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Analyzing Access to Higher Education: Through the Lens of Socioeconomic Factors at Bucknell University

Autumn J. Patterson
ajp027@bucknell.edu

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By

Autumn J. Patterson

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Approved by:

Janet T. Knoedler
Adviser: Jan Knoedler

Amy M. Wolaver
Co-Adviser: Amy Wolaver

Honors Council Representative: Chris Ellis

Department Chairperson: Erdogan Bakir

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Abstract

Access to higher education in the United States greatly varies depending on numerous characteristics; especially an applicant's race and financial status. This thesis aims to answer the following questions regarding access to higher education at Bucknell University: How have socioeconomic factors affecting access evolved in the past twelve years? Has this change increased or decreased access for Bucknell students? Does the level of access change when gender and race are analyzed? Is Bucknell successfully leveling the playing field for all students regarding their earning potential after they graduate? Lastly, does the mismatch hypothesis apply to Bucknell? By utilizing data from the Offices of Admission, Financial Aid, Registrar, and Career Development Center at Bucknell University, this thesis examines what characteristics are significantly impacting a student's chance at admission and eventually matriculation to Bucknell University. Further, this thesis examines how these significant predictors have evolved since 2006. This thesis finds that access to Bucknell University, through the lens of both admission and matriculation, is heavily dependent on financial status. Furthermore, race is still a significant factor in the admissions decision and even with the increase in acceptances of minority students, matriculation has remained flat or become negative. Lastly, for low income students who are accepted to Bucknell University, there is no evidence of a mismatch hypothesis once they graduate from Bucknell University and begin working.

1. Introduction

Access to higher education has recently been a major area of analysis for economists. With college tuition continuously on the rise, many wonder whether or not low socioeconomic students will ever be able to afford a four-year institution. As an example, in January 2017, Gregor Aisch et al, published an article in the *New York Times* titled "Some Colleges Have More Students from the Top 1 Percent than the Bottom 60. Find Yours". This article drew enormous attention to universities that do not provide equal access for students of all levels of socioeconomic status. Bucknell University ranked as the sixth worst school in this article, based on their ranking of access, with 20.4% of students from the top 1% of income distribution ($630K+) but only 12.2% of students from the bottom 60% (<$65K). After this article was released, many Bucknell students as well as administrators wondered where this data came from as well as the validity of the results.

While this *New York Times* article drew significant attention to this problem through media discussions, the scholarly research on which it was based was written by Raj Chetty et al (2017) titled "Mobility Report Cards: The Role of Colleges in Intergenerational Mobility". Chetty and his team deduce four major conclusions in this report. First, access to college varies greatly by parental income. Second, children from either low or high income families have similar earnings outcomes later in life contingent on the college they attended; therefore, the mismatch hypothesis does not exist. Third, rates of upward mobility differ across colleges. Finally, the fraction of students from low-income families did not change between 2000-2011 at elite private colleges, but actually fell at colleges with the highest rates of bottom to top quintile mobility (Chetty et al, 1). Chetty et al is the first scholarly article to analyze all types of colleges; one unique element of the analysis was that it linked students to their household income

by using parental tax records. With this data, Chetty and his team were able to create mobility report cards for the majority of colleges across the United States and analyze which universities have the highest rates of upward mobility, defined as students moving from the bottom 20% of the income distribution to the top 20%.

This thesis aims to examine the first two conclusions Chetty and his team deduce for a school in his sample, by analyzing how socioeconomic factors have shaped the student body at Bucknell University throughout the last twelve years. Furthermore, econometric analysis is used to investigate the following questions: How have socioeconomic factors evolved in the past twelve years? Has this change increased or decreased access for Bucknell students? Does the level of access change when gender and race are analyzed? Is Bucknell successfully leveling the playing field for all students regarding their earning potential after they graduate? Lastly, does the mismatch hypothesis apply to Bucknell?

A common belief among Bucknell students is that wealthier students are more likely to be accepted to Bucknell as well as eventually matriculate. Based on all the United States applicants since Fall 2006 that filled out the Free Application for Federal Student Aid (FAFSA), the average amount of parental income of a Bucknell applicant is $163,671, while the average household income in the United States in 2018 was $61,372 (Konish 2018). Based on these United States applicants, Bucknell University draws a student body from households that are wealthier than the average household in America. Furthermore, many students believe that a parent's connections play a large role in the jobs students receive after graduation; thus, wealthier students are believed to graduate with better, higher paying jobs. This thesis will help to confirm or deny these stereotypes, as well as contribute to the overall research on access to higher education by specifically analyzing Bucknell. The results of this research will benefit

Bucknell by informing the administration of how outcomes for Bucknell students have changed, and whether or not Bucknell has improved access to low income students. Moreover, even if access to low income students has increased, this thesis will shed light on whether these low income students are more likely to matriculate. If acceptances have increased for low income students, while matriculation has remained stable, then the reputation of Bucknell University is greatly shaping its student body and the administration should be aware of that result.

The remainder of this thesis is organized into the following five sections. Section Two discusses prominent theories about upward mobility and access to higher education and how this has evolved over the past 20 years. Sections Three and Four discuss the collection of data as well as the theoretical models used. Section Five examines the results of the models, analyzing the predictors a student that is accepted to Bucknell obtains and then whether or not that student decides to matriculate. Additionally, this section will discuss the factors affecting a student's starting salary and whether or not Bucknell is helping all students achieve equal starting salaries. Finally, Section Six summarizes this research, discusses the potential for further research, and offers policy suggestions for Bucknell Administration.

2. Literature Review

2.1. Mobility Trends within the United States

Economists have been studying intergenerational mobility, identifying patterns and developing trends within the United States for years. The literature consistently finds certain variables to be significant predictors of the level of mobility an individual is able to achieve. These variables include, but are not limited to, race, parental income, gender, and location. Specifically, when looking at higher education and its impact on socioeconomic mobility, the same trends are found when analyzing these same variables.

First, a child is automatically placed into different demographic categories based on their race and parents socioeconomic status that predetermine the likelihood of particular socioeconomic statuses at adulthood. These preconceived notions have been documented, again and again, through countless studies. Unfortunately race and a child's socioeconomic background play a large role in the level of mobility a child is likely to achieve. As Mary Corcoran stated, "Even when children come from similar backgrounds, black children will do less well economically as adults than will white children, and there is suggestive evidence from employer surveys and audit studies that race-based discrimination still exists" (Corcoran 261). In short, structural racism plays a huge role in individual's success and even today is still benefitting white citizens over their minority counterparts. Coincident with structural racism benefitting white citizens, there remains a persistent level of low socioeconomic status for minorities within this country. This pattern remains with them throughout their adult life, whether it is through receiving a lower salary for the same job or facing discrimination.

When combining these patterns of race with other factors such as location and parental income, economists find similar patterns with the level of mobility that is achievable. However,

other studies have shown, when controlling for race, that the level of education can change. "Interestingly, controlling for background does eliminate white children's schooling advantage. And in some studies, once background disadvantages are controlled, blacks usually acquire more schooling than do whites (Corcoran et al 1987, Mayer 1991, Haverman et al 1991). This is inconsistent with the argument that black children are less motivated to stay in school than are white children for 'cultural' reasons" (Corcoran 260). There are some misconstrued beliefs that minority students do not want to stay in school and therefore inevitably receive less schooling. In contrast, Corcoran (1995) argues that a student's background and environment when growing up is a better predictor of the amount of schooling they will receive, not their race.

Relocation studies, including Chicago's Gautreaux experiment, have attempted to measure the effect of a child's background has on mobility.

> "Evaluations of Chicago's Gautreaux experiment, which relocated black public housing residents into subsidized city and suburban private apartments, strongly support the notion that neighborhoods matter. Rosenbaum (1991) compares outcomes of children relocated in city apartments to those of children relocated in suburban apartments. He finds that children in the suburbs were much less likely to drop out of high school, were considerably more likely to attend college, were more likely to be employed and had higher earnings" (Corcoran 256).

While this is an older study, the outcome is still extremely relevant and is a common theme studied today. The location where students are growing up and spending time has a significant impact on their outcome later in life. While the Chicago Gautreaux experiment focused on black public housing, the effect of where a student grows up can be applied to any race, as seen in studies by Corcoran et al (1987), Mayer (1991), Haverman et al (1991). While relocation studies

provide interesting insight into mobility and how mobility is impacted from different neighborhoods, the studies are extremely controversial and there are some problems with the outcomes due to potential selection bias. According to Corcoran (1995), selection bias cannot be eliminated only reduced within these studies.

Studying intergenerational mobility has recently been on the rise, especially because there is a concern that socioeconomic mobility is declining as income inequality is increasing. "Indeed, the theoretical analysis in Solon (2004) shows that, other things equal, a rise in earnings inequality associated with increased returns to human capital would bring with it an increased intergenerational earnings elasticity as well" (Lee, et al, 771). Due to the increase in income inequality, researchers are left wondering if the chance for mobility has also declined for citizens of the United States. "The key issue in our view is not that mobility is declining but rather that some regions of the United States persistently offer less mobility than most other developed countries. This lack of a trend in intergenerational mobility contrasts with the increase in income inequality in recent decades" (Chetty 2014 146). Chetty, et al (2014) study further discusses the implications of being born in the 'wrong' region or area of the country, and subsequently having a significantly lower chance of achieving mobility than someone born in the 'right' region.

Raj Chetty linked parental tax records to student data and analyzed mobility at the most detailed level economists have yet conducted. "The stability of intergenerational mobility is perhaps more surprising given that socioeconomic gaps in early indicators of success such as test scores, parental inputs, and social connectedness have grown over time" (Chetty 2014 146). While intergenerational mobility is not decreasing, the inequality between standardized test scores and the capacity of low socioeconomic students to attend higher education is increasing. Furthermore, "A useful visual analogy is to envision the income distribution as a ladder, with

each percentile representing a different rung. The rungs of the ladder have grown further apart (inequality has increased), but children's chances of climbing from lower to higher rungs have not changed" (Chetty 2014 141). Economists and public policy professionals have been attempting to create solutions that could lower income inequality in this country. For example, Corcoran suggests the government "provide more economic resources to poor families and to poor children, and enable poor families to buy into 'better neighborhoods'. This could be accomplished through earned income tax credits, refundable child care tax credits, housing vouchers, job opportunities programs etc" (Corcoran 243). Moving children into better neighborhoods is consistent with the belief that background is a significant predictor of a students' success.

