THE IMPORTANCE OF EMPLOYMENT STATISTICS FOR STUDENTS APPLYING TO COLLEGE

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Abstract

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For students applying to college, there has been an increasing interest over the past few decades in the employment opportunities available to them after college, as shown in the Cooperative Institutional Research Program survey (2011).

This study utilizes a discrete choice experiment (DCE) to determine the value, as measured by the part-worth utility, prospective students place on hypothetical Higher Education Institution's (HEI) that offer better employment statistics after graduation, relative to other institutional attributes deemed important to students applying to college.

The DCE used the orthogonal main effect plan with six attributes each at three levels. The Firth bias reduction Maximum Likelihood Method was used to estimate the marginal utility of the attributes and interactions of the attributes with the covariates from the conditional logit model which modeled the DCE.

The sample consisted of 220 high school juniors and seniors from Texas, Delaware, and Vermont who answered eighteen discrete choice scenarios, making trade-offs in deciding in each which of two hypothetical HEI's they most preferred (as the three levels of the six attributes that made up each institutional option presented were randomly varied). The aggregated results showed that respondents overwhelmingly preferred institutions that offered, in order from

highest utility: the highest average salary levels, the highest 6-year graduation rates, and the highest employment rates. Respondents had no significant preference for the remaining three attributes: tuition rate[1], distance from home, and *U.S. News & World Report* ranking.

These results show that students at the point of applying to college want evidence to assure them that they will be able, with high probability, to graduate from college and secure a full-time job after they graduate, preferably in jobs that offer the highest average salary.

Key Words: Discrete choice experiments; Orthogonal main effect plans; Conditional logit model; Employment statistics; Average salary of college graduates by major of study; Graduation rate for college graduates; Employment rate of college graduates

[1] It should be noted that tuition was presented in the survey as gross tuition minus scholarships, minus loans to equal a net tuition that was set to zero in each attribute level. The gross tuition, scholarships, and loans amount was varied and the loan amount represented the net tuition amount as survey respondents were told that they could either incur the loan or pay it off.

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Chapter 1

1.1 Introduction

In 2018, 19.9 million students will attend a higher education institution (HEI) in the United States. Many of these students will be going to college with the assumption that after spending four years of their life (however on average the time to degree is actually more like 5-6 years) and thousands of dollars (tuition prices could range from $0-$58,000 per year, Powell, 2018), this investment in time and money will pay off in terms of acquiring the skills necessary to attain a rewarding job and place in society.

It should be noted that attaining a high paying job is not the only reason why students attend a HEI. The 2017 Hobson Report, which surveyed 60,000 students, lists the top 16 reasons why students attend college. While many of the top 16 reasons listed show that students have an interest in pursuing career fields (i.e. “Because I want to pursue a particular career”, “to help me get a better job”, “to earn more money”), they are also interested in pursuing college for other reasons which include: “to be intellectually challenged”, the desire to meet new people, “to continue learning & development” and “to experience university life”(Bhardwa, 2017). That being said of the top 10 reasons listed in the Hobson report, six of them pertain to reasons that are motivated by earning more income in a given field.

1.2 The problem

This research study addresses the lack of specific information accessible to high school students at the point of their decision-making about colleges, both information about specific colleges/universities in terms of how well the graduates of a particular school and major of study have fared in the workforce and also the lack of information pertaining to graduation rates by college. This information can be important for students choosing among HEI’s and those interested in pursuing a particular major of study. This study offers an experimental setting to

assess the importance that high-school juniors and seniors place on employment and graduation statistics of a given college or university.

Currently, students who are attending college to increase their lifetime earnings are seemingly making the wrong decision. A study completed by the Urban Institute (2013) found that the amount of wealth held by individuals under the age of 46 lags previous cohorts when they were the same age. The authors attribute this difference to: a) higher college tuition rates which lead to a higher debt load, b) no net growth in wages since the late 1990's, c) the mid-2000's housing bubble and resulting economic recession, d) delayed entry into the labor market, e) lower educational attainment when compared to previous generations[2], f) lower relative minimum wage, g) higher shares of their pay taken out to fund social security and health care, h) later family formation, and i) less employment, after entering the workforce[3] (The Urban Institute, 2013). Furthermore, a study completed by the Associated Press, using data from the U.S. Bureau of the Census Current Population Survey, found that 53% of recent college graduates were either under- or unemployed (Weissman, 2012). In 2014, a survey by the Pew Research Center found that 83% of college graduates were without a job at the time of graduation (Hamilton, 2014). In 2018, average mal-employment rates stand at 43.4% according

[2] https://www.urban.org/urban-wire/lost-generations-wealth-building-among-young
[3] https://www.urban.org/sites/default/files/publication/24416/904576-Lost-Generations-Wealth-Building-Among-the-Young.PDF

to statista.com[4]. Additionally, real wages have decreased for college graduates. Between 2000 and 2011 real wages for college graduates decreased by 5.4% (Shierholz et al, 2012)[5] [6].

