data indicate that positive selection is occurring, then shadow education plays an important role in widening the educational gap between advantaged and disadvantaged students and worsens educational inequality. In contrast, if the data support the negative selection hypothesis, then shadow education could serve as an effective tool to mitigate educational inequality between social classes, as those most disadvantaged students would benefit more from shadow education than do advantaged students. Therefore, in addition to providing a more accurate picture of the role of shadow education in educational stratification, examining the systematic pattern of treatment effect heterogeneity will also inform policymakers as to which populations benefit from shadow education and which populations require more support.

Analytical Strategy: Methods, Data, and Measurement

Methods

To estimate both the average and heterogeneous effects of shadow education, I first estimate individuals' propensity scores for receiving shadow education using probit regression as follows:

$$\mathrm{P} = p(d_i = 1|X_i)$$

A propensity score is the conditional probability of treatment given the observed covariates X. In this form, P is the propensity score and d_i indicates whether student *i* uses shadow education or not, and X is a vector of observed covariates. I estimate the propensity scores for three counter

factual model separately (all models are described in greater detail in the measurement section below). Based on this estimated propensity scores, I examine the average treatment effect on the treated (ATT). ATT represents the average gain from shadow education for those who actually were treated:

$$\tau_{att} = E(y^{d=1} - y^{d=0}|d = 1)$$

I use nearest neighbor and kernel matching to estimate the ATT for each counterfactual model; unmatched differences also calculated for the comparison.

While the estimated results of ATT indicate the average effects of shadow education, I use SM and SD methods to estimate treatment effect heterogeneity. Both methods are based on propensity score matching approaches. Based on the estimated propensity scores for using shadow education, SM constructs a balanced propensity score strata, which means that those who use shadow education and those who do not are not statistically different in terms of the mean value of every covariate and propensity score. Then, I estimate propensity score stratum–specific effects using OLS regression, and finally I summarize the systematic pattern of heterogeneous treatment effects in response to shadow education across propensity strata using a variance-weighted least squares regression (Brand, Pfeffer and Goldrick-Rab 2012). I repeat this analysis for three counterfactual scenarios.

In addition to the SM method, I conduct a sensitivity test using the SD method. By using the SD method, I can test for sensitivity to the parametric and strata-specific homogeneity assumptions imposed in the SM method (Brand, Pfeffer and Goldrick-Rab 2012). Based on the estimated propensity scores, SD fits a separate nonparametric regress of the SAT scores on the

propensity score and then takes the difference in the nonparametric curves between those who use shadow education and those who do not (Brand, Pfeffer and Goldrick-Rab 2012:14).

Data

In this analysis, I use the Educational Longitudinal Survey of 2002 (ELS), which contains extensive information about respondents' social and economic backgrounds and their educational information such as grades, educational activities, and aspirations. ELS 2002 followed a nationally representative sample of U.S. high school sophomores in 2002 through their senior years in 2004 and beyond in 2006. All of my measurements are based on the 2006 restricted-use dataset (from the base year to the second follow-up).

From the data, I restrict my sample to those who have a valid SAT or ACT scores to determine the effect of shadow education on SAT scores. I further restrict my sample to those who answered both base and first follow-up surveys and stayed in the same school, since only those samples have valid answers to questions about use of shadow education. Since I use only a portion of the total sample, it is difficult to generalize my findings to high school students in general. Since, my sample includes the majority of students in the sample who prepared for SATs in school and actually took the SAT, however, it has still important implication for understanding the role of shadow education in the college preparation process. The final sample includes 6,900[1] high school seniors in the United States, but the actual sample varies by each counterfactual model.

[1] Following the Institute of Education Sciences' restricted-use data security procedures, I rounded the unweighted Ns to the nearest 10.

Measurements

First, in terms of the treatment variable, I generate three categories for the shadow education variables: (1) those who did not use any shadow education, (2) those who used only public resources, and (3) those who used only private resources or used private resources in addition to public resources. Since I use these three categories for the shadow education variable, I generate multiple contrasts. The effect of private test preparation is my key interest and thus I examine (1) the effect of private shadow education vs. anything else (the all-inclusive, or baseline, comparison), (2) private shadow education vs. public shadow education, and (3) private shadow education vs. no test preparation.

Second, I utilize various independent variables to estimate a student's propensity to use private shadow education compared to the three counterfactuals. These include demographic characteristics, family background, prior educational achievement, educational motivation/aspiration, parents' expectation/involvement, and high school characteristics. All measures of the independent variables are from base year data (2002). Most variables have only a small amount of missing data; however, five variables do have a relatively greater amount of missing data (remedial class, PSAT plan, college info-seeking, discussing SAT prep with parents, and discussing school courses with parents). Instead of removing those missing cases, however, I create an additional level that denotes missing for each of the five variables, following prior studies on shadow education (Byun and Park 2012; Domingue and Briggs 2009; Hansen 2004). I also conduct the same analyses with a non-missing sample (listwise deletion), which yields similar results.

1) Demographic characteristics: Gender is a dummy variable (male = 1) and race/ethnicity includes white [reference category], Black, Asian, Hispanic, and other races (Native Hawaiian, Pacific Islander, American Indian, and Alaska native)
2) Family background: I use a dichotomous variable for family composition such as whether or not a student lives with both parents (both parents = 1). The socioeconomic status (SES) index is provided by ELS and is a standardized composite score based on five variables, including father/mother's education, family income, and father/mother's occupation.
3) Prior educational achievement: I utilize four variables to measure prior educational achievement. Tenth grade GPA, math and reading composite test scores provided by ELS, and the number of AP and remedial courses. Except the remedial class variable, the other three variables are continuous. The remedial class variable consists of three categories (yes, no [reference category], and missing).
4) Educational motivation/aspiration: Educational motivation includes five variables. These are students' educational expectations (1–8), importance of good grades (1–4), homework hours per week (more than 10 hours = 1, less than 10 hours = 0), plans to take the PSAT (yes, no [reference category], and missing), and seeking college information (yes, no [reference category], and missing).
5) Parents' expectations and involvement: Three variables are used for measuring parental characteristics. These are parent's educational expectations (1–7), discuss SAT preparations with parents (never [reference category], sometimes, often, and missing),

and discuss school courses with parents (never [reference category], sometimes, often, and missing).

6) High school characteristics: Students' school features includes three variables, which are private school (Yes:1, No: 0), school region (south [reference category], northeast, midwest, and west), and urbanity (urban[reference category], suburban, and rural)

Finally, the SAT score is my outcome variable. For those with only ACT scores, ELS 2002 converted the ACT scores to the SAT scale, which ranges from 400–1600.

Results

Descriptive statistics

< *Table 1 about here* >

Table 1 shows the results of descriptive statistics by shadow education use. My key interest group, those who used private shadow education, is quite different from the group that used only public shadow education and those who did not use any shadow education.

First, it is apparent that private shadow education goers have much better economic backgrounds than those who do not use shadow education, which confirms our prior assertion that use of private shadow education greatly depends on individual economic background. High school characteristics also shows a clear distinction between private shadow education goers and others. A greater percentage of private shadow education goers attend private schools and schools in urban

areas. In terms of demographic characteristics, there are more women in private shadow education, and Black and Asian students are more likely to use private shadow education than White students. Prior educational achievement shows somewhat mixed results. For example, average 10th grade test scores are highest in non-shadow education goers and lowest for those engaged in private shadow education, though the gap is very small. However, 10th grade GPA is highest for public shadow education goers and the lowest in the non-shadow education group. In terms of number of AP courses taken, private shadow education goers took a greater number of AP courses than other groups. These results suggest that shadow education in the United States seems to be used for both remediation and enrichment. In terms of educational motivation and aspiration, the gap between private shadow education goers and public shadow education goers is relatively small, but there is a substantive differences between non-shadow education goers and others. This result indicates that motivation/aspiration is an important factor in determining the use of any SAT preparation activities, but that this does not seem to be a critical factor in distinguishing between private and public resources. The results show that private education goers' parents have higher educational expectations and are more involved in their children's education than other groups. In particular, they are much more likely to discuss SAT preparation with their children, which indicates that the use of private shadow education seems to be strongly determined by parents' expectations or level of involvement.

Determinants of using private shadow education

< Table 2 about here >

As a first step to examine average and heterogeneous effects of shadow education, I first estimate the propensity score for each individual who took private shadow education using a probit regression model. Table 2 shows the results of the probit regression model according to three counterfactual scenarios. The three models show very similar results. As expected, parents' SES, students' educational motivation/aspiration, parents' expectation/involvement, and school type (private vs. public) have a positive effect on engaging in private shadow education. One of the key differences between three models is that students' educational motivation, which includes five covariates, is highly significant in the "private vs. anything else" and "private vs. none" models, but only marginally significant, and has relatively weaker effects in the "private vs. public" model. As we saw in the descriptive statistics, student motivation is relatively less important in determining whether one engages in private shadow education over public shadow education, compared to other key factors.

In terms of demographic characteristics, women are more likely to use private shadow education than men in the "private vs. anything else" and "private vs. none" models. Black, Asian, and Other students are more likely to engage in private shadow education than White students in every model, and the data for Hispanic students show no significant differences.

The results of prior academic achievement are somewhat ambiguous. Tenth grade test scores and GPA have negative effects on using a private shadow education in every model. Although, the effects of remedial courses has no significant impact, these results seem to indicate that students primarily use private shadow education for remedial purposes. However, the effects of AP course-taking on using private shadow education were positive across all three models and is suggestive of the use of private shadow education for purposes of enrichment. Given that prior

research has indicated that the purposes of private shadow education differ by race (Byun and Park 2012) and socioeconomic background (Buchmann, Condron and Roscigno 2010), these findings seem to point to the dual use of private shadow education in the United States: both remediation and enrichment.

Average effects of shadow education

< *Table 3 about here* >

Based on the estimated propensity scores, I estimate the average treatment effect on the treated of private shadow education under the three counterfactual models. Table 3 shows the results of the matching estimates and unmatched differences of private shadow education. First of all, private shadow education has a statistically significant effect on SAT scores in every model and with every matching method. For example, those who use private shadow education scored about 18 points higher on the SAT than those who did not use private shadow education (private shadow education vs. anything else). Although the estimates of the second model (private shadow education vs. public shadow education) are slightly lower than those of the third model (private shadow education vs. none), the differences are relatively very small. For example, the effect of private shadow education to public shadow education is about 19 points and the effects of private shadow education to none is about 22 points. This result suggests that the use of public shadow education does not effectively substitute for the role of private shadow education. Lastly, while there is are no big differences in estimates between matching methods, nearest neighbor matching, and kernel matching estimates, the estimates of unmatched differences shows substantially higher effects from private shadow education than those of matching, which indicates some selection

issues in the use of private shadow education by the observed covariates. In short, under the assumption of effect homogeneity, private shadow education has clearly positive effects on SAT scores regardless of the counterfactuals and increases SAT scores by about 17 to 22 points.

Heterogeneous effects of shadow education

< Table 4 about here >

Next, to estimate treatment effect heterogeneity, I construct balanced propensity score strata based on estimated propensity scores of using private shadow education under the three counterfactual models. The mean values of every covariate and propensity score between treated and untreated students in the same propensity strata are not statistically different ($p <$. 001). Table 4 shows the mean value of every covariate and treatment variable for the "private vs. anything else" model. It presents a very clear pattern of students' family backgrounds, educational motivation/aspiration, parents' educational expectation/involvement, and the percentage of private and urban school increasing as propensity score strata increases. This indicates that individuals in higher propensity strata are more advantaged than those in lower propensity strata.

In terms of demographic characteristics, the percentage of female, Black, and Asian students increases as the propensity score strata increases. In particular, women are at about 75% and Asian students are at about 41% in the highest propensity strata. This suggest that there is a significant difference among gender and race in terms of using private shadow education.

Another notable pattern is the changing proportion of public shadow education goers and non-shadow education goers. As the propensity to use private shadow education increases, the proportion of using public shadow education rapidly increases and thus, the number of non-shadow

education goers decreases. For example, among those who did not use private shadow education in the highest propensity strata, about 83% of those students used public shadow education, and only 17% of such students did not use any shadow education, while these figures were 54% and 46% respectively in the lowest strata. This indicates that while advantaged students actively utilize alternative public shadow education resources, even if they do not use private shadow education, many disadvantaged students do not use any preparation resources to prepare for the SAT.

< Figure 1 about here >

Next, based on propensity score strata, I estimate stratum-specific treatment effects (level-1) and then I examine the systematic pattern of heterogeneous treatment effects across propensity score strata with variance weighted least squares regression (level-2). Figure 1 shows the linear trend of treatment effects across the strata with stratum-specific effects for the "private vs. anything else" model (Appendix A presents every coefficient and significance for the level-1 and level-2 slopes for all three counterfactual models). The level-2 slope is 14.539 and is statistically significant at the 0.01 alpha level. This means that as one strata increases, the effects of private shadow education on SAT scores increase by 14.539 points. The difference between the highest (7^{th}) and the lowest (1^{st}) propensity score strata is about 120 points. This pattern clearly supports the positive selection hypothesis, which indicates that those who are most likely to use shadow education benefit most from it. This positive selection hypothesis is particularly important in terms of educational stratification in the United States. This is because, as seen in Table 4, high propensity goers are already advantaged students and thus, positive selection could further exacerbate educational inequality between advantaged and disadvantaged students. In sum, although the average effects of shadow education seems to be moderate, the effect of private

shadow education is substantially large for more advantaged students who are also most likely use shadow education.

Next, I examine the pattern of effect heterogeneity of private shadow education based on alternative counterfactuals. I repeat the SM method for "private vs. public" and "private vs. none" models. Since public shadow education is a more affordable resource for the majority of students, understanding the effectiveness of public shadow education is particularly important when seeking to alleviate educational inequality.

< *Figure 2 about here* >

Figures 2-a and 2-b show the results of two alternative counterfactual models. Both counterfactuals also show similar upward linear slopes for "private vs. anything else." The level-2 slope for "private vs. public" is 17.278 and it is statistically significant (P-value = .008) and the level-2 slope for "private vs. none is 13.075, which is also statistically significant (P-value = .013). Both counterfactuals clearly indicate a positive selection pattern. These results suggest that use of public shadow education does not change the pattern of positive selection for private shadow education.

Auxiliary analysis

< *Figure 3 about here* >

Lastly, using an SD method, I conduct a sensitivity test for the linearity assumption imposed in SM method. Figure 3 presents the results of the "private vs. anything else" model. The x-axis represents the continuous propensity score and the y-axis represents the differences in nonparametric regressions between the treated and un-treated groups. The effects of private

shadow education increase as propensity score increases; however, after a .6 propensity score, the effects of private shadow education decrease until the highest propensity score. Thus, the effects of shadow education are strongest around a propensity score of .6 and weakest in the lowest propensity distribution. Although the SM method shows a statistically significant positive linear trend, the SD method suggests relatively weak effects at the highest tail of the propensity score distribution.

< Figure 4 about here >

Figure 4 presents the results of the SD method for two alternative counterfactuals. In both figures, the effects of private shadow education increase as propensity score increases, which clearly indicates positive selection. While the effects of private shadow education compared to public resources in figure 4-a slightly decrease after the .7 propensity score, the effect of private shadow education to none in figure 4-b continuously increases across the propensity scores.

In conclusion, the overall trend of SD method for three counterfactual scenarios also support the positive selection hypotheses. Although, there is evidence of a decreasing pattern at the highest propensity scores, the key implications of this remain unchanged. That is, advantaged students benefit more from private shadow education and the most disadvantaged students benefit least from it.

Conclusion

The overall goal of this study was to examine the causal effects of shadow education on SAT scores and thus to investigate the impact of shadow education on educational inequality in the United States. The key questions that asked in this study are as follows: (1) What is the average

effect of private shadow education on SAT scores?; (2) How do the effects of private shadow education differ based on individual likelihood of using shadow education?; and (3) How do the average and heterogeneous effects of private shadow education differ according to multiple counterfactual scenarios: private shadow education vs. anything else, vs. public shadow education, and vs. none. These questions have important implications for accurately understanding the impacts of shadow education on educational stratification. By examining variation in effects on SAT scores by the likelihood of using private shadow education, this study challenges the effect homogeneity assumption and sheds light on the exact role of shadow education in educational stratification. Moreover, by considering multiple counterfactual conditions, I investigated the possibility that alternative public resources could substitute for private shadow education. To examine these questions, first I utilized propensity score matching to study the average effects of private shadow education, with careful consideration of preexisting heterogeneity. Then, I used SM and SD methods to estimate treatment effect heterogeneity in analyzing the effects of private shadow education.

Using rich data from the Educational Longitudinal Study of 2002, we found significant variation in effects on SAT scores by likelihood of using private shadow education. Those who were most likely use private shadow education benefitted the most from it. Since higher propensity goers are already socioeconomically advantaged, this pattern suggests that private shadow education widens the education gap between social classes. Even if we had found there to be positive average effects from using private shadow education, this variation in effects would have quite different implications. That is, although the average effects of private shadow education are moderate, which limits the relevance of private shadow education to educational inequality, the

positive selection pattern suggests that the most advantaged students benefit considerably more from private shadow education and thus it functions as a strong mechanism of educational stratification in the United States. Moreover, I find that using public resources in lieu of private shadow education neither ameliorates the impact of private shadow education on academic outcomes nor changes the positive selection pattern.

This study broadens our understanding of how private shadow education is a critical factor in exacerbating educational stratification in the United States. However, the policy implications of this study are quite complex. Intervening in shadow education would be extremely difficult due to the fact that shadow education operates in the private sector. Some countries such as South Korea, Uganda, and Mauritius have tried to ban shadow education, but these bans have been ineffective (Bray 2006). If direct intervention in shadow education is difficult, then, this study raises the question of public education in terms of its system and quality in the United States. In this sense, it would be useful to examine what current educational environments boost the prevalence and impact of shadow education. If the impact of shadow education centers on SAT preparation activities and the college entrance process, what kind of alternative systems could be put in place? And more specifically, given that public shadow education does not help to mitigate the disproportionate impact of private shadow education, what differences exist between those two educational activities? What kind of additional learning opportunities within formal schooling could be provided to disadvantaged students, and how can these activities be made effective compared to private shadow education? These questions are only part of what policy makers and stratification scholars need to examine in order to ameliorate the educational inequality that is caused by private shadow education. In conclusion, given the increasing prevalence of private

shadow education in the United States, this study emphasizes that the acquisition of educational advantages greatly depends on private investment and that the pathway to social mobility through education appears to cross the border of public education. Therefore, extensive efforts to enhance educational equality is necessary, taking into account both public and private educational contexts.