2.2. Affirmative Action and the Mismatch Hypothesis

Increasing access to education has been addressed in many ways. Historically, the government has stepped into attempt to help equate minorities in this country through affirmative action. Arcidiacono (2015) states the original motivation for affirmative action is the history of discrimination in the United States, especially against black citizens. While proponents of affirmative action believe it is helping minority students access higher education, critics argue that affirmative action is not helpful in the long run. "The average SAT score for African Americans entering Duke University in 2001 or 2002 was 140 points lower than the average for white students" (Arcidiacono, et al, 4). Fisher, et al, (2007) believes due to the publicly available difference in test scores, white students might believe the black students in their classes do not deserve to be at the same university. Likewise, black students might perceive white students to believe minority students are not qualified and therefore affirmative action is heightening stereotype threat (Fisher, et al, 534). If students attending a university are falsely stereotyped

because they are from a minority group, they might subconsciously not try as hard in their classes and fall into the stereotype of their race. However, a minority student might be just as qualified as their white counterpart, but because they believe they are not as qualified or believe their peer's perception of them is negative, their desire to pursue and eventually receive a degree might decrease.

Due to admissions lowering their standards for minority students, at least in respect to standardized test scores, critics argue that minority students will not be successful once they attend college and fall behind their peers. For example, as Arcidiacono reports, "the mismatch hypothesis argues that many of the beneficiaries of preferences are so misplaced academically that they would actually be better off in the absence of affirmative action" (Arcidiacono, et al, 6). If minority students are less prepared academically, they might not be able to thrive at challenging universities. On the other hand, proponents of affirmative action believe "race sensitive admissions are necessary not only to correct past discrimination, but to broaden disadvantaged students' access to education" (Alon, et al, 294). Fischer, et al, (2007) concludes affirmative action both positively and negatively affects minority students and the stereotypes about intelligence level around these students. However, the benefits are significant and therefore the current practice of affirmative action helps minority students' access to college and their future endeavors.

Hypothetically, if a college were to ignore race within their admissions process they might not take into account the lower average standardized test scores of minority students (Guinier 2016). If a student from a lower socioeconomic group cannot afford a private tutor for a standardized test, it is likely they will receive a lower score and will not be able to compete with the wealthier white students applying to the same college. Alon, et al, (2005) analyzes the

mismatch hypothesis and finds minority students' likelihood of graduating is significantly higher for more selective universities. Increasingly selective universities typically have additional resources to support their students, and, therefore, minority students coming in less prepared are graduating at higher rates than less selective schools with less resources. Furthermore, highly selective schools typically have a higher endowment per student and thus can spend more money on each student and have smaller classroom sizes.

2.3 Access to Higher Education

Another frequent topic in the literature on the economics of higher education is the cost of college and whether or not students of all socioeconomic levels have access to higher education, especially to the best schools in the country. Furthermore, parents under financial stress do not prioritize money towards education. "Parents allocate income between current consumption and investments in children's human capital (e.g. schooling). Because poor families are constantly in economic crisis, these families must concentrate on survival. They have little time, money, or energy to devote to developing children's human capital or earnings potential" (Corcoran 242). On the other hand, Dubow (2009) discusses how highly educated parents are more likely to send their children to an elite college; thus, the student will likely graduate, and receive a well-paying job. It is likely these highly educated parents come from a higher socioeconomic background and therefore can afford the tuition at elite institutions in the United States. By sending wealthy children to a selective school with strong connections to companies for jobs after graduation, they are continuing the virtuous cycle of students in high socioeconomic status staying at the high socioeconomic level for the rest of their life.

Furthermore, since students of low socioeconomic status cannot afford to attend the most expensive schools, they are already at a disadvantage according to Dale, et al, (2002). This study

determined that higher average tuition costs lead to higher income in later years because tuition and expenditure per student is extremely positively correlated. In a more recent study, Hill (2011) discusses how lower income students are asked to pay a lower net price and a lower share of the full tuition price, but pay a significantly higher share of their family incomes than high socioeconomic students. Wealthy schools have been the most effective at lowering the tuition cost for its low socioeconomic students. "Schools with higher levels of wealth, measured by endowment per student, reduced net prices to the lowest levels and have experienced the largest increases in shares of low-income students" (Hill, et al, 13). Hoxby (2015) discusses how the most selective institutions have the highest value-added for each student, due to the increased level of spending per student. Furthermore, because these wealthy institutions spend so much more per student than other schools, this triggers wealthier students to spend more money on graduate and post-graduate school.

While wealthier schools have been able to help students afford their institutions, access to these elite schools has not increased. Hill (2011) determined high ability low-income students are underrepresented at wealthy schools by 28% or more, depending on the definition of high ability that is used. Hoxby, et al, (2015) argues many high-achieving low-income students might still be unreached by traditional information methods even if their counselors and university admissions staff do everything to their ability to provide information. Due to these students lacking accurate and helpful information, they are not making informed decisions on where to apply to college. Furthermore, students who lack information regarding college applications are also misinformed regarding financial aid at these institutions. Terenzini (2001) discusses how students' perceptions of how much their parents can afford to pay affect where they choose to attend college. This results in the unfortunate outcome of low income students either not

attending college, or attending an institution where achieving upward mobility is extremely unlikely.

Numerous factors influence the level of mobility someone is able to achieve, however, higher education has the most profound effect. Moreover, if a student does get accepted into a university, they will hopefully choose a major that will lead to them receiving a high starting salary. "Individuals select a college major based on a variety of factors including expected earnings, patterns of labor force participation, uncertainty, non-price preferences, and then likelihood of graduation"(Robst 398). The problem with this scenario is for a student who may not be as prepared for college coming from a lower income family and thus does not have the resources to successfully complete a more difficult major, the major they end up pursuing may have a lower starting salary. A study completed at Duke University in 2012 found "natural science, engineering, and economics courses are more difficult, associated with higher study times, and are more harshly graded than their humanities and social science counterparts" (Arcidiacono 2012, et al, 3).

Arcidiacono, et al (2012) further discusses how 54% of black males eventually switch out of one of these majors after showing initial interest, in comparison to only 8% of white males. If these black students are not as prepared as their white counterparts and do not have the resources available to them to succeed in these more difficult majors, are they successfully able to complete another major and still graduate to achieve upward mobility? Furthermore, Duke is a highly selective school with a higher endowment per student and should theoretically have the resources available to support minority students in more challenging majors. If minority students are changing majors at a highly selective school with countless resources, similar trends are likely occurring at less selective schools (Arcidiacono, et al, 2012). On the contrary, Torche

(2011) finds the chances of achieving economic success are equal for all students who complete a Bachelor of Arts degree, regardless of previous socioeconomic status. She argues that labor markets for college graduates operate the same way, thus a student's socioeconomic and demographic factors do not have a significant effect on a student's starting salary.

Highly selective universities with higher endowments per student are successful in terms of helping minority students graduate. However, they have lower overall rates of upward mobility after graduation (Chetty, et al, 2017). Furthermore, the highly selective universities also have the lowest levels of access. Chetty, et al, (2017) distinguish high mobility rate colleges as schools throughout the country that are the most successful at moving a student from the bottom quintile of income distribution to the top quintile. These schools distinguish themselves by increasing access to lower socio-economic students; however, these universities have the lowest endowment per student rates in the country yet they still have very good outcomes at placing their students into higher paying jobs after graduation. While there is not a common theme that describes all of these schools, many of the Universities that fall into this category are known for teaching their students a specific skill needed in the work force (Chetty, et al, 2017).

2.4. Implication of Policy

Over the years the cost of college has continued to increase; however, to date, there have been few successful policies put in place to help with the increasing costs. One of the biggest problems with access to higher education is the lack of information some potential students have regarding financial aid. Hoxby, et al, (2015) focused on high-achieving low income students in the United States and the effect of increasing the amount of information given regarding fee-waivers and the FAFSA. The results of this study found the intervention increased the number of fee waivers used; however, it did not have a significant effect on the probability of a student

filling out the FAFSA. The cost of this intervention was only six dollars per student, and the researchers believe a highly regarded institutions such as the College Board or the ACT would be able to implement this through the mailers they are already sending to students (Hoxby 2015, et al, 33). By implementing a program like this, high-achieving low income students would be given a fair chance of success, at a reasonable cost.

Furthermore, Andrews, et al, conducted a Texas based study that analyzed top students at public high schools with disadvantaged backgrounds. The program implemented attempted to provide information to low income students, provide scholarships, and support the student once they enroll in a public University. The results of this program made a student more likely to graduate at the 95% confidence level, as well as less students changing into 'easier' majors once at a University. Similar to the Hoxby (2015) article, this study found that high ability low income minority students are the most sensitive to increasing information and support services once at college.

3. Data

Student data for this thesis was collected from the following Bucknell offices: Career Development Center, the Registrar, Office of Admissions, and the Financial Aid Office, specifically for United States citizens entering the University from Fall 2006 to Fall 2018. There are a total of 102,445 observations in the full data set. These data points were merged using student ID number from the different offices. After the data was merged, the student ID number was replaced with a random number in order to maintain confidentiality, in accordance with the Institutional Review Board rules. The data includes the following variables: race, gender, cumulative GPA, student major, the college the student applied to (College of Engineering, College of Management, College of Arts and Sciences), the college the student graduated from, parental income and indicator variables for need based aid, Pell grant recipient, first generation college student, and student athlete. The descriptive statistics for this data set can be found in table D in the appendix.

In order to de-identify the address of the student, the data was geo-coded by census tract. Demographic information from the students' census tract was then used as a proxy for actual location. These demographic variables were obtained from the American Community Survey. The demographic variables include the unemployment rate, the GINI coefficient (a statistical measure of inequality), the percentage of homes valued over one million dollars, the percentage of the population in that census tract that have a bachelor's degree, and the percentage of the population in that census tract below the poverty level. Furthermore, the distance in miles from the student's home to Bucknell was calculated to represent how far a student has to travel to attend Bucknell University.

Data from the Career Development Center was collected through a student self-reported survey and includes students entering Bucknell from Fall 2006 to Fall 2014. There are a total of 2719 students that report a starting salary after graduation. The students answered questions regarding their plans after graduation, whether that be their job or the graduate school they're attending, their starting salary, and their location post-graduation. Due to this being self-reported data, if there are errors within the survey they should be random errors. The data was collected and cleaned in accordance with the Institutional Review Board.

4. Empirical Model

The study applies two types of empirical models to the data set. The estimation methods used include a probit model as well as ordinary least squares (OLS). The full probit models can be found in the Appendix (Model A and Model B). Model A allows for the analysis of access to Bucknell by analyzing which students are admitted to Bucknell. The dependent variable is a binary variable representing a student accepted to Bucknell University between the entering terms Fall 2006 to Fall 2018. Model B uses a subset of admitted students from Fall 2006 to Fall 2018 and studies the binary variable of whether or not a student matriculates. Using a probit model allows for the prediction of the odds that a student is accepted to Bucknell and whether or not they attend Bucknell, as well as to calculate the marginal effects. A probit model versus a logit model is ideal in this situation due to the large data size; thus, the assumption the errors are normally distributed. The results of Models A and B allow for the analysis of access to higher education, specifically at a smaller liberal arts college, as well as to identify patterns of who is actually matriculating to Bucknell University.

