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### Determinants of Post-Secondary Education Attainment

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**DETERMINANTS OF POST-SECONDARY EDUCATION  
ATTAINMENT**

By  
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A Thesis Submitted to  
Department of Economics  
Skidmore College  
In Partial Fulfillment of the Requirement for the B.A Degree  
Thesis Advisor: Qi Ge

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## **Abstract**

This paper uses high school longitudinal dataset to address a central question: What are the factors determining whether a student decides to enroll in post-secondary education, particularly 4-year Bachelor's degree programs? Employing a Probit empirical design, this study measures the probability of a student attending both post-secondary education and specifically Bachelorette programs when considering an array of student- and parent-specific independent variables. The results highlight the importance of family influence on a student's PSE outcome, most notably parental expectation. Further analysis also indicates that students with PSE inclinations experience larger effects across all variables. The findings of this paper suggest policy-makers to focus on fostering a pro-PSE culture for low socioeconomic families at minority communities.

## 1. Introduction

Education is perhaps one of the most important aspects of growth and development for both an individual and the structure of an economy (Becker, 1964; Arias & McMahon, 1998; Lemieux, 2006). Extensive research, such as Krueger and Ashenfelter (1992) and Card (2001), has been done to show the importance of education to an individual, particularly in terms of its returns in the labor market. Specifically, according to Gary Becker's (1964) foundational theoretical model of "human capital", the more one invests in education, the more future returns, in the form of higher earnings and better employment prospects, one can expect to gain. More importantly, in a world with growing population and rapid technological advancement, having a higher education at the post-secondary level or beyond is becoming increasingly necessary to maintain socioeconomic wellbeing (Carlson & McChesney, 2014; Lemieux, 2006). Some research even points to the nonpecuniary benefits of higher education such as better health outcomes and more successful marriages (Oreopoulos & Petronijevic, 2013).

The education system in most countries is divided into these stages: pre-school (age 3-5), primary (age 5-11), secondary (age 11-18), and post-secondary (age 18+). As a student progresses through these stages of education, he gains increasing human capital. Throughout a student's educational career, an important decision needs to be made at the completion of the secondary stage: should I continue to the next stage of my education? More specifically, do the benefits of higher education outweigh its costs? This assessment becomes particularly important when it comes to post-secondary education (hereinto referred to as PSE) as costs increase significantly.

In this paper, to study the factors determining whether a student decides to enroll in post-secondary education, I utilize a longitudinal dataset from the National Center for Education

Statistics (NCES) that contains information on the students and parents such as socioeconomic status, geographic region, and educational expectation. The NCES offers an excellent data source for this research question due to its focus on the transition plans from secondary to postsecondary education, in addition to the length and extensiveness of its coverage. Another advantage is that it also acknowledges the importance of social context—families, schools, and society—to students’ experiences. In this study, I focus on the parental background factors that shape the family environment for students, which helps them foster a “cultural” perspective on PSE that ultimately contributes to their decisions. Under this strategy, I employ both student-specific and parent-specific variables available in the dataset following the “cultural factors” framework as used in recent related studies, such as Finnie (2014) and Childs et al. (2014), to empirically examine their effects on both the probability of a student attaining a Bachelor’s degree and any PSE degree (Bachelor’s or Associate’s).

My findings provide support for the argument that parental background has a significant impact on a student’s PSE likelihood. Most notably, the parent’s expectation on the student’s PSE outcome can influence the latter’s decision in both directions: compared to having no expectation whatsoever, the student has 1.74-5.58% higher probability of attaining PSE if the parent expects at least a Bachelor’s degree, and 5.18% lower probability if the parent expects only an Associate’s degree or no PSE degree. Moreover, the results indicate that the effects of all my variables, both student- and parent-specific, are considerably stronger on students who already have inclinations toward PSE; this difference is statistically significant as verified by a two sample t-test. On the other hand, it seems that some non-parental background factors also affect a student’s PSE prospect to some extent. For instance, living in the Northeast and being Asian increase one’s PSE likelihood by 4.8% and 3.79%, respectively, whereas attending a

public high school decreases that likelihood by 3.87%. However, despite logical inference, I do not find support for any statistically significant correlation between the amount of money saved by parents for their children's future educational needs and the latter's eventual PSE outcome.

My paper will serve as an addition to a thread of studies that focus on a student's background factors, particularly his family's influence over his PSE decision. Ultimately, my paper will provide more justifications for examining family background variables, and thereby enriching the literature in the determinants of PSE attainments. Furthermore, my results also provide some insights for policy-makers to help design policies that maximize PSE attainment, including improving regional distribution of educational resource, increasing PSE exposure in non-Asian minority communities, and encouraging pro-PSE thinking in low socioeconomic families.

The rest of the paper is organized as follows. Section 2 presents a review of existing literature relevant to this paper. Section 3 describes the data used and the variables identified for this study. Section 4 outlines the empirical model and estimation methods employed in the study. Section 5 discusses and interprets the regression results along with concluding remarks.

## **2. Literature Review**

Gary Becker (1964) lays the foundation for the economics of education with the "human capital" framework. There were some controversies over his method of analyzing human behaviors with an economic model (discussed below) and his rationale that human capital is augmentable, which introduces the idea that education is the principal way to increase human capital. Becker argues that individuals make choices of investing in human capital based on rational cost-benefit analyses that include an anticipated return on investment. Becker's general

theory is that an individual's capacity in the labor market is in direct proportion to his education, and that people achieve higher profits from higher education. A simplified econometric model derived from Becker's work that illustrates his framework is shown here:

$$\ln W_i = \text{constant} + \beta_1 S_i + \beta_2 E_i + \varepsilon_i \quad (\beta > 0)$$

in which the wage  $W$  of individual  $i$  is positively correlated with his level of schooling,  $S_i$ , and work experience,  $E_i$ . The economic insight provided by this equation is that the opportunity cost of one more year of schooling is foregone earnings, which implies that the benefit has to be commensurate with these foregone earnings, and thus should lead to a proportional increase in earnings in the future. This theory has important implications, among which the most relevant to this study is that it enables economists to quantify an individual's decision-making process and study the factors that contribute to investment in education. Specifically, an individual decides whether to invest in education based on how much it costs (both directly and in terms of opportunity cost) and how much economic returns that education is expected to yield in terms of future earnings and employment prospects. More generally,

$$U_i = B_i - C_i$$

In which an investment is worthwhile if the overall utility  $U_i$ , derived from the benefit-cost calculation, is positive. On the other hand, one might not choose to pursue more education if  $C_i$  is larger than  $B_i$ , indicating that the overall utility is negative. With that in mind, it can be said that those who invest in education are generally the ones who can afford the costs, and expect a significant return in the future.