However, there are conflicting reports on what percentage of college graduates are unemployed or underemployed. Using data from the U.S. Census Bureau, Abel & Dietz (2016) found that, as of 2015, only 5% of recent college graduates were unemployed, and this unemployment rate had dropped from 7% in 2011. They also show that the unemployment rate is substantially higher for individuals without a college diploma. They show with empirical evidence that being underemployed is, for many, a temporary (if somewhat painful) phase. At age 22, only 49% of college grads worked in "college jobs", however by age 27, 59% of college grads worked in "college jobs". This is still a very high percentage (41%) of college graduates who are underemployed and lends credence to the argument that individuals entering into a college or major should know what they are getting into before they incur a high amount of debt. These authors also found that a key determinant in whether graduates were underemployed is the

[4] https://www.statista.com/statistics/642226/underemployment-rate-of-us-college-graduates-by-major/

[5] The fact that college graduates are seemingly somewhat insulated from recessionary forces "masks" the fact that many college graduates are either under employed or mal employed (Fogg & Harrington, 2011). Mal employment occurs when an individual is working in a job whose requirements are under the skill level they were trained for in college. The authors define "college jobs" according to the Department of Labor's O*NET database. This database contains information from a questionnaire given to employees and "professional occupational analysts" to collect information on the job requirements of various occupations. The authors use one question in this questionnaire, which asks what level of education is required for a given job, to determine whether a job is a "college job" or a "non-college job".

The Center for Labor Market Studies at Northeastern University found that the mal employment rate, or the percentage of college graduates working in jobs under the skill level they were trained for, was just under 37% in 2013 (Foroohar, 2013) and this percentage rose from 2000, when the mal employment rate was 28% (as cited in Sum et al, 2012). Fogg and Harrington (2011), using data from the U.S. Census Bureau, also found a rise in the mal-employment rate from 2000 to 2011 and add that the mal employment rate differs for different age groups in the "college labor market". The mal employment rate was worst for the youngest cohort (students age 20-24) of the college labor market wherein for this cohort, the mal employment rate increased from 2000 to 2010 from 29.8% to 39.1%. While the year 2000 preceded a recession which occurred in 2001 and 2010 was a period just after the Great Recession that occurred between 2007-2009 so the comparison is less than perfect, the massification of higher education has brought on changes to the labor market that slip past gauges of the unemployment rate alone, so the mal employment rate is important to examine. For example, Harrigan states that in 1970 only 2% of firefighters had college degrees, while today 14% have college degrees; the same can be said for taxi drivers and retail store clerks (Semuels, 2013). Furthermore, over the last 30+ years there has been a fundamental change to the labor market in the U.S. due to the heavy influence of off-shoring of production and jobs and improvements in technology, as detailed by Acemoglu and Autor (2010) in footnote 10, below. Acemoglu and Autor (2010), make the point that college graduates in high skill majors like engineering, science, math etc. (and those with graduate degrees) are reaping the rewards of the college wage premium and in terms of securing appropriately challenging employment after graduation, but others in low-skill majors do not reap the same rewards in the labor market.

[6] While the period between 1990 and the present has been heavily influenced by three recessions (1990-1991, 2000, and 2007-09), individuals above the age of 46 have withstood recessionary periods as well (in 1945, 1949, 1953, 1958, 1960-61, 1969-70, 1973-75, 1980, and 1981-1982 (McNees, 1992)).

major of study they pursued, wherein STEM fields (science, technology, engineering, math) have a lower share of graduates who are underemployed.

So, why has demand for college not dropped off significantly given higher prices and lower economic returns (on average) for graduates compared with generations past[7]? Or, why aren't significantly more students graduating in the STEM fields[8]? The reasons could be related to the information asymmetries this paper aims to illuminate and begin to correct. One of the main arguments that supports attending college stems from the argument that says that the unemployment rate for high school graduates is higher than it is for college graduates and that life-time earnings overall are higher for college graduates when compared to high school graduates. The earnings gap between college graduates and high school graduates is known as the college wage premium. However, it should be noted that this earnings gap between college and high school graduates has recently flattened, as between 2010 and 2015, the college wage premium did not change (Valletta, 2016). A historical chart of the college wage premium can be seen in Appendix 4. While the college wage premium is supported by empirical research, some would argue the inexactitude of its broad promotion; Acemoglu & Autor (2010) argue that the college wage premium is actually due to an increase in earnings for individuals with an advanced (i.e. graduate) degree, certain majors with strong earnings, i.e. STEM majors (science technology engineering and math) and business majors, and the fact that the wages of lesser skilled employees have declined since 1980[9].