According to Dubow (2009), students with educated or wealthier parents are more likely to be accepted to and attend a selective University. Thus, Models A and B include socioeconomic variables such as parental income and whether or not the student received need based aid. The following variables were gathered from the students' census tract: percentage of the population in the census tract with a bachelor's degree, the unemployment rate, the percentage of houses with a value over 1 million dollars, the GINI coefficient (a statistical measure of income inequality), and the percentage of the population in the census tract below the poverty level. These variables from the census tract are of interest because a student is typically a product of their environment (Corcoran 1995). Furthermore, due to not having information on a

student's parents' level of education, by using the percentage of the population with a bachelor degree will be an informative proxy. A limitation to this data set is that parental income values are only available for students who apply for financial aid through the FAFSA; therefore, the whole population is not represented. In order to represent the wealthier students applying to Bucknell that do not need financial aid, the percentage of homes above one million dollars in their census tract will be used as a control. Furthermore, an indicator variable labeling which applicants did not apply for financial aid was created. Lastly, the unemployment rate as well as percentage of people below the poverty level help to analyze the environment students are applying from and therefore might influence their choice to attend Bucknell University.

Along with socioeconomic factors, Chetty, et al (2014) discuss the numerous demographic characteristics that affect a student's ability to achieve upward mobility. In order to investigate the effects of demographic factors, race variables and gender are included in the model. Bucknell publicly discusses how different colleges have different acceptance rates, so in order to control for these different rates, dummy variables for each college the student applied to are in Model A and B. Furthermore, time and its impact on acceptances and enrollment is also analyzed. A dummy variable for each year is included in the model to control for differences over time as well as allow for non-linear relationships.

To determine the effect time has on other variables, interaction variables with time on the following variables: gender, race, and parental income are included in the model. Interaction terms allow for the effect of each variable to vary since 2006. In turn, the model will be able to estimate how these socioeconomic variables as well as demographic variables have impacted admissions within the past 12 years. Bucknell has publicly discussed its desire to make the student body more racially and socioeconomically diverse as part of its strategic plan, and these

probit models should shed light on what has been going on during the past 12 years.

The pooled OLS model, Model C in the Appendix, utilized within this research estimates the starting salary of students from Bucknell from the entering years Fall 2006-Fall 2014. This model allows us to determine the level of equality Bucknell creates for all students once they graduate as measured by starting salary, an aspect of the mismatch hypothesis. The theory behind this is that due to affirmative action, some students are misplaced and therefore do not perform well in college and consequently have lower earnings potentials and starting salaries. Bucknell has a reputation for an extremely strong alumni network and this study will confirm or deny how resources other than academics are impacting a student's job placement after graduation.

Robst (2007), discusses the implication of college major on starting earnings potential and for this reason college major is used as a control in the model. In order to classify majors, Bucknell University categorizes majors in the College of Arts and Sciences into the following: Arts and Humanities, Social Science, and Natural Science Technology & Mathematics. While this classification is consistent for most majors, Mathematical Economics and Economics might skew the social science category because, on average, students with these majors have a higher starting salary. The College of Management and Engineering students are grouped together. Once again, Accounting and Financial Management majors might have a higher starting salary than majors is Markets Innovation and Design; however, for the purpose of this study these groups are analyzed together. Along with controlling for different earning potentials from each major, Corcoran (1995) discusses the differences both gender and race can have in starting salaries so these dummy variables are included in Model C.

Within the literature on higher education, many question if students coming from different backgrounds all have the same chance to be successful after college (Robst 2007). Dubow (2009) discusses the benefits students from wealthier families have when finding a job such as connections to the real world. Many students believe wealthier individuals already have an advantage in comparison to their lower socioeconomic peers. In order to control for this, parental income is included in the model as well as census tract variables such as the percentage of homes above 1 million dollars as well as the percentage of people with a bachelors' degree. Both of these census tract variables will provide information regarding the environment in which the student grew up. In order to control for changes over time, both time and time squared are in the model to represent a non-linear relationship. Furthermore, time is interacted with the different major categories to analyze any changes since 2006. The last control used within this model is whether or not a student is employed and attending graduate school. This needs to be controlled for due to a graduate student completing research while still in school and therefore having a lower starting salary.

5. Results

5.1. Probit Model A

As seen in table A in the Appendix, the first probit model analyzes every United States citizen who applied to Bucknell University from Fall 2006 to Fall 2018 and shows a difference over time in the students accepted. In order to fully address this question, three different versions of model A were created (Model A_1, Model A_2, and Model A_3). Model A_1 analyzes the full data set and does not include any parental income variables. Model A_2 analyzes parental income as well as demographic information and therefore deletes over 67,000 observations. Lastly, Model A_3 analyzes the full data set with parental income and an indicator variable for which students are missing parental income. As previously mentioned, the largest missing piece of the data set is parental income, due to only having available this data for students who apply for financial aid. Within the full data set, approximately two thirds of applicants do not apply for financial aid; thus, over 67,000 observations are missing. In order to determine how significantly this omission was biasing the model, all three models were analyzed and compared. Model A_1 excludes parental income and therefore suffers from omitted variable bias and Model A_2 includes parental income and does not control for the other observations; therefore, the parental income variable itself is biased. After these considerations, Model A_3 suffers the least from potential bias and the results discussed further in this chapter reflect the coefficients from Model A_3. Moreover, the comparison of Model A_2 and Model A_3 shows the change in the population of students when adding in the observations missing parental income values.

First, the racial dummy variables have different levels of significance when holding everything else constant. Due to Bucknell having the reputation of a predominantly white liberal arts school, the variable White is excluded in order to compare other races to White counterparts.

An Asian applicant applying to Bucknell has a significant and positive marginal effect at the 95% confidence level compared to White applicants. Holding everything else constant, being an Asian student increases the likelihood someone is accepted to Bucknell by 13.48% in comparison to White applicants. While this value alone is positive and significant in magnitude, over time, this value has decreased and every interaction term has a significant negative coefficient except for Fall 2017. In order to test the significance of Asian students' acceptance since 2006, an F-test was run with a Chi Square value of 58.723 and a p-value of less than 0.001. Thus, over time significantly fewer Asian students have been accepted to Bucknell in comparison to White students.

Furthermore, for students who are not Black, White, Hispanic, nor Asian acceptance level has not significantly increased since 2006. Likewise, the F-test results in a Chi-Square value of 14.65 with a p-value of 0.2611. Therefore, over time there is not a significant relationship between acceptance to Bucknell and students who identify with a racial identity of Other versus their White counterparts. On the contrary, a Black student applying to Bucknell University, holding everything else constant, is 11% less likely to be accepted than a White student. Black interacted with each entering year has a positive coefficient except for 2014 and 2018, however, most of these years are individually insignificant. After running an F-test on all Black interaction terms, there is a significant positive relationship with a Chi-Square value of 29.159 and a p-value of 0.003. This leads to the conclusion that, since 2006, Bucknell University has been able to significantly increase its acceptances of Black students in comparison to White students. The high magnitude of the coefficient on the black term alone still gives reason to believe that Black students are disadvantaged when applying to Bucknell, yet this disadvantage is shrinking. The exact opposite trend is occurring with Hispanic applicants at Bucknell.

Holding everything else constant, a Hispanic student is 11.8% more likely to be accepted than their white counterpart. However, since 2006 this relationship has significantly decreased. The coefficient is negative for each of the interaction terms with Hispanic and time and the F-test reveals a Chi-square test statistic of 26.148 with a p-value of 0.01. While Black students have significantly increased their chances of admission since 2006, the opposite is happening to Hispanic students. The probability of acceptance for each race over time is depicted in Graph A in the appendix.

While race has historically had a large impact in college admissions, so has students' financial status (Guiner 2016; Chetty et al 2017; Goodman, et al 2015; Cahalan and Perna 2015). Hoxby (2015) discusses how a large part of student's financial stress impacts where they decide to apply, but it should not affect their admission status once they apply to a college. On average, someone who receives a Pell grant is 10.7% more likely to be accepted to Bucknell, holding everything else constant. Furthermore, a student receiving need based aid is 8.1% more likely to be accepted to Bucknell holding everything else constant. The magnitude of these numbers might be explained by the small level of applicants from the total data set who receive these two forms of financial aid. Out of all applicants only 4% receive a Pell grant and 16.8% receive need based aid. Based on the positive coefficients on both of these variables it appears as if Bucknell Admissions Office does not let the amount of financial aid needed impact the admission decision of the student. However, when looking at parental income, this conclusion shifts. For every 1% increase in parental income, the student is 6.25% more likely to be accepted to Bucknell University, holding everything else constant.

This result is consistent with previous literature from Dubow (2009) and Chetty, et al (2017) which discusses wealthier students having an easier time being accepted to more selective

colleges. This result leads to the question: are these students able to afford private tutors and therefore better prepare themselves for standardized tests (Guiner 2016), or are these students being accepted because they are more likely to pay the tuition and subsequently not need financial aid? In order to further explore this question, a data point explaining the academic ability of each potential student would need to be added to the model to help control for natural ability as well as high school preparedness. While parental income might be telling some of the story of high school qualifications, the magnitude and significance of the variable still suggest a strong relationship between parental income and acceptance to Bucknell University. Furthermore, when interacting parental income with each time period all of the coefficients are negative and significant. Therefore, over time, Bucknell Admissions has been able to slowly increase its acceptances of lower socioeconomic students. This change is significant over time at the 95% confidence level with a Chi-Square test statistic of 4967.3 and a p-value of less than 0.001.

As previously mentioned, parental income data is only available for students who apply for financial aid through the FAFSA; therefore, in order to include all of the data points, an indicator for students who did not apply for financial aid is included in the model. The students not applying for financial aid are most likely able to afford tuition without help from the government or the financial aid office at Bucknell, and therefore represent a wealthier proportion of the population. Holding everything else constant, a student who does not apply for financial aid is 18% more likely to be accepted to Bucknell than someone who does. While this variable is going in the opposite direction of the need based aid indicator, it also represents almost two thirds of the applicants, and therefore is an accurate predictor of the whole population. This variable is representing the students who are in the top 1% of income distribution and is

consistent with previous research that an increase in income allows for an increase in acceptances to college (Dubow 2009; Chetty et al 2017). Furthermore, this is also consistent with the belief that low income students do not have high levels of access to higher education (Dillon and Smith 2013; Chetty, et al, 2017; Goodman, et al 2015). Due to the extreme magnitude of this coefficient, it is likely this variable is also reporting some of the story of academic ability as well as which students applied to Bucknell early decision. However, due to the extreme magnitude of this coefficient, there is definitely a significant relationship between the level of a student's wealth and acceptance to Bucknell University.