In this literature review, I will present past studies that explore the various factors impacting the education investment decision-making process, particularly post-secondary education. It should be noted that although not mentioned explicitly, all these studies implicitly

assume that it is the students who are making the PSE decisions. However, it is likely that the parents are directly or indirectly responsible for part of that decision process. Hence, the main contribution of my paper is to incorporate the parents' perspectives into the analysis of PSE decisions by examining factors such as parental expectations and supports. The structure of this literature review includes three parts: first, a general investigation of the returns to education studies, including those that focus on returns to PSE; second, a comparison between the effects of attending a 2-year Associate's degree and that of a 4-year Bachelor's degree granting college; lastly, an examination of the "cultural" framework that focuses on endogenous factors of a student, most notably family background characteristics. I will also mention how some of these papers are related to my study and how they inspire some of my design features, as well as summarize the contribution of my paper to the literature of this topic in the end.

## ***2.1 Returns to Education***

Following the "human capital" framework as introduced in Becker (1964), many studies were conducted to explore the relationship between levels of education and labor market successes. The consensus in terms of the direction of this relationship seems to be that higher educational attainment leads to higher income in the labor market. For example, Krueger and Ashenfelter (1992) use surveys of genetically identical twins with different schooling levels to contrast their wage rates. Given the unique advantage of their data, in which sample members are genetically identical twins who share similar family backgrounds, their estimates are relatively free from bias due to the correlation between schooling and the student's ability or other characteristics. This is a major achievement in the literature of returns to schooling, since ability bias is difficult to control for. Krueger and Ashenfelter (1992) find that an additional year of schooling increases wages by 12%-16%, which is much larger than the 9% they would have



obtained from the data had they been unable to adjust for ability bias. Indeed, they stress the potential underestimation of returns to education if ability is not controlled for. Despite this achievement, Krueger and Ashenfelter (1992) also acknowledge that their study may still be biased due to unobserved factors. Notably, a family may wish to send both twins to further schooling if they show exceptional promise. On the other hand, a family may try to equalize future earnings for the twins by providing the less promising child more education. Some studies try to address this problem of unobserved factors by employing instrumental variables in a natural experiment setting. For instance, Angrist and Krueger (1991) estimate the impact of compulsory schooling on earnings by using quarter of birth as an instrument for education, since season of birth is related to educational attainment because of school start age policy. Their results indicate that unobserved variable bias does not significantly change the conventional OLS estimates, which further consolidates the argument for the positive correlation between future earnings and education levels.

Another comprehensive study by Arias and McMahon (1998) employs new “dynamic” and “expected dynamic” rates of return to education that take into account trends in earnings at older ages when calculating rates of return. Assuming major income trends are based on underlying technological change, globalization, and other factors that are likely to persist, their analysis is rigorous in the sense that they control for the larger economic background factors previously unaccounted for in Krueger and Ashenfelter (1992). After incorporating these trends and focusing on the longitudinal returns to education for a diverse cohort of workers from 1967 to 1995, Arias and McMahon (1998) find that, despite some fluctuations, the dynamic rates of return to education in the U.S. from 1967-95 averaged 11.7-13.3%.

Although Arias and McMahon (1998) make their contribution to the literature by controlling for background trends in earnings, they still do not address the ability bias issue. Given its endogeneity and the lack of any single variable that accurately measures it, ability is, indeed, difficult to control for. Krueger and Ashenfelter (1992) are only able to do so due to the unique advantage of their data involving identical twins. Therefore, in recent years more researchers have focused on the supply-side of the education market to examine the causal relationship between education and earnings, namely the side of schools, universities, and other educational institutions. Card (2001) provides an excellent overview of some of the supply-side methodologies used to estimate returns to education that address the ability bias. A notable method emphasized by Card (2001) is the use of institutional features of the education system to form credible instrumental variables for individual schooling outcomes, thereby circumventing the problem of ability bias on the demand side. Essentially, this method utilizes observable variables that affect schooling choices but are uncorrelated with (or even independent of) abilities, such as minimum school-leaving age, tuition costs, or the geographic proximity of schools. According to Card (2001), using supply-side shocks to identify demand-side parameters is a cornerstone of structural econometric methodology. Compared to the demand-side analysis, the 11 studies throughout the 1990s reviewed by Card (2001) that employ this structure coupled with instrumental variables point to a causal effect of education that is at least as big and sometimes substantially bigger than the corresponding OLS estimates using the same data. Specifically, the OLS estimates of the return to schooling range approximately from 3% to 9%, whereas their corresponding IV estimates are generally 15-70% larger. To sum up, Card (2001) finds that after adjusting for ability bias with the help of some innovative methodology, all

studies reviewed arrive at the same conclusion that investment in education does yield positive future returns, with considerably larger magnitudes than the conventional OLS measures.

The literature mentioned so far largely confirms Becker's (1964) theory that more investment in education leads to more future returns in terms of higher earnings. However, levels of education not only affect future income, but also the long-term sustainability of income. Investment in education is one of the largest expenditures that most people make in their lives; it is therefore imperative that this investment translates into real and sustainable increase in income throughout their lifetime in the labor market. The studies mentioned above present the positive impact of education on future earnings, but it is equally vital that this impact remains stable in light of significant economic downturns. This issue is addressed by Carlson and McChesney (2014) with their quantitative comparative analysis for the years 1991-2010 on income as it relates to educational attainment in the U.S.. Their conclusion essentially confirms the positive correlation between the education level attained and future earnings. More importantly, they also argue that more education also leads to lower income volatility during periods of economic downturns. In their analysis, Carlson and McChesney (2014) refer to economic downturns as recessions based on the definition by the National Bureau of Economic Research (NBER): a recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. Their study design of controlling for the larger economic background mirrors that of Krueger and Ashenfelter's (1992) when controlling for major income trends, but by taking into account specifically the negative impacts of economic downturns on income levels, Carlson and McChesney (2014) prevent their results from suffering potential downward bias. Their results indicate that from 1991 to 2010, those without PSE have

experienced a decrease in buying power ranging from 6.4% to 14.3% after adjusting for inflation. In terms of relation to my study, Carlson and McChesney (2014) make a further observation that PSE seems to be the cut-off line for increasing income. Specifically, their results indicate that obtaining a Bachelor's degree only ensured equilibrium with inflationary increases over the two decades, and that the buying power and standard of living in the U.S. is declining for all education levels below a Bachelor's degree. This observation is very relevant to the U.S., considering the projected widening income inequality and wealth gap also mentioned in Carlson and McChesney (2014).

A similar conclusion is drawn by Lemieux (2006) that only workers with PSE degrees experience a substantial gain in their relative wages between 1973 and 2005, highlighting the crucial role played by PSE in changing the wage structure. Lemieux (2006) utilizes the Current Population Survey (CPS) data obtained from the U.S. Census Bureau, which has the advantage of being one of the oldest, largest, and most well-recognized surveys in the U.S., particularly when it comes to labor force statistics. However, it should be mentioned that Lemieux (2006) only uses data on male hourly wages. This could cause the analysis to not be representative of female workers, who, according to some of the results from Carlson and McChesney (2014), actually fare better than their male counterparts in terms of wage changes. Integrating descriptive evidence from quantile regressions and more structural estimates from a human capital model with heterogeneous returns (Becker, 1964), Lemieux (2006) concludes that most of the increase in wage inequality in the years 1973-2005 is due to a dramatic increase in the return to PSE. By contrast, other factors, such as labor market experience, primary and secondary education, and the position of workers without PSE in the wage distribution play very little role in explaining changes in the wage structure. These findings expand the discussion of income in relation to

higher education, and point to the importance of PSE not only to the labor market successes of individuals, but also to the income structure of a society.