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Table 1. Descriptive statistics by shadow education use: Educational Longitudinal Study 2002 (N=6,900)

	Full sample	Private shadow education	Public resources	None
Demographic Characteristics				
Male	.46(.007)	.42(.016)	.41(.010)	.57(.014)
Race				
White	.72(.007)	.63(.015)	.73(.009)	.79(.011)
Black	.11(.005)	.17(.012)	.11(.006)	.07(.007)
Asian	.05(.003)	.08(.006)	.05(.004)	.03(.004)
Hispanic	.09(.004)	.09(.009)	.09(.006)	.09(.008)
Other race	.03(.003)	.04(.007)	.03(.004)	.03(.004)
Family backgrounds				
Parents' SES	.23(.011)	.42(.023)	.20(.014)	.14(.020)
Both parents(0/1)	.67(.007)	.67(.015)	.67(.010)	.67(.014)
Educational Achievements				
10^{th} grade GPA	3.06(.010)	3.05(.022)	3.11(.013)	2.99(.020)
AP courses	1.09(.025)	1.35(.058)	1.07(.034)	.921(.049)
Remedial class(0/1)				
Yes	.08(.004)	.09(.011)	.08(.005)	.08(.008)
No	.87(.005)	.85(.011)	.87(.007)	.87(.010)
Missing	.06(.003)	.06(.008)	.05(.005)	.05(.007)
Test score(10^{th})	54.74(.13)	54.17(.30)	54.71(.166)	55.20(.278)
Educational Motivation/Aspiration				
Educational expectation (1-8)	6.43(.016)	6.68(.033)	6.47(.022)	6.18(.033)
HW hours per week(10h) (0/1)	.29(.007)	.37(.016)	.29(.010)	.22(.012)
Importance of good grades(1/4)	3.55(.009)	3.64(.018)	3.59(.013)	3.40(.021)
Plans to take the PSAT				
Yes	.75(.007)	.81(.013)	.76(.009)	.68(.014)
No	.20(.006)	.13(.011)	.19(.008)	.26(.013)
Missing	.06(.003)	.06(.008)	.05(.004)	.06(.007)
Seeking college info				
Yes	.82(.006)	.87(.011)	.84(.007)	.75(.013)
No	.10(.005)	.06(.007)	.09(.006)	.16(.011)
Missing	.08(.004)	.08(.009)	.07(.005)	.09(.008)
Parents' Expectation /Involvement				
Educational expectation (1-7)	5.61(.016)	5.82(.032)	5.62(.021)	5.46(.032)
Discuss SAT prep with parents				
Never	.30(.007)	.18(.012)	.28(.009)	.41(.014)
Sometimes	.41(.007)	.41(.016)	.44(.010)	.35(.014)
Often	.17(.006)	.28(.014)	.16(.007)	.12(.010)
Missing	.12(.005)	.13(.011)	.12(.006)	.12(.009)
Discuss courses with parents(1-3)				
Never	.10(.004)	.07(.008)	.09(.006)	.15(.010)
Sometimes	.47(.007)	.43(.016)	.48(.010)	.49(.015)
Often	.31(.007)	.37(.016)	.32(.010)	.25(.013)

Missing	.12(.005)	.13(.010)	.11(.006)	.11(.009)
High school Characteristics				
Private (0/1)	.11(.003)	.18(.009)	.11(.004)	.08(.005)
Region				
Northeast	.19(.006)	.23(.014)	.19(.008)	.18(.012)
Midwest	.28(.007)	.21(.013)	.28(.009)	.34(.014)
West	.17(.006)	.19(.014)	.17(.009)	.17(.013)
South	.35(.007)	.38(.015)	.37(.010)	.31(.013)
Urbanity				
Urban	.26(.007)	.33(.015)	.25(.009)	.24(.012)
Suburban	.53(.007)	.53(.016)	.54(.010)	.54(.015)
Rural	.20(.006)	.14(.011)	.22(.009)	.23(.012)
Outcome				
SAT scores	1011.171(2.99)	1020.52(6.82)	1006.68(3.92)	1012.79(6.15)
N	6,900	1610	3530	1770

Note: Descriptive statistics are weighted, with unweighted sample sizes reported in the last row. Standard deviations in parentheses.

Table 2. Probit Regression Estimates for Models Predicting Private Shadow Education Use: Educational Longitudinal Study 2002

	Private shadow education vs.		
	Anything else	Public resources	None
Demographic Characteristics			
Male	-.110(.047)*[a]	-.006(.050)[b]	-.378(.063)***
Black[c]	.291(.075)***	.215(.080)**	.509(.108)***
Asian	.315(.076)***	.277(.081)***	.454(.124)***
Hispanic	.098(.084)	.088(.091)	.139(.116)
Other race	.295(.127)*	.255(.137)†	.394(.174)*
Family backgrounds			
Parents' SES	.281(.036)***	.265(.039)***	.368(.315)***
Both parents	-.030(.049)	-.029(.054)	-.038(.067)
Educational Achievements			
10th grade GPA	-.082(.044)†	-.133(.048)**	-.008(.061)
AP courses	.044(.016)**	.050(.017)**	.038(.022)†
Remedial class[d]	.059(.076)	.036(.082)	.085(.100)
Missing	.022(.120)	.011(.125)	.068(.176)
Test score(10th)	-.019(.004)***	-.017(.004)***	-.029(.005)***
Educational Motivation/Aspiration			
Educational expectation	.071(.024)**	.050(.026)†	.127(.032)***
HW hours per week	.124(.049)*	.093(.053)†	.191(.067)**
Importance of good grade	.074(.042)†	.046(.047)	.138(.055)*
PSAT plan[e]	.076(.062)	.056(.068)	.102(.084)
Missing	-.109(.140)	-.045(.152)	-.298(.199)
Seeking college info[f]	.201(.079)**	.106(.089)	.388(.098)***
Missing	.338(.128)**	.219(.144)	.584(.173)**
Parents' Expectation /Involvement			
Parents' edu expectation	.049(.024)*	.047(.026)†	.059(.031)†
Discuss SAT prep with parents[g]			
Sometimes	.219(.059)***	.157(.065)*	.414(.076)***
Often	.451(.075)***	.424(.081)***	.593(.099)***
Missing	-.032(.218)	-.053(.236)	.023(.252)
Discuss courses with parents[h]			
Sometimes	.026(.080)	-.007(.089)	.067(.105)
Often	.031(.088)	-.005(.097)	.094(.117)
Missing	.333(.229)	.282(.249)	.491(.273)†
High school Characteristics			
Private school	.340(.051)***	.283(.054)***	.511(.068)***
Northeast[i]	.130(.061)*	.134(.066)*	.117(.084)
Midwest	-.097(.058)†	-.054(.063)	-.225(.076)**
West	.059(.071)	.114(.078)	-.048(.096)
Suburban[j]	-.036(.055)	-.057(.059)	.004(.074)
Rural	-.120(.074)	-.147(.080)†	-.103(.101)
Wald Chi2	436.07	297.86	476.45
P>X	.000	.000	.000
N	6900	5130	3380

Note: a. †p < .10 *p < .05 **p < .01 *** p <.001, [b]Standard errors in parentheses;
[c]Whites are omitted; [d]No is omitted; [e]No is omitted; [f]No is omitted; [g]Never is omitted: [h]Never is omitted; [i] South is omitted; [j]Urban is omitted.

Table 3. Matching Estimates of Private Shadow Education on SAT Scores

	Private shadow education vs.		
	Anything else	Public resources	None
Unmatched Differences	29.480***[a]	30.170***	28.105***
	(5.743)[b]	(6.075)	(7.166)
Nearest Neighbor Matching (k = 5)	17.431*	19.868**	22.294*
	(6.968)	(7.285)	(10.370)
Kernel Matching	18.667**	19.299**	21.358*
	(6.433)	(6.705)	(9.713)
N	6900	5130	3380

Note: a. $^{\dagger}p < .10$ $*p < .05$ $**p < .01$ $***p < .001$, [b]Standard errors in parentheses;

Table 4. Descriptive Statistics by Strata and Treatment Condition: Private Shadow Education vs. Anything Else

	Stratum 1		Stratum 2		Stratum 3		Stratum 4		Stratum 5		Stratum 6		Stratum 7	
	d=0	*d=1*	*d=0*	*d=1*	*d=0*	*d=1*	*d=0*	*d=1*	*d=0*	*d=1*	*d=0*	*d=1*	*d=0*	*d=1*
Treatment														
Private shadow	.000	1.000	.000	1.000	.000	1.000	.000	1.000	.000	1.000	.000	1.000	.000	1.000
Public shadow	.543	.000	.632	.000	.713	.000	.727	.000	.770	.000	.808	.000	.828	.000
None	.457	.000	.368	.000	.287	.000	.273	.000	.230	.000	.192	.000	.172	.000
Demographic Characteristics														
Male	.553	.557	.485	.481	.464	.453	.415	.507	.407	.453	.399	.368	.241	.264
Race														
White	.876	.899	.766	.709	.644	.627	.646	.545	.497	.544	.406	.456	.138	.226
Black	.021	.000	.059	.055	.112	.134	.103	.150	.178	.153	.267	.190	.241	.283
Asian	.024	.038	.066	.119	.098	.085	.102	.184	.176	.179	.197	.217	.414	.415
Hispanic	.066	.063	.087	.094	.103	.114	.103	.087	.097	.075	.072	.091	.172	.057
Other race	.013	.000	.022	.023	.043	.040	.046	.034	.052	.049	.058	.046	.035	.019
Family backgrounds														
Parents' SES	-.226	-.338	.063	.081	.287	.281	.424	.387	.574	.574	.806	.875	1.314	1.241
Both parents(0/1)	.684	.671	.679	.661	.692	.667	.703	.672	.704	.725	.695	.716	.655	.774
Educational Achievements														
10^{th} grade GPA	3.124	3.031	3.062	3.047	3.052	3.044	3.053	3.073	3.004	3.050	3.015	3.106	3.191	3.217
AP courses	.473	.544	.863	.823	1.020	1.045	1.179	1.406	1.483	1.684	1.649	2.051	3.379	3.038
Remedial class(0/1)														
Yes	.062	.051	.080	.084	.086	.095	.107	.101	.083	.093	.137	.102	.172	.151
No	.896	.911	.856	.864	.861	.840	.836	.865	.858	.850	.800	.815	.724	.736
Missing	.042	.038	.064	.052	.053	.065	.057	.034	.059	.057	.063	.083	.104	.113
Test score(10^{th})	56.135	55.251	54.760	54.592	54.960	53.582	54.548	55.046	54.246	54.987	53.713	54.838	56.162	53.053
Educational Motivation/Aspiration														
Educational expectation	5.801	5.848	6.316	6.348	6.594	6.577	6.629	6.705	6.801	6.850	7.135	7.164	7.741	7.698
HW hours per week(10h) (0/1)	.133	.127	.222	.223	.319	.294	.382	.358	.431	.446	.519	.601	.828	.736
Importance of good grades(1/4)	3.304	3.342	3.483	3.481	3.511	3.582	3.602	3.633	3.670	3.671	3.772	3.791	3.191	3.830
Plans to take the PSAT														
Yes	.573	.582	.717	.742	.827	.806	.841	.860	.881	.858	.875	.907	.897	.887
No	.377	.418	.212	.197	.120	.139	.115	.106	.059	.082	.048	.023	.034	.038
Missing	.050	.000	.071	.061	.053	.055	.044	.034	.060	.060	.077	.070	.069	.075

Seeking college info														
No	.241	.253	.106	.119	.068	.049	.055	.058	.035	.049	.019	.011	.034	.018
Yes	.678	.696	.806	.794	.852	.886	.873	.884	.886	.878	.887	.909	.897	.906
Missing	.081	.051	.088	.087	.080	.065	.072	.058	.079	.073	.094	.080	.069	.076
Parents' Expectation/Involvement														
Educational expectation	5.108	5.215	5.506	5.529	5.709	5.692	5.816	5.850	5.965	5.997	6.116	6.180	6.552	6.397
Discuss SAT prep with parents														
Never	.631	.645	.367	.338	.225	.269	.157	.126	.114	.078	.048	.037	.000	.000
Sometimes	.279	.266	.425	.452	.488	.438	.485	.512	.441	.453	.310	.349	.207	.226
Often	.008	.013	.073	.068	.141	.139	.210	.198	.296	.334	.486	.512	.759	.717
Missing	.082	.076	.135	.142	.146	.154	.148	.164	.149	.135	.156	.102	.035	.057
Discuss courses with parents(1-3)														
Never	.192	.203	.127	.135	.100	.075	.065	.123	.064	.088	.038	.053	.034	.037
Sometimes	.564	.544	.496	.516	.467	.507	.399	.478	.421	.396	.334	.354	.276	.264
Often	.177	.177	.252	.223	.292	.279	.388	.230	.369	.386	.462	.480	.655	.642
Missing	.067	.076	.125	.126	.141	.139	.148	.169	.146	.130	.166	.113	.035	.057
High school Characteristics														
Private (0/1)	.057	.089	.181	.148	.331	.289	.428	.338	.469	.474	.644	.625	.793	.755
Region														
Northeast	.110	.063	.163	.168	.205	.204	.218	.256	.207	.228	.289	.290	.310	.321
Midwest	.480	.494	.335	.303	.255	.254	.236	.174	.209	.153	.135	.096	.069	.057
West	.101	.101	.139	.148	.160	.179	.148	.188	.187	.205	.180	.260	.276	.321
South	.309	.342	.363	.381	.380	.363	.398	.382	.397	.414	.396	.354	.345	.301
Urbanity														
Urban	.137	.202	.253	.222	.298	.278	.389	.338	.501	.477	.575	.539	.620	.604
Suburban	.474	.494	.539	.542	.562	.622	.517	.541	.427	.474	.399	.437	.345	.377
Rural	.389	.304	.208	.236	.140	.100	.094	.121	.072	.049	.026	.024	.035	.019
Outcome														
SAT scores	1008.49	982.15	1002.31	1007.39	1014.09	996.88	1022.67	1037.82	1019.10	1050.18	1032.38	1089.42	1117.93	1146.74

Figure 1: Stratification Multilevel (SM) Method for Heterogeneous Treatment Effects

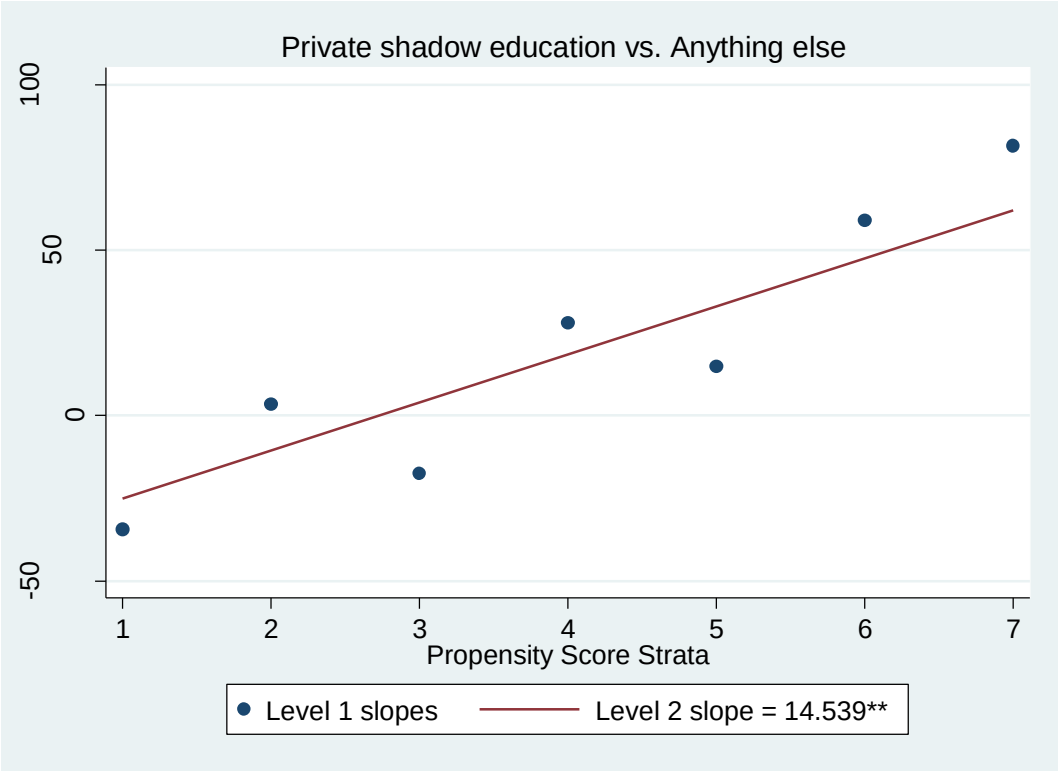


Figure 2: Stratification Multilevel (SM) Method for Heterogeneous Treatment Effects

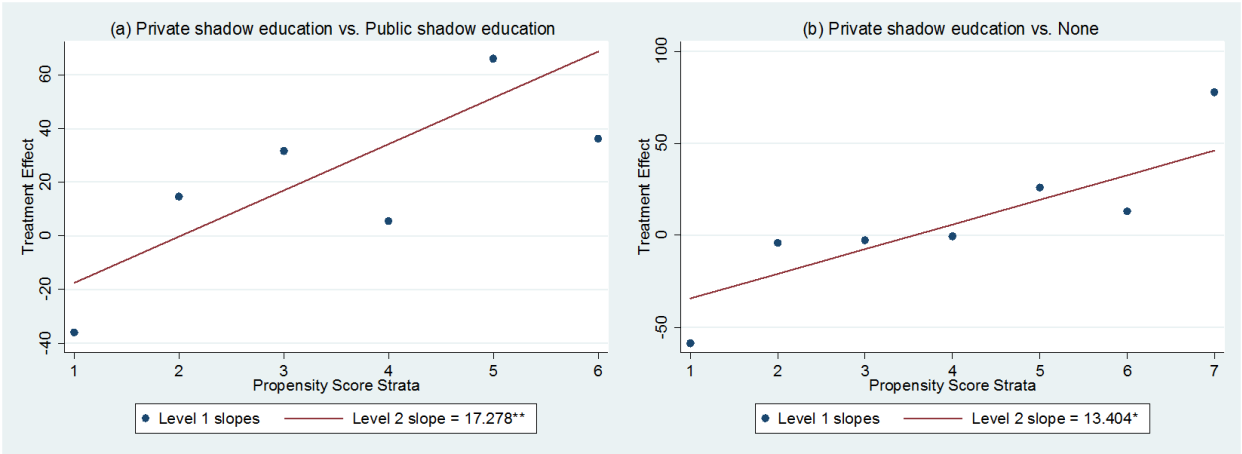
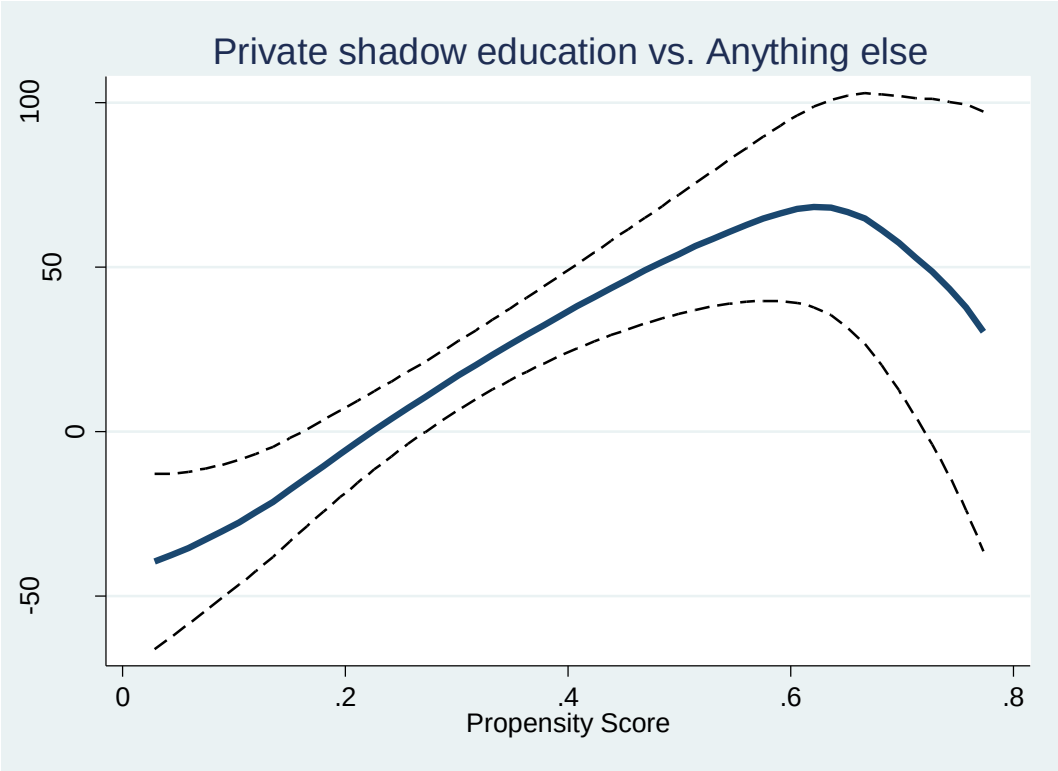
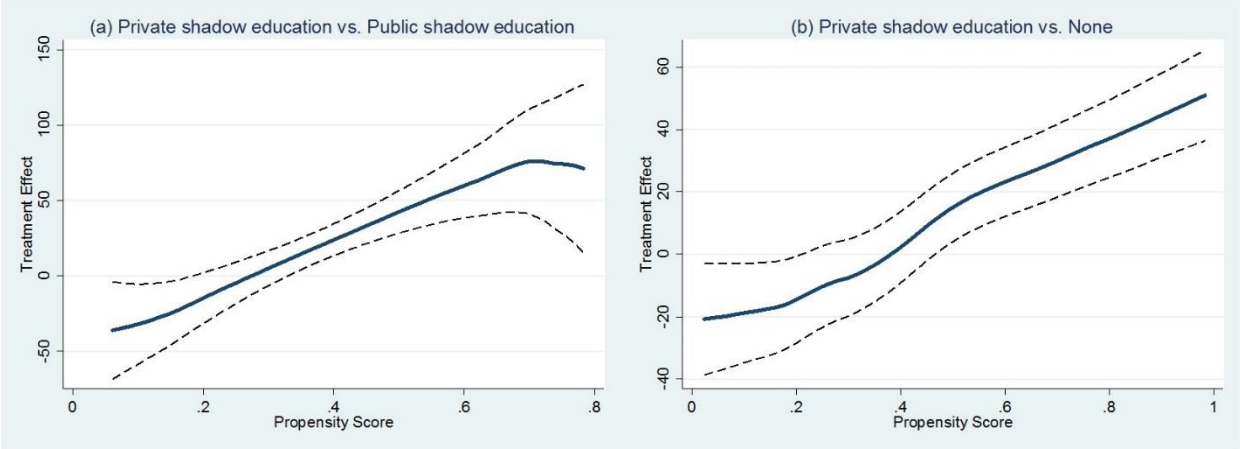