Likewise, for every 10% increase in the population with a bachelors' degree in a students' census tract, the student's likelihood of acceptance to Bucknell increases by 4.99%, holding everything else constant. This result is also consistent with Dubow (2009) as well as Corcoran (1995) that increased levels of education in a student's home environment greatly impacts that students' educational attainment. The high value of this coefficient as well as level of significance leads to the hypothesis that this coefficient is also reporting some of the story of academic ability of the student applying. If a student lives in an area where a larger number of people have a bachelor's degree, it is more likely that their parents also received a higher education. If a student's parents are highly educated, they might push their children harder in school as well as have the resources to help their child achieve good grades and receive standardized test scores (Arcidicano 2012; Robst; Chetty, et al 2017).

Along with the percentage of people with a bachelor's degree being a significant variable from the census tract, the unemployment rate, GINI coefficient, and the percentage of population below poverty are significant at the 95% confidence level. For every 10% increase in the unemployment rate in a student's census tract, that student is .58% less likely to be accepted to

Bucknell University, holding everything else constant. While the unemployment rate variable is significant, it is not telling a large amount of the story regarding who is accepted to Bucknell University. Likewise, for every 10% increase in the amount of population below the poverty level, a student is 1.46% more likely to be accepted to Bucknell University. Lastly, for each 10% increase in the GINI coefficient, a student is 5.54% more likely to be accepted to Bucknell University. Therefore, students coming from a census tract that has an increased level of income inequality are more likely to be accepted to Bucknell. This result is consistent with the findings that Bucknell University has more students from the top 1% of income distribution than the bottom 60% (Chetty, et al, 2017). Most likely, students coming from places with higher levels of income inequality represent the top 1% of income distribution of applicants. It is likely that the GINI coefficient is also telling some of the story of academic ability of an applicant.

The final two census tract results which are both significant at the 95% confidence level are the percentage of homes with a value above one million dollars and the percentage of White people from that census tract. The housing variable is used as a proxy for the top 1% of income distribution; for every 10% increase in the amount of homes with a housing value above one million dollars, an applicant is 1.05% more likely to be accepted to Bucknell. Once again, this variable is used as a proxy for the top 1% of income distribution, because if a student lives in a census tract that has a high percentage of housing values above one million dollars it is likely their level of wealth is high as well. Furthermore, when comparing this result from the value obtained in Model A_2, we see that value is highly insignificant and is negative. In Model A_3, when the whole sample is analyzed, this result becomes highly significant and is positive in magnitude. Therefore Model A_3 is a much better predictor of the entire wealth level of applicants to Bucknell. Lastly, due to Bucknell predominantly being a White school, the census tract racial

breakdown was also included in the model. For every 10% increase in the amount of White people in a student's census tract, the likelihood that this student is accepted to Bucknell decreases by .23% on average. Similar to the unemployment rate in a student's census tract, this variable is telling a very small part of the story on which applicants are being accepted to Bucknell.

Due to Bucknell's three colleges all having different acceptance rates, a dummy variable for each college is included in the model. Holding everything else constant, a student applying to the management college is 9.1% less likely to be accepted than someone applying to the College of Art and Sciences. This result is consistent with the fact that the College of Management has been growing each year as well as the publicized information about it being more difficult to be accepted to the College of Management versus the College of Arts and Sciences. Moreover, admission to the College of Engineering is significant at the 95% confidence level; a student is 4.4% less likely to be accepted to the College of Engineering than the College of Arts and Sciences.

Along with controlling for the different colleges a student can apply to, controls for distance as well as gender are also included in the model. Distance is significant at the 95% confidence level. On average, for every 1% increase in distance to a student's home the student is 0.77% more likely to be accepted to Bucknell, holding everything constant. This result makes sense considering Bucknell student body represents states from all over the country. Moreover, female is significant at the 95% confidence level. On average holding everything else constant, a female is 2.73% more likely to be accepted to Bucknell University than their male counterparts. Furthermore, over time female has a significant effect on admission to Bucknell University at the 95% confidence interval, with the last five years having a negative effect. An F-test on these

interaction terms results in a Chi-Square test statistic of 23.23 and a p-value of 0.023. This is consistent with previous literature which discusses how historically female students have higher academic scores from high school than their male peers; however, this difference has been shrinking over the years (Ma, et al, 2014). The last control within this model is each entering term from Fall 2007 to Fall 2018, omitting Fall 2006. While acceptances in the years Fall 2011 to Fall 2015 were negative and therefore more selective in applicants, the last 3 years Fall 2016 to Fall 2018 have all been positive and significant at the 95% confidence level. This is consistent with the growth of Bucknell as well as increasing class size for the new College of Management in comparison to Fall 2006.

After running this probit model, the Breush- Pagan test was used to test for heteroscedasticity and the test was significant. In order to help control for this, an econometric command was used to control for heteroscedastic errors in R. While heteroscedasticity might still be present in the model, it was controlled for as best as possible using the software. Furthermore, a concern with multi-collinearity was also addressed due to variables such as parental income, Pell grant recipient status, and need based aid recipient status being correlated. However, after taking Pell grant recipient out of the model, the log likelihood ratio goes farther from 0. The correlation between Pell recipient and need based aid recipient is only 0.32. Due to the low correlation level as well as the increase in the log likelihood ratio, both Pell grant recipient and need based aid recipient are left in the model. Furthermore, the large sample size of this data set should reduce the problems associated with multi-collinearity.

5.2 Probit Model B

As seen in Table B in the appendix, Model B analyzes a subset of the data that includes only accepted students. Similar to Model A, Model B_3 will be used and analyzed throughout this chapter due to having the least amount of bias. There are countless factors students take into account when deciding to where to attend college. The independent variables are identical to those in model A, which allows for the analysis of the difference in significance level of specific variables, thus to imply which factors actually matter in the matriculation of the Bucknell student body. This model deduces which students are more likely to matriculate and which factors are significant in that decision to attend. Bucknell University Admissions can attempt to recruit and accept as diverse a class as possible; however, the composition of the student body is determined by those who actually decide to matriculate to Bucknell.

The first noticeable result is that gender is no longer a significant predictor. This result makes sense due to the equal numbers of males and females in most entering classes. Furthermore, while it might be more difficult for males to be accepted initially, gender has no effect on matriculation decisions over time. Similar to gender, race also has a much less significant effect on matriculation decisions. Furthermore, the only race/ethnic group that is significantly less likely to matriculate to Bucknell is Asian students. Holding everything else constant, an Asian student is 13.5% less likely to matriculate to Bucknell than their white counterpart. On the contrary, Asian students have not had a significant effect on matriculation over time, with a Chi-Square test statistic of 17.69 and a p-value of 0.1254. While Asian students have no significant relationship with matriculation, being a Black student negatively hurts matriculation over time. With a Chi-Square value of 20.505 and a p-value of 0.58, Black students are less likely to matriculate to Bucknell over time than White students at the 90%

confidence level. The only year that is individually significant at the 95% confidence level is the entering year of Fall 2015. One plausible explanation for this difference is the incident in which three Bucknell students were expelled for uttering racial slurs on the campus radio station in the spring of 2015 (Fox News 2015). If a black student was in the process of deciding what school to attend at this time, this incident likely negatively impacted that decision and therefore black students were less likely to matriculate that year. Both Hispanic students and students with a racial identity of Other do not have a significant effect on matriculation over time. The probability of matriculation of each race over time is depicted in Graph B in the appendix.

Furthermore, parental income remains significant at the 95% confidence level but the magnitude of the variable is smaller. Holding everything else constant, for every 1% increase in parental income, an admitted student is .9% more likely to attend Bucknell University. Over time this relationship has significantly decreased at the 95% confidence level with a Chi-Square test statistic of 40.95 and a p-value of less than 0.001. Due to parental income not representing the true level of wealth of the student body, it is not surprising that students who do not apply for financial aid are 9.7% more likely to matriculate to Bucknell University at the 95% confidence level than someone who applied for financial aid. The large magnitude of this coefficient is most likely from early decision applicants who are less likely to apply for aid if they are committing to attend such an expensive University before learning about their financial aid options. This result is consistent with the Chetty finding that more students on Bucknell's campus come from households in the top 1% of income distribution than in the bottom 60% of income distribution (Chetty, et al, 2017). The last proxy used to measure wealth of the student body is housing value. In this model, the percentage of houses above 1 million dollars becomes insignificant at

the 95% confidence level. Therefore, the indicator variable for students who do not apply for financial aid is telling the whole story of the wealthier applicants.

Another result consistent with the overall higher education literature is the significance of the distance variable. On average, for every one percent increase in the distance a potential student lives from Bucknell, that student is 5.14% less likely to matriculate to the school. Geographical access is a large factor for higher education; if a student cannot afford the transportation to a school that is not near any major public transportation hubs, they might be less likely to matriculate (Hillman 2016). On the other hand, students who receive need based aid from Bucknell are more likely to matriculate than students who do not receive aid. This pattern can be seen through both the Pell recipient variables as well as whether or not a student received need based aid. On average, if a student receives a Pell grant they are 20.22% more likely to matriculate to Bucknell than someone who does not. Likewise, on average, if a student receives need based aid from Bucknell, they are 6.5% more likely to matriculate than someone who does not. The magnitude of these variables is consistent with the fact that the best way to increase access to higher education is through financial subsidies, in order to make it as affordable as possible for students (Chetty, et al, 2017; Hoxby 2015). Furthermore, out of accepted students, only 7.7% of admitted students receive a Pell Grant and only 33.5% students receive financial aid. Students who are fortunate enough to receive this type of aid have probably applied to similar schools and received similar financial aid packages from those Universities. One possible explanation for Bucknell retaining these students at such high rates is due to the strong alumni connections as well as the higher average starting salary of most graduates. Moreover, if a student receives aid and is under the assumption that their parents can afford to pay the tuition, that student is more likely to attend that University (Terenzini 2001).

Additionally, the following census tract variables are significant at the 95% confidence level when analyzing matriculation to Bucknell: the GINI coefficient, the percentage of population with a bachelor's degree, and the percentage of population below the poverty level. For every 10% increase in the GINI coefficient, a student is 2.23% more likely to matriculate to Bucknell. For every 10% increase in the percent of population that have a bachelor's degree in a student's census tract, an admitted student is 4.78% more likely to matriculate. Lastly, for every 10% increase in the percent of population below poverty in the student's census tract, a student is 7.59% more likely to attend Bucknell. Both the GINI coefficient and the percentage of people with bachelor's degree are consistent with the previous literature that highly educated wealthy people are more likely to send their children to a selective institution. This outcome results in the cycle of wealthier educated people in the United States sending their children to selective Universities who then are more likely to end up in the top of income distribution once they graduate (Robst). One possible explanation for the large magnitude of the coefficient on the percentage of population below the poverty rate is consistent with the analysis of Pell grants as well as need based aid. Bucknell's reputation for having an extremely strong alumni network is most likely attracting these lower income students due to these student's desire to escape poverty and climb up the socioeconomic ladder. This belief that Bucknell is a way to escape poverty will be further explored in section 5.3 with Model C which predicts starting salary. The census tract variables that are not significant at the 95% confidence level include the unemployment rate and the percentage of White people in a student's census tract.