The works of Carlson and McChesney (2014) and Lemieux (2006) help extend the debate of investment in education in relation to future returns into broader and more long-term perspectives, which significantly contribute to a more comprehensive take on the importance of investment in education (particularly PSE) in the literature. On the other hand, and more related to the purpose of my paper, other studies have focused more on the impacts of PSE on individuals and how they make decisions on investing in PSE. For example, Oreopoulos and Petronijevic (2013) review research on the varying costs and benefits of higher education and explore in full the complexity of the decision to invest in and attend college for a student. In their review, Oreopoulos and Petronijevic (2013) emphasize that relative returns to a college education are rising in terms of earnings, and that this recent rise has been largely driven by technological changes that increased demand for skillful workers who can complement the use of new technologies. An important point raised by Oreopoulos and Petronijevic (2013), which has not been mentioned in studies examined so far, is the nonpecuniary benefits from having a college education. Some of these benefits include a greater sense of accomplishment, better health outcomes, and more successful marriages. It is notable that these effects remain significant even after controlling for family background and income, as stressed in the review. Overall, Oreopoulos and Petronijevic's (2013) review broadly summarizes the benefits of PSE to an individual into pecuniary and nonpecuniary, and argues for the potential for PSE to positively affect a wide range of outcomes over one's lifetime. One final important point mentioned in their review is that students uninterested in or unable to complete a 4-year college degree appear to benefit from completing a 2-year degree. The benefits of a 2-year degree and its contrast to a 4-

year one are themselves topics that have been intensely researched on, and they will be discussed in more details in the second part of this literature review.

## ***2.2 Two-year vs. Four-year College***

Within the realm of post-secondary education, there are also options with different impacts on a student's future earnings. As mentioned earlier in the review by Oreopoulos and Petronijevic (2013), it seems that having a 2-year community college education, which often cumulates in an Associate's degree, is still better than having no PSE at all in terms of future earnings. Many studies suggest that this 2-year option is especially suitable to those who may be academically, financially, or otherwise challenged to complete a 4-year degree. For instance, Monk-Turner (1994) analyzes the differences in earning ability among college entrants 10 years after high school graduation by types of first college entered, while controlling for academic ability, socioeconomic background, and college goal. The sample for this study is drawn from the two youth cohorts of the National Longitudinal Survey on Labor Market Experiences (NLS), provided by the Bureau of Labor Statistics. A noteworthy design feature is that Monk-Turner's (1994) sample only selects a relatively age homogeneous population with an average age of 27, since age is a significant variable in analyzing earning ability. Another useful feature is that the sample only includes those individuals who have IQ scores, thereby further reducing potential biases due to endogeneity. However, IQ score is by no means a perfect measurement of abilities; this raises some concerns regarding the extent to which ability bias is controlled in this study. Nevertheless, Monk-Turner's (1994) results indicate a difference in rate of returns for each additional year of education, with a 5.4% return for 2-year entrants and a 7.9% for 4-year entrants. Another potential issue here is that the dependent variable in this study is the type of college first entered, rather than the degree obtained. To address this issue, a later paper by

Turner and Monk-Turner (2003) analyzes the economic returns to education by years of education completed and type of degree attained, using a sample drawn from the National Longitudinal Survey of Youth (NLSY). This paper also includes several control variables in its model to estimate the differences in economic returns to education by gender and race. Their results agree with those of Monk-Turner (1994), in the sense that only Bachelor's degree recipients enjoy an economic advantage on completion of the degree (10%). However, their results also suggest that Associate's and other 2-year degree holders do not significantly benefit in terms of wage changes. Beside years of education and the Bachelor's degree, they find that being white and male are also positively associated with higher wages. Both these studies conclude that having a Bachelor's degree is more beneficial for future earnings compared to a 2-year community college degree, even though they seem to disagree on the benefits of the latter.

Although these papers suggest a higher return for 4-year compared to 2-year college education, they acknowledge that a 2-year PSE still yields potential benefits. A more extensive exploration into the labor market returns to 2- and 4-year college conducted by Kane and Rouse (1995) highlights the benefits of a 2-year PSE. A key design feature of this study is its integration of two different datasets: the National Longitudinal Study of the High School Class of 1972 (NLS-72) and the National Longitudinal Survey of Youth (NLSY). By combining the advantages of both datasets, such as the more complete schooling information of the NLS-72 and the more extensive family background information of the NLSY, Kane and Rouse (1995) are able to conduct a more comprehensive analysis. After evaluating wage and annual earnings differentials 6-14 years after high-school graduation while controlling for family background and ability, Kane and Rouse (1995) find that the average person who attended a 2-year college earned about 10% more than those without any college education, even without completing an

Associate's degree. This finding certainly encourages students to pursue at least a 2-year PSE. It is important to note that although tuition levels may be very different for these two types of college, the opportunity costs in terms of forgone earnings, which represent the bulk of the cost of PSE, are rather similar once ability and family background are controlled. This further suggests a higher return for 4-year college. On the other hand, they also conclude that despite the relatively small wage differentials enjoyed by 2-year entrants when compared to 4-year entrants, the returns may have been large enough to justify the public and the private investments into 2-year community colleges. Kane and Rouse's (1995) study design is particularly relevant to my paper due to their incorporation of family background by controlling explicitly for parental family income. Building on their design, I will make further improvements by controlling for more family background variables such as parental expectations of and support for the student's college education.

After reviewing these literatures, an important question arises: what are the effects of 2-year community colleges on PSE educational attainment? This question is addressed in Rouse's (1993) seminal paper: *Democratization or Diversion? The Effect of Community Colleges on Educational Attainment*, which explores this issue from both the student's and policy maker's perspectives. Rouse's (1993) major contribution to this topic is the identification of two separate effects of community college on PSE attainment. One is "democratization", which states that community colleges present those who might not have otherwise attended college an opportunity to do so with their generally lower costs and entry requirements. The other effect is "diversion", in that community colleges also attract students who might otherwise have attended a 4-year college. By separating these two conflicting effects, a clearer analysis can be made. Using a sample of 6,786 individuals from the High School and Beyond (HS&B) senior cohort, Rouse



(1993) finds that the diversion effect is marginally outweighed by the democratization effect, meaning that generally community colleges attract more otherwise non-PSE considering students than 4-year college considering ones. Indeed, this finding suggests that on net community colleges increase total years of schooling, but do not necessary change a student's likelihood of attaining a Bachelor's degree. Overall, the results of this study underline the benefits of community college for students, at the same time encourage investments into community colleges as a public policy. Additionally, Rouse (1993) mentions the possibility that the student's location may be correlated with unobservable determinants of educational attainment, which prompts me to include geographic regions into my analysis.