Figure 3: Smoothing-Differencing (SD) Method for Heterogeneous Treatment Effects



Note: Solid line indicates local polynomial fit. Dashed lines indicate 95 percent confidence interval

Figure 4: Smoothing-Differencing (SD) Method for Heterogeneous Treatment Effects



Note: Solid line indicates local polynomial fit. Dashed lines indicate 95 percent confidence interval

Appendix A. Stratification Multilevel (SM) Estimates of Private Shadow Education on SAT Scores

	Private shadow education vs.		
	Anything else	Public shadow Edu	None
Level-1			
Stratum 1	-34.476	-36.086*[a]	-58.547*
	(22.168)[b]	(16.438)	(25.119)
Stratum 2	3.339	14.498	-4.195
	(13.889)	(14.052)	(18.389)
Stratum 3	-17.535	31.685†	-2.787
	(18.383)	(16.740)	(40.041)
Stratum 4	27.995	5.397	-.574
	(21.069)	(21.304)	(31.751)
Stratum 5	14.775	66.102†	25.991
	(20.901)	(34.359)	(26.302)
Stratum 6	58.851**	36.146	12.991
	(22.645)	(65.099)	(25.728)
Stratum 7	81.497		77.844
	(50.932)		(50.834)
Level-2	14.539**	17.278**	13.404*
	(4.613)	(6.506)	(5.399)
N	6900	5130	3380

Note: a. †p<.10 *p<.05 **p<.01 ***p<.001, [b]Standard errors in parentheses

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Chapter 2: College student employment and persistence in postsecondary education

Introduction

The U.S. education system has undergone many positive developments in the last several decades. For example, college enrollment rates among high school graduates have continuously increased and reached about 70 percent in 2009 (National Center for Education Statistics 2010), and implementing campus diversity has become the norm throughout most of the United States (New York Times September 15, 2009). The opportunity to attend college in terms of gender, race, and class has greatly increased relative to several decades ago. However, these positive developments are tempered by an unfavorable but important educational trend: college dropout. The dropout rate has increased, alongside increased enrollment and diversity. The percentage of first-year students at four-year colleges who returned for their second year was 73 percent in 2010 (American College Testing Program (ACT) institutional dataset), and the percentage of four-year college students who earned a degree within five years of entry was 52 percent in 2010. According to the OECD Directorate for Education, the United States now has the highest college dropout rate in the industrialized world (Symonds, Schwartz and Ferguson 2011).

It is widely acknowledged that college completion is much more important now than it once was (Hebel 2000). A highly industrialized and globalized economy such as the United States demands skilled workers, and a college degree is considered to be minimum requirement for most well-paying jobs in the current labor market. Thus, individuals who do not complete a postsecondary credential do not have access to certain higher paying jobs in the labor market, which is a difficult barrier to overcome. Prior research has identified the majority of college dropouts are those students who are socially and economically disadvantaged (Bean 1985;

Braxton 1988; Braxton 2000; Pascarella and Chapman 1983; Spady 1970; Stage 1988; Stage and Hossler 1989); this has significant implications for educational stratification. Even though the opportunity to attend college has been expanded and the importance of a college degree has increased, college completion has remained a very challenging goal for disadvantaged students. Thus, a better understanding of the mechanism of college dropout is crucial to any thorough analysis of inequality in postsecondary education.

There are many factors that can contribute to an individual's decision to drop out; this chapter focuses on the effect of student employment on dropout. Student employment is in many ways one of the most important activities that affect students' academic performance and decisions while in college (Bozick 2007; Iwai and Churchill 1982; Metzner and Bean 1987; Perna 2010; Riggert et al. 2006; Roksa and Velez 2010; Tinto 1975; Tinto 1993). With increasing educational costs and an unfavorable financial aid system, student employment has become a common option and sometimes the only option available to many less affluent students to meet educational costs. Even for affluent students, job experience during postsecondary education is considered to be an important factor in their successful transition to the labor market after graduation. Therefore, as Riggert et al. (2006:64) notes, "Student employment... is an educational fact of life." Given the prevalence of student employment and the use of significant time and energy that employment often entails, it is quite important to ask how those activities affect educational persistence.

Although the increasing rate of college student employment has garnered some media attention in recent years (e.g., New York Times May 19, 2011), the effects of college student employment on dropout have received far less scholarly attention than high school student employment (Riggert et al. 2006; Bozick 2007). The findings gained from studies on high school student employment are not easily applicable to the college context, and postsecondary

student employment differs from that of high school student employment in several important ways. First, college students have much more flexibility in managing their time for work and study. They need to spend less time in the classroom and have a variety of options by which to adjust their academic schedule. That is, unlike high school students, college students have more agency due to the educational organizational structure. Second, while high school is mandatory, college students are already selected individuals in terms of academic motivation and aspiration. Third, organizational and life-course conditions such as school tuition and living arrangements differ greatly from those of high school. Along these lines, the effects of student employment during postsecondary education may show somewhat different patterns from those of high school student employment. In summary, further research is needed on the impact of student employment in college.

In this chapter, I aim to examine how college students' employment affects, dropout and how this trend influences educational stratification in the United States. I build on prior studies of student employment on educational persistence, both in high school and college, by addressing several analytical issues. First, I examine the relationship between college student employment and dropout using propensity score matching to address concerns over pretreatment heterogeneity. Many prior studies have pointed out that those who engage in student employment are different from those who do not in terms of social background (National Research Council 1998; Entwisle, Alexander and Olson 2000; Schoenhals, Tienda and Schneider 1998). If this pretreatment heterogeneity affects both selection into college employment and the dropout decision, the estimated effects of student employment may be biased. Therefore, careful consideration should be given to students' preexisting backgrounds to accurately estimate the impact of student employment on the dropout decision, and

propensity score matching can address this issue more effectively than conventional OLS regression.

Second, student employment has quite complex dimensions to define in terms of its quantity, timing, types, purpose and so forth. This treatment heterogeneity complicates the implications of student employment on educational outcomes. This study defines student employment as work that a full-time student engages in outside of school, and particularly focuses on examining how work intensity affects the dropout decision differently. That is, rather than analyzing a single counterfactual condition such as whether or not a student works, this study assumes complex counterfactual scenarios (intense work [20 hours or more] vs. moderate work [less than 20 hours] vs. no work), and aims to explore how the effect of employment on dropout varies by work intensity. In terms of timing, I examine first-year students. The first year is the most critical period in Tinto's perspective (Tinto 1993), as it affects second year attrition. I also examine bachelor's degree completion within 6 years after first enrolling. By utilizing these two outcome variables, I can examine the short- and long-term impacts of first-year employment on college persistence.

Lastly, along with estimating the average effects of student employment on the dropout decision, I examine how effects of work vary by individual propensity to work. Understanding effect heterogeneity is particularly important in considering treatment heterogeneity. That is, the quantity, purpose and types of job differ significantly according to students' social backgrounds and thus assuming that the effect of work is same for every student is unreasonable. Students' propensity to work is an effective measure that reflects individual social positions. For example, those who are more likely participate in work tend to come from disadvantaged families, who often work to pay their college expenses rather than for other reasons. On the other hand, those who are less likely to engage in work come from more

advantaged families and are more likely to work to prepare for their future careers, rather than to pay for college expenses. Therefore, by examining treatment effect heterogeneity, this study sheds light on how the effects of student employment vary by students' social positions, which can help to identify those who are most penalized by participating in work during college.

To examine these questions, I analyze data from the National Longitudinal Survey of Youth 1997 by using propensity score matching and the stratification-multilevel and smoothing-differencing methods (Xie, Brand, and Jann 2012). This chapter contributes to an understanding of persistence in postsecondary education by examining the effect of student employment on dropout, focusing on causal inference and treatment effect heterogeneity. This study finds that engaging in intense work has deleterious effects on first-year retention and on graduation within six years. However, the causal effect of intense work on college persistence significantly varies by likelihood of participation in intense work. The data show that those who are least likely to engage in intense work are most penalized from it. In other words, student employment is less harmful to those from most disadvantaged social backgrounds—in fact, student employment helps this population to persist and eventually achieve a bachelor's degree. As these findings indicate that the effects of student employment differ according to a student's socioeconomic status, policymakers should seek to establish policies regarding student employment that differ according to a given population's likelihood of participation in work.

Background

Factors Influencing Dropout

Since attrition represents a significant cost not only to individuals but also to institutions and society, many scholars and policymakers have sought to reduce the attrition rate. Past

studies, including Tinto's (1993) seminal work (1993), have identified many factors and mechanisms of dropout. The factors influencing dropout behavior include gender (Pascarella, Duby and Iverson 1983; Spady 1971), minority status (Braxton 1988; Pascarella and Chapman 1983; Stage 1988; Stage and Hossler 1989), students' socioeconomic status (Braxton, Brier and Hossler 1988; Pascarella and Chapman 1983; Stage and Hossler 1989), parents' educational background (Pascarella and Chapman 1983; Pascarella, Terenzini and Hibel 1978; Stage 1988), students' educational aspirations (Bean 1982; Pascarella, Terenzini and Hibel 1978), college GPA (Bean 1982; Bean 1983; Cabrera et al. 1992), and institutional characteristics (Chaney et al. 1991; Mallette and Cabrera 1991; Pascarella and Chapman 1983). Recently, scholars have been paying more attention to the effects of financial aid (Alon 2011; DesJardins, Ahlburg and McCall 1999; Hochstein and Butler 1983; Stampen and Cabrera 1986) and student employment status (Iwai and Churchill 1982; Metzner and Bean 1987). The factors identified in the research are highly correlated with one another and intensify or sometimes offset each other. Many of the identified contributing factors are closely related to individuals' economic backgrounds. The cost-benefit approach, which depends on an individual's economic constraints, is a key mechanism in determining persistence in postsecondary education.

Economic Constraints of Postsecondary Education

College education is expensive and the costs are continuously rising. Between the 1990s and 2000s, public college costs rose 22 percent increase and private college costs rose 27 percent (Riggert et al. 2006; Snyder and Hoffman 2003). Despite these rapid increases in college expenses, enrollment at postsecondary institutions has grown continuously over the past several decades (Riggert et al. 2006; National Center for Education and Science). Much

of this increase in postsecondary enrollment can be attributed to increased enrollment from low-income and socially disadvantaged families (Planty, Bozick and Ingels 2006). Increased enrollment among underrepresented populations, along with rising costs, means that many of these new students have had to find ways to cover their college costs, in contrast to students from higher socioeconomic backgrounds, whose parents often subsidize most of their children's college expenses. Thus, even though the expansion of educational opportunities has enabled many more disadvantaged students access to higher education than in the past, this expanded opportunity has not been accompanied by sufficient means for them to graduate. Government-sponsored financial aid programs are one of the many options for financing individual education costs, but many low-income students hesitate to enter into debt (Bozick 2007). Economically, the key question involved in the decision to drop out is "whether leaving will put students financially ahead of where they'll be after amassing four years of student loan debt in a lukewarm job market" (Reuters Mar 27, 2012). Since disadvantaged students may expect, perhaps mistakenly (Brand and Xie 2010), lower returns on their education investments, they must weigh the benefits of improved job prospects upon graduation against the considerable costs of incurring increasing debt over the course of their enrollment (Bozick 2007). Also, low-income students often believe that financial aid cannot fully cover the college cost and thus, many who qualify actually do not apply (Bozick 2007; Kane 1999; Orfield 1992).

Student Employment in Postsecondary Education

Given these economic constraints, many disadvantaged students enter the labor market to defray the cost of college while they are pursuing postsecondary education. Rising college costs has coincided with increasing student employment (Hexter 1990; O'Brien 1993; Riggert et al. 2006). From the 1960s, student employment has steadily risen, and today, approximately

80 percent of undergraduates work during their postsecondary education (NCES 1988). Using data from the Bureau of Labor Statistics from 1998, about 55.6 percent of students between ages 16 and 24 identified themselves as being employed (Bureau of Labor Statistics 1998). In addition to more students working, the number of hours spent in the labor market also has been on the rise (Roksa 2011; Scott-Clayton 2007). It is clear that student employment has become a major part of many students' lives.

Even though the overall trend of student employment has been on the rise, the patterns of work engagements are complex and differ by social class (Cooksey and Rindfuss 2001; Roksa 2009). For example, individual students' motivation to seek employment varies by family background. While the least affluent students work to pay for their college tuition, some students work to earn spending money during college life or to establish job experience that will someday go on a résumé**.** Also, the intensity of work varies by social class. Some students work over 35 hours per week while others work only a few hours. Given these different patterns of work engagement, we can expect that the relationship between employment and dropout is quite complex and also speculate that the effect of student employment on the dropout rate is heterogeneous by family background.

Overall, given the economic conditions of postsecondary education, student employment is a very common extra-curricular activity for most college students and it is a crucial part of college life. In many ways, it affects students' academic commitment, and plays a decisive role in their overall performance and persistence in postsecondary education. However, much of the debate surrounding dropout and degree completion in postsecondary education has focused on the effect of financial aid programs, and far less attention has been paid to how students actually manage their economic burden while enrolled. Thus, in this chapter, I examine how student employment affects the decision to drop out in postsecondary

education considering its complex patterns of work engagement and individual's family background.

Employment and Persistence – Three General Perspectives

The relationship between student employment and schooling has been examined from three general perspectives. These three perspectives are closely related to in terms of theoretical conceptualization and methodological approaches to the student employment issue.

The first perspective maintains that student employment has a direct impact on both academic performance and likelihood of school completion. This view is called a "zero-sum" perspective. The key point of this view is that student employment imposes constraints on the use of time (Bozick 2007; Lee and Staff 2007). Since the time that a student can utilize is limited, if students use more time to work, they have less time for school-related activities such as studying (Bozick 2007; Lee and Staff 2007; Schoenhals, Tienda and Schneider 1998). Thus, this perspective assumes that time at work generally has a negative effect on school performance and completion. However, recent studies have found that the relationship between work intensity and academic outcomes is not linear and that even moderate participation in the labor market can have positive consequences on college achievement. These studies concluded that only intensive participation is deleterious to school performance and completion (Bozick 2007; D'amico 1984; Marsh 1991; Orszag, Orszag and Whitmore 2001). Despite their complex and at times contradictory results, studies from this first perspective commonly assume that student employment has a direct effect on individual students' schooling.

The second perspective argues that the observed relationship between student employment and school performance only reflects preexisting heterogeneity between students in terms of their family background, academic ability, motivation, aspirations and so on. This

perspective assumes that if we consider the selection process that determines who enters the student workforce, the relationship between employment and school performance is not significant (Schoenhals, Tienda and Schneider 1998; Lee and Staff 2007). The key point of this view is that, contrary to the zero-sum perspective, student employment is the effect, rather than the cause, of preexisting differences between students. For example, the least affluent high school student tends to spend the longest time working and have the highest risk of dropout (National Research Council 1998). Race, prior grades, and educational aspirations also affect high school students' work intensity and school performance (Entwisle, Alexander and Olson 2000; Schoenhals, Tienda and Schneider 1998). Therefore, the actual causes of poor academic performance or a high likelihood of school dropout lie in students' preexisting backgrounds, their characteristics before entering the college. According to this perspective, the crucial point of analysis is controlling for preexisting heterogeneity between students. Unless scholars can fully control for various family and academic backgrounds that might affect students' academic performance, studies may produce incorrect conclusions about the effect of student employment on dropout trends. Several prior studies extensively dealt with this issue in the study of high school employment and academic performance using various advanced statistical methods (Lee and Staff 2007). However, only a few studies have considered this preexisting heterogeneity in examining college student employment. Thus, a key research goal of this study is to examine the causal relationship between college student employment and dropout while taking into account preexisting heterogeneity.

The third perspective asserts that the effect of student employment on school performance is conditional on students' preexisting backgrounds. This view assumes that student work has a direct effect on school performance but that its effect is not homogeneous for every student. Prior studies have shown evidence of the conditional effects of student

employment on academic performance, such as an individual's demographic and socioeconomic background. For example, intensive work in the 10th grade has deleterious effects only for white male students, and only for female students in the 11th grade (D'Amico 1984). Individual motivation to work also differentiated the effects of student employment. Intensive work does not have negative consequences for those who were working to save money for college and even appears to benefit economically disadvantaged students (Entwisle, Alexander and Olson 2005; Marsh 1991). Therefore, this perspective emphasizes that interpreting the average effects of student employment limits the relevance and significance of student employment on college life.