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[7] Data from The National Center for Education Statistics (NCES) (2014) shows that the level of enrollments, nationally, has increased steadily over the last few decades. In recent years, total enrollments have flattened but much of this represents the sharp decline in the fortunes of the for-profit higher education sector and some decline in two-year college enrollments. Enrollment rates are increasing at a much slower rate across all other sectors compared to previous decades (NCES, 2018a).

[8] It should be noted that the number of graduates in the STEM fields has increased from 380,000 in 2008 to roughly 550,000 in 2015/2016, while the number of graduates in the humanities has remained nearly steady increasing from 370,000 in 2008 to only 380,000 graduates in 2015/2016 (Wright, 2017).

[9] Many publications broadly assert that attending college will on average result in higher lifetime earnings, which is otherwise known as the college wage premium. However this broad promotion of higher education is incomplete. Altonji et al (2011) found that the difference in average monetary returns to schooling between electrical engineering majors and education majors was equal to the difference between college and high school graduates. While the college wage premium has increased from 1979-2008, this increase has only been around 13 log points (approximately 13%) for males with a 4-year college degree as there was a slowdown in the demand for college graduates in the 1990's. Earnings for male high school graduates have dropped by approximately 10 log points

While it is true that college graduates still earn more than individuals without a college degree and this is a major reason why students go to college, many questions remain. If students had employment statistics[10] (E.S.) by major available at the time they were considering college, would there be dramatic increases in the number of students entering the STEM (science, technology, engineering, and math) fields? And would there be a precipitous drop in the number of students entering humanities majors? If this shift occurred, it could clear up the chronic shortages in the labor market as it relates to the STEM fields[11]. Would more students and their families instead choose to use the money they would have invested in a college degree and invest this money into starting a business? Would they choose a less expensive HEI? Would demand for non-STEM degrees fall precipitously if students were aware of the employment and graduation rates of specific majors at specific universities and students were given up to date information on the employment rate and average salary of graduates from each major of study at every HEI? Would students choose a HEI with a lower tuition price and a lower ranking if the E.S. of the lower priced HEI were equivalent to the higher priced and higher ranked HEI? Overall, this research aims to shed light on some of these questions through an experimental test

(approximately 10%) over the same time period (Acemoglu & Autor, 2010). Female college and high school graduates' growth in wages were not significantly different from those of men (p.14). Thus, the decline in earnings of low-wage workers has been a major factor causing the college wage premium to grow over the last thirty years. Grogger and Eide (1995) show that the reason that there was an increase in the college wage premium between 1980-1995 was because more students switched into "relatively" high skill majors like "business, engineering and science" (p.285), and out of "low skilled" (a term given by the authors meaning surgeons, engineers, etc. are defined as high skill majors and education, arts, etc. are low skill majors) majors like education, social science, and "letters". Autor (2010) shows that there has been a "polarization" in the type of jobs in the labor market between high and low skill occupations, with growth in the tails and a hollowing out of the middle of the distribution. Low skill positions have grown mainly because of the increased need for service-type positions; high skill occupations like surgeons and positions that require a graduate degree have also grown while many middle skill positions have been replaced by technological advances including automation and by offshoring of jobs. (China's entrance into the WTO in 2001 had a major impact on world trade and offshoring of manufacturing jobs, see Autor, 2013). It should also be noted that many researchers in this field of research, human capital theory and analysis, lump the earnings of all college graduates into one average amount. However, according to Acemoglu & Autor (2010), the growth in the college wage premium between 1979 and 2009 mainly came from individuals with advanced degrees or those who were in high skill majors at the bachelors level. The authors describe high skill occupations as "managerial, technical, law, medicine, science, engineering etc. (Acemoglu & Autor, 2010, p. 1077) They conclude that wages for all individuals with a college education (in high-skill and low-skill majors), as a whole, did not grow substantially in real terms between the period of 1979-2009. Thus, the reason for the growing gap in the college wage premium was mainly because of the decrease in earnings for individuals with no college education.

[10] Employment statistics, as defined in this paper, is the percentage of graduates in a given major, who attain employment.