However, some criticism of Rouse (1993) argues that it does not take into account the unusual pathways toward a Bachelor's degree (for those who intend to obtain one) that most community college entrants are taking, nor does it consider the effect of the student's own academic expectation. To address these critiques, a later study by Alfonso (2006) examines the impacts of 2-year colleges on baccalaureate degree attainment by estimating models that allow controlling for pathways of enrollment. This is done by incorporating a variety of control variables available in the National Education Longitudinal Study (NELS) dataset, including whether a student interrupts his schooling; whether a student delays enrollment in college after high school graduation, and the student's field of study. What is more relevant to my paper is that Alfonso (2006) takes into account the student's educational expectations in the form of a dummy variable that equals 1 if the student has an expectation for at least a Bachelor's degree, and 0 otherwise. Thanks to the extensiveness of my data source (discussed in the next section), I will be able to expand the student expectation into an array of more detailed dummies. Using these improved techniques, Alfonso (2006) finds that community colleges significantly reduce

the probability of attaining a Bachelor's degree, as compared to 4-year colleges. This result can be explained by an over-motivation of 4-year college students combined with an under-motivation of community college students. In essence, Alfonso (2006) argues for a larger diversion than democratization effect, casting doubt on 2-year colleges' contribution to a student's baccalaureate attainment.

### ***2.3 Cultural Factors Framework***

One might notice that most of the studies presented so far employ the common technique of controlling for a student's ability and background. However, in reality it is hard to argue against the impacts of these factors on a student's decision for PSE attainment. For this purpose, Finnie, Lascelles, & Sweetman (2005) explore the effects of family background on access to PSE. They utilize Statistics Canada's 1991 School Leavers Survey (SLS) and 1995 School Leavers Follow-up Survey (SLFS), which interview the same group of students before and after they graduated from high school. The original SLS dataset contains the background information which generates the independent variables used in their models, while the follow-up allows them to identify the students who have gone on to PSE, and if so, at what level. My study employs a similar method since I also take advantage of a longitudinal data source that allows me to collect family background information on students and their PSE outcomes. Enabled by the rich data, Finnie et al. (2005) identify several family background characteristics including parental education, family type, place of residence, language, and ethnicity, as well as the effects of variables representing high school outcomes and related attitudes and behaviors. It is noticeable that when compared to other studies that include family background, such as Alfonso's (2006), this study's analysis is much more extensive. Based on this identification, Finnie et al. (2005) conduct a series of multinomial logit regressions and find that family background appears to

have an enduring effect on the determination of who goes on to PSE, even among what appears to be equally qualified, and perhaps even equally motivated students. This finding challenges the traditional way to examine the question of PSE determinants that estimate factors such as financial costs and prospects of future returns, and only incorporating family background as controls, thereby opening the gateway to a new approach to this research topic.

The issue of the student's ability affecting his PSE attainment is addressed by Finnie and Mueller (2007), which employs a very similar methodology as Finnie et al. (2005). By exploiting the unprecedented rich information available in the Canadian Youth in Transition Survey (YITS), Finnie and Mueller (2007) are able to investigate the various influences of early background on access to PSE with variables such as high school grades, academic participation, and standardized test scores. For student ability in particular, their results show that a 10% increase in high school grades leads to a 13% decrease in 2-year program likelihood and 21% increase in 4-year program likelihood. This means that students who are more academically capable are not only more likely to attend PSE but also display a clearer preference for a Bachelor's degree program. Thus, apart from the importance of family background as established by Finnie et al. (2005), Finnie and Mueller (2007) show that the student's ability also has a significant impact on his PSE outcome.

Building on these past studies, Finnie (2014) expands the family background approach into an empirical framework, in which he proposes a shift away from the narrow considerations and assumptions of the standard neoclassical economics paradigm, which focuses on the benefit of PSE in terms of future labor market earnings compared to its financial and opportunity costs. Finnie (2014) argues that the conventional thinking does not take into account the complexity of PSE decision in reality, citing complications such as imperfect information faced by students at

the time of decision, the contradiction between short-term behaviors and long-term goals displayed by students with varying degrees of self-control, as well as the effect of how students identify themselves among their peers and in their societies. This complex reality of PSE decision has been explored before by Oreopoulos and Petronijevic (2013), but their review only focuses on studies that still operate under the conventional neoclassical paradigm. In light of these complications, Finnie (2014) designs an empirical approach using a multinomial logit regression model that features an array of qualitative variables designed to directly access non-financially related factors that contribute to a student's PSE attainment. He summarizes these largely qualitative variables into what he calls "cultural factors", defined as factors that represent an understanding of and appreciation for the value and broad benefits of PSE. In essence, two students facing the same economic/financial calculations (the benefit and cost considerations mentioned above) with the same financial means may make different PSE decisions because they have different cultural orientations with respect to PSE as defined in this way.

This notion of "cultural factors" challenges the traditional theoretical model that focuses on the economic cost-benefit analysis, based on Gary Becker's "human capital" framework (Becker, 1964). The difficulty of Finnie's (2014) new approach, however, lies in the specification of quantifiable variables that can effectively represent these qualitative factors. He considers "family culture" as a collection of variables fostering a pro-PSE environment for a student. Utilizing the Youth in Transition Survey (YITS), he identifies parental educational background as one of the proxy variables representing "family culture". Explicitly, the number of years of education received by each parent can effectively express the culture of that family and its subsequent influence on the children's likelihood of PSE attainment. For example, a family in which both parents went to PSE could positively influence the children's decision,

making them more likely to choose PSE than those from a family with no parental PSE background, regardless of the family's income or costs of PSE. Earlier work by Finnie, Childs, & Wismer (2011) and Bodycott and Lai (2012) essentially arrive at the same conclusion in terms of the significant impact of family culture on PSE decision, although the latter focuses on the specific case of the educational attainment of Chinese students who pursue cross-border PSE.

Other than parental educational background, Finnie (2014) also mentions the significance of a student's self-perception of the importance of PSE and the continuation of his schooling. He argues that a student's self-perception of PSE is largely constructed by his "family culture" and perhaps the culture of his society at large. Since the latter is difficult to quantify and its effects are less clear, parental educational background can be considered to capture most of the effect in this regard. On the other hand, the continuation of a student's schooling can be measured by whether said student is present in school for a given period of time without interruption, similar to how one of the control variables for pathways of enrollment is measured in Alfonso (2006) as mentioned earlier. Specifically, given two students of the same family financial standing and parental educational background, the one spending more time in school and maintains better academic standings is more likely to go to PSE. Furthermore, I reason that more factors such as whether a student seeks after-school tutoring or other forms of academic advancement/assistance should be incorporated to expand the analysis of "cultural factors". For example, such a variable included in my study is a dummy indicating whether the parent has taken the student to any academic related activities outside of school. This variable can represent the cultural environment surrounding the student, and it comprises elements of both parental support and after-school academic advancement.