I examine these three perspectives in this chapter. If the zero-sum view is correct, then intensive college employment has a direct and deleterious effect on college dropout rates. If the preexisting heterogeneity perspective is correct, then student employment does not have a direct impact on the decision to drop out of college and is only the result of selection bias in the process of participating in the student labor market. Lastly, if the heterogeneity perspective is correct, then student employment does has a direct effect on the decision to drop out, but this effect is heterogeneous depending on an individual's socioeconomic background. In the following section, I discuss analytical strategies to examine these three perspectives in detail.

Analytical Strategy: Methods, Data, and Measurement

Methods

In this study, I use propensity score matching, stratification-multilevel (SM) and smoothing-differencing (SD) methods. The analytical strategy is similar to that of chapter 1 in that I use a four-step methodological approach. First, using a rich array of personal and academic data, I estimate individuals' propensity scores for participation in the student labor

market (treatment condition). Since I use complex counterfactuals states, I define three sets of counterfactual scenarios. The key treatment condition is intensive involvement in the student labor market. Thus, I compare intensive work (20 hours or more) to (1) anything else (moderate work and no work), (2) moderate work (less than 20 hours), and (3) no work.

Second, I examine the average treatment effect on the treated (TT) under three counterfactual scenarios. These results could examine whether or not the zero-sum perspective is more accurate than the preexisting heterogeneity perspective. I also examine average effects of intense work against three counterfactual conditions without matching and compare the results to those of propensity score matching approach.

Third, based on estimated propensity scores, I estimate propensity score stratum-specific employment effects on college dropout using logistic regression (level-1) and summarize the trends across strata using a hierarchical linear model (level-2). This stratification-multilevel model assumes treatment effect heterogeneity and thus provides a linear trend in the variation of effects by propensity strata (Brand and Xie 2010; Brand and Simon-Thomas 2013; Brand, Pfeffer, and Goldrick-Rab [working paper]).

Then, using the smoothing-differencing method (SD), I test for sensitivity to the parametric and strata-specific homogeneity assumptions imposed in the stratification-multilevel method (Xie, Brand, and Jann [Forthcoming]). The smoothing-differencing method fits two separate nonparametric regressions of the dependent variable on the propensity score and takes the difference between the treated and untreated groups. While the stratification-multilevel model summarizes linear trends of variation in effects, the smoothing-differencing model can depict curvatures in the trends in effects. In sum, by using three methods--propensity score matching, stratification-multilevel and smoothing-differencing--I examine the average

effects of college student employment on dropout, as well as the pattern of the treatment effect heterogeneity of college employment.

Data

In this analysis, I use the National Longitudinal Survey of Youth 1997 (NLSY97). NLSY97 tracks a nationally representative sample of approximately 9,000 youths who were 12 to 16 years old as of December 31, 1996, with annual interviews starting in 1997. NLSY97 contains a broad array of information, including social and family background, schooling, demographic transitions, as well as labor market participation and outcomes. Although employment and labor market outcomes are the focus of the NLSY97, it also covers detailed information about the transition from high school to postsecondary education and from postsecondary education to the labor market. In terms of education, NLSY97 includes all schools that an individual attended since the last interview, the level and type of school, the dates of the respondent's enrollment, and characteristics of the school. Since persistence after the first year of college and completion of a bachelor's degree are the key interests in this study, this extensive information on individuals' time in high school helps to estimate the individual's propensity to participate in the labor market in their first year of college. The analysis that follows uses data collected through Round 15 of the survey, at which time the respondents ranged in age from 26 to 32 years. Among 8,984 individuals initially interviewed in round 1, about 83 percent (7,423) of the round 1 sample were interviewed in round 15. I restrict the sample to those who ever attended a four year college by 2005 and those who do not have any missing data on treatment (employment history) and outcome variables (college history). The total sample includes 2,614 individuals, but the final sample differs for each counterfactual model.

Measurement

My treatment variables are employment status outside of school in the first year. In this study, I only focus on paid employment outside of school. I calculate the average work intensity during the first year and divide the employment into three categories: No employment, moderate employment (up to 20 hours per week), and intensive employment (over 20 hours per week). These categories regarding work intensity have been used in several prior studies, which allows for a comparison of this study's findings with prior studies.

My two outcome variables are whether or not a student completed the first year of college and attained a bachelor's degree within six years after college entrance. Many prior studies have pointed out that first-year completion is the most crucial factor in college enrollment attrition (Aughinbaugh and Gardecki 2008; Tinto 1993). Each school a respondent attended has an identification code in the NLSY97 and thus, I examine whether the respondents remained at their first college for at least 12 months. I did not include students who transferred into another four-year college for their second year as dropout cases. I used bachelor's degree completion within six years as another outcome variable to examine how the first year of employment affects students' later educational attainment.

To estimate an individual's propensity for employment, I use a rich array of background factors, including demographic, socioeconomic, educational, institutional, and college financial conditions. Aside from some demographic variables, most of the variables are utilized from data one year before respondent attends college. If the value is missing for a given year, I used data from the previous year. Then, remaining missing data is imputed based on all other variables in the model.

1) Demographic characteristics: Gender is a dummy variable (male = 1). The race variable includes white [reference category], black and Hispanic. Total family size is a continuous variable and family composition is a dichotomous variable where living with both biological parents is 1 and any other configuration is 0.
2) Socioeconomic characteristics: family income is a continuous variable that indicates annual household income in given year. Parents' education is a continuous variable and it is an average value of both parents' education.
3) Educational characteristics: GPA is a continuous variable, and the NLSY provides credit weighted overall high school GPA. I also include ASVAB math verbal score as a continuous variable to capture students' cognitive abilities. Lastly, total hours worked during age 14-19 is also included for educational characteristics.
4) Institutional characteristics: Three variables are used for measuring college characteristics which include urbanity (1 = urban, 0 = rural) and private or public school [reference category], and school region (Northeast [reference category], North central, South and West).
5) The student's financial situation: I utilize three variables to measure a student's financial condition regarding education. All three measures are dummy variables where 1 indicates that someone received financial aid and 0 indicates that they did not. The three variables are loans, fellowships and family support.

Results

Descriptive statistics

<Table 1 about here>

Table 1 shows descriptive statistics by student employment condition. The overall trend suggests that those who engage in intense work during the first year have the most disadvantaged socioeconomic backgrounds compared to the moderate and no-work group. For example, annual family income was about $84,418.32 for the no-work group, and $67,805.82 for the intense work group. Parents' education followed a similar trend. Parents' average years of schooling for no-work group was about 14.426 years, and 13.598 years for the intense work group. The intense work group also worked most during ages 14 to 19. Also, the percentage of those who received family support is the smallest for the intense work group among three groups, as well as the percentage of living with both parent. In sum, it is apparent that socioeconomic background is negatively associated with work intensity and that those who engage in intense work come from most disadvantaged families.

While there are significant differences between the intense work group and the other two groups, the moderate and no-work group have somewhat mixed trends along several dimensions. For example, while the no-work group comprised individuals from more advantaged socioeconomic backgrounds than the moderate group according to indicators such as family income, parents' education, working hours during ages 14-19 and so forth, other factors including family composition, educational backgrounds and college financial condition indicate the reverse. For example, the moderate group had most advantaged educational backgrounds such as high school GPA and ASVAB test scores. The moderate group also has the lowest dropout rate and the highest rate of degree completion among three groups. This group also received the most scholarships and loan support during college. These trends coincide with prior studies that moderate participation in work has positive impact on educational outcomes (Bozick 2007; D'amico 1984; Marsh 1991; Orszag, Orszag and Whitmore 2001). In sum, the descriptive statistics suggest that while those who engage in

intense work have clearly disadvantaged socioeconomic, educational, and financial conditions, the moderate and no-work groups are relatively similar to each other.

Determinants of participation in student employment

To estimate the average and heterogeneous effects of intense work, I first estimate the propensity scores for a student engaging in intense work compared to three counterfactuals using probit regression. Table 2 shows the results of probit regression estimates.

<Table 2 about here>

The overall results of three models are similar. In terms of socioeconomic variables, both family income and parents' education negatively affected the probability of engaging in intense work in all three models. Family income was statistically significant in intense vs. anything else and intense vs. none; however, parents' education was not significant in every model. This suggests that family income is a major factor that affects individual propensity to engage in intense work.

Every educational background variable was statistically significant in all three models. While high school GPA and ASVAB test scores were negatively associated with engaging in intense work, hours worked during ages 14 to 19 was positively associated with intense work. This result clearly indicates that those who engaged in intense work were less likely than the other groups to have advantaged academic backgrounds.

In terms of institutional characteristics and financial condition of college, only public school had a statistically significant effect—those engaged in intense work were more likely to attend public colleges. Although all three financial aid variables negatively affected the probability of engaging in intense work, only loans had a statistically significant effect in every model. Furthermore, compared to scholarships and family support, loans had a greater effect

on selection into intense work. This result suggests that loans are an important financial aid mechanism that determines students' employment during college.

Lastly, among the demographic variables, family composition had a significant effect in every model. That is, the intense work group was less likely to be living with both biological parents. Family size was only significant in the intense vs no-work model: it had a positive effect on engaging in intense work compared to the no-work model.

In sum, the intense group was less likely have advantaged socioeconomic and educational backgrounds compared to the moderate and none groups. These indicate that several key backgrounds factors such as family income, family composition, prior academic achievements, and loan acceptance are major determinants for engaging in intense work during college.

Average effects of intense work

<Table 3 about here>

Based on estimated propensity scores, I examine the average treatment effect on the treated. Table 3 shows the results of matched and unmatched estimates of engaging in intense work along three counterfactual models. In terms of 2nd year attrition, intense work had a deleterious effects on 2nd year retention in both the matching and unmatched models and in every counterfactual scenario. For example, unmatched estimates show that intensive work increases the dropout risk about 2.5 times ($e^{.905} = 2.472$) compared to the moderate work group and 1.8 times ($e^{.561} = 1.752$) for the no-work group. In comparison to the estimates of unmatched differences, the matching model reduced estimates in every counterfactual scenarios. For example, intensive work increased dropout risk about 1.8 times ($e^{.593} = 1.809$) for the moderate work group and 1.5 times ($e^{.414} = 1.512$) for the no-work group.

Engaging in intense work also had a significant effect on degree completion in every model. Those who engaged in intensive work were less likely to complete a bachelor's degree within 6 years compared to the moderate and no-work groups. According to the unmatched model, intensive work decreased the probability of bachelor's degree completion by 49 percent compared to the moderate group and 45 percent compared to the no-work group. The matching estimates were slightly lower than the unmatched estimates. Engaging in intensive work decreased the probability of degree completion by 45 percent compared to the moderate group and 44 percent compared to the no-work group.

The overall trends indicate that engaging in intensive work has a significant negative effect on 2nd year retention and degree completion. That is, student employment has a causal effects on persistence in college, and seems to support the zero-sum perspective over the preexisting heterogeneity perspective. However, the matched estimates were relatively smaller than those of the unmatched model, which suggest some evidence of pretreatment heterogeneity issues that drive selection into treatment. In addition, considering that the estimates were larger for "intense vs moderate" model than for the "intense vs none" model, it appears that the deleterious effects of intense work do not simply result from constraints on the use of time, which is a key argument of the zero-sum perspective. If time constraints were the key factor in the negative effects of intense work, the effects of intense work would be greater in the intense vs. none model. Thus, this result suggest that how intensive student employment affects college persistence in more ways than just reducing the amount of available time to devote to schoolwork.

Heterogeneous effects of intense work

<Table 4 about here>

Next, to examine the heterogeneous effects of intense work based on the propensity to engage in intense work, I construct balanced propensity score stratum based on estimated propensity scores. Table 4 summarizes the individual characteristics for those who did or did not engage in intense work by propensity stratum (intense vs. anything else model). This result confirms again that those who are more likely engage in intense work have disadvantaged social positions. For example, the average family income for highest stratum (i.e., those most likely to engage in intense work) was about $60,000, and $86,000 for the lowest stratum (i.e., those least likely to engage in intense work). Parents' average education was about 13 years for the highest stratum and 15 years for the lowest stratum. Educational backgrounds also indicate that those with a high propensity to engage in intense work had lower prior academic achievements and worked longer hours during 14th to 19 years old than students in the lowest stratum. In terms of institutional characteristics and financial aid, while the percentage of attending public school increased as propensity score strata increased, the likelihood of receiving any financial aid decreased as propensity score strata increased. This overall trend is very similar to the "intense vs moderate" and "intense vs. none" models.

<Table 5 and Figure 1 about here>

Based on propensity score strata, I estimate treatment effect heterogeneity using the stratification-multilevel method. Within stratum–specific treatment effects are estimated by logit model (Level-1), then the linear trends of treatment effects are summarized using variance weighted least squares regression (Level-2). Figure 1 shows all six graphs that include 2nd year attrition and bachelor's degree completion models, and table 5 presents every coefficient and significance for the level-1 and level-2 slopes for all six counterfactual scenarios.

Second year attrition and bachelor's degree completion shows opposite trends in that while the 2nd year attrition model depicts a decreasing pattern across propensity strata, the

bachelor's degree completion model shows an increasing pattern. These results uniformly indicate that those who were least likely to engage in intense work faced the most negative consequences from it. That is, the effect of intense work were most deleterious for students from the most advantaged social backgrounds and the least deleterious for those from the most disadvantaged social backgrounds. For example, in figure 1-(a), the level 2 slope for intense vs. anything else model of 2nd year attrition was -.165, and the coefficient was statistically significant at the .05 alpha level. This indicates that a unit change in stratum rank was associated with a -.165 reduction in the treatment effects, which suggests that the risk of dropout by engaging in intensive work decreased as propensity score increased. This decreasing pattern is similarly observed in the "intense vs. moderate" and "intense vs. none" models. The level 2 slope of "intense vs. moderate" was -.069 and was statistically significant at the .10 level, and the level 2 slope of "intense vs none" model was -.361 and was statistically significant at the .01 level. In addition to these negative level 2 slopes, table 5 shows that the coefficients of the highest stratum in "intense vs. anything else" and "intense vs. none" were -.464 and -.546. These negative coefficients suggest a 37 percent decrease in the expected odds of dropout ($e^{-.464}$) in "intense vs. anything else" and a 42 percent ($e^{-.546}$) in the "intense vs. none" model. That is, engaging in intense work was positively related to college persistence for the most disadvantaged students. The negative coefficients are only observed in those two stratum, and the coefficient of highest stratum in "intense vs. moderate" was .409 ($e^{.409} = 1.505$).

The level-2 slopes of the bachelor's degree completion model were positive in all three counterfactual scenarios. This increasing pattern suggests that engaging in intense work decreased the probability of completing bachelor's degree within 6 year most for students in the lowest propensity strata and least for students in the highest propensity strata. For example, the level 2 slope of "intense vs. moderate" model was .147 and it was statistically significant

at the .1 alpha level. Thus, as propensity stratum increased, the deleterious effects of intense work on degree completion decreased. In fact, the coefficient of highest stratum in the "intense vs moderate" model was -.036, which indicates only a 3.5 percent decrease in the expected odds of bachelor's degree completion ($e^{-.036}$). Compared to the coefficients in the lowest stratum ($e^{-.766} = .465$), the effects of intense work of highest stratum were relatively very small. Although the other two models, "intense vs anything else" and "intense vs none", also clearly depicted an increasing pattern, the level 2 slopes were not statistically significant and require further sensitivity tests.

Auxiliary analysis

<Figure 2 about here>

Lastly, I conduct sensitivity tests using a smoothing-differencing method. Figure 2 shows the result of smoothing-differencing method for each of the six counterfactual scenarios. The overall trend the smoothing-differencing model confirms the results of stratification-multilevel method. That is, the effect of intense work on dropout decreased across propensity scores and increased for bachelor's degree completion.

In terms of the 2nd year attrition model, in figures 2-(a) and 2-(b), I find gradually decreasing curves from the lowest propensity to the highest in the "intense vs. anything else" and "intense vs none" models. The notable pattern is that the effects of intense work on dropout were negative for those in a propensity distribution of about .9 and above. This pattern is very similar to that of the stratification-multilevel method. The effects of intense work on dropout decreased as the propensity to engage in intense work increased, and it even had a positive effect on persistence in first year for those most likely participate in intense work. Figure 2-(b) shows a somewhat different pattern. In the "intense vs. moderate" model, the lowest propensity

distribution had a treatment effect that was a little higher than .1, which decreased slightly as the propensity distribution went from 0 to .2. For those in the middle range of propensity scores, the treatment effect of .1 remained relatively constant, then sharply decreased to 0 as it approached the highest propensity distribution. This suggests that unlike the findings from the stratification-multilevel method, a decreasing pattern is only observed in the lowest and highest propensity distributions, and the treatment effect is close to zero at the highest propensity distribution. In terms of bachelor's degree completion, although the level-2 slope of stratification-multilevel method was only statistically significant in the "intense vs moderate" model, all three graphs show gradually increasing curves from the lowest to highest propensity scores and positive effects for the high propensity students. The curves very gently increase from the lowest to about .8 propensity scores, then it increases relatively rapidly after .8 to the highest propensity distribution.

In sum, the results of the smoothing-differencing method are similar to those of the stratification-multilevel method. One notable pattern is that those who are most likely engage in intense work actually benefit from intense work to persist their first year in college and complete bachelor's degree within six years.

To understand how financial support changes the patterns of treatment effects heterogeneity, I conduct an additional analysis to examine heterogeneous treatment effects by loan acceptance. From the probit regressions, loan receipt is the most significant predictor for engaging in intense work among the three financial aid mechanisms. Figure 3 shows the results of stratification-multilevel and smoothing-differencing methods by loan acceptance.

<Figure 3>

While the level 2 slope for those who did not receive any loans is -.190 and it is statically significant, the level 2 slope for those who received loan is -.079 and it is not statically

significant. The smoothing-differencing method also shows a similar trend that the treatment effects for those who do not receive loans are consistently and rapidly decreasing from the lowest to highest propensity scores, the treatment effects are relatively unchanged across the propensity scores for those who receive loan. This results suggest that when sufficient financial support is provided, the beneficial effects of engagement in intense work for disadvantaged students disappears. This indicates that the heterogeneous effects of intense work on college persistence largely due to different financial conditions and purpose of work between low and high propensity students.

Discussion and Conclusion

This chapter explores how student employment affects dropout rates and bachelor's degree completion, and how these effects differ by the likelihood that an individual will participate in the student labor market. These two questions arise from concerns of stratification, and those seeking to address issues such as to how marginalized students manage their disadvantaged economic situation and bring about positive results from their time in college. The key findings of this study are as follows. First, engaging in intense work has significant deleterious effects on both 2nd year retention and degree completion within six years. The magnitude of the average effects are larger for the "intense vs. moderate" than the "intense vs. none" model, and this provides some evidence that the effects of student employment vary by work intensity. Second, the effects of intense work significantly vary by propensity to participate in intense work, and the patterns of treatment effect heterogeneity suggest that those who are least likely to engage in intense work are penalized most from it. This means that engaging in intense work has more negative impacts on students from more advantaged social

backgrounds, while its effects are very small or even positive for students from the most disadvantaged social backgrounds.