[11] It should be noted that STEM is a very broad category (some would even include social science in this category) and there are both shortages and surpluses in the various STEM fields (Larson & Xue, 2017).

of the college choice process which measures formally the utility high-school juniors and seniors place on a given major of study at a given HEI where the given choices differ by graduation rate, gross tuition, amount of scholarship/grant and loan aid disbursed (which fluctuates uniformly with gross tuition so that net tuition always equals zero in every scenario posed to respondents), distance from home, employment prospects after graduation, and the *U.S. News & World Report* national rankings for undergraduate HEI's.

1.3 Students' effort to increase their value in the labor market

Maringe (2006) found that, in the United Kingdom, prospective students are becoming more consumer based in their search for courses and institutions of higher education, which means that students are increasingly choosing courses and institutions to improve their career prospects rather than out of an interest in the subject. The authors attribute the increased interest in professional degrees to the additional fees introduced in the United Kingdom's higher education system. While this study was completed outside of the United States, Pryor et al (2011) found similar results in the U.S. The 2011 edition of the UCLA-based CIRP (Cooperative Institutional Research Program) Freshman Survey (Pryor et. al), which was based on surveying 203,967 freshmen at 270 four-year HEI's of "varying selectivity" rates, shows that, in 2009, 2010, and 2011 the number one reason freshmen decided to attend university was, "to get a better job" (p.11).

In a study from Western Australia, Soutar & Turner (2002) also found that employment prospects are a key factor in a prospective student's decision to attend a particular higher education institution.

1.4 Conclusion

Paulsen (1990) stated that most of the college choice literature comes from the fields of psychology, economics and sociology. The present research would fall within the field of economics. Much of the research on college choice in the field of economics focuses on a student's response to the costs and perceived benefits of enrolling in a HEI.

There is no research that specifically asks how students applying to college would react if historical E.S.'s, broken down by major, were published on the websites of

institutions. The closest type of research analyzing whether E.S. would be valued by students are surveys that ask students why they are attending college, i.e. Pryor et. al (2011).

Chapter 2 Purpose of the proposed research and literature review

This study aims to determine what value, utility rating (measures how useful something is to the person), or importance prospective students place on the E.S. of a higher education institution (HEI) by major of study through Discrete Choice Experiments (DCE). This employment data, broken down by major for each HEI, includes a) average salary of graduates 1 year and 10 years after graduation and, b) average number of graduates who received full time employment 1 year and 10 years after graduation. Showing 1 and 10 year post-graduation figures for these indicators gives students an idea of the annual growth rate in salary for graduates of a given HEI. Along with employment statistics, the DCE scenarios in this study also provide respondents with information on: a) graduation rate, b) gross tuition, c) scholarship aid, d) loan aid awarded, e) distance from home, and f) *U.S. News & World Report* rankings[12]. The levels of these indicators are varied in each DCE scenario to provide different hypothetical options of HEI's with varied performance characteristics and respondents are asked which option they prefer in a series of paired comparisons. For the various characteristics, utility ratings are then gleaned from this data on their choices.

2.1 Objective/Thesis

The purpose of this research is to answer the question: Would students value this level of detailed employment information? One way of determining the extent to which prospective students value this information is to find out whether and to what extent

[12] As mentioned earlier, the amount of scholarship and loan aid disbursed fluctuates uniformly with gross tuition so that net tuition always equals zero in every scenario posed to respondents.

students prefer a hypothetical HEI that reports better E.S. versus a HEI that reports worse E.S.in relation to other characteristics that affect students' choices.

Based on college choice literature, it is theorized that in choosing a HEI, E.S. will have the highest average utility score of all the attributes across respondents (Berger, 1988; Boudarbat, 2008; Antonji et al., 2011; Cannings et al., 2002; Paulsen 1990;). In terms of direction of preference for other attribute levels, students should overall prefer an institution that has the lowest net price[13] (Savoca, 1990), is the most selective to which they gain admission (Hearn, 1991; McDonough et al, 1998), is closest to home (Zemsky & Oedel, 1983 in Hossler & Gallagher, 1987) and has the highest graduation rate. In practice, of course, students must trade off among these dimensions when they choose among institutions with different values of each.

Based on empirical research on college choice, students from higher income families are in general more willing than other students to attend HEI's that are far from home, very selective, with a high net price, and high E.S. Thus, preferences will most likely be dependent in part on the socio-economic status of the respondent (Hoxby & Avery, 2013). Students from lower income families are generally more willing to attend less selective institutions, as they are more cost conscious. They also prefer HEI's that are closer to home.

[13] However high achieving students would prefer to pay for a highly selective HEI that may carry a higher tuition price.

2.2 Literature review

This study aims to determine the value or utility rating prospective students place on the employment statistics for a HEI's graduates relative to other attributes of a HEI. Please see Appendix 1 – part A and B for a detailed listing of the attributes, levels of these attributes, and the characteristic variables posed to respondents in the introductory portion of the survey.