Interestingly, Child, Finnie, & Mueller (2014) argue that this “cultural” framework is of particular relevance to groups that are currently underrepresented in PSE (especially at the 4-year college level), such as ethnic minorities, the disabled, rural students, and students from low-income families. More importantly, Child et al. (2014) attempt to answer why some children from families without a history of PSE go on to access PSE while others do not. After analyzing a wide array of factors such as race, family educational support, educational resources at home, etc. using the Canadian YITS dataset, they find that above all, it appears to matter most what the family *does* as opposed to what it *has*. That is to say, the amount of educational support a family offers its children, both materially and culturally can directly impact the children’s PSE likelihood. This study serves as another important source of inspiration for my paper in identifying several independent variables that measure the amount of tangible support the student gets from his parent, such as the frequency in which he receives help with homework from the parent.

Given these previous studies, one can see that they all follow a central theme: the conventional economic-centered framework appears insufficient to explain the determinants of PSE attainment, and that more background factors need to be taken into consideration. Under the general guidance of Finnie (2014) and his definition of “cultural factors”, later studies contribute to the literature by identifying more “cultural” variables that help explain the forces driving students toward PSE. As more factors surface, we gain a better understanding of what exactly causes students to pursue PSE, and we begin to view this cost-benefit assessment of PSE attainment in a more diverse way that reflects more of the reality. In short, it now appears that if a student is taught to value PSE, is prepared for PSE (academically and otherwise), and

ultimately wishes to attend PSE, there is a high probability that the student will participate in PSE – and costs will not stand in the way.

The general framework of my study adheres to this “cultural” approach exemplified by Finnie (2014). As mentioned in the beginning of this literature review, the main contribution of my paper is to incorporate the parents into the analysis of PSE decisions by introducing new variables that capture parental influences on students. This focus is partially due to the clear importance of family background that most studies examined here have confirmed; partially because of the fact that parents inevitably exert influence over students’ PSE decisions, and by integrating parental information into the analysis, I hope to capture some of that influence. Specifically, I achieve this through the inclusion of four variables not yet seen in the literature: parental expectations of the student’s PSE outcome, after-school academic activities, frequency of help with homework, and amount of money saved for PSE prospects. I will discuss these variables with more details in the next section. Ultimately, my paper will serve as an addition to this thread of studies following Finnie’s (2014) empirical approach to explore variables that capture family influence over students’ PSE decisions, thereby providing more justification for the “cultural” notion and enriching the literature in determinants of PSE attainments.

### **3. Data**

#### ***3.1 Data Sources***

The data used for this study is derived from the High School Longitudinal Study of 2009 (HSLS:09), which is the fifth wave in a series of National Center for Education Statistics (NCES) secondary longitudinal studies for the U.S. Department of Education. Since its release, this dataset has been used in many studies across different fields that benefit from an extensive

longitudinal survey of high schoolers and their parents, such as Barr (2015) and Middleton, Leavy & Leader (2013). The main purpose for HSLs:09 was to explore secondary to postsecondary education transition plans and the evolution of those plans. The HSLs:09 base year took place in the 2009–10 school year, with a randomly selected sample of fall-term 9th-graders in more than 900 public and private high schools. A post-secondary update on the same cohort took place in the summer of 2013 to learn about the cohort’s post-secondary plans and decisions. It is noteworthy that HSLs:09 is a stratified survey through a two-stage process. Specifically, a sample of 944 participating schools were first randomly selected, then in the second stage of sampling, 25,206 students were randomly sampled from these schools’ 9<sup>th</sup> grade enrollment lists. Surveys were completed by students, students’ parents, principals, and mathematics and science teachers and the school’s lead counselor, either on the phone or online. This study focuses mainly on variables pertaining to surveys on students and their parents. One of the main advantages of HSLs:09, in addition to the length of its coverage, is that it takes the student as the fundamental unit of analysis and attempts to identify factors such as motivation, beliefs, and interests that lead to academic goal-setting and decision-making. Another advantage is that it also acknowledges the importance of social context—families, teachers, peers, and the wider community—to students’ experiences. These design features are especially important to this study as they provide rich background information on the complexity of a student’s PSE decision-making process, particularly for identifying cultural factors.

Despite the richness of HSLs:09, there are inevitably missing data observations resulting from mostly sample members not responding to certain questions in the survey. This study makes no attempt to impute missing data due to the difficulty and unreliability of imputation methods. For example, the dummy variable adjustment and mean substitution methods either



result in biased regression coefficients or corrupt marginal distribution of the outcome variable (Alfonso, 2006). Therefore, my analyses have been restricted to only those respondents for whom there is complete data in each variable being regressed. As a result, my sample size has been reduced to 5,054.

### ***3.2 Dependent Variables***

To investigate the impact of various factors on the likelihood of a student attaining PSE as well as a 2-year Associate's degree vs. 4-year Bachelor's degree, I will employ two sets of regressions with only the dependent variable being different. Both dependent variables are derived from the college program level in 2013 for sample members, as part of the information collected from the post-secondary update in 2013. The first dependent variable, PSE\_Not, equals to 1 for individuals who are enrolled in any PSE programs, including Bachelor's, Associate's, and university transfer Associate's degree programs; it equals to 0 for individuals who do not enroll in any PSE programs, including those just taking courses without attending a degree offering program, and those who do not yet have a plan. For the second regression, the sample space is restricted to only PSE enrollees, i.e. those who report 1 for the variable PSE\_Not. This reduces the sample size to 4,385 individuals. The second dependent variable Bachelor\_Associate takes the value of 1 if the student enrolls in a 4-year Bachelor's program, and 0 for those in a 2-year Associate's program, including university transfer Associate's program.

### ***3.3 Independent Variables - Individual Characteristics***

All my independent variables are derived from the survey results in the 2009 base year. A caveat here is that since my dependent variables are taken from the 2013 update while my independent variables are taken from the 2009 base year, I have to make the assumption that these independent variables are not dynamic over this timespan. Adhering to the structure of

previous studies designed to study the educational attainment of post-secondary students (Alfonso, 2006), this study includes sex and school type with dummy variables for male and public school, respectively. For more complicated categorical variables such as race and school region, I generate several dummies including Asian, African American, white, and “others” (including Hispanic, Native American, and multiracial) as base for race; Northeast, Midwest, South, and West as base for region (these are the only four regions sampled in the HSLs:09). Moreover, there are two continuous variables: socioeconomic status and students’ school engagement. Socioeconomic status is a composite variable created by the National Center for Education Statistics using parent/guardians’ education, occupation, and family income that ranges from -1.7526 to 2.5668. Similarly, school engagement is calculated by the NCES from variables such as the frequencies in which a student shows up to class without doing homework or bringing books and stationary, as well as how often a student is late to class. A note to be made here is that Alfonso (2006) includes the student’s educational expectation as one of its key contributions; this is also included in this study, which is collapsed into dummy variables for expectations of Associate’s, Bachelor’s, higher than Bachelor’s degrees, and the base being those who are not sure.