When analyzing which students are more likely to matriculate to each college, both colleges are significant at the 95% confidence level in comparison to the College of Arts and Sciences. A student admitted to the College of Management is 4.69% more likely to matriculate

than a student admitted to the College of Arts and Sciences. This is consistent with the strong reputation of the College of Management as well as the college being more selective in the admissions process. By accepting fewer people to the College of Management, those students might be more satisfied with their acceptances and therefore more likely to attend Bucknell. On the contrary, a student accepted to the College of Engineering is 8.1% less likely to matriculate than a College of Arts and Sciences student. While the College of Engineering also has an extremely strong reputation, there are also a large number of Engineering Colleges around the country and it is likely that these admitted students are going to pick the best college to which they are accepted.

In order to understand the differences between Model A and Model B, as well as to connect this project to real world applicants, the following simulations describe different students' acceptance and matriculation probabilities to Bucknell University. Table G depicts the difference in male vs. female acceptance and Table H depicts the difference in male vs. female matriculation. These probabilities were calculated by using the mean scores for each variable and only manipulating the gender and year of application. Therefore, these probabilities represent the average Bucknell applicant. The second example is a female student, applying to the College of Engineering in 2015 with a parental income level of $25,000, and the following census tract statistics: 0.039 percent with a bachelor's degree, 0.44 below poverty, no houses above one million dollars, and an unemployment rate of 14.2%. Table I depicts the probability of acceptance and Table J depicts the probability of matriculation for a white vs. black applicant with the same data characteristics.

Similar to Model A, testing for heteroscedasticity using a Breush-Pagan test, the test was positive; thus, the model had heteroscedastic errors. In order to help control for this factor, an

econometric command within R was used. Furthermore, in terms of multicollinearity between a Pell grant recipient and a need based aid recipient, Model A and Model B reacted the same to removing the variable Pell with the log likelihood ratio going farther away from 0. While it is difficult to obtain smaller error values with multicollinearity, the large size of the data set should reduce this problem. Furthermore, due to the level of significance of these variables, they are both telling an important part of the story about who actually matriculates, and these should be retained in the model.

5.3. Pooled OLS Model C

This section aims to investigate the second claim of Chetty, et al 2017, which is that the mismatch hypothesis no longer exists at most universities across the country. Chetty deduces that children from any level of parental income have the same chances at achieving higher earning potentials based on the university they attend. Chetty and his team were able to track college graduates and record their earnings at the age of 32 and to make this claim based on this data. In addition, there is a common perception on Bucknell's campus that wealthier students have more connections and their parents can help them get a higher paying job after graduation. In order to investigate this question, the Model C (located in the appendix) predicts starting salary of all graduating students who entered Bucknell between the Fall of 2006 and Fall of 2013. In order to deal with not having a parental income data point for each student, once again two models were created. Model C_1 has parental income but only includes half the observations. The second model, Model C_2, includes an indicator for students who did not apply for financial aid. Similar to sections 5.1 and 5.2 above the model that will be analyzed within the rest of this section is Model C_2 because it accounts for the whole data set. Furthermore, if we assume students who never filed for financial aid are wealthy, the no parental income variable should represent the wealthier students graduating from Bucknell and their connections.

As seen in table C in the appendix, the output for the OLS regression using starting salary as a dependent variable provides numerous results. First, in order to control for the difference in earnings potential of all the majors at Bucknell, a dummy variable for each category was added to examine the difference. Furthermore, interaction terms for each major with time was included in order to see if earnings have evolved since 2006. Based on the information that the Career Development Center publicizes about starting salary of Bucknell Students, the results are

consistent that both College of Management and College of Engineering students are graduating with significantly higher starting salaries than someone majoring in the Arts and Humanities. If a student is a graduate of the College of Management, their starting salary is 35.13% higher than an Arts and Humanities student, on average, holding everything else constant. Second, if a student is a graduate of the College of Engineering, their starting salary is 49.09% higher on average holding everything else constant. Similar to both of these terms being individually significant, the interaction term is also significant at the 95% confidence level. On average, for every year increase since 2006, salaries for Management majors have decreased by 2.24% in comparison to Arts and Humanities majors, while starting salaries for Engineering majors have decreased by 2.43% year over year.

Furthermore, within the College of Arts and Sciences, the other two categories are Natural Science Technology & Mathematics and Social Science. Social Science majors, on average, have a starting salary 12.66% higher than their Arts and Humanities counterparts, significant at the 90% confidence level. While this makes sense for some of the majors within Social Science, both Mathematical Economics and Economics majors have higher average starting salaries and could arguably be analyzed in a separate category. Moreover, Natural Science Technology & Mathematics does not have any effect on starting salary. Both Social Science and Natural Science Technology & Mathematics interacted with time is insignificant at the 95% confidence level. It is important to note that students majoring in Natural Science Technology & Mathematics are going to have higher earnings potentials later in life; however, many of these students are attending graduate school after Bucknell. The last control used in this model is whether or not a student is employed and in graduate school. If this is the case, a student is most likely doing research at the University where they are attending graduate school,

therefore making less money, likely as a teaching research assistant. This variable is significant at the 95% confidence level and this student will be making 15.2% less than the average Arts and Humanities students. For this reason, Chetty and his team analyze salary once someone has reached the age of 32 in order to measure their success after attending a graduate school. Bucknell University would have to send out a survey to graduates later in life asking them their starting salary to truly analyze this question. At the present time, this data does not exist.

In order to attempt to answer whether or not the mismatch hypothesis applies to Bucknell, both race as well as financial status of the student need to be analyzed. Breaking the results down by category, each individual race does not have any impact on the starting salary of Bucknell graduates. However, when running an F-test on the race variables together, there is an overall significant effect at the 95% confidence level on starting salary with an F-statistic of 2.596 and a p-value of 0.03465. While this result implies that race has a joint effect on starting salary, there is not one race that is disadvantaged due to all the individual variables being insignificant.

Along with race being insignificant, parental income is also an insignificant predictor of starting salary. This result is inconsistent with the belief that students from wealthier families are more likely to receive a higher paying job after graduation. There is a strong perception that a student from a wealthier family has more connections to the "real world" and therefore does not have to work as hard to obtain a higher paying job; however, this model provides no evidence of parental income increasing or decreasing a student's starting salary. In the data sample of alumni who successfully filled out the post-graduation survey with a salary, only 32 out of the 2719 students' parents have a salary in the top 1% of income distribution (630,000+). For this reason, an indicator variable for students who did not fill out the FAFSA is also included in the model.

This variable theoretically represents the wealthier students at Bucknell and is also not significant at the 95% confidence level. Based on both income and the students that did not apply for financial aid, it does not appear that family wealth has a significant impact on a student's starting salary.

The final variable representing the wealth of the student body is the percentage of homes above one million dollars from the student's home census tract. This variable is insignificant at the 95% confidence level and therefore does not have an impact on starting salary. Due to all three financial status variables being insignificant in the model, in order to determine their joint significance, an F-test was completed on parental income, no parental income, and housing value above one million dollars. This test is insignificant at the 95% confidence level with an F-statistic of 1.2043 and a p-value of 0.3. Based on the insignificance of this test and the individual variables, the level of student wealth is not an accurate predictor of starting salary. Thus, Bucknell successfully levels the playing field for graduates of all socioeconomic levels in terms of starting salary.

The last census tract variable included within the model is the percentage of population with a bachelor's degree. This variable is significant at the 95% confidence level; on average, for every 10% increase in the percentage of population with a bachelor's degree, starting salary increases by 2.35%. This result is consistent with the hypothesis that students from areas with larger numbers of educated people, and more highly educated parents are also going to receive a higher education and therefore obtain a higher paying job (Robst). Furthermore, this variable could also be telling some of the story of parental connections as well. If a student's parents are highly educated, their parent's job is mostly likely going to have a higher salary and therefore lead to more connections for their children to utilize when seeking a job.

The most obvious result in this study is the significance that GPA has on starting salary from Bucknell. On average, for every 0.1 increase in cumulative GPA, a student's starting salary increases by .81% on average. This is consistent with previous literature that students who are better prepared for college and, therefore, subsequently graduate with higher GPA's earn more in income (Robst 399).

The last demographic variable included in this model is gender. On average, holding everything else constant, the starting salary for males graduating from Bucknell is 13.13% higher than a female student. Arcidiacono et al (2012) discusses how males are significantly more likely to major in something that leads to having a higher starting salary. However, the magnitude of this result is surprising because the model controls for differences in major. Therefore, this leads to the conclusion that males are more interested in a career with a higher starting salary than female graduates of Bucknell, as well as confirming the overall wage gap significantly increasing starting salary of graduates. While the trend for females earning less money than males has significantly decreased since the late 20th century, the wage gap is still present in today's society (Blau, et al 2016).

Lastly, in order to analyze the type of background each student comes from, the following characteristics are included in the model: whether or not a student receives need based aid, is a first generation college student, or a community college scholar. These variables all theoretically relate to a student's starting salary due to impacting the number of connections a student has in the real world as well as how much time a student would be able to spend studying. If a student received need based aid, there is a higher likelihood that some of their scholarship is through work-study arrangement with the University, which means that the student has less time to focus on their studies. This potentially has a negative effect on a student's

cumulative GPA and is therefore relevant. A community college scholar only spends two years at Bucknell and during this time it might be challenging to successfully create connections with alumni. Similarly, a first generation college student is the first person in their family to seek a higher education; once again, this factor could negatively impact the number of connections they have as well as their overall knowledge about finding a job. None of these variables are significant at the 95% confidence level. Furthermore, the F-statistic on these three variables is 1.44 and not significant at the 95% confidence level. Thus, despite these hypotheses, a student coming from these backgrounds does not have a disadvantage after graduating and receiving a starting salary.

After careful analysis, the results of this model are consistent with Chetty et al (2017) that the mismatch hypothesis does not exist at most universities across the country. This conclusion is drawn from the insignificant values for race as well as for the variables representing lower income and less connected students: need based aid recipients, first generation college students, and community college scholars. While the coefficients on the socioeconomic variables are all negative, none of them have any overall significance. Furthermore, parental income is also not a significant predictor of starting salary. While there are certain majors that lead to higher starting salaries than someone majoring in the Arts and Sciences, these results are consistent with previous literature discussing the difference in earnings potential of these majors (Arcidiacono, et al 2012).