There is no research that specifically asks how students applying to college would react if historical institutional E.S.'s, broken down by major, were published on the websites of institutions. Much of the research that hovers around this topic focuses on college choice, and the factors affecting the decision to attend a particular college or university (McDonough, 1997; Chapman, 1981). There are many studies that utilize conjoint analysis in college choice[14]; however, many of these studies originate from outside the U.S. (Moogan et al, 2001, Soutar & Turner, 2002). As detailed in footnote 19, while there are numerous sources informing prospective students/applicants about HEI's (i.e. *U.S. News & World Report* ranking, university websites & brochures, the White House's College Scorecard website, payscale.com, etc.), there is no independently verified information source that details historical employment statistics from a specific school and major of study (e.g., the History department at Amherst College).

[14] Conjoint analysis, which is very similar to the experimental method used in this study, DCE, is an experimental method often used in marketing research that gives respondents brands with varying attribute levels and asks them which option they most prefer. Based on the choices a respondent makes, a utility level is calculated and attributed to each attribute level.

2.2.1 What information sources are currently available?

There are several resources that give average earnings of college graduates. Payscale.com gives average salary levels for all available graduates of a given institution, which is based on operators of the site using crowdsourcing[15] as their sample data source[16]. Some of the criticisms of payscale can be found in the footnote below[17]. A description of some of the other sources that are similar to payscale can be found in the following footnote[18].

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[15] Crowdsourcing is a relatively new phenomenon in which individuals looking for a solution to a problem or help with production seek the assistance from a community of people online.

[16] http://www.businessinsider.com/why-payscale-is-not-like-kim-kardashian-2012-10

[17] Some of the criticisms of payscale.com include: The number of respondents is entirely dependent on entries of data from users of the internet who choose to respond, which means that these entries could be from individuals who never attended the HEI being rated or who give inaccurate information about their earnings. There is also potential bias in responses in that those with low earnings may be less likely to respond. Additionally, the number of responses for each institution varies greatly wherein some institutions receive a limited amount of responses. However, determining the variation in sample size or possible biases for each HEI rated is impossible because, as another criticism states, payscale.com doesn't release information on how they calculated each median salary amount because their mthod is proprietary. Thus there is no way of validating the information they provide. Other critiques regarding payscale.com's sample are that the site does not include individuals with advanced degrees nor individuals who are unemployed. Leaving out graduates who are unemployed can lead to an overestimation of salary figures while excluding graduates with advanced degrees leaves out many with higher earnings to which college was the gateway. Aroundlearning.com checked the tax records of several graduates, in certain states like Arkansas, Tennessee, Virginia, Colorado, and Texas to verify payscale.com's findings, and found great discrepancies (See here: http://aroundlearning.com/2013/09/8-problems-with-payscale-coms-college-rankings-and-one-solution/). Additionally, payscale.com does not give the percentage of graduates within a major of study or within a HEI who found employment nor does it break down the salary levels by major of study. Instead, the site gives institution-wide median starting and mid-career earnings for those who provided information. See: http://www.payscale.com/college-salary-report-2014/full-list-of-schools . There are many other criticisms levied against payscale.com, for example, the majority of the sample contains recent graduates whose earnings will tend to be lower. The final and probably most significant complaint is that their estimations do not utilize random samples and are not experimentally controlled.

Still, the demand for the information payscale.com provides can be seen by the growth in popularity of the site. Major publications like Forbes use the estimations provided by payscale to factor into their ranking of colleges and universities. Payscale has branched out its services to countries like the United Kingdom, Australia, New Zealand and began a beta site in China in 2008. Additionally, in March of 2014 the company received an influx of $100 million from Warburg Pincus, a global private equity firm (Shieber, 2014).

[18] Other sources that give employment information about graduates include: The U.S. Bureau of Labor Statistics (BLS), census.gov, The White house College Scorecard, Glassdoor.com, Indeed.com and Vault.com, and salary.com (provides salary data by profession). However, these sites do not provide detailed information on the employment success of graduates from a particular institution and a particular major, nor do they show annually what percentage of the graduating class is fully employed. Most of the information on these sites, as in the case of the BLS, is not broken down by major of study and by race,

Probably one of the most influential information sources prospective students access to find out more information on HEI's are the many national rankings, in particular those by the *U.S. News & World Report*[19]. The *U.S. News & World Report* ranking was first published in 1983 (Dill, 2009). The popularity of their ranking of HEI's was such that they expanded to the UK in 1992 (Smith et al, 2000). A higher ranking can mean more revenue for the institution by virtue of bringing in more applications and even allowing the institution to charge a higher tuition price. However, rankings "may be misleading to students" and have "serious negative impacts" on institutions (Kehm & Stensaker, 2009, Xiv). While some suggest that rankings offer greater transparency and are more democratic in the assessment of the institution than simply depending on the marketing literature of the HEI and informal "word of mouth" reputation, others criticize the rankings as faulty in terms of the assumptions made in their methodology. Please see the endnotes in this paper for a discussion of some of the problems rankings present[20].