### ***3.4 Independent Variables – Family Background***

Most of the variables mentioned above are the student’s individual characteristics, which have mostly been covered in previously studies (Alfonso, 2006; Card, 2001; Krueger and Ashenfelter, 1992; Monk-Turner, 1994). The focus of this paper is on family background factors that have not been addressed extensively, which help form the “cultural” factor framework. One of the contributions of this study is the parents’ expectations of their children’s educational outcome. This variable is included in the HSLs:09 datasets, constructed from the answers

provided to the question of how far in school the parent thinks the 9<sup>th</sup> grader will achieve. Similar to the student's educational expectation, I create several dummy variables denoting parents' expectations of Associate's, Bachelor's, higher than Bachelor's degrees, and "not sure" as base.

Another set of contributions of this study revolves around the amount of support parents provide for their children outside of school both in terms of academic assistance and financial preparation, which I believe are more important than their expectations since these are the more tangible resource inputs that actually help the student. For this purpose, the first variable I identify is a dummy indicating that parents have helped their 9<sup>th</sup> grader obtaining academic instructions outside of school in the last year at the time of taking the survey. This variable returns 1 if the parent checked any of the following activities: music, dance, art, or theater; organized sports; religious group; math or science camp; academic assistance such as learning center, personal tutor or summer school program. This variable is chosen because it indicates the parent's efforts in helping the student identifying academic interests that may assist their decision of which type of PSE institution to attend, as well as potential major choices.

The second variable focuses on a more continuous support from parents: the frequency in which they help their children with homework during a school year. Compared with taking the students to out-of-school academic activities once or a few times a year, a continuous effort to help them with homework might offer a stronger indication on the parent's attention to their children's education. However, it should be noted that this attention may be correlated with expectation; for example, parents who pay more attention to their children's education by helping them with homework more often could be those that have higher expectations to begin with. This categorical variable is also split into three dummies for less than once a week, 1 or 2

days a week, 3 or more days a week, and never as base. Note that this variable only reveals how often the parent helps the student with homework without specifying the reason. For example, a higher frequency might suggest that the parent is more attentive, but it can also mean that this student is struggling more academically. Moreover, other important details such as exactly how this help is extended or for which subject are also absent.

Finally, for parental support in the form of financial preparation, I include a variable that denotes the amount of money the parent has currently set aside for the student's future educational needs. Like all other categorical variables, I create three dummies for the amount \$1 - \$10,000, \$10,000 - \$25,000, \$25,000 or more, with the base being those who did not save anything. This variable is included because it offers information on the financial side of the parental support in addition to family income, which is already factored into the SES variable. Moreover, it reveals more about the level of early preparation the parent makes for the student's future educational needs. However, the degree of preparation this variable represents is arguable, since this information is collected for 9<sup>th</sup> graders in 2009, three years prior to their PSE decisions. Another potential disadvantage here is endogeneity. Specifically, a parent might have more money set aside simply because the family is more financially sound and can therefore afford a higher amount of wealth being idle, which does not indicate anything about the parent's effort to prepare for the children's future education. This problem could potentially be solved by controlling for family wealth or income. However, I choose to include this variable under the assumption that this endogeneity problem might not be too impactful since family income is already included as a factor in SES which can be controlled.

### **3.5 *Summary Statistics***

Table 1 displays the summary statistics for the dependent variable before being collapsed into two dummies for the two separate regressions. One can see that most of the sample members do, in fact, end up in a 4-year Bachelor's program, and less than 15% fail to enroll in any post-secondary education program.

Tables 2 and 3 show the summary statistics for major independent variables included in this study. In order to highlight the contributions of this study, only parental support variables are shown here. For this sample, it seems that the general distribution of expectations of the student is quite similar to that of the parent, especially for those expecting an Associate's or higher than a Bachelor's degree. What is interesting is that the number of students without a clear idea for PSE far outweighs their parental counterparts, by nearly 2.5 times. On the contrary, the number of parents who expect a Bachelor's degree is 71% more than the number of students who do. This difference here seems to suggest that for those students who do not have a plan for their PSE trajectory themselves, their parents may actually have a Bachelor expectation for them.

In terms of helps with homework, Table 4 shows that the majority of parent reports helping their children with homework at least once a week, with nearly 15% report more than 3 days a week. An interesting conjecture one can make here is that those parents who offer more continuous support to their children's education may be the same ones who have higher expectations. Some further analysis confirms this conjecture: parents who expect a Bachelor's degree or higher tend to spend more days in a week helping their children with homework, and vice versa. Although it is difficult to establish causality based on just these two variables.

Lastly, the amount of funds currently set aside for the student's future educational needs is presented in Table 5. From this table, one can see that more than 40% of the sampled parents has saved no more than \$10,000, and about 5% has no saving whatsoever. After some further

analysis, I notice that similar to help with homework, parents who expect higher educational outcomes tend to coincide with those who save more in advance. However, the causality here is, again, difficult to confirm without controlling for family income/wealth. But it is nonetheless interesting to see the correlation between parental expectation and their actual support, both in terms of homework and financial preparation.

#### **4. Methodology**

Given the research question of this study, both dependent variables are set to be binary variables, with one indicates whether a student decides to pursue PSE, and the other indicates whether that program is for a 4-year Bachelor's degree. In order to estimate the effects of all my independent variables on a student's PSE/bachelorette attainment, this study proposes the following equation using the Probit model:

$$Pr (Y_i = 1) = \Phi (\beta_{1i} X_i + \beta_{2i} P_i + \varepsilon_i)$$

where  $Y_i=1$  indicates that student  $i$  enrolls in PSE/a Bachelor's degree PSE,  $X_i$  is a matrix of independent variables for student-specific factors, and  $P_i$  is a matrix for parent-specific factors, as detailed in the Data section. I chose the Probit model because, given the dummy nature of my dependent variables, OLS may lead to predicted probability out of the 0, 1 bound, which has no economic meaning in my case. Furthermore, the Probit model allows for estimating marginal effects, which is more interesting to this study as it reveals the individual effect of each independent variable while evaluating all others at their means.

As with most Probit models, the estimating method used here is the maximum likelihood estimation, which finds the value for the parameter  $\beta$  that maximizes the joint likelihood of  $Y_i=1$ , i.e. the student decides to pursue PSE/a Bachelor's degree. In order to compare how the same set

of independent variables result in whether the student eventually chooses a 2-year Associate's or a 4-year Bachelor's degree, I will run two separate regressions with the two different dependent variables: one represents if a student decides to enroll in any PSE compared to not enrolling, and the other represents if a student chooses a 4-year Bachelor's PSE as opposed to a 2-year Associate's.

## **5. Results & Conclusion**

### ***5.1 PSE vs. Non-PSE***

Table 6 shows the effects of all the independent variables on the probability of a student's decision to pursue either a Bachelor's or an Associate's PSE as opposed to no PSE program under the robust Probit regression. Note that all the coefficients shown are the marginal effects, which indicate the percentage increase in the probability of the dependent variable being 1 given a unitary increase in an independent variable, holding all other independent variables constant. I will briefly discuss the effects of those variables that are statistically significant, as denoted in Table 6.