The mismatch hypothesis focuses on students graduating with different salaries from different socioeconomic levels, but it also considers how underrepresented students have to change majors once they are at a University. Arcidiacono (2012) discusses this in his study completed at Duke University that found minority and low income students are more likely to

switch out of the more difficult majors, into a less challenging that leads to a lower starting salary. While Model C in this thesis was able to control for the difference in earnings potential for the Bucknell major categories, it does not control for students who are admitted into one major and then compelled to change majors because they had insufficient preparation in high school. Therefore, in order to answer the question of whether or not the mismatch hypothesis exists at Bucknell with more certainty, one would have to control for the students who are forced to change majors. If there is a similar finding to the Duke University research project, then there might be evidence of a mismatch hypothesis at Bucknell. Lastly, controlling for the major students have at graduation, there is no evidence of a mismatch between lower income or minority students at Bucknell having a significantly less starting salary than their wealthy White counterparts.

When conducting a Breusch-Pagan test for heteroscedasticity, the test was positive. In order to control for this robust standard errors were calculated. The levels of significance and coefficients in table C are representative of these robust standard errors. When using robust standard errors, the level of significance of the variables does not change.

6. Conclusion

The results from this paper support findings from the previous literature about higher education and the patterns that studies, such as Chetty et al (2017), deduce about race and parental income greatly affecting student's access to higher education. This thesis was completed at a university with a heavily white and wealthy student body, and is therefore a perfect example of Dubow's (2009) argument that wealthier students are more likely to attend a selective school and thus graduate with a more prestigious degree than their lower socioeconomic counterparts. While Bucknell University has been discussing its desire to create a more diverse student body, the results of Models A and B show that acceptance and eventually matriculation is still extremely dependent on students' financial status at admission. Moreover, race still has a large effect on the students who are admitted as well as the students who eventually matriculate.

Second, the results of Model A and Model B are consistent with Dubow (2009), Corcoran (1995), and Chetty, et al (2017): parental income and resources available to high school students significantly impact a student's access to higher education. This claim is shown through the level of significance and large positive magnitude of parental income and students who didn't apply for financial aid as well as the percentage of population from a student's census tract with a bachelor's degree. Students coming from wealthier, more educated, families automatically have an advantage over more disadvantaged applicants. While both of these variables could potentially be telling some of the story about academic ability from high school, the high level of significance as well as the magnitude of these variables leads to the conclusion that wealthier students indeed have an advantage. Combining both race and income variables, Bucknell has not been able to increase its socioeconomic diversity through acceptances since 2006. For this reason, this thesis confirms the claim in Chetty et al (2017) that Bucknell University has more

students from the top 1% than the bottom 60% of income distribution. In terms of increasing racial diversity, Bucknell has been able to increase acceptances for both Asian and Hispanic students, but not towards Black students. Since 2006 Bucknell University Admissions has been able to slightly increase its acceptances of Black students year over year; however, Black students are still significantly less likely to matriculate than White students. Due to admissions increasing acceptances to certain races over time but with the matriculation rates staying flat or becoming negative, Bucknell's reputation is strongly shaping the student body and affecting which students are more likely to matriculate.

While access to low income students has not significantly increased in terms of acceptance or matriculation, for the lower socioeconomic students who do matriculate to Bucknell, there is little evidence of the mismatch hypothesis. While there are certain majors that do significantly lead to a higher starting salary than a student majoring in Arts and Humanities, any student successfully completing a major that leads to higher paying jobs will graduate with a higher starting salary. In Model C, neither parental income, housing value, race, need based aid recipient, first generation college student, nor community college scholar have a significant effect on starting salary. In this situation, Bucknell has successfully been able to level the playing field for students coming from these backgrounds. On the whole, for low income and/or minority students who do matriculate to Bucknell, if they complete a major that leads to a higher starting salary, they should not be significantly disadvantaged when seeking a job compared to their wealthy White peers.

Any research project has its limitations. In that context, the main limitation to this study is the omitted variable of academic achievement in high school. Having this variable in the error term in both Models A and B could bias the coefficients within the regression. Therefore, when

predicting who is being accepted to the Bucknell University, the marginal effects might change once adding in academic achievement. Further, not having data on which students applied for early decision as well as which students were admitted as a legacy does not allow for the control of acceptance rates increasing. Both of these variables would most likely positively impact a student's chances at being accepted to Bucknell, and favor wealthier applicants, thus, not changing the general finding.

As previously mentioned, the greatest source of omitted variable bias in this model is the lack of an academic indicator from high school. If this variable were to be included in the model, theoretically, the magnitude of the indicator variable for students who did not fill out the FAFSA would likely decrease. This is due to the likelihood that wealthier students typically obtain higher standardized test scores in high school. Furthermore, the racial variables explaining acceptance to Bucknell University would most likely increase in magnitude. This is due to the likelihood that minority students tend to obtain lower standardized test scores from high school (Guiner 2016). Once controlling for academic ability, a black student will most likely have a lower chance of being accepted than their counterpart white student. Therefore, once adding in academic ability, the overall results of this thesis would not change. Lastly, due to Bucknell becoming a testing optional school beginning with next year's admitted class (class of 2024), the results of this thesis will remain valid and can be applied to future incoming classes.

Based on this study, recommendations for Bucknell Administration include the following. First, this study should be replicated including the variable of academic index in order to see how Admissions has been able to control for this factor over time. If there are similar results to the ones obtained in this study, Bucknell University should adapt its strategic plans to increase acceptances of Black students as well as to increase matriculation access for all

under represented races. Furthermore, one of the most informative results of this study is that students who are not applying for financial aid are significantly more likely to be accepted to Bucknell as well as eventually matriculate. While this finding is consistent with the previous research of Chetty et al (2017) and Dubow (2009), it is imperative that Bucknell's Administration attempt to correct this inequality by improving access to all applicants throughout the admission process. A goal of Bucknell discussed in its strategic plan has been to increase diversity in all forms. In order to fully commit to this goal the University needs to weight student wealth less heavily in its admissions decision (Bucknell Strategic Plan 2006).

Further research based on this study could include analyzing whether or not a student is continuing the major that they initially declared throughout their time at Bucknell. While Model C does not find evidence supporting the mismatch hypothesis, the model does not control for whether or not admitted students change majors once enrolled at Bucknell. This econometric analysis would provide insight into the resources students can utilize at Bucknell and whether or not a student is successfully completing their initially chosen major. Theoretically, any student coming to Bucknell should be able to successfully complete any major the student has an interest in and use resources available to them to persevere. If there is a trend for minority or low income students to be more likely to switch out of more difficult majors and into less difficult ones, similar to the finding for Duke University (Arcidiacono et al 2012), Bucknell Administration should be aware of this finding and take action. As seen in Model C, there are tendencies for certain major categories graduating with higher starting salaries, and Bucknell's Administration needs to be wary of the fact that students with fewer resources might be less able to successfully complete the more difficult majors.

Finally, the results of this study can be compared to other universities similar to Bucknell, such as other schools within the Patriot league or to other small liberal arts colleges. Hill (2011) argues that over 28% of low income, high ability students are underrepresented at selective universities. This statistic is due to the admissions process throughout the United States that favors wealthy white students at these universities; therefore, it is the responsibility of these colleges to change this statistic. Particularly given that these institutions, in the past, have produced a large percentage of the nation's leaders in both the public and private sector. Bucknell has publicly discussed its desire to increase both racial and socioeconomic diversity; however, both of these goals are extremely difficult to achieve when tuition costs are increasing and the reputation of Bucknell as a wealthy white institution has not evolved. This model thus should be beneficial to the administration because they can use it to reshape future incoming classes as well as re-examine this model every year to see how access has improved in comparison the years in this study.

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II. Appendix

Model A- Probit Estimation of Admission to Bucknell

Admitted to Bucknell = β_0+ $\beta_1$other+ $\beta_2$other*time+ $\beta_3$asian+ β_4 asian*time+ β_5 black+ β_6 black*time + β_7 hispanic+ β_8 hispanic*time+ β_9 female+ β_{10} female*time+ β_{11}year+ β_{13} Admit Management+ β_{14} Admit Engineering+ β_{15} No Parent Income + β_{17} ln(parent income) + β_{18} ln(parent income)*time + β_{19} distance from Bucknell + β_{20} percentage white+ β_{21} GINI + β_{22} Percent house value above 1 mil+ β_{23} Pell+ β_{24} Need Based Aid + β_{25} Percent Bachelor Degree + β_{26} Unemployment Rate + β_{27} Percent Below Poverty

Model B- Probit Estimation of Matriculation to Bucknell

Matriculated to Bucknell= β_0+ $\beta_1$other+ $\beta_2$other*time+ $\beta_3$asian+ β_4 asian*time+ β_5 black+ β_6 black*time + β_7 hispanic+ β_8 hispanic*time+ β_9 female+ β_{10} female*time+ β_{11}year+ β_{13} Admit Management+ β_{14} Admit Engineering+ β_{15} No Parent Income + β_{17} ln(parent income) + β_{18} ln(parent income)*time + β_{19} distance from Bucknell + β_{20} percentage white+ β_{21} GINI + β_{22} Percent house value above 1 mil+ β_{23} Pell+ β_{24} Need Based Aid + β_{25} Percent Bachelor Degree + β_{26} Unemployment Rate + β_{27} Percent Below Poverty

Model C- OLS Estimation of Starting Salary

Log (Starting Salary)= β_0+ $\beta_1$year+ β_2 year squared+ β_3 log(parent income) + β_4 GPA+ β_5 Major Social Science+ β_6 Major Social Science* Time + β_7 Major Natural Science Technology & Math+ β_8 Major Natural Science Technology & Math * Time+ β_9 Major Management+ β_{10} Major Management*Time+ β_{11} Engineering Major+ β_{12} Engineering Major*Time + β_{13} Male+ β_{14} White + β_{15} Asian + β_{16} Black + β_{17} Hispanic + β_{18} Percentage Home value above 1 million+ β_{19} Percentage with a Bachelor's Degree+ β_{20} Employed and in Graduate School+ β_{21} Need Based Aid+ β_{22} First Generation College Student + β_{23} Community College Scholar + β_{22} No Parent Income