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gender, and age. (Age is important because, as seen in endnote i, the mal employment rate was worst for the youngest cohort, students age 20-24. Race and gender are important because of the gender and race gaps, wherein females and minorities are paid much less for the same job, or they are not employed at the same rate, compared to white males, even if they possess the same level of skills (Altonji & Blank, 1999)).

The BLS, the census.gov and the White House's College Scorecard only give broad data that is nationally based, i.e. the average earnings for employed lawyers equals around $93,000 per year, or it gives the average annual earnings of graduates from a particular college, as in the case of the University of Colorado at Boulder for which the average salary listed is $50,800. However after digging through the excel data on earnings provided by the White House's College Scorecard, much of the earnings data for each university is missing and is listed simply as "PrivacySuppressed", meaning that there were very few cases with data.

Another issue with these reports is the understandability of the information provided and whether prospective students are willing to dig through the various tables of excel data provided by the BLS site and try to interpret them. The simplicity of the U.S. News and World Report rankings is probably one reason why its measure has become so popular.

[19] David Dill, of the University of North Carolina, states that, in the history of higher education, ranking HEI's based on a set of criteria is a relatively "new phenomena"(Dill, 2009). The *U.S. News and World Report* ranking was first established in 1983. Dill states that when the *U.S. News & World Report* rankings were first released they were the first of their kind to give a ranking to an institution based on the institution's undergraduate program.

[20] The main problem with the ranking system is that the rankings "are taken seriously and are used to guide university('s) strategic decisions"(Dill, 2009, p.101). The rankings are somewhat comparable to how publicly traded companies focus on their stock price in making financing decisions for the corporation and

It should be noted that varying levels of *The U.S. News & World Report* ranking, are included as an institutional attribute in this study. The *U.S. News & World Report* rankings for the institutional choices given in this study have three levels: #7, 46, and above 100. One result that is central to this study is whether respondents will value a

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setting the corporation's goals and strategy. Thus, the goals of the institution are more investor focused (investors include large donors; or arming the university in order to receive more research funding, which can entail building state of the art facilities, hiring professors who bring in grant funding, etc.) rather than being student focused on outcomes of students, like whether they gain meaningful employment after graduation that is in accordance with their skill level, which are not factored into the ranking.
Institutional rankings are based largely on values of "inputs" like "expenditures per student, student/faculty ratios, faculty salaries, percentage of faculty with the highest degree in their field, size of the library, admission selectivity, and prestige rankings". However, these "input" criteria have been found by Pascarella & Terrenzini (1991) to be inconsequential to "student learning" when analyses use controls for background characteristics of student bodies (Dill, 2009, p.103-104). U.S. News & World Report has since slightly shifted its rating system to incorporate outputs, like graduation rate. However, academic reputation, a rating given by provosts and other administrative representatives from competing institutions, still accounts for 22.5% of an institution's overall ranking. 35% of the ranking is based on the per-student wealth of the institution, specifically "alumni donations", "faculty resources", and "financial resources". While output measures like "retention rate and "graduation rate" now make up 30% of the ranking, the ranking is not based on the employment outcomes of graduates (Strauss, 2013). Thus the rankings, which at least higher-income students rely on as an information source in deciding which university they will attend, do not tell prospective students how successful they will be in terms of learning and employment after graduation. While rankings are associated with prestige, a prestigious degree in a low-skill major may not pay off in the market place.
One research study found that groups most interested in the rankings were individuals from a "narrow segment of the population" from higher SES families. They wanted to attend an institution that would bring them greater prestige. However the average student, according to a study done in the U.K., was more interested in information about offerings in the "subject" they were interested in studying, "teaching reputation", "entry requirements", "employment prospects", "location", "available academic and support facilities", "social life", and "costs of study" than in institutional ranking (Conner et al., 1999 (In) Dill, 2009, p.11).
In a survey of "221,897 Freshmen" students in the U.S., McDonough et al (1998) pulled their data from the 1995 CIRP (Cooperative Institutional Research Program's) Freshman Survey and found that only 11% of respondents thought the rankings were important in their selection as to which HEI they would attend, and "60%" found no use for them in their decision on which HEI to attend (Longden & Yorke, 2009).
Rankings are faulty in that they give a rank to the entire institution, whereas departments may differ greatly in terms of their quality. There are different rankings for graduate programs by field in the U.S. News & World Report rankings, however this level of detail is not given for the undergraduate level.
There is more contextual information needed to describe the quality of an institution than what the ranking system denotes. To say that one institution is one point above another in ranking ignores the multiple qualitative aspects associated with each institution. To this point, Marginson (2009) states that information regarding each institution should be broken down so that "users can interact with the data"((In) Kehm &,Stensaker, 2009, XV). For instance, a manager of a production facility will use multiple measures to gauge the performance of the factory he/she is overseeing in an effort to increase the efficiency of his/her production line. He/she would not try to sum up all aspects of production into one tidy number.
Unlike other countries like the U.K. and Australia, all of the information provided to the U.S. News and World Report is not "verified" by an independent body – all of the information is "provided by the institution"(Dill, 2009, p.106) and there has been clear evidence of misrepresentation in some cases.