There are two possible explanations that explain the patterns of treatment effect heterogeneity observed in this study. First, different counterfactuals between low- and high propensity students may influence this pattern. High propensity students who do not engage in intense work already have extremely high dropout rates, and this can mask the effects of intense work on dropout. That is, regardless of work engagement, students from poor social backgrounds often drop out for other reasons. In contrast, dropout for low propensity students is relatively rare, and thus the impact of intense work on dropout is relatively larger for high propensity students. Second, another key reason that high propensity intense work-students are penalized the least from or even benefit from engaging in intense work could be attributed to their poor economic backgrounds. That is, without engaging in intense work during college, they would not be able to pay their tuition or living expenses. Considering that low- and high-propensity students have vastly different financial situations, it is reasonable to expect that the purpose of work is significantly different between those two groups. Therefore, different financial conditions and purpose of work between low and high propensity students may affect the observed patterns of treatment effect heterogeneity.

Two key implications can be discussed from these results. First, for advantaged students, engagement in intense work should be carefully considered. Although job experience is considered to be one of the most important requirements for the labor market entrance, it can also that threaten completion of a bachelor's degree. Therefore, unless it is necessary for financial purposes for college retention, advantaged students should carefully consider their employment options when deciding to participate in student employment.

Second, although disadvantaged students are less penalized form intense work or sometimes benefit from it, engagement in intense work is still problematic for several reasons. For example, spending a great amount of time on work reduces time for school, which can contribute to bad grades or a lack of socialization in college. Considering that one's grades can also affect successful transition from college to work, this could reduce returns to education for disadvantaged students, even if they do complete a bachelor's degree. Therefore, providing sufficient financial aid to disadvantaged students is still an important task for reducing educational inequality in the United States.

In conclusion, this study deepens our understanding of student employment by demonstrating that the effect of employment on dropout is heterogeneous depending on not only work intensity but also on the individual's propensity to work outside of school. Given the extreme prevalence of student employment in the current educational context, the findings of this study suggest that the effort to reduce the deleterious effects of intense work should be practiced with careful consideration on sub-populations that have different reasons for and effects of student employment.

Table 1. Descriptive Statistics by Student Employment: National Longitudinal Survey of Youth 1997 (N=2614)

	Full sample	Intense	Moderate	None
Demographic Characteristics				
Male	.448	.440	.388	.529
	(.497)	(.497)	(.488)	(.499)
White	.661	.643	.687	.646
	(.473)	(.480)	(.464)	(.479)
Black	.213	.198	.192	.251
	(.410)	(.399)	(.394)	(.434)
Hispanic	.125	.159	.121	.103
	(.331)	(.366)	(.326)	(.305)
Family size	4.117	4.132	4.153	4.060
	(1.356)	(1.497)	(1.351)	(1.232)
Both parents	.603	.511	.641	.634
	(.489)	(.500)	(.480)	(.482)
Socioeconomic Characteristics				
Family income	76287.99	67805.82	75435.25	84418.32
	(68170.36)	(58226.45)	(65409.75)	(77682.39)
Parent's education	14.096	13.598	14.167	14.426
	(2.701)	(2.524)	(2.644)	(2.854)
Educational Characteristics				
High school GPA	321.523	312.583	327.104	322.1
	(47.565)	(47.422)	(45.381)	(49.232)
ASVAB test	66.379	61.890	69.057	66.822
	(24.575)	(24.512)	(23.438)	(25.483)
Hours worked 14^{th} /19^{th}	2770.086	4193.294	2676.083	1698.367
	(1940.403)	(2028.505)	(1555.49)	(1513.082)
Institutional Characteristics				
Public school	.710	.784	.673	.696
	(.454)	(.412)	(.470)	(.460)
Urbanity	.740	.734	.732	.755
	(.444)	(.461)	(.443)	(.431)
Northeast	.204	.210	.215	.187
	(.403)	(.407)	(.411)	(.390)
North Central	.279	.311	.288	.241
	(.448)	(.463)	(.453)	(.428)
South	.349	.332	.320	.399
	(.477)	(.471)	(.467)	(.490)
West	.168	.148	.178	.174
	(.374)	(.355)	(.383)	(.379)
Financial aid				
Loan	.274	.249	.308	.252
	(.446)	(.433)	(.462)	(.435)
Scholarship	.463	.414	.504	.453
	(.499)	(.493)	(.500)	(.498)
Family support	.522	.435	.555	.555
	(499)	(.496)	(.497)	(.497)
Outcome				
Drop out(2^{nd} year)	.142	.235	.094	.123
	(.349)	(.424)	(.292)	(.329)
Degree completion	.488	.343	.559	.521
	(.500)	(.475)	(.497)	(.499)
N	2614	711	1051	852

Note: Standard deviations in parentheses.

Table 2. Probit Regression Estimates for Models Predicting Engagement in Intense Work

	Intense vs.		
	Anything else	Moderate	None
Demographic Characteristics			
Male	-.091	.052	-.299***[a]
	(.060)[b]	(.068)	(.077)
Black	-.179*	-.141	-.233*
	(.087)	(.098)	(.112)
Hispanic	.228*	.188†	.343**
	(.096)	(.106)	(.126)
Family size	.029	.013	.068*
	(.022)	(.024)	(.029)
Both parents	-.187**	-.230**	-.154†
	(.066)	(.074)	(.086)
Socioeconomic Characteristics			
Family income	-8.26e^{-7}†	-3.80e^{-7}	-1.88e^{-6}**
	(5.00e^{-7})	(5.75e^{-7})	(6.23e^{-7})
Parent's education	-.011	-.013	-.005
	(.013)	(.001)	(.016)
Educational Characteristics			
High school GPA	-.001†	-.002†	-.001
	(.001)	(.001)	(.001)
ASVAB test	-.004**	-.005**	-.003
	(.001)	(.002)	(.002)
Hours worked/14-19th	.001***	.001***	.001***
	(.000)	(.000)	(.000)
Institutional Characteristics			
Public school	.191**	.192*	.193*
	(.068)	(.076)	(.087)
Urbanity	-.015	-.015	-.039
	(.068)	(.076)	(.088)
North Central	-.048	-.056	-.077
	(.086)	(.095)	(.113)
South	-.028	.021	-.149
	(.086)	(.097)	(.111)
West	-.0148	-.141	-.208
	(.101)	(.112)	(.131)
Financial aid			
Loan	-.154*	-.163*	-.163†
	(.073)	(.081)	(.095)
Scholarship	-.006	-.043	.041
	(.069)	(.077)	(.088)
Family support	-.041	-.064	.026
	(.068)	(.074)	(.086)
Constant	-.719*	-.076	-.669†
	(.300)	(.340)	(.384)

Note: [a] †p<.10 *p<.05 **p<.01 ***p<.001, [b]Standard errors in parentheses

Table 3. Matching Estimates of Engaging Intense Work on 2nd Year Attrition and Degree Completion by College Type

	Intense vs.		
	Anything Else	Moderate	None
2nd year attrition			
Unmatched differences	.735***	.905***	.561**
	(.137)	(.157)	(.171)
One-to-one matching	.560**	.593*	.414
	(.215)	(.261)	(.324)
Degree completion			
Unmatched differences	-.657***	-.693***	-.612***
	(.108)	(.117)	(.140)
One-to-one matching	-.772***	-.616**	-.580*
	(.171)	(.198)	(.256)
N	2614	1762	1563

Table 4. Mean Covariate Values by Propensity Score Strata and Treatment Condition: Intense vs. Anything Else

	Propensity Score Strata													
	Stratum1		Stratum2		Stratum3		Stratum4		Stratum5		Stratum6		Stratum7	
Variables	d=0	d=1	d=0	d=1	d=0	d=1	d=0	d=1	d=0	d=1	d=0	d=1	d=0	d=1
Demographic Characteristics														
Male	.485	.654	.436	.570	.415	.385	.397	.451	.434	.355	.459	.437	.750	.556
Black	.226	.308	.213	.253	.206	.221	.274	.230	.181	.180	.246	.168	.125	.074
Hispanic	.047	.038	.126	.127	.116	.163	.179	.164	.211	.132	.131	.219	.313	.204
Family size	4.047	4.154	4.150	3.975	4.083	4.016	4.179	4.303	4.307	4.201	3.771	4.328	4.563	3.556
Both parents	.759	.577	.666	.658	.571	.484	.548	.631	.440	.476	.344	.445	.250	.315
Socioeconomic Characteristics														
Family income	93393.61	79944.63	77585.68	75321.65	75245.94	68184.41	66687.09	81501.73	57322.24	61172.32	55541.00	60911.28	62457.31	57578.73
Parent's education	15.243	14.533	14.199	14.214	13.770	13.887	13.347	13.50	13.439	13.641	13.151	13.014	12.866	12.942
Educational Characteristics														
High school GPA	339.867	321.791	324.016	327.186	318.585	309.498	312.064	313.965	304.217	315.1994	301.828	306.746	287.006	294.335
ASVAB test	75.790	68.491	67.697	66.689	65.281	64.373	58.564	63.658	57.520	60.772	59.903	58.192	54.441	54.140
Hours worked/14-19th	918.909	724.064	1790.075	1997.295	2776.353	2714.448	3496.474	3660.383	4334.656	4600.75	6030.776	5889.884	8575.563	8456.529
Institutional Characteristics														
Public school	.564	.654	.693	.622	.784	.721	.754	.787	.801	.799	.373	.924	.750	.852
Urbanity	.747	.808	.763	.658	.724	.771	.687	.762	.741	.730	.705	.714	.813	.722
North Central	.237	.154	.269	.215	.286	.287	.257	.303	.265	.370	.377	.311	.500	.389
South	.379	.462	.363	.418	.336	.279	.330	.320	.355	307	.296	.361	.188	.315
West	.205	.115	.164	.190	.173	.197	.162	.164	.145	.127	.082	.109	.188	.111
Financial aid														
Loan	.318	.385	.269	.266	.286	.262	.285	.197	.229	.291	.230	.235	.186	.130
Scholarship	.526	.539	.487	.532	.492	.402	.436	.418	.404	.466	.279	.311	.375	.241
Family support	.645	.769	.574	.582	.505	.443	.475	.516	.422	.429	.377	.269	.188	.241

Table 5. Stratification Multilevel (SM) Estimates of Engaging in Intense Work on 2nd year attrition and Degree Completion.

	Intense vs.		
	Anything Else	Moderate	None
2nd year attrition			
Level-1			
Stratum1	1.670***	1.274*	1.220**
	(.454)	(.510)	(.394)
Stratum2	.840**	.951*	.406
	(.312)	(.377)	(.360)
Stratum3	.275	.569†	.641†
	(.305)	(.315)	(.346)
Stratum4	1.067**	.794**	.334†
	(.308)	(.262)	(.451)
Stratum5	.292	.979**	-.546
	(.277)	(.381)	(.393)
Stratum6	.796*	.409	
	(.386)	(.697)	
Stratum7	-.464		
	(.631)		
Level-2	-.165*	-.069†	-.361**
	(.080)	(.116)	(.125)
N	2614	1762	1563
Bachelor's degree completion			
Level-1			
Stratum1	-1.238**	-.766*	-1.172**
	(.434)	(.358)	(.372)
Stratum2	-.760**	-.959***	-.534*
	(.248)	(.268)	(.263)
Stratum3	-.487*	-.813**	-.533*
	(.219)	(.246)	(.258)
Stratum4	-.837**	-.419*	-.610†
	(.249)	(.193)	(.355)
Stratum5	-.206	-.521†	-.112
	(.215)	(.281)	(.388)
Stratum6	-.989**	-.036	
	(.332)	(.643)	
Stratum7	1.168		
	(.811)		
Level-2	.114	.147†	.181
	(.071)	(.087)	(.114)
N	2614	1762	1563

Note: [a] †p<.10 *p<.05 **p<.01 ***p<.001, [b]Standard errors in parentheses

Figure 1: Stratification Multilevel (SM) Method for Heterogeneous Treatment Effects

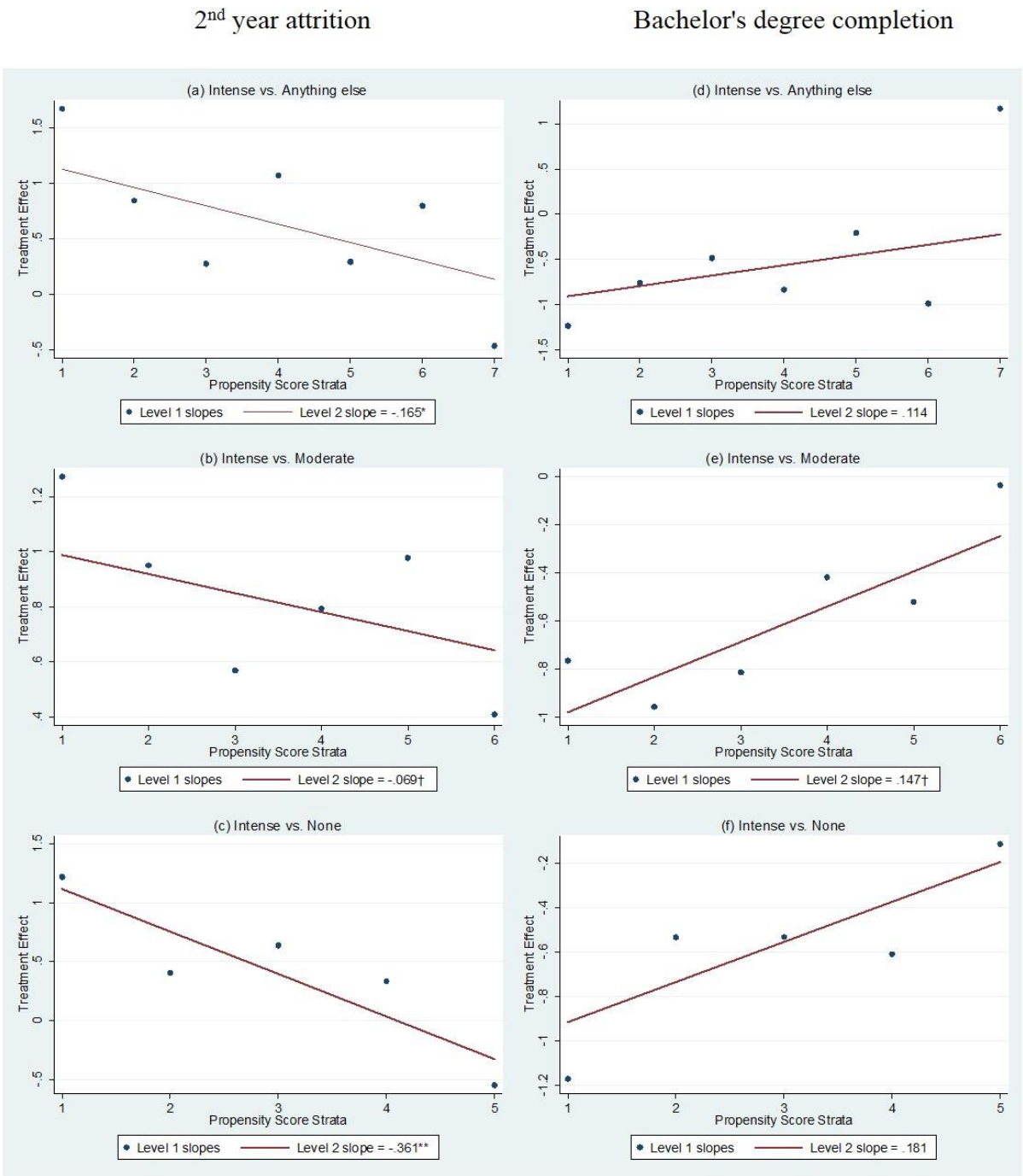
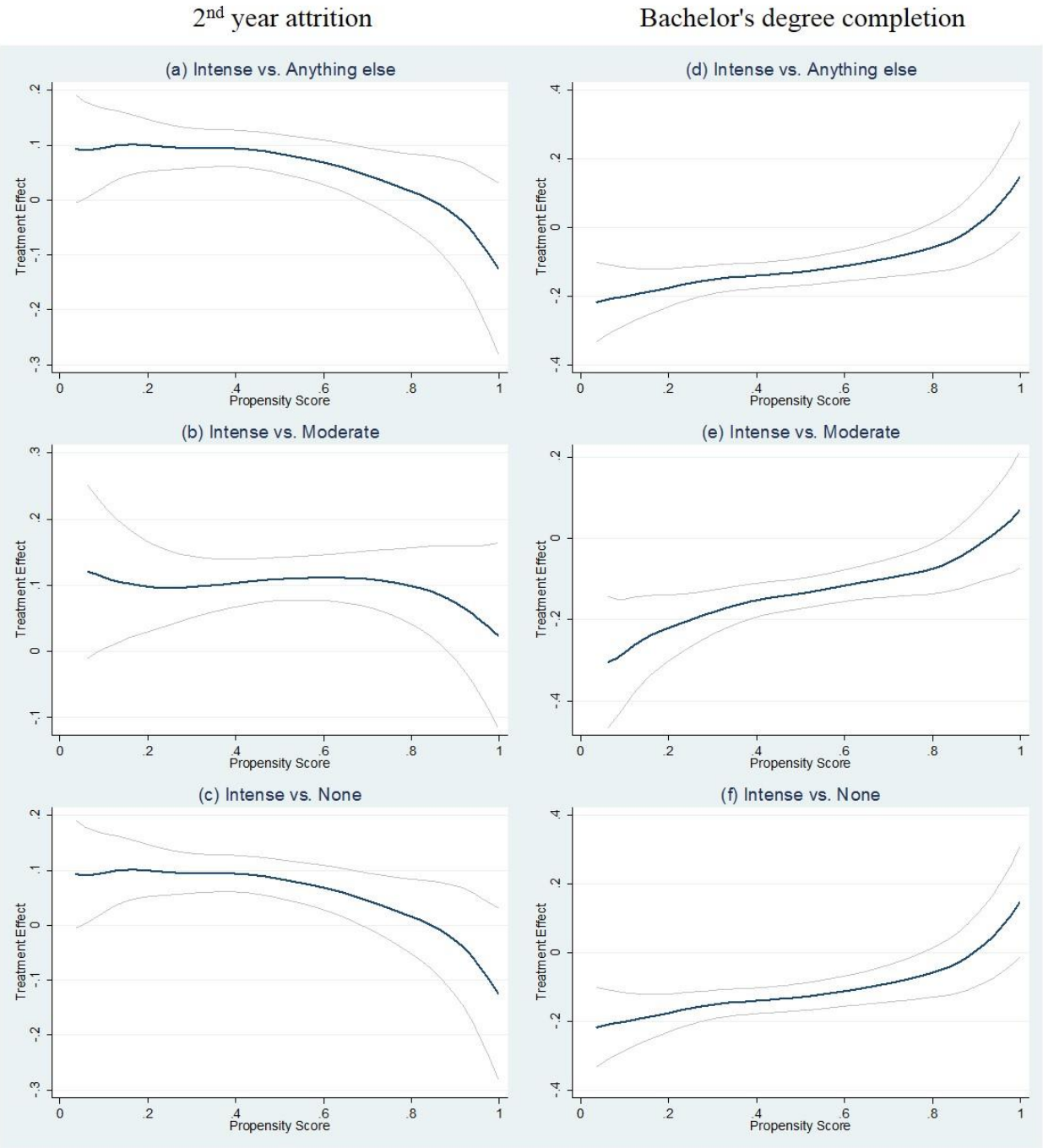
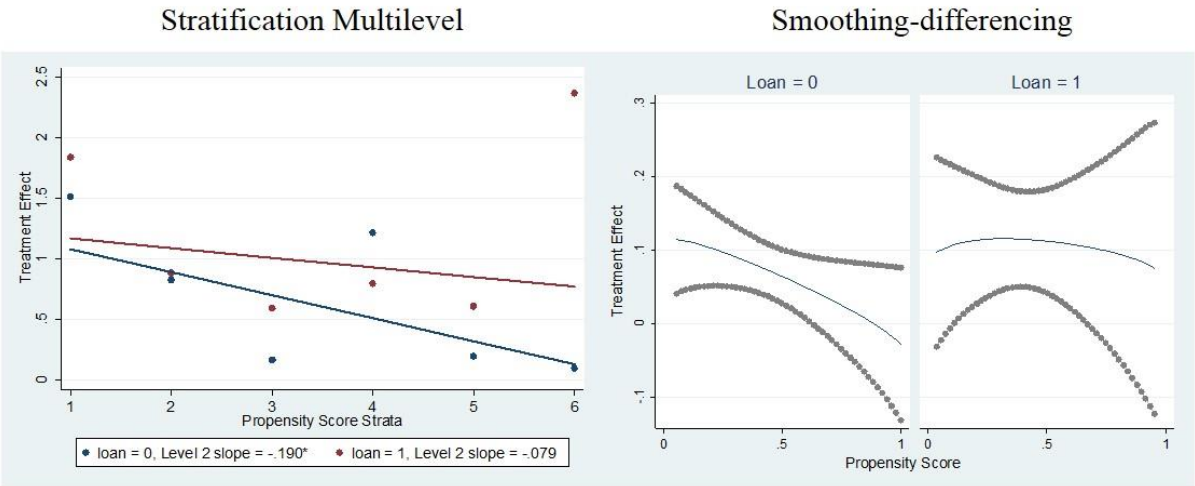


Figure 2. Smoothing-differencing (SD) method for heterogeneous treatment effects.