Table A: Model A output

Marginal Effects of Admittance to Bucknell University

Variable	Marginal Effect A1	Significance	Marginal Effect A2	Significance	Marginal Effect A3	Significance
Other	0.1202	.	0.1464		0.09709	
Other*2007	-0.0082		-0.1068		-0.0125	
Other*2008	-0.04854		-0.0745		-0.0478	
Other*2009	-0.06326		-0.0409		-0.05152	
Other*2010	-0.1194	.	0.00304		-0.1229	.
Other*2011	0.04696		0.20471		0.03284	
Other*2012	-0.0276		0.1374		0.02378	
Other*2013	-0.09419		-0.10166		-0.099212	
Other*2014	-0.0961		-0.1142		-0.10073	
Other*2015	-0.1278	*	-0.26364		-0.1169	*
Other*2016	-0.1078	.	-0.09877		-0.08255	
Other*2017	-0.1434	**	-0.1435		-0.1044	.
Other*2018	-0.1361	**	-0.1689		-0.12313	*
Asian	0.1582	***	0.1172		0.13487	***
Asian*2007	-0.0825	**	-0.0901		-0.0921	***
Asian*2008	-0.0816	**	-0.05643		-0.06551	*
Asian*2009	-0.13556	***	-0.1206		-0.11142	***
Asian*2010	-0.12027	***	-0.0602		-0.09571	***
Asian*2011	-0.1149	***	-0.06298		-0.112	***
Asian*2012	-0.0731	**	0.00544		-0.0664	*
Asian*2013	-0.05525	.	-0.0263		-0.0566	.
Asian*2014	-0.09131	***	0.00223		-0.0924	***
Asian*2015	-0.04933	.	-0.1849		-0.0770	**
Asian*2016	-0.1137	***	0.0144		-0.0509	*
Asian*2017	-0.0383		0.10029		0.02412	
Asian*2018	-0.1157		-0.04282		-0.0600	*
Black	-0.05478	*	-0.09557		-0.11026	***
Black*2007	0.03388		-0.03735		0.016949	
Black*2008	-0.0208		0.2412		0.0514	
Black*2009	0.0678		0.2544		0.158532	**
Black*2010	-0.00067		0.2105		0.09067	.
Black*2011	-0.004791		0.1509		0.05611	
Black*2012	-0.04147		-0.0178		0.00927	
Black*2013	0.01263		0.0916		0.04987	
Black*2014	-0.05044		-0.00614		-0.00287	
Black*2015	0.0257		0.060542		0.0543	

Black*2016	-0.0902	**	0.11308		0.03258	
Black*2017	-0.03433		0.1175		0.0808	*
Black*2018	-0.0989	***	0.01506		-0.00177	
Hispanic	0.14536	**	-0.0254		0.11828	*
Hispanic*2007	-0.07344		-0.0102		-0.06178	
Hispanic*2008	-0.04685		0.1395		-0.02324	
Hispanic*2009	-0.10425	.	0.00896		-0.12108	*
Hispanic*2010	-0.09165	.	0.17815		-0.07783	
Hispanic*2011	-0.0768		0.14144		-0.06171	
Hispanic*2012	-0.13566	**	-0.04106		-0.13167	**
Hispanic*2013	-0.0663		-0.0097		-0.07558	
Hispanic*2014	-0.13188	**	-0.0087		-0.1219	**
Hispanic*2015	-0.0752		-0.0316		-0.0908	.
Hispanic*2016	-0.1543	***	0.08744		-0.10756	*
Hispanic*2017	-0.0892	*	0.141		-0.03829	
Hispanic*2018	-0.1520	***	0.044		-0.1083	*
Female	0.03949	***	0.0038		0.02731	*
Female*2007	0.00063		0.05489		0.00653	
Female*2008	-0.00271		0.064988		0.003317	
Female*2009	-0.02875	.	-0.01634		-0.0184	
Female*2010	0.03058	.	0.0783		0.03577	*
Female*2011	0.00164		0.05571		0.01497	
Female*2012	0.001167		0.0544		0.00711	
Female*2013	0.01142		0.0631		0.01724	
Female*2014	-0.02045		0.046935		-0.01103	
Female*2015	-0.02045		0.05189		-0.0173	
Female*2016	-0.03549	*	0.0107		-0.01822	
Female*2017	-0.01648		0.01537		-0.00348	
Female*2018	-0.0226		0.0098		-0.014	
Fall 2007	-0.03099	**	-0.2806	*	-0.02814	*
Fall 2008	-0.043622	***	0.27458	*	-0.00668	
Fall 2009	-0.018766	.	0.4895	***	-0.01964	
Fall 2010	-0.0337	**	0.440521	***	0.001456	
Fall 2011	-0.0618	***	0.2623	*	-0.03709	**
Fall 2012	-0.05326	***	0.3807	***	-0.05317	***
Fall 2013	-0.03613	**	0.4779	***	-0.05161	***
Fall 2014	-0.00769		0.4751	***	-0.005785	
Fall 2015	-0.06897	***	0.429	***	-0.04857	***
Fall 2016	0.01189		-0.2827	*	0.21369	***
Fall 2017	0.0077		0.04253		0.18492	***
Fall 2018	0.054	***	0.059		0.2172	***

Management	-0.069	***	-0.1275	***	-0.0909	***
Engineering	-0.03359	***	-0.0602	***	-0.044	***
Distance	0.0069	***	0.0058	.	0.0077	***
Percent White	-0.01965	.	0.0125		-0.0233	*
GINI	0.41879	***	0.2789	***	0.5548	***
Percent Houses above 1 million	0.05272	***	-0.002677		0.10587	***
Pell	0.08096	***	0.0505	***	0.1070	***
Need Based Aid	0.3388	***	0.0616	***	0.08105	***
Percent Bachelor's Degree	0.4999	***	0.3758	***	0.49965	***
Unemployment Rate	-0.006015	***	-0.00594	***	-0.00589	***
Percent Below Poverty	0.1595	***	0.1825	**	0.14603	***
Parents Income	N/A	N/A	0.0835	***	0.0625	***
Income*2007	N/A	N/A	0.0187		-0.002813	.
Income*2008	N/A	N/A	-0.0503	***	-0.01787	***
Income*2009	N/A	N/A	-0.0707	***	-0.007141	***
Income*2010	N/A	N/A	-0.0702	***	-0.01678	***
Income*2011	N/A	N/A	-0.0467	***	-0.01353	***
Income*2012	N/A	N/A	-0.0512	***	-0.004262	**
Income*2013	N/A	N/A	-0.064	***	-0.00059	
Income*2014	N/A	N/A	-0.068	***	-0.0085	***
Income*2015	N/A	N/A	-0.0577	***	-0.00572	***
Income*2016	N/A	N/A	-0.0213	.	-0.0535	***
Income*2017	N/A	N/A	-0.047	***	-0.04958	***
Income*2018	N/A	N/A	-0.042	***	-0.04661	***
No Parent Income	N/A	N/A	N/A	N/A	0.1799	***

Significance Code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Table B: Model B Output

Marginal Effects of Matriculation to Bucknell University

Variable	Marginal Effect B1	Significance	Marginal Effect B2	Significance	Marginal Effect B3	Significance
Other	-0.00683		-0.09187		-0.01095	
Other*2007	0.13308		0.20309		0.13639	
Other*2008	-0.27299	***	-0.27547	**	-0.27036	***
Other*2009	-0.07135		0.00835		-0.06385	
Other*2010	-0.13340		-0.01332		-0.12024	
Other*2011	-0.01939		0.03849		-0.01399	
Other*2012	-0.08270		0.13233		-0.07742	
Other*2013	-0.02763		0.07462		-0.01199	
Other*2014	-0.17778	.	-0.05829		-0.16573	.
Other*2015	-0.09149		-0.0528		-0.08912	
Other*2016	0.07087		0.28924	*	0.07258	
Other*2017	-0.03959		0.04257		-0.03234	
Other*2018	0.06658		0.21385		0.07140	
Asian	-0.13432	***	-0.12275	**	-0.13563	***
Asian*2007	-0.06634		-0.07901		-0.06680	
Asian*2008	0.08656		0.08254		0.08842	
Asian*2009	-0.06990		-0.06348		-0.06821	
Asian*2010	-0.09024	.	-0.05205		-0.08842	
Asian*2011	-0.00695		-0.02512		-0.06821	
Asian*2012	0.00612		-0.01585		0.01071	
Asian*2013	-0.03362		-0.005502		-0.02408	
Asian*2014	-0.07098		-0.06968		-0.05817	
Asian*2015	0.01251		-0.05211		0.01376	
Asian*2016	-0.03882		-0.06607		-0.04161	
Asian*2017	-0.00086		-0.01357		0.00242	
Asian*2018	0.03092		0.05206		0.03182	
Black	-0.04709		-0.03553		-0.05403	
Black*2007	0.08623		0.14533		0.08746	
Black*2008	-0.03512		-0.03445		-0.02051	
Black*2009	0.03210		0.03683		0.03999	
Black*2010	0.01957		0.1384		0.03334	
Black*2011	-0.07146		-0.05093		-0.06343	
Black*2012	-0.01273		0.00618		-0.00478	
Black*2013	-0.01450		0.01150		0.01116	
Black*2014	-0.09604		-0.0519		-0.07542	
Black*2015	-0.13188	*	-0.12716	*	-0.07212	*
Black*2016	-0.06946		-0.11175	.	0.02934	
Black*2017	-0.08258		-0.10541		-0.02568	
Black*2018	0.02215		0.03984		0.02634	

Hispanic	-0.03074		0.03984		-0.02568	
Hispanic*2007	0.21962	.	0.03885		0.21429	.
Hispanic*2008	-0.11946		0.11798	.	-0.12396	
Hispanic*2009	-0.06836		-0.19497		-0.07112	
Hispanic*2010	-0.05162		-0.15939		0.03337	
Hispanic*2011	-0.08238		-0.12619		-0.06343	
Hispanic*2012	-0.11527		-0.19386	*	-0.11821	
Hispanic*2013	-0.02999		-0.05180		-0.02939	
Hispanic*2014	-0.08767		-0.18417	*	-0.08583	
Hispanic*2015	-0.04024		-0.09983		-0.04522	
Hispanic*2016	-0.07631		-0.15473	.	-0.08672	
Hispanic*2017	-0.09137		-0.16385	.	-0.08594	
Hispanic*2018	-0.08113		-0.14504		-0.08594	
Female	-0.03174		-0.05369	*	-0.03153	
Female*2007	0.00333		0.01762		0.00336	
Female*2008	0.08709	**	0.13034	**	0.08798	**
Female*2009	0.01197		0.00396		0.01127	
Female*2010	0.01589		0.03341		0.01663	
Female*2011	0.01535		0.03066		0.01611	
Female*2012	0.05445	.	0.06892	.	0.05422	.
Female*2013	-0.00195		0.01294		-0.00102	
Female*2014	0.04475		0.07542	.	0.046687	
Female*2015	0.01993		0.01238		0.019883	
Female*2016	0.00775		0.04812		0.00664	
Female*2017	0.01978		0.03403		0.01951	
Female*2018	0.03072		0.06007		0.03116	
Fall 2007	0.01215		0.15764		0.00988	
Fall 2008	0.03777	.	-0.1087		0.06498	*
Fall 2009	0.09423	***	-0.00906		0.12369	***
Fall 2010	0.08907	***	0.07886		0.1305	***
Fall 2011	0.10827	***	-0.02627		0.12759	***
Fall 2012	0.08728	***	0.02857		0.11971	***
Fall 2013	0.10292	***	-0.09034		0.17224	***
Fall 2014	0.07633	***	-0.18782	*	0.14032	***
Fall 2015	0.05181	*	0.00345		0.06701	*
Fall 2016	0.00591		0.13098		0.00903	
Fall 2017	-0.01289		0.02284		0.01327	
Fall 2018	-0.04175	*	-0.05571		-0.03129	
Management	0.04653	*	0.02344		0.04687	*
Engineering	-0.08199	***	-0.06931	***	-0.08095	***
Distance	-0.05165	***	-0.04503	***	-0.05144	***
Percent White	-0.03548		-0.02401		-0.03322	
GINI	0.24765	***	0.2622	**	0.22729	***