poorly ranked institution with excellent employment statistics (E.S.) over a highly ranked institution with poor E.S. While this scenario is not likely in the real world, the hypothetical scenarios posed to respondents in DCE studies are simply put forth to test how much the respondent values each attribute level.

2.2.2 Summary of college choice literature

This study revolves around the topic of student college choice. The elements deemed most influential in the college choice process can be broken into the following categories: 1) Institutional characteristics: location, quality of faculty, etc. 2) Characteristics of the individual: the student's ability as measured by their GPA and SAT or ACT scores, family income level, the student's own aspirations, cultural capital of the student's family, etc.. 3) Outreach by the institution – marketing efforts via pamphlets, interpersonal communication, hosting of campus visits.

The first two categories of college choice literature listed above, institutional characteristics and characteristics of the individual, are fundamental to this study. Literature on 'institutional characteristics' was utilized to determine which attributes and levels of them to use for this study while 'characteristics of the individual' will be used for the analysis portion of this study. The third category, outreach by the institution, was included tangentially in this study with the inclusion of the *U.S. News & World Report* ranking as an attribute. An examination of the stages of college choice and which attributes, be they institutional or individual, are important in each stage is provided next.

2.2.3 Stages of college choice:

Researchers studying college choice, like Litten (1982) and Jackson's

(1982) foundational research in the field of college choice, have categorized the stages of the college choice process into: "pre-search" (Chapman) or "pre-disposition" stage (Jackson, 1984 (In) Hossler & Gallagher, 1987), "search", "application", "choice", and "matriculation" stages. Jackson (1982) states that students go through a period of formation of "preference" for college attendance, "exclusion" wherein students form their "choice sets" of institutions to consider, and, finally "evaluation" in choosing which HEI they will attend[21].

The elements of college choice, which fall into the categories of institutional characteristics, personal characteristics, and outreach activities by the institution, have been found to have a significant role at different stages of the college choice process. The next section will detail when certain attributes are most important during different stages of the college choice process.

2.2.3.1 "Pre-search" or "predisposition" stage:

Individual student characteristics, i.e. their SAT scores and high school GPA, aspirations, family income level, race, gender, parents' level of education, "parental encouragement", etc. play a greater role in the pre-search phase than in later stages (Conklin & Daily, 1981)[22].

[21] Both Litten (1982) and Jackson (1982) developed these stages after a careful literature review and many articles on college choice still use the stages demarcated by these two authors to summarize the college choice process. These two models on the stages of college choice differ only slightly and are very similar in having a pre-disposition stage, a search phase and finally an application stage.

[22] Conklin & Dailey (1981) conducted a longitudinal study wherein the authors surveyed 2,700 high school students between 1967 and 1970. The survey was self--reported, and had a 62% response rate when measuring through the entirety of the of the three-year period. The authors then coded the survey and ran a regression, finding correlation between "consistent" parental involvement through the three years and attendance at a 4--year university. The study included interaction effects between variables because higher SES is linked both with more parental involvement and with students who attain higher levels of education, but they controlled for family income level. A problem with the study is the homogenous sample they used as 96% of their sample were students of Caucasian descent. Additionally, this study is also over 50 years old now and students may act differently today.

"Ability" and academic achievement are linked with college-going behavior (Hossler & Gallagher, 1987). A student's academic performance in terms of their SAT scores and GPA affect college choice. Students tend to self-select where they will attend based on their performance in these measures (McDonough, 1997). Avery & Hoxby (2004, 31) found that students from higher income families are less willing to attend HEI's that have an average SAT score lower than their own score when compared to students from lower income families.