Note: Solid line indicates local polynomial fit. Dashed lines indicate 95 percent confidence interval

Figure 3: Stratification Multilevel (SM) and Smoothing-differencing Methods for Heterogeneous Treatment Effects on 2nd Year Attrition by Loan Acceptance: Intense vs. Anything else.



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Chapter 3. The Effects of English Training Abroad on Labor Market Outcomes in Korea

Introduction

English proficiency has become a valued global commodity, particularly in non-English speaking countries. A major factor in this is that English has become the *lingua franca* of international business, and in a globalized 21st century economy, the demand for and importance of English have increased accordingly (Economist 2014). In this global context, efforts to acquire English proficiency can improve one's job prospects and thus constitute rational behavior. As such, English study has become a fairly common phenomenon in many non-English speaking countries around the world (Crystal 2003; Lang and Siniver 2009; Nunan 2003; Olivo 2003; Park and Abelmann 2004).

The increased value of English to one's labor market prospects has had a corresponding effect on how English is taught and learned. In addition to the English taught in schools and in private tutoring sessions, many have now turned to language study abroad as a way to attain English proficiency. English training abroad[2] (hereafter ETA) is short-term language study training where students often spend 6 months to 2 years taking language courses at educational institutions, typically in countries where English is the main spoken language. ETA is becoming increasingly popular and is considered to be a lucrative industry. For example, in 2012, it is estimated that about 1.5 million students worldwide went abroad to study English (Norris 2013:

[2] I use ETA to indicate English training abroad. Other similar terms used in this field include English study abroad, language study abroad, and language training abroad.

28–32). According to this report, the United States received the second largest number of students (252,143) and was the top revenue earner ($3,812,402,160) for ETA in 2012.

The growing popularity of this practice affects both the sending and receiving countries. For example, in the United States, Chinese and Saudi Arabian students' enrollments for ETA increased by 25 percent and by 40 percent in 2011 and 2012, respectively (Norris 2013:32). These growth rates are similar to those seen in 2010 and 2011. A detailed examination of South Korea (hereafter Korea), a major sending country, also reveals the increasing prevalence of ETA. In 2001, only about 2 percent of 4-year college students left Korea for English training abroad, but in 2011 almost 10 percent of 4-year college students did so[3] (Ministry of Education, Science and Technology 2012). According to the media, the average cost for one year of ETA in 2011, including tuition and living expenses, was well over $27,000 (Choi 2012). As Korea's 2011 GDP per capita was about $24,000, it is clear that ETA constitutes an expensive educational investment and is thus less feasible for students from limited economic backgrounds. In addition, students who engage in ETA often take a leave of absence from their education to do so, which can postpone their graduation by one to two years. It is clear that students spend a significant amount of money and time on ETA and that this trend is only increasing.

Despite the fact that ETA has a fiscal impact on both the sending and recipient countries, there has been surprisingly little empirical research on the economic returns to ETA. Only a few

[3] Several other studies have reported much higher numbers. For example, Ahn (2007) reported that almost 15 percent of 4-year college students experienced ETA, and many mainstream media reports have shown even higher percentages. The statistics from the Ministry of Education, Science and Technology can be viewed as a conservative estimate of current trends.

studies have examined the effects of English proficiency on labor market outcomes in non-English speaking countries (Sakellariou 2009; Lang and Siniver 2009). This study thus aims to understand how English proficiency operates upon the transition from college to the labor market by analyzing the effect of ETA on employment and wages in the case of the Korean labor market.

Analyzing the effects of ETA has important social implications for Korea, as doing so will enable us to better understand ETA's efficacy and its impact on social equity. First, given the huge investment required for ETA, if ETA does not have sufficiently significant effects on the labor market outcomes, it represents a great loss of time and money not only for participating individuals but also for society as a whole. Second, if ETA has positive effects on labor market outcomes, it could increase social stratification. As most English programs, including ETA, are forms of private education, one's opportunity to engage in any of these programs depends greatly on socioeconomic status.

In this study, I augment and extend prior research on the effects of English proficiency on labor market outcomes by considering several key issues previously unaccounted for. First, while most prior studies have focused on average effects on employment status and wages, I investigate effects of ETA on job quality and wage distribution. To accurately determine the effects of ETA, labor market models must be context-specific. Within the Korean labor market, it is necessary to assess the impact of ETA using a segmented labor market framework (Lee 2001; Jung 2002). Second, I examine how the effects of ETA differ between those who possess elite college credentials and those who do not. Elite school credentials is one of the most important factors in determining the success of one's transition to the Korean labor market (Altbach and Umakoshi

2004; Park 2007; Seth 2002). Therefore, understanding the effects of ETA in conjunction with elite school credentials will enable a more comprehensive understanding of the impact of ETA on Korean society. Moreover, from a sociological standpoint, this approach aims to explore the increase in differentiation among college graduates. My key concern is how those with higher socioeconomic status use ETA as a mechanism of social mobility within post-secondary education. It could boost the elite school premium, or it could be a compensatory tool for those who did not attend an elite school. Lastly, while most prior studies have used human capital theory to explain the motivation and consequences of acquisition of English proficiency, I also consider the credentialing perspective, which argues that the value of English proficiency is culturally and politically determined in Korea (Park and Abelmann 2004). Does ETA affect employment and wage because of the objective English skills gained? Or is it because employers see those who engage in ETA as more educated candidates? The central difference between these two perspectives is that in human capital theory, the level of one's educational attainment is viewed to be a direct measure of a job candidate's productive capacity, whereas credentialing theory postulates that the value of an individual's education does not necessarily correlate to that person's productive capacity (Brown 2001: Collins 1975). In examining these two perspectives, I aim to understand how employers value ETA and its impact on labor market outcomes.

The main contribution of this study is to show that even though the average effects of ETA seem to be modest as most prior research has indicated, it does have substantial positive effects on getting a good job and earning higher wages. Also, the study finds that ETA is especially helpful for those who do not attend elite colleges. That is, ETA is a useful tool for non-elite school students

to supplement their weak formal education. These findings indicate that ETA has a substantial impact on labor market outcomes in Korea, and thus labor market opportunities are strongly determined by an individual's socioeconomic background, as the cost of participation in ETA presents a barrier to entry for individuals from lower socioeconomic backgrounds.

The education system and labor market in Korea

Several factors make Korea a particularly conducive area from which to analyze the effects of ETA. First, the push toward acquiring English proficiency has been a prominent phenomenon in Korean society and has exceeded the general worldwide trend in both prevalence and total expenditures. For example, Korea's annual spending on English education in 2006 was estimated to be about $120 billion, which was roughly equivalent to 2 percent of Korea's nominal gross domestic product of that same year (SERI 2006). Private English education has become ubiquitous, and now spans kindergarten students to middle-aged working adults (Gong 2012; Seo 2013). College students view English fluency as one of the most important skills to gain in order to ensure a successful transition to the labor market (Kim 2011). As many media reports make clear, the reasons behind this trend are pretty straightforward. People consider English proficiency to be a new instrument of social mobility that will give them a competitive edge in an era of globalization (Kim 2012).

Second, views on the value of English proficiency are closely related to the changing educational landscape in Korea. Since the 1990s, there has been a drastic expansion in university-level education. Korea's current advancement rates from high school to university or college exceeds 80 percent, which is among the highest in the world (Korean National Statistical Office

2010). This dramatic increase in university-level education has caused the value of a college degree to decrease and the premium of a few elite schools to increase (Altbach and Umakoshi 2004; Seth 2002). Under these conditions, competition for achieving educational advantages within higher education has intensified. Students are eager to accumulate human capital or additional credentials in addition to their college degree in order to qualitatively differentiate themselves from other college graduates, and ETA has become one of the most efficient ways for college students to achieve increased human capital or credentials.[4]

Third, Korea's highly segmented labor market is an important institutional feature that also increases competition among college students. After the Asian economic crisis of 1997 the number of non-standard jobs in Korea such as fixed-term employment, part-time employment, and temporary agency work increased dramatically (Kye 2008). While non-standard forms of employment have the same qualification requirements as full-time positions, many studies have noted that non-standard workers not only receive significantly lower wages but also have much weaker job security than that of standard workers[5] (Lee 2001; Jung 2002). Firm size is another important distinction in the Korean labor market. There are significant wage differences between

[4] In the Korean labor market, two factors are typically used for evaluating applicants' English proficiency: their resume and an English interview. However, only a few companies conduct an interview in English, and the majority of companies depend on applicant's resume to ascertain the candidate's level of English proficiency. In particular, any kind of educational experience is most highly valued in this process.

[5] In this article, I use the terms "standard job" and "non-standard job." A standard job is usually similar to a full-time job but this term is used to emphasize that in addition to being full-time, a standard job comes with a higher salary and fringe benefits, as well as also strong job security and an established professional pathway in the Korean labor market.

small firms and large firms, and there is little mobility between the two types of firms (Jung 2002). In addition, large firms provide significantly more comprehensive benefits, increased job stability, and seniority-based reward systems (Lee 2001; Kye 2008; Hwang 2003). Therefore, this highly segmented labor market nature, which features strong demarcations between job type and firm size, intensifies competition among college graduates to be better positioned than their cohorts when entering the labor market. The intersection of large firms and standard job arrangements is considered to be the most stable job situation in Korea, and finding employment in this job category is a high priority for most graduates.

Human capital, credentials, and the effects of ETA on labor market outcomes

Human capital theory offers insight into the motivations behind and consequences of English acquisition in South Korea. Human capital theory explains that a difference in economic benefits according to level of education reflects corresponding returns to individuals' investments in education (Becker 1964; Mincer 1974). Individuals decide on their optimal educational path by weighing the economic benefits of higher schooling against the costs (Card 2001). In this scenario, an individual's investment in education is an example of rational behavior based on a utility-maximizing strategy. In addition to the individualistic rational choice approach, human capital theory emphasizes productivity enhancement as a function of education. This theory posits that educational attainment increases wage levels and employment prospects by directly increasing individuals' productive capacities. According to human capital theory, then, employers value high levels of educational attainment because this quality is said to directly produce higher levels of

productive capacity, which then contributes to economic growth. (Becker 1964; Mincer 1974; Stiglitz 1975). Accordingly, ETA represents an individual's investment in his or her education, meant to increase the value of their human capital by attaining English proficiency, which results in economic benefits to the individual, as firms value the productivity that is often associated with ETA.

Most prior research on the impact of English language skills has examined the effects of English skills through the lens of the human capital theory and has found that an individual's level of English ability has positive effects on his or her labor market outcomes. For example, Chiswick and Miller (1995, 2002, 2003) found that English proficiency for immigrants from non-English speaking countries has significant positive effects on earnings in the United States, Canada, and Australia, and that there is complementarity between English proficiency and other forms of human capital. That is, English skills enhance the effects of other forms of human capital, such as educational attainment, on their earnings. While Chiswick and Miller examined the effects of English proficiency on earnings for the immigrants in the English speaking countries, Sakellariou (2009) and Lang and Siniver (2009) examined the effects of English knowledge as a foreign language on earnings in Vietnam and Israel, respectively. In both studies, English knowledge had significant positive effects.

The question of the impact of English knowledge on labor market outcomes has received much attention in Korea, and several recent studies have sought to answer this question. For example, English test scores such as TOEFL and TOEIC have a modest, positive effect on wages (Kim and Choi 2009, 2010; Kim 2011) and employment (Lee and Yang 2011; Kim 2011). ETA

also has modest positive effects on wages and employment (Ahn 2009; Park 2009). Kim (2011) found that while ETA did have substantial effects on the initial selection process, it had only modest effects on final employment. Only a small number of studies have examined the effects of ETA according to job category. For example, Kim (2011) found that ETA did not have a significant impact on the likelihood of obtaining a job at a large firm or in having a standard job.

In sum, most studies have demonstrated that English skills do have a positive impact on labor market outcomes in both English speaking and non-English speaking countries. In terms of ETA in particular, while the size of the effects of ETA differs based on the data and analytical strategies used, overall trends indicate that this effect is relatively modest, considering the amount of time and money that is invested into ETA.

While the human capital approach seeks to understand the economic rationale behind ETA in Korea, this approach has limitations for understanding the mechanisms and consequences behind particular behaviors, which are performed by individuals who are highly stratified in terms of their socioeconomic and cultural backgrounds. Educational credentialing theory puts forth an alternative explanation for the effects of ETA. One of the key arguments of credentialing theory is that the value of an educational degree is culturally and politically formed, rather than being an indication of one's objective technical skills, and that this cultural perception stratifies job market entry (Weber 1978; Brown 2001: Collins 1975, 1979). This relationship between credentialing structures and labor market outcomes arises from competition among status groups rather than among individuals, and it operates as a process of social exclusion. Collins (1979), in his seminal work *The Credential Society*, argued that although more educated workers do tend to have better

jobs, this is only because these individuals have had *more* education than others in their cohort, not necessarily because they increased productive capacity, which is assumed in human capital theory. Collins' status competition model has laid the groundwork for many educational theories that emphasize the role of education in social stratification (i.e., social closure, degrees of control, etc.).[6] In educational theories, the key mechanism behind social stratification is that the privileged group not only emphasizes the value of educational credentials, but also seeks to shape admissions criteria. Furthermore, due to their high economic, cultural, and social capital, this group is able to devote a great deal of time and money to their children's education (Alon 2009).

From this perspective, then, the social phenomena associated with ETA can be interpreted as a new form of *social closure* that is mediated by educational credentials. This perspective could offer an important reason as to why ETA is so popular in Korean society. If we consider ETA to be an emerging *exclusionary barrier* for labor market entry, the preoccupation with ETA in Korea is not a natural phenomenon that builds human capital in line with global trends, but rather is rooted in concrete power struggles between social classes to exclude others from and be included in advantageous educational positions. In other words, according to the credentialing theory, ETA is merely an additional credential that favors middle and upper class students, and the growing emphasis on the value of English proficiency in Korea has been politically enacted by struggles between status groups, independent of its efficacy and impact on productivity. In this sense, this great boom in international credentials (e.g., ETA, foreign school credentials, and internship in

[6] See Brown (2001) for a thoughtful discussion about Collins' work and credentialing theory.

foreign firms) in Korea could bring about credential inflation and exacerbate existing inequalities in job market entry specifically and in the education system more generally.

Theoretical model

Effects of ETA on employment

Many studies have demonstrated that English ability positively impacts an individual's labor market outcomes across a wide range of societies. Given this, I expect to find a positive relationship between ETA and employment (i.e., whether or not an individual is successfully employed after graduation [**Hypothesis 1-a]**). Although most prior studies have found only modest effects of English ability on labor market outcomes, it is possible that interpretation of the observed effects of ETA on overall employment status or on average wages might mask the full impact of ETA on the transition from college to the labor market. This study thus explores the possibility that the size of the effects differs by job quality and wage distribution.

Examining the effects of ETA on employment is complex, as it is necessary to examine both supply and demand. That is, while employers may prefer more highly educated workers, more highly educated workers have higher "reservation wages" and therefore may be more selective in their job choices. Since these effects offset each other, an observed weak association between employment and ETA might be masking any positive and negative effects that manifested in either the supply or the demand sides. When examined through the lens of job quality, however, the balance of supply and demand effects may be different. I therefore utilize competing risk models in order to provide a more accurate analysis of the impact of ETA on employment. Therefore, if

ETA is found to be something that either increases one's human capital or one's credentials in the Korean labor market, then ETA would have a weak or even negative impact on obtaining non-standard jobs or standard jobs in a small firm, both of which are considered to be less desirable than standard jobs in a large firm. Accordingly, those who have ETA are more likely to get hired in a standard job in a large firm than those who have not (**Hypothesis 1-b**).

In terms of employment, it is difficult to examine whether the employers value ETA as human capital or as a credential, since such an analysis would need to include supply side effects. For example, as a human capital perspective, ETA may have a strong positive effects on the standard job/large firm and weak effects on other job categories, since English ability is greatly emphasized in standard job/large firm (demand side) and those who experienced ETA are more likely to apply this job category (supply side).[7] If ETA is valued as a credential, it may show a similar pattern. Although, employers in every job category may value this additional education (demand side), students who engage in ETA are likely to be more selective in choosing a job (supply side), which would present only strong positive effects on decent job categories.

Effects of ETA on wages

While I expect the average effect of ETA on wages is positive (**Hypothesis 2-a**), I expect that the effect is not constant across the wage distribution. If ETA is valued as a sign of English proficiency, which can increase one's productive capacity, it likely to have more impact in the

[7] For example, 52% of those who worked in a standard job/large firm reported that they used English "sometimes" or "often," but only 32% of non-standard workers reported that they used English in their work.

upper wage distribution, as such jobs often use English more often than jobs in lower wage distributions.[8] The effects of ETA should therefore increase as wage level increases (**Hypothesis 2-b**). On the other hand, if ETA is a merely an additional credential, I expect that its impact to decrease as wage level increases. At a higher wage distribution, individuals typically possess distinctive human capital or credentials such as a degree from an elite school, a highly valued certificate, and a certain level of professional knowledge.[9] Thus, among those who are at similar wage levels, the relative effects of ETA should decrease as wage level increases (**Hypothesis 2-c**).

Association between ETA and elite school attendance

Examining the heterogeneous effects of ETA on employment and wages according to elite school credential aims to understand how competition for educational advantages expanded to within college graduates. Under human capital theory, if we consider that elite school students are already highly selective job seekers and thus are more likely to apply to and eventually attain their desired job in the labor market,[10] the effects of ETA are expected to be greater for those who

[8] For example, while 55% of those in 75th wage quantile reported that they used English "sometimes" or "often" in their work place, only 26% of those in lowest 25th wage quantile reported that they used English in their work.