Percent Houses above 1 million	-0.00282		0.11012	***	-0.01359	
Pell	0.19288	***	0.19755	***	0.20226	***
Need Based Aid	0.05105	***	0.07478	***	0.06515	***
Percent Bachelor's Degree	0.48357	***	0.35194	***	0.47823	***
Unemployment Rate	0.00175		0.00218		0.00181	
Percent Below Poverty	0.75273	***	0.60655	***	0.75869	***
Parents Income	N/A	N/A	0.00000008	***	0.00992	**
Income*2007	N/A	N/A	-0.01283		0.00007	
Income*2008	N/A	N/A	0.00918		-0.00434	.
Income*2009	N/A	N/A	0.00679		-0.00425	.
Income*2010	N/A	N/A	-0.00327		-0.00629	*
Income*2011	N/A	N/A	0.00879		-0.00307	
Income*2012	N/A	N/A	0.00163		-0.00481	.
Income*2013	N/A	N/A	0.01099		-0.00978	***
Income*2014	N/A	N/A	0.01859	.	-0.00941	***
Income*2015	N/A	N/A	0.00310		-0.00235	
Income*2016	N/A	N/A	-0.01170		-0.00013	
Income*2017	N/A	N/A	-0.00522		-0.00422	.
Income*2018	N/A	N/A	-0.00161		-0.00189	
No Parent Income	N/A	N/A	N/A	N/A	0.09706	**

Significance Code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Table C: Model C Output

OLS Model Estimating Starting Salary

Variable	Estimate C_1	Significance Level	Estimate C_2	Significance Level
Year	-0.0410		0.01414	
Year Squared	0.0064	*	0.00347	.
Parent Income	0.006		0.0061	
No Parent Income	N/A	N/A	0.0739	
GPA	0.0909	***	0.0817	***
Major Social Science	-0.0454		0.1267	.
Major Social Science*Time	0.0141		-0.0166	
Major Natural Science Technology & Mathematics	-0.2289	*	0.00375	
Major Natural Science Technology & Mathematics*Time	0.0303		-0.01132	
Major Management	0.2399	*	0.3513	***
Major Management* Time	-0.00195		-0.0113	.
Engineering Major	0.3606	***	0.49	***
Engineering Major*Time	0.003		-0.0243	***
Male	0.1286	***	0.1313	***
White	-0.0375		-0.0708	
Asian	0.0350		0.0195	
Black	0.0511		0.0221	
Hispanic	-0.0073		-0.0041	
Percent House Value above 1 million	0.105	.	0.0544	
Percent Bachelor Degree	0.2456	**	0.235	**
Employed and Graduate School	-0.1392	**	-0.152	**
Need Based Aid Recipient	-0.0158		-0.0224	
First Generation College Student	-0.021		-0.0188	
Community College Scholar	-0.0799		-0.0928	

Significance Code: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1

Table D: Descriptive Statistics Applicants

Category	Source	Variable	Mean
Race and Gender	Bucknell University Office of Admissions. Average represents the percentage of applicants that identify with each race or gender.	White	0.885156
		Black	0.063114
		Asian	0.075668
		Hispanic	0.069121
		Other	0.012491
		Female	0.491117
Financial Status Variables	Financial Aid Office at Bucknell University	Pell Grant Recipient	0.039905
		Need Based Aid Recipient	0.168033
		Parent Income	163671.5
Census Tract Variables	American Community Survey	Percentage White	0.824276
		GINI Coefficient	0.435598
		Percent Housing Value above 1 million dollars	0.111174
		Percent Bachelor Degree	0.281878
		Unemployment Rate	5.70911
		Percent Below Poverty Level	0.065376
College Descriptions	Bucknell University Office of Admissions.	College of Management	3082
		College of Engineering	25438
		College of Arts and Sciences	75823
	Bucknell University Office of Admissions	Admit Yes	0.313976
		Matriculation	0.113106

Table E: Descriptive Statistics Admitted Students

Category	Source	Variable	Mean
Race and Gender	Bucknell University Office of Admissions. Average represents the percentage of applicants that identify with each race or gender.	White	0.889144
		Black	0.044998
		Asian	0.099427
		Hispanic	0.069672
		Other	0.013263
		Female	0.5224933
Financial Status Variables	Financial Aid Office at Bucknell University	Pell Grant Recipient	0.069454
		Need Based Aid Recipient	0.307601
		Parent Income	181651.5732
Census Tract Variables	American Community Survey	Percentage White	0.829829
		GINI Coefficient	0.441805967
		Percent Housing Value above 1 million dollars	0.12648
		Percent Bachelor Degree	0.295640726
		Unemployment Rate	5.433164
		Percent Below Poverty Level	0.062922
College Descriptions	Bucknell University Office of Admissions.	College of Management	0.027391723
		College of Engineering	0.226969
		College of Arts and Sciences	0.762336
	Bucknell University Office of Admissions	Matriculation	0.360236

Table F: Descriptive Statistics Bucknell Graduates with Starting Salary

Category	Source	Variable	Mean
Race and Gender	Bucknell University Office of Admissions. Average represents the percentage of applicants that identify with each race or gender.	White	0.9428
		Black	0.0333
		Asian	0.0515
		Hispanic	0.04304
		Other	0.007917
		Male	0.4694
Financial Status Variables	Financial Aid Office at Bucknell University	No Parental Income Data	0.428256
		Need Based Aid Recipient	0.344739
		Parent Income	164472
Census Tract Variables	American Community Survey	Percent Housing Value above 1 Million dollars	0.1259
		Percent Bachelor's Degree	0.305
College Variables and GPA	Registrar	Arts and Humanities	0.089404
		Social Science	0.3579
		Natural Science Technology & Mathematics	0.11699
		Management Major	0.1718
		Engineering Major	0.2233
		GPA	3.3254
Student Characteristics	Registrar /Career Development Center	Starting Salary	51993.39
		First Generation College Student	0.098234
		Community College Scholar	0.005519

Table G: Probability of Acceptance: Male vs. Female Students

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Male	23%	25%	24%	26%	22%	21%	21%	25%	21%	46%	44%	47%
Female	26%	28%	25%	32%	26%	24%	25%	27%	22%	48%	46%	48%

Table H: Probability of Matriculation: Male vs. Female Students

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Male	34%	39%	45%	46%	46%	45%	50%	47%	40%	34%	34%	30%
Female	31%	45%	43%	44%	44%	47%	47%	48%	38%	31%	33%	30%

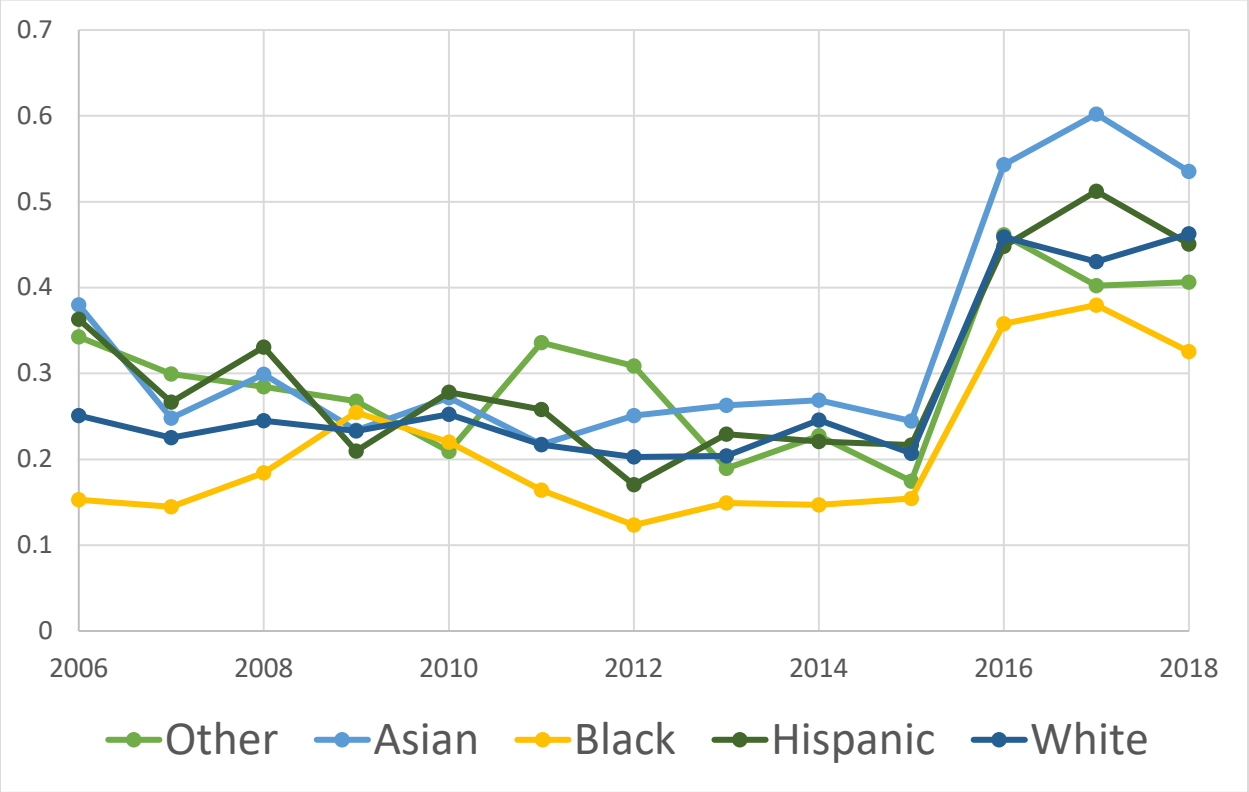
Table I: Probability of Acceptance: Black vs. White Female

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Black	54%	60%	66%	68%	58%	50%	56%	52%	53%	76%	79%	74%
White	65%	67%	64%	71%	65%	63%	64%	66%	60%	84%	83%	84%

Table J: Probability of Matriculation: Black vs. White Female

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Black	78%	79%	80%	80%	77%	80%	80%	78%	74%	74%	74%	76%
White	77%	80%	80%	80%	80%	81%	81%	81%	79%	77%	78%	77%

Graph A: Probability of Acceptance Over Time: Race



Graph B: Probability of Matriculation Over Time: Race