The results from the first regression are not very strong, as only two variables have marginal effects exceeding 5%. For the student-specific characteristics, one can make some useful observations. Not surprisingly, socioeconomic-status has some measurable impact: with 1-unit increase (the variable value changing from 0 to 1), a student is predicted to be 5.33% more likely to enroll in some type of PSE. Based on the range of the socioeconomic-status variable in the HSLs:09 (from -1.9302 to 2.8807), this effect can be better interpreted as a 20% increase in socioeconomic-status will raise a student's PSE likelihood by 5.33%. This result adheres to the consensus in the literature regarding the essential role of financial capability in PSE decisions

(Becker, 1994). Interestingly, despite being statistically significant, the effect of good school engagement only yields a small 1.18% per unit increase in the student's PSE likelihood. This seems to suggest that being actively engaged in school does not affect whether a student decides to pursue PSE, but it could also be because the way HSLS:09 measures this variable does not adequately represent school engagement. Compared with private schools, being in a public school decreases this probability by 3.87%. This could be because that private schools are generally better funded, and can therefore provide higher quality secondary education than public schools can. However, there is again an endogeneity problem, such that given the usually higher tuition costs of private schools, students who attend them tend to be from wealthier families with higher socioeconomic-statuses, which lead to higher PSE probability in its own way. Geographically, being in the Northeast seems to have some significant positive impact comparing to the West (4.8%). This may be explained by the fact that states in the Northeast enjoy higher concentration of educational resources when compared to the West, particularly in states like Massachusetts. On the other hand, this result is somewhat surprising since there is also a considerable concentration of high quality schools in California. But it is difficult to do further analysis since the data does not offer any more detailed location information. It should be noted I make the assumption here that students tend to attend schools in the same region as they are from. Demographically, being Asian and white has a positive impact of 3.79% and 3.1%, respectively, which could suggest cultural or institutional reasons (Straker, 2016). In terms of expectation, the results make sense intuitively. Students who expect to attain a Bachelor's degree or higher are, in fact, around 5-6% more likely to go to some type of PSE in the end when compared to those without any ideas on the subject.



For the parental support variables, there are some unexpected results. Similar to student expectation with “don’t know” as the base, if the parent thinks the student will attain a Bachelor’s degree or higher, the student is more likely to do so. However, a parent who expects only an Associate’s degree results in a 5.18% decreased probability for the student’s PSE likelihood, and this value is statistically significant. This suggests that as far as attaining a post-secondary education goes, a lower parental expectation has a greater negative impact on the student’s educational trajectory than that of his own. A possible reason is that these parents are more financially or otherwise constrained, therefore could not offer more support to their children’s PSE ambition even if they wanted to. However, this hypothesis is difficult to verify without cross-comparing with other variables such as socio-economic status. In terms of help with homework, it seems that when compared to never receiving help, the more frequent a student gets help with homework from his parent, the less likely he will choose to pursue a college education. One possible explanation to this trend, as mentioned earlier, is that a higher frequency indicates that the student struggles more with homework, therefore is less academically capable for PSE. This could be verified in future studies that incorporate and control for student academic ability. However, note that these effects are not very significant statistically. Lastly, the results suggest that parents who save more for their children’s future educational needs only increase their PSE likelihood if they saved \$10,000 or more, and only to a limited extent (<2%). Given the potential endogeneity problem with family wealth/income as well as the statistically insignificant marginal effects, this correlation is not strong.

## **5.2 *Bachelor’s vs. Associate’s***

The second regression, as shown in Table 7, shows the marginal effects on the probability of attaining a 4-year Bachelor’s as opposed to a 2-year Associate’s degree PSE program. The

results largely mirror those of the previous regression in terms of directions, but each marginal effect is considerably larger. This means that the same factors have greater impacts on changing the PSE likelihood of a 2-year program enrollee than they do for the bachelorette likelihood of a non-PSE enrollee. This difference is confirmed via a two sample t-test to be statistically significant for most of the variables.

For the student-specific factors, the variable with the largest impact by far is socioeconomic status, with 20% increase resulting in 16.1% higher probability for a 4-year PSE program. This contrasts sharply with the 5.33% from the first regression, suggesting that socioeconomic barrier is more present for students with PSE aspirations compared to those without. But since the socioeconomic status variable in HSLS:09 is comprised of several other factors such as family income and parental educational background, it is difficult to determine exactly what is causing this contrast. Compared with private schools, being in a public school again poses a much larger disadvantage of 9.27% lower chances. In terms of regional differences, it seems that compared to the West, living in the Northeast and Midwest offers substantial advantage at 12% and 12.3%, respectively. Even the South seems to perform better with a 5.66% higher probability for attaining 4-year degrees. If I am correct to assume that these regions as well as private schools enjoy better educational resources, and that students prefer attending schools in their home regions, then these results suggest that this regional difference is a bigger obstacle for Bachelor-considering students than just PSE-considering ones. Demographically, Asian students once again enjoy a considerably higher probability of 14.2%, compared to 5.75% for white students. In terms of student expectation, the results here represent a correlation very similar to the one from the first regression: students who expect higher are more likely (roughly 8-10%) to achieve higher.

On the parent's side, the results largely mirror those of the first regression, but again with much larger marginal effects. Compared to parents without any expectation for their children's PSE, those who expect only an Associate's degree decreases the student's bachelorette probability by as much as 11.9%. In contrast to the 5.18% decrease in the first regression, it seems that the parents of Bachelor-aspiring students exert more influence over their PSE decisions than parents of non-PSE-aspiring ones. This is reflected more consistently in the marginal effects of homework helps. Parents who help their children more often consistently reduce their bachelorette likelihood (5.02%; 7.61%; 10.9%). However, this could be more easily explained by the student's own lack of academic abilities as mentioned before. Same as before, the effects of out-of-school academic activities and saved educational funds are not statistically significant.

### ***5.3 Interactive Terms***

It should be noted that in both regressions, I take into account the interaction between some of the independent variables by creating interactive terms as new variables and including them in the regressions. Specifically, I am interested in how living in the Northeast, being Asian, and receiving help with homework three or more times a week interact with a student's Bachelor expectation and his parent's Associate expectation. I find these interactions most interesting because they are some of the variables with large marginal effects that are statistically significant. Table 8 and 9 present the results of these interactive terms for PSE vs. Non-PSE and Bachelor's vs. Associate's, respectively. Note that the interaction between Asian and parents with Associate expectation is omitted from the regression by STATA because this variable has only 6 observations, meaning that only a handful of Asian students have parents expecting only Associate's degrees. Somewhat surprisingly, none of these interactive terms yields statistically

significant results, suggesting that no pair of independent variables chosen exhibit strong interaction.