[9] For example, many prior studies have pointed out that the college effects are greater at the higher wage distribution than at the lower wage distribution (Machado & Mata, 2005; Budria, 2010).

[10] Based on my data, about 50% of elite school graduates had a job in the standard job/large firm, while only 24% of non-elite school graduates were employed in this category.

graduate from elite schools than for those who do not. This is because, as mentioned earlier, decent jobs in Korea such as standard/large firm or higher wage jobs are more likely to use English at work, which means that graduates from elite schools benefit more from ETA than those from non-elite schools (**Hypothesis 3-a**). On the other hand, if the effects of ETA are based on credentialism, then those with weak formal educational credentials (i.e., non-elite school graduates), will benefit from ETA more than elite school graduates will (**Hypothesis 3-b**). That is, employers value ETA as an additional educational credential, rather than a sign of English proficiency that is needed for their work.

Data and methods

Data

For this study, I used the Graduate Occupational Mobility Survey 2007 (GOMS) to attain my data. GOMS is a representative sample of individuals who graduated from postsecondary level education in 2007. The 2007 GOMS collected information regarding approximately 25,000 graduates, or about 5 percent of the 502,764 individuals who graduated from university-level education in 2007. The 2007 GOMS sample represents Korean graduates selected by the proportional stratified sampling method based on the 2007 Statistical Research for Employment of Higher Education Graduates of Korean Educational Development Institute (KEDI). Survey categories include educational background, job-seeking activities, certificates, vocational training, job experience, personal information, and family background, all of which affect entry into the labor market and stabilization. Due to substantial differentials between four-year college graduates

and two-year college graduates in terms of in an individual's route to labor market entrance and the criteria used to determine wages, I restricted my analysis to four-year college graduates. I also omitted medical school and teacher's college graduates, since graduates of medical school and teacher's colleges typically undergo different transition paths from school to work. I further eliminated those who had missing data for key variables; the final sample was 7,619 students. Among these 7,619 students, the 6,546 students who obtained any job after graduation were used to examine the effects of ETA on wages using quantile regression.

Measurement

Table 1 presents the measurements of the variables. Most of these variables are related to the respondents' social backgrounds, their academic background, or their demographic features. Each individual's parents' educations are measured by years of schooling completed. Family income in Korean won at the time respondents entered university is measured by using a continuous variable. GPA is measured by a continuous variable on a 100-point scale, and major and elite schools are measured by categorical variables. To determine attendance at elite universities, I used college rankings in 2007 published by the Joong-Ang daily newspaper. This ranking considered schools' educational resources, general prestige, job placement, globalization level, professors' research performance, and so on. I designated the top 9 schools, which ranked in the top 10 in every assessment category, as elite universities. Prior research has demonstrated that these three variables—school ranking, GPA, and major—are the most important factors in determining graduates' transition from school to work (Oh 2007).

Along with these three variables, I added an English test score variable to control for students' level of motivation in the job seeking process. English tests include various private institutions' examinations such as TOEFL, TOEIC, IELTS, and the GRE. One's English test score is a key element in the recruiting process in Korea[11]. It is necessary to control for motivation level in examining the effects of ETA, so as to distinguish whether a positive coefficient for ETA reflects the causal effect of ETA or whether it reflects other attributes that can be associated with ETA, such as students' level of motivation or degree of effort put into searching for a job. That is, such attributes could affect not only selection into ETA but also labor market outcomes. While separating out these effects is difficult to address in studies that use observational data, I utilize English test scores to control for these related attributes. Compared to ETA, English test scores are less likely to depend on families' economic resources and thus is a useful variable to account for an individual's motivation and efforts for their job preparation and their cognitive ability independent of economic resources. The variable is composed of three categories: non-testers, those who scored below 80 points out of 100, and those who scored above 80 points.

The key independent variable, ETA, is coded by a dummy variable. Lastly, the dependent variables are logged monthly wages and first employment status after graduation. Both variables are considered to reflect labor market performance after graduation. For employment status, I use two employment variables. First, I use a dichotomous variable, whether or not individual got a job after graduation and second, I divide employment into three categories: non-standard jobs,

[11] While a test score is considered to be an indicator of a candidate's English ability, test scores are usually considered to reflect graduates' reading, grammar, and listening skills, rather than their speaking ability.

standard jobs in a small firm, and a standard job in a large firm. In Korean society, these categories are quite significant in determining successful transition to the labor market. Standard jobs in large firms are considered to be the most stable and sought-after jobs in Korea (Jung 2002). In this study, I use both standard job and firm size with more than 300 employees as criteria for the most stable and valued job category

<Table 1 about here>

Analytic Strategy

In order to assess effects of ETA on employment outcomes, I first utilize event-history analysis. As the GOMS 2007 survey was conducted two years after the sample's graduation, the sample is right censored. This means that conventional OLS regression could produce biased results. To address this, I use the Cox regression analysis and competing risk regression. Duration in this study is the time in months that it takes for an event (first employment) to occur and it is a continuous measurement. The starting point is one year before the date of college graduation. Because the difference in mean age between the ETA and the non-ETA groups was very small, I set the same starting point for both groups. All the independent variables are time invariant. If the event did not happen within two years after graduation, observations are right censored. Based on this research design, I estimate two models. First, using a Cox regression with a dichotomous indicator of employment status, I estimate whether or not respondents made a successful transition from college to work after graduation (Hypothesis 1-a). Then I estimate competing risk models to examine how the effects of ETA differ according to job quality (Hypothesis 1-b). Finally, I

estimate how the effects of ETA differ based on elite school status for all three competing risk models to determine the relationship between ETA and elite school credentials (Hypothesis 3-a, 3-b).

To estimate the effects of ETA on the wages of an individual's first job, I use a quantile regression analysis. Because my key interests in this study are to examine how the effects of ETA differ based on wage distribution and to estimate changes in the effects of ETA due to the varying effects of other explanatory variables such as elite school along the wage distribution, quantile regression is an efficient way to delineate a comprehensive picture of the effects of ETA. OLS regression uses the conditional means as a measure of a central tendency and is therefore limited in its ability to detect the relationship between the independent and dependent variables in non-central locations of the whole wage distribution (Buchinsky 1998; Hao and Naiman 2007: 22). In this study, I estimate two quantile regression models. The first model includes ETA and all other covariates, and the second model adds an interaction term between ETA and elite schooling. Using the first model, I examine the effects of ETA on wages and how the effects of ETA change according to wage distribution (Hypothesis 2-a, 2-b, 2-c). With the second model, I seek to understand how the effects of ETA differ based on elite school status (Hypothesis 3-a, 3-b). OLS regression results are also presented as average effects of ETA in each model.

Results

Descriptive statistics

Table 2 shows the characteristics of GOMS graduates by ETA status. The characteristics of those who engaged in ETA vary along a number of dimensions. The most prominent difference between the ETA and non-ETA groups was family income, which was much higher for the ETA group. This clearly indicates that participation in ETA was strongly dependent on students' family economic resources. Respondents with ETA experience had substantially higher English test scores than those without this experience. In addition, a greater percentage of students in the ETA group attended elite schools than in the non-ETA group. Graduates who experienced ETA tended to receive higher wages than others. They also showed a higher rate of employment in standard jobs than in other types of positions. Overall, descriptive statistics indicate that graduates who engage in ETA seem to have more economic family resources, better academic backgrounds, and also achieve better labor market outcomes.

<Table 2 about here>

Effects on employment

First, I estimated the Kaplan-Meier survival rate for employment by ETA and elite schooling, respectively. As the job search usually begins one year before graduation, the event history analyses start from that point. During this year, the survival rate decreased very slowly. Then, in the first several months right after graduation, the survival rate decreased rapidly, and then it decreased gradually towards the end. In figure 1-a, the ETA group had a slightly lower survival rate than the non-ETA group. That is, ETA had a positive effect on getting a job after graduation, which supports hypothesis 1-a. However, there was no significant difference between graduates of elite and non-elite schools in terms of employment status. The log-rank test results

show that ETA had a statistically significant impact on attaining a job, but that elite schooling was not statistically significant (Appendix Table A.1). These results correspond to the results from the Cox regression model: ETA had positive and significant effects but the elite school premium did not. The results of the Cox regression model are provided in the Appendix (Table A.2).

<Figures 1 and 2 about here>

I also tested the Kaplan-Meier survival rate by ETA and the elite school premium simultaneously. These results are presented in figure 2. The ETA/elite group clearly had the lowest survival rates compared with the other three groups. This indicates that those who engaged in ETA and in elite schooling were the most popular candidates in the labor market. Interestingly, the non-ETA/elite group had the highest survival rate at the end of tail among the four groups. This means that students who graduated from elite schools without engaging in ETA spent more time in obtaining their first job than did non-elite school graduates. Along with the null effect of elite schools on employment in figure 1, these patterns suggest a dual process between job seekers (supply) and job providers (demand). That is, while strong candidates are more selective and may not accept a job offer unless their expectations are met, weak candidates might get a less desirable job more, such as a non-standard job or a job at a small firm. Thus, to more accurately understand the role of ETA in employment procedures, I employed a competing-risk model between different job categories.

Table 3 presents the results of the competing risk model. I divided employment into three categories: non-standard jobs, standard jobs in a small firm, and standard jobs in a large firm. Having a non-standard job is the event in the first column. In this model, both ETA and elite

schooling had a negative effect on outcome. Thus, those who went to an elite school or engaged in ETA were less likely to obtain a non-standard job. The second column represents the findings associated with having a standard job in a small firm. These findings indicate that ETA still had a negative effect on outcomes, but this finding was only marginally significant. An elite school premium had a strong negative effect on obtaining a standard job in a small size firm. Even though a standard job in a small size firm in Korea is considered to be a relatively stable job, those who graduated from elite schools or experienced ETA were less likely to obtain jobs in this job category. This indicates that the ETA group or the elite school students expected "reservation wages" that are higher than those for a standard job in a small size firm and thus continued their job search until they found employment in a "better" job category.

<Table 3 about here>

The third column provides results for having a standard job in a large firm. Both ETA and the elite school premium had a strong positive effect on obtaining a standard job in a large firm. Since this job category is considered to be the most stable job among the three, ETA and the elite school premium apparently had a positive effect on attaining a good job in the Korean labor market. These results correspond effectively to hypothesis 1-b. Generally, ETA had a positive effect on overall job placement, but its effects were modest. However, if we consider job quality, then ETA played a significant role in an individual attaining a good job in the Korean labor market. In figure 3, I present the graphical results of the competing-risk model by ETA and by elite school premium.

As with the competing-risk regression results in Table 3, figure 3-c (standard job/large firm), the four groups are in reverse order of figure 3-a (non-standard job) and 3-b (non-standard

job/small firm). That is, the effects of ETA and elite schooling affect getting a standard job/large firm and other job categories differently. In terms of obtaining a standard job in a large firm, the effects of ETA were greater for elite school graduates than for non-elite school graduates. That is, the differences in the cumulative incidence rate between elite school/ETA individuals and elite school/non-ETA individuals were greater than those of non-elite school individuals. This result seems to support hypothesis 3-a, which is that the effects of ETA are determined by human capital rather than by credentialism. However, given the importance of the elite school premium in the Korean labor market, the ETA effects manifested a notable pattern between the four groups. Not only did ETA boost the effects of the elite school premium, but it also offset substantial differences between the non-ETA/elite group and the ETA/non-elite group, compared with the average differences between elite school graduates and non-elite school graduates in figure 3-d. These findings indicate that ETA operated in two ways: (1) it strengthened the effects of the elite school premium and thus indicated to prospective employers that elite school graduates with ETA experience were the best candidates for the job, and (2) ETA also seemed to be effective for students who did not attend an elite school in supplementing their job market prospects.

<Figure 3 about here>

Effects on Wages

Table 4 presents the results of the quantile regression model. In this analysis, I included all the covariates used in the previous models[12]. As a first step, I examined the effects of ETA and the elite school premium on wages without an interaction term (Model A). The wage effects of ETA

[12] The full results are provided in the Appendix (Appendix Tables A.3 & A.4).

and of the elite school premium were highly significant across most of the wage distributions. Both the quantile and OLS regression results showed positive effects of ETA and support hypothesis 2-a.

The effects of the elite school premium were largest at the second highest wage quantile and gradually decreased as the wage quantile decreased, while the effects of ETA decreased from the second lowest wage quantile and was weakest at the highest wage quantile. These results support hypothesis 2-c over 2-b, indicating that ETA is considered to be an additional credential rather than a form of human capital. This understanding of ETA as an additional credential may be due to the fact that as wage level increases, the likelihood that individuals possess greater human capital or non-ETA credentials, such as professional knowledge or a highly valued certificate, also increases, which would decrease the relative effects of ETA. These results indicate that ETA had a strong effect on wage levels for those along the lower wage distribution but functioned only as a supplementary factor at the upper quantile distribution. Nevertheless, the effects of ETA were substantial at all of the wage distributions. For example, ETA was associated with an 11 percent ($=e^{.105}$), 9 percent ($=e^{.093}$), and 6 percent ($=e^{.048}$) increase in monthly wages at the 10^{th}, 50^{th}, and 90^{th} percentiles, respectively. Also, excepting the highest wage quantile, the effects of ETA for each quantile was greater than those found by using OLS regression.

<Table 4 about here>

In Model B, I included the interaction term between the elite school premium and ETA to determine whether or not the effects of ETA could be differentiated by school type. The interaction term was statistically significant in three out of the five quantiles (50^{th}, 75^{th}, and 90^{th}), and the

estimates of these three quantiles were all negative. Figure 4 shows the ETA coefficients of quantile regression by school type.

In figure 4, the effect of ETA was stronger for graduates from non-elite schools than for those from elite schools after the 0.25 wage distribution. Whereas the effects of ETA for elite school students decreased until the highest wage quantile and the coefficients were close to 0 at the three upper quantiles, the effects of ETA for non-elite school students were relatively constant across the whole wage distribution. This result corresponds with hypothesis 3-b. If ETA were considered to be an indicator of one's English proficiency, then the effects of ETA on wages would be higher for elite school graduates, considering that this population was more likely engage in jobs that require English fluency. However, these results indicate that ETA operated as a supplementary credential for formal education, and thus those who had weaker formal educational credentials benefitted more from ETA. Therefore, the wage effect of ETA was particularly useful for non-elite school graduates to increase their wage level in the overall wage distribution.

<Figure 4 about here>

Summary and implications

This study examined the economic returns to English by analyzing the effects of ETA on the transition from college to the labor market in Korea. From my analysis I present the following key findings. First, ETA had a strong positive effect on obtaining a standard job in a large company, which is considered to be the most stable job in the Korean labor market, while it had a negative effect on obtaining a non-standard job or a standard job in a small company. Second, the strong

positive effects of ETA on obtaining a standard job in a large firm substantially reduced the gap between ETA/non-elite school graduates and non-ETA/elite school graduates, in terms of chances of getting into this job category. Third, ETA had a positive effect on wages, but its effects were more beneficial for graduates from non-elite schools than for those from elite schools. Fourth, findings on the mechanism of how ETA affects labor market outcomes were mixed. For employment it seemed to follow the human capital perspective, but for earnings, credentialism seemed to be the more likely explanation. Although most prior studies have only examined the human capital aspect of ETA, this study presents the significant possibility that the effects of ETA on labor market outcomes are derived from credentialism, which is rooted in cultural and exclusionary behaviors than in efficiency considerations. Based on these findings, I conclude that ETA has a substantial impact on an individual's *successful transition* from college to the labor market. In addition, the competition between status groups to gain educational advantages has expanded to the private sector, which indicates that ETA is an emerging channel for social mobility and an important mechanism of stratification in Korean society.

This study has several limitations that could be addressed in future research. First, due to the nature of data, I only looked at the effects of ETA on students' first jobs. Data that follow wage or employment trajectories could provide a deeper understanding of the effects of ETA. For example, there is the possibility that among elite school students, ETA and non-ETA employees have similar wages in highest wage quantiles but different wage trajectories. Second, despite my efforts, this study was unable to untangle the mechanism of *how* ETA affects labor market outcomes. Since the main goal of this study is to determine whether ETA has a positive and

significant effect on wages and employment, I was unable to directly examine whether the effects of ETA arise from human capital or from credentialism. Data and an analytical strategy that focuses on separating out both human capital effects and credentialism effects are needed for further studies.

Despite these limitations, the findings of this study have important implications for education policy in Korea. ETA, or international education more generally, introduces a qualitatively new dimension to the social competition to achieve better labor market outcomes than one's cohort. Unlike the competition for the educational advantage that takes place within public and local education systems, participation in ETA completely depends on an individual's economic and cultural capital, thus excluding the majority of those with lower socioeconomic status. Furthermore, it is extremely difficult to control for these effects through local policy interventions, as this phenomenon involves various private actors such as families, firms, and overseas educational institutions. It is expected that the increasing value of English proficiency in a globalized economy will further strengthen the impact of international education including ETA in many non-English speaking countries around the world. The findings of this study, therefore, provide a better understanding of the motivation for and consequences of achieving English proficiency, and calls for further discussion among stratification scholars and policymakers on how to address increasing inequalities in labor market opportunities associated with English education.

Table 1. Measurement of Variables; Korean Adults Who Graduated with University-Level Education in 2007 (N=7619)

Independent variables	Description	Mean	Standard Deviation
English training abroad	Dummy variable; 1=yes 0=No	0.162	0.369
Elite school	Dummy variable; 1=yes 0=No	0.090	0.286
Gender	1= Male 0= Female	0.532	0.499
Age	Respondent's age	25.973	1.840
Family Income	Monthly family income when respondent started college	421.157	490.360
Father's education	Years of schooling completed	11.760	2.711
Mother's education	Years of schooling completed	10.857	2.614
GPA	100-point scale	81.319	8.494
English test score	100-points scale; 0=Non-tester 1=under 80 points 2= over 80 points; Non-tester is omitted		
Major	5 dummy variables*; Humanities are omitted*		

Table 2. Characteristics of Graduates by English Training Abroad; GOMS in 2007 (N=7619)

Variables	English Training abroad	
	Yes (*n*=1241)	No (*n*=6378)
Age	26.24 (1.667)[a]	25.92 (1.867)
Gender(1=male)	0.51 (.500)	0.54 (.499)
Family income (won)	528.44(616.543)	400.42(459.189)
Father's education	12.39 (2.601)	11.64 (2.716)
Mother's education	11.43 (2.505)	10.75 (2.620)
Elite school (1=elite)	0.12 (.324)	0.08 (.278)
GPA (100-point scale)	82.10 (7.941)	81.17 (8.589)
Major (%)		
Humanities	16.63	12.73
Social Sciences	28.36	27.68
Engineering	30.15	28.23
Sciences	12.86	12.15
Education	4.08	6.97
Art	7.93	11.24
English test score (%)		
Non-testers	35.03	65.18
Below 80 points	21.42	22.98
Above 80 points	43.55	11.84
Monthly wages (won)	208.62(80.642)	175.71(79.127)
Job status (%)		
Unemployment	10.59	13.51
Non-standard job	21.61	27.93
Standard job/Small firm	27.31	34.95
Standard job/Large firm	40.48	23.61

[a]Standard deviation in parentheses.