#### ***5.4 Concluding Remarks***

The results of my analysis offer some interesting insights, especially when contrasting the marginal effects of the same independent variables between the two different regressions. Overall, it is clear that the majority of factors affect the bachelorette likelihood of a 2-year program considering student than they do for the PSE likelihood of a non-PSE considering student. This means that at least for the factors included in my study, their effects are felt more strongly for students who already have inclinations toward PSE. In terms of my study's contribution to the "cultural" framework literature on PSE determinants, it is apparent that parental expectation on their children's college education has significant impact, particularly for PSE-considering students. On the other hand, the effects of after-school academic activities and amount of money saved for PSE prospects fail to be statistically significant. Lastly, the frequency of help with homework effects, although statistically significant, may be biased due to potential endogeneity with the student's academic ability.

Based on my results, some important policy implications can be drawn for education policy makers. First, improve resource distribution across different regions of the country to advance the educational outcome of students residing in the South and the West. Second, cultivate a better understanding of the importance of PSE in non-Asian minority communities. Finally, foster a pro-PSE culture in families by encouraging both students and parents to expect and strive for PSE, especially those with lower socioeconomic-statuses.

Admittedly, there are some limitations to my study, most notable of which is the presence of two major endogeneity problems. The first one is potential endogenous family financial

capability, as it may impact whether parents send their children to private schools, how much fund they are able to save for their children's future educational needs, as well as their expectation of their children's PSE outcome. Apart from the endogenous family financials, there is also the endogenous student ability, which could explain the negative correlation between frequency of homework help and PSE likelihood. The first issue could be improved by controlling variables such as family income or wealth directly rather than through a proxy such as the composite variable socioeconomic-status. Similarly, the endogenous ability problem can be amended in future studies by incorporating more independent variables such as grades, standardized test scores and high school transcripts to control for ability, as suggested by past papers in the literature (Monk-Turner, 1994; Kane & Rouse, 1995; Finnie & Mueller, 2007). In addition to addressing these endogeneity problems, future research could conduct more detailed examinations of a student's PSE decisions beyond just a 2-year vs. 4-year program if data permits. Some examples include regressing more dependent variables that explore how family culture affects a student's major choice, the size and quality of his PSE program (as measured by student population and ranking), and his geographical preference. The inclusion of these more detailed variables will expand the spectrum of the impact of family culture on a student's PSE attainment, and further enrich the literature on this topic.

## Appendix

**Table 1. PSE Outcome Distribution**

Program of study	Frequency	Percentage
Bachelor's	3,165	61.59
Associate's	1,287	25.04
Non-PSE	687	13.37
Total	5,139	100

**Table 2. Student PSE Expectation Distribution**

Student Expectation	Frequency	Percentage
Associate's	183	3.56
Bachelor's	1,032	20.08
Higher than Bachelor's	3,000	58.38
Don't know	924	17.98
Total	5,139	100

**Table 3. Parent PSE Expectation Distribution**

Parent Expectation	Frequency	Percentage
Associate's	176	3.42
Bachelor's	1,766	34.36
Higher than Bachelor's	2,930	57.01
Don't know	267	5.20

Total	5,139	100
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**Table 4. Help with Homework Frequency Distribution**

Help with homework	Frequency	Percentage
Never	918	17.86
Less than once a week	1,780	34.64
1 or 2 days a week	1,700	33.08
More than 3 days a week	741	14.42
Total	5,139	100

**Table 5. Saved Funds Distribution**

Saved funds	Frequency	Percentage
None	239	4.65
< \$10,000	2,253	43.84
\$10,000 - \$25,000	1,293	25.16
> \$25,000	1,354	26.35
Total	5,139	100

**Table 6. PSE vs. Non-PSE Regression**

VARIABLES	y1	
Socioeconomic-Status	0.053***	(0.00663)
School Engagement	0.012**	(0.00507)
Outside Academic Activity	-0.015	(0.0115)
Male	0.005	(0.00913)
Public	-0.039***	(0.0107)
Northeast	0.048***	(0.0175)
Midwest	0.010	(0.0134)
South	0.001	(0.0125)
Student Expecting Associate	-0.013	(0.0220)
Student Expecting Bachelor	0.062***	(0.0156)
Student Expecting Higher	0.048***	(0.0116)
Parent Expecting Associate	-0.052*	(0.0301)
Parent Expecting Bachelor	0.017	(0.0192)
Parent Expecting Higher	0.056***	(0.0191)
Asian	0.038*	(0.0211)
Black	-0.019	(0.0171)
White	0.031***	(0.0114)
Homework Help 1/Week	-0.005	(0.0137)
Homework Help 1 or 2/Week	-0.023*	(0.0135)
Homework Help 3 or More/Week	-0.026	(0.0176)
Saved \$1-\$10,000	-0.010	(0.0207)
Saved \$10,000-\$25,000	0.018	(0.0221)
Saved >\$25,000	0.011	(0.0226)
Observations	5,048	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Table 7. Bachelor's vs. Associate's Regression**

VARIABLES	y1	
Socioeconomic-Status	0.161***	(0.0107)
School Engagement	0.023***	(0.00825)
Outside Academic Activity	-0.017	(0.0182)
Male	-0.021	(0.0141)
Public	-0.093***	(0.0160)
Northeast	0.120***	(0.0260)
Midwest	0.123***	(0.0215)
South	0.057***	(0.0199)
Student Expecting Associate	-0.001	(0.0416)
Student Expecting Bachelor	0.077***	(0.0243)
Student Expecting Higher	0.097***	(0.0189)
Parent Expecting Associate	-0.119**	(0.0593)
Parent Expecting Bachelor	0.010	(0.0326)
Parent Expecting Higher	0.081**	(0.0321)
Asian	0.142***	(0.0348)
Black	-0.020	(0.0295)
White	0.058***	(0.0184)
Homework Help 1/Week	-0.050**	(0.0210)
Homework Help 1 or 2/Week	-0.076***	(0.0211)
Homework Help 3 or More/Week	-0.109***	(0.0276)
Saved \$1-\$10,000	-0.017	(0.0337)
Saved \$10,000-\$25,000	0.009	(0.0353)
Saved >\$25,000	0.050	(0.0360)
Observations	4,385	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 8. PSE vs. Non-PSE Interactive Terms**

VARIABLES	y1	
Northeast x Student Expecting Bachelor	0.026	(0.0385)
Northeast x Parent Expecting Associate	-0.022	(0.0543)
Asian x Student Expecting Bachelor	0.045	(0.0619)
o.Asian x Parent Expecting Associate	-	
Homework Help 3 or More/Week x Student Expecting Bachelor	-0.024	(0.0307)
Homework Help 3 or More/Week x Parent Expecting Associate	0.008	(0.0462)
Observations	5,048	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9. Bachelor's vs. Associate's Interactive Terms**

VARIABLES	y1	
Northeast x Student Expecting Bachelor	0.034	(0.0495)
Northeast x Parent Expecting Associate	0.142	(0.112)
Asian x Student Expecting Bachelor	-0.047	(0.0780)
o.Asian x Parent Expecting Associate	-	
Homework Help 3 or More/Week x Student Expecting Bachelor	0.006	(0.0466)
Homework Help 3 or More/Week x Parent Expecting Associate	-0.005	(0.0992)
Observations	4,385	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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