Table 3.Subhazard Ratios of Competing Risk Model for the First Employment of College Graduates in GOMS 2007 (N=7619)

Covariate	Sub Hazard ratio		
	Non-Standard job in a large firm	Standard job in a small firm	Standard job
ETA	.886†[a]	.876*	1.517***
	(.065)[b]	(.057)	(.087)
Elite school	.766**	.481***	1.954***
	(.072)	(.050)	(.125)
Male	.785**	.783***	1.727***
	(.056)	(.043)	(.117)
Age	.927***	1.056***	1.015
	(.018)	(.014)	(.016)
Family income	1.000*	1.000*	1.000*
	(.000)	(.000)	(.000)
Father's education	.978†	1.000	1.015
	(.012)	(.010)	(.012)
Mother's education	1.006	.987	1.002
	(.013)	(.011)	(.012)
GPA	.997	.990***	1.021***
	(.003)	(.003)	(.003)
English test score[c]			
below 80 points	.920	.704***	1.096
	(.054)	(.038)	(.067)
above 80 points	.713***	.592***	1.702***
	(.057)	(.042)	(.104)
Major[d]			
Social science	.706***	.995	1.379***
	(.054)	(.071)	(.114)
Education	.938	1.103	.375***
	(.085)	(.098)	(.063)
Engineering	.539***	1.210**	1.674***
	(.045)	(.086)	(.138)
Sciences	.800**	.920	1.215*
	(.067)	(.072)	(.112)
Art	1.117†	1.315**	.439***
	(.095)	(.104)	(.064)
Wald Chi2	379.66	270.00	892.24
Prob>chi2	0.000	0.000	0.000

Note: a. †p<.10 *p<.05 **p<.01 ***p<.001, [b]Standard errors in parentheses
[c]Non-testers are omitted, [d]Humanities are omitted.

Table 4. Parameter Estimates from Quantile Regression Models for Log Monthly Wages, Korean Adults Who Graduated with University-Level Education in 2007 (N=6546)[a]

	Quantile Regression			OLS		
	q.10	q.25		q.50		q.75
	q.90					
A. ETA + Elite						
English training abroad	.105*[b]	.112***	.088***	.097***	.061**	.084***
	(.047)[c]	(.020)	(.015)	(.013)	(.018)	(0.015)
Elite school premium	.090	.202***	.229***	.242***	.236***	.189***
	(.072)	(.029)	(.015)	(.019)	(.021)	(.019)
B. ETA*Elite						
English training abroad	.074	.112***	.105***	.106***	.076***	.089***
	(.053)	(.021)	(.016)	(.013)	(.022)	(.016)
Elite school premium	.041	.210***	.253***	.262***	.250***	.198***
	(.078)	(.042)	(.017)	(.024)	(.026)	(.021)
English training abroad	.193	-.015	-.104**	-.078†	-.092*	-.040
×Elite school premium	(.144)	(.053)	(.034)	(.039)	(.041)	(.043)

Note: [a]Each model includes all control variables but not shown. ; [b†]p<.10 *p<.05 **p<.01 ***p<.001 ; [c]Bootstrap standard errors in parentheses (300 replications);

Figure 1. Kaplan-Meier Estimates of Survival Function for the First Employment of College Graduates by ETA and Elite School in GOMS, 2007

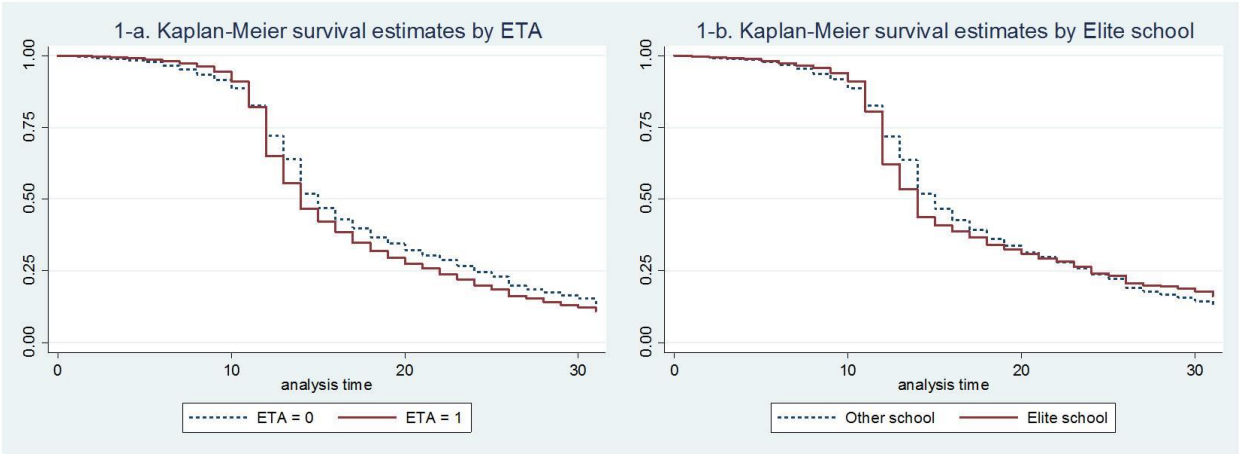


Figure 2. Kaplan-Meier Estimates of Survival Function for the First Employment of College Graduates by ETA and by Elite School Premium in GOMS, 2007

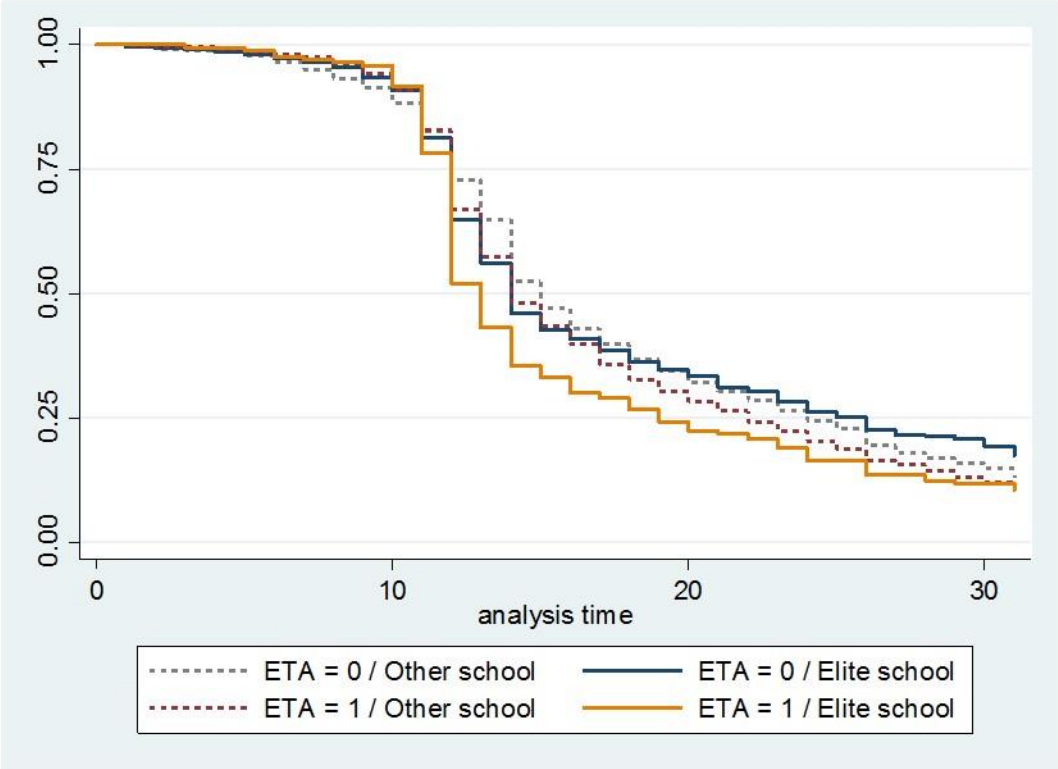


Figure 3.Cumulative Incidence Rates of Competing-Risk Model for the First Employment of College Graduates by ETA and by Elite School Premium in GOMS, 2007

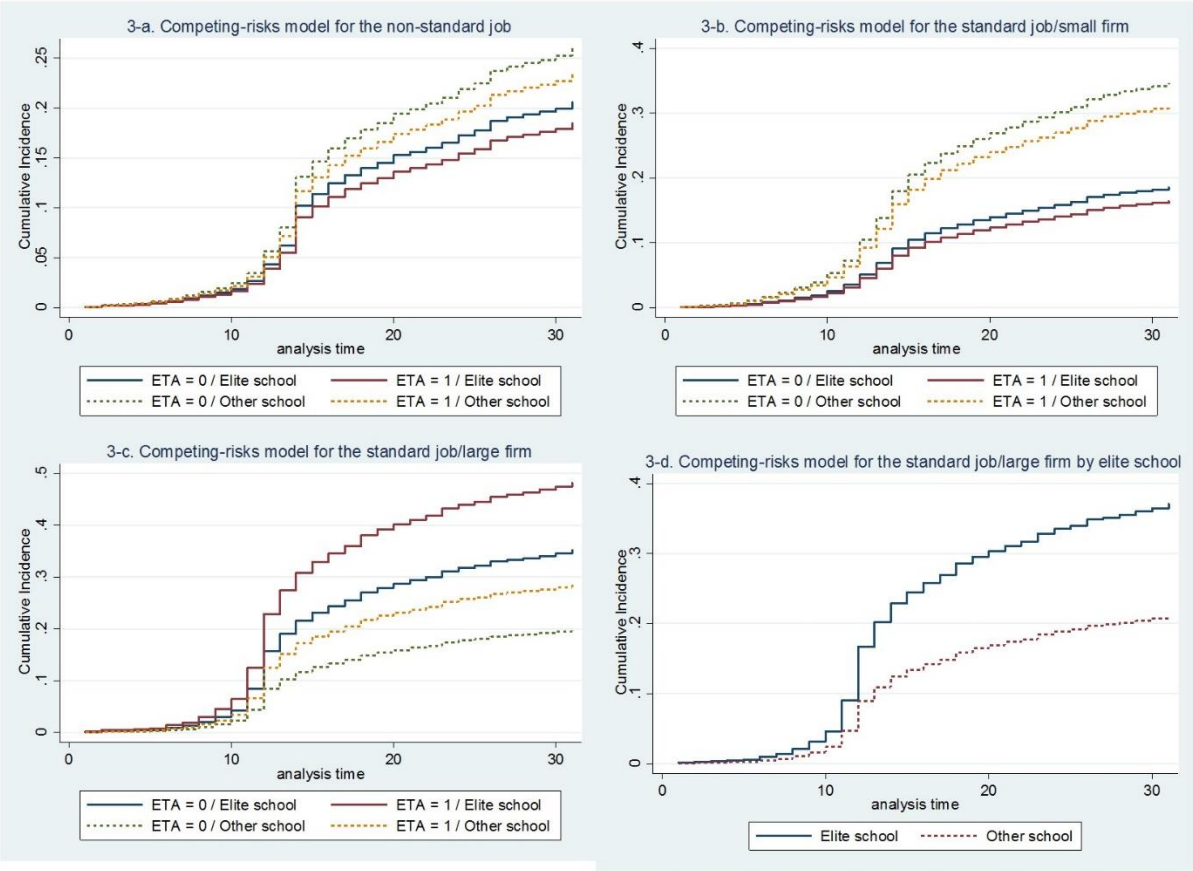
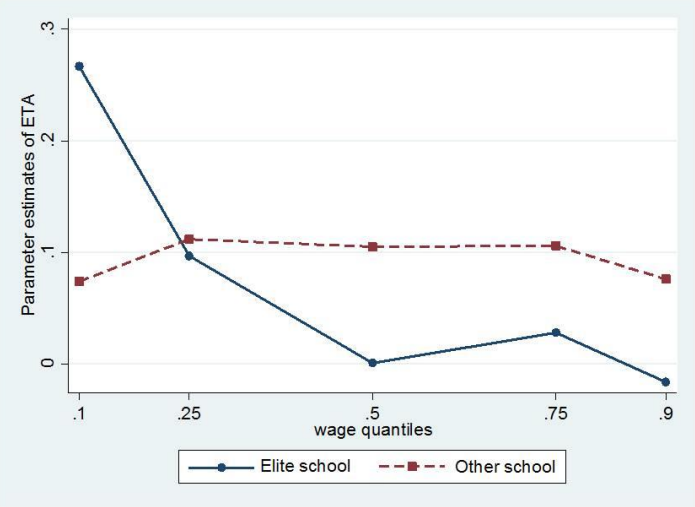


Figure 4. Parameter Estimates of ETA from Quantile Regression Interaction Models for Log Monthly Wages by Elite School Premium in GOMS 2007



Appendix

Table A.1. Log-Rank Test for Equality of Survivor Functions.

Test	Chi2	Pr>Chi2
By ETA		
Log-rank test	13.67	0.0002
By Elite school		
Log-rank test	0.06	0.814
By ETA &Elite school		
Log-rank test	19.95	0.0002

Table A.2.Cox Estimates of Hazard Ratio for the First Employment of College Graduates in GOMS, 2007 (N=7619)

Variables	Haz. Ration	S.E	Z	P>|z|
ETA***	1.184	.042	4.77	.000
Elites School	1.083	.050	1.72	.086
Male	1.022	.036	0.62	.538
Age	1.003	.009	0.36	.720
Family Income***	1.000	.000	4.06	.000
Father's Education	.994	.006	-1.01	.313
Mother's Education	.996	.007	-0.72	.475
GPA**	1.004	.002	2.77	.006
English Test Score[a]				
*80below****	.729	.023	-9.83	.000
*80above****	.808	.030	-5.74	.000
Major[b]				
Social Science	.984	.041	-0.39	.694
*Education****	.768	.041	-5.00	.000
Science	.934	.043	-1.49	.137
*Engineering****	1.200	.050	4.30	.000
*Art***	1.159	.055	3.07	.002
		LRX^{2}-259.62 Prob>chi2 .000		

Note: [a]Non-testers are omitted, [b]Humanities are omitted.
*p<.05 **p<.01 ***p<.001

Table A.3. Parameter Estimates from Quantile Regression Models for Log Monthly Wages, Korean Adults Who Graduated with University-Level Education in 2007 (N=6546):Model 1

	Quantile Regression					OLS
	q.10	q.25	q.50	q.75	q.90	
A. ETA + Elite						
English training abroad	.105*	.112***	.088***	.097***	.061**	.084***
	(.047)	(.020)	(.015)	(.013)	(.018)	(0.015)
Elite school premium	.090	.202***	.229***	.242***	.236***	.189***
	(.072)	(.029)	(.015)	(.019)	(.021)	(.019)
Language test score(80-)[a]	-.059	.021	.070***	.051***	.023	.022
	(.044)	(.021)	(.143)	(.013)	(.020)	(.014)
Language test score(80+)	.171***	.207***	.206***	.165***	.114***	.169***
	(.045)	(.024)	(.015)	(.014)	(.019)	(.016)
Age	.035**	.032***	.027***	.026***	.030***	.032***
	(.011)	(.005)	(.004)	(.004)	(.007)	(.004)
Male	.100**	.171***	.185***	.176***	.170***	.162***
	(.040)	(.024)	(.016)	(.013)	(.026)	(.015)
Family income	.000***	.000***	.000***	.000**	.000*	.000***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Father education	-.004	.004	.004	.010***	.007*	.006*
	(.007)	(.004)	(.003)	(.003)	(.003)	(.003)
Mother education	.007	.003	.007**	.004***	.008*	.005*
	(.007)	(.005)	(.003)	(.003)	(.003)	(.003)
GPA	.001	.002	.003***	.003***	.005***	.002**
	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)
Social science[b]	.180**	.159***	.086***	.061**	.048	.109***
	(.057)	(.030)	(.018)	(.019)	(.029)	(.018)
Education	-.141	.082	.117***	.077**	-.007	.051*
	(.078)	(.058)	(.023)	(.024)	(.030)	(.025)
Engineering	.385***	.258***	.164***	.138***	.083**	.210***
	(.055)	(.279)	(.018)	(.018)	(.026)	(.018)
Sciences	.187**	.116***	.067***	.066**	.003	.087***
	(.059)	(.030)	(.019)	(.020)	(.027)	(.020)
Art	-.083	-.092**	-.112***	-.126***	-.160***	-.118***
	(.065)	(.032)	(.021)	(.024)	(.035)	(.021)
R^2	.086	.130	.158	.162	.145	.210

Note: Bootstrap standard errors in parentheses (300 replications); †p<.10 *p<.05 **p<.01 ***p<.001
[a]Non-testers are omitted, [b]Humanities are omitted.

Table A.4. Parameter Estimates from Quantile Regression Models for Log Monthly Wages, Korean Adults Who Graduated with University-Level Education in 2007 (N=6546);Model 2

	Quantile Regression					OLS
	q.10	q.25	q.50	q.75	q.90	
B. ETA*Elite						
English training abroad	.074	.112***	.105***	.106***	.076***	.089***
	(.053)	(.021)	(.016)	(.013)	(.022)	(.016)
Elite school premium	.041	.210***	.253***	.262***	.250***	.198***
	(.078)	(.042)	(.017)	(.024)	(.026)	(.021)
English training abroad ×Elite school premium	.193	-.015	-.104**	-.078†	-.092*	-.040
	(.144)	(.053)	(.034)	(.039)	(.041)	(.043)
Language test score(80-)[a]	-.058	.023	.070***	.048***	.025	.021
	(.043)	(.021)	(.013)	(.012)	(.018)	(.014)
Language test score(80+)	.178***	.207***	.202***	.161***	.115***	.168***
	(.043)	(.025)	(.015)	(.015)	(.019)	(.015)
Age	.038***	.032***	.027***	.026***	.030***	.032***
	(.009)	(.006)	(.004)	(.004)	(.006)	(.004)
Male	.090**	.171***	.183***	.175***	.167***	.162***
	(.034)	(.024)	(.016)	(.013)	(.026)	(.015)
Family income	.000***	.000***	.000***	.000**	.000*	.000***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Father education	-.004	.004	.005	.009**	.007*	.006*
	(.007)	(.004)	(.003)	(.003)	(.003)	(.003)
Mother education	.007	.003	.005*	.004	.008*	.005
	(.007)	(.005)	(.003)	(.003)	(.003)	(.003)
GPA	.001	.002	.003***	.003***	.005***	.002***
	(.002)	(.001)	(.001)	(.001)	(.001)	(.001)
Social science[b]	.178**	.157***	.086***	.058**	.048	.109***
	(.052)	(.028)	(.019)	(.019)	(.031)	(.018)
Education	-.147	.082	.114***	.072**	-.005	.051*
	(.076)	(.060)	(.025)	(.025)	(.033)	(.025)
Engineering	.388***	.258***	.164***	.136***	.081**	.210***
	(.049)	(.028)	(.017)	(.016)	(.028)	(.018)
Sciences	.184***	.115***	.070***	.061**	.004	.087***
	(.052)	(.030)	(.020)	(.022)	(.031)	(.020)
Art	-.077	-.095**	-.108***	-.126***	-.155***	-.118**8
	(.060)	(.032)	(.022)	(.022)	(.036)	(.021)
R^2	.086	.130	.158	.163	.146	.210

Note: Bootstrap standard errors in parentheses (300 replications); †p<.10 *p<.05 **p<.01 ***p<.001
[a]Non-testers are omitted, [b]Humanities are omitted.

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