These authors also found that students with a high GPA and SAT score are not concerned with attributes like distance from home, public vs. private, or in-state vs. out of state location. However, they are sensitive to attributes like "tuition", and "room and board" costs (p. 51), except for students that have parents that went to very selective HEI's or are from very high-income groups (Avery & Hoxby, 2004).

Additionally, whether the student attended a private or a public high-school and the knowledge they have on costs and financial aid affect a student's predisposition for college in terms of their taste for college and how selective the colleges are that they enter into their choice set (Hossler & Gallagher, 1987). Hossler and Gallagher (1987) state that a HEI's direct marketing efforts have little impact in the "predisposition" stage of the college choice process for all students (see p. 209).

Another major factor at work in the predisposition stage is the student's family income level. There is a consensus among many researchers in college choice that the student's family income level is the most significant factor in determining both the type of HEI the student attends and whether they will attend

any college in the first place (Hearn, 1991; Hearn, 1987[23]; Hossler et al, 1989, p. 32). Paulsen's (1990) summary of the college choice literature states that students that are more likely to attend college tend to be "white", "not married", from a family with higher socio-economic status, have parents who attended college, have high parental encouragement, have high academic ability, have high "educational and occupational aspirations", and have friends who are going to college (p.26).

Peters (1977, in Hossler & Gallagher, 1987) found that students from high-income groups are "four times more likely" to attend a HEI. The direction of this relationship is still true more recently as Cabrera & LaNasa, 2001, found, in a longitudinal study, that 71% of low income students did not take the necessary steps to qualify for higher education; this figure was only 30% for high income students[24]. Additionally, the skills or traits that make students from higher income groups more likely to attend a HEI are first formed in pre-school and are "cumulative" (Hossler & Gallagher, 1987, p. 210).

There is a strong correlation between students who come from high-income families and those who attend HEI's that are very selective (Brown et al, 1999). As Avery & Kane (2004) show, students from higher income families have "stronger tastes for college" (p.357) as their cultural capital in education is greater (Bordieu, 1986).

[23] Hearn (1991) used the 1980 and 1982 High School and Beyond sample, which is part of the National Center of Education Statistics database. The survey sampled 30,000 high school seniors, however only 3,396 respondents' answers were used for this study as only 3,396 respondents "answered fully to the high school and beyond items" and attended a recognized HEI within 1 year after graduating (See p. 162). Hearn ran a regression and found significant relationships between "Parental Income" and the level of "selectivity" of the college the student attended. However, in 1988 Hearn published a paper that found that socio-economic status has very little influence on which college or university a student attends (see Hearn, 1988).

[24] Cabrera and LaNasa (2001) used the 1988 National Educational Longitudinal Study to study 8th graders and followed their academic progression through high school and whether they attended a HEI.

Within this pre-search or "predisposition" stage there are also a number of environmental factors that are positively correlated with college-going behavior. Students who attended a high school with a stronger curriculum, which offered more math, science and AP courses, are more likely to attend a 4-year HEI even after controlling for SES and ability (Hearn, 1984; Kolstad, 1979; Peters, 1977 in Hossler & Galagher, 1987), however, this relationship between the presence of a strong curriculum and attending a four-year higher education institution is not strong once the control variables are added.

In this study, family income level, SAT scores, GPA, race, and gender are all included in the survey instrument as preliminary questions, before the discrete choice experiments (DCE) portion of the survey and will be used as student characteristics variables. Additionally, the curriculum level of the respondent's high school experience is taken into account as respondents are asked whether they have taken any AP courses.

2.2.3.2 Search phase:

During the search phase, Institutional attributes like the following become important factors:

-size of student population and quality of campus environment,

-"distance from home"

The latter becomes an important factor for students in the search phase of college choice. Zemsky & Oedel (1983) found that, as family income level decreases, the distance a HEI is from the student's home becomes a more important issue for students in the college choice process as they are less able to incur the additional costs of room and board. They also found that low SAT scores, (below 1100

combined math and verbal score) are associated with students going to a college that is closer to home (p. 32)[25].

Avery & Hoxby (2004) found that distance from home is a more influential factor for students from low-income families than for those from high-income families as the former are less likely to attend HEI's far from home (p. 31). Overall, high-achieving students from high-income families would more willing than students from low-income families to travel far from home in order to attend a highly selective university (Zemsky & Oedel, 1983).

Academic quality etc. will have a greater role in the search phase when the student is narrowing down the number of institutions they are considering applying to in developing their "choice sets". Hossler & Gallagher (1987) found that institutional marketing tools, like pamphlets, brochures, etc., were used more by students during the search phase than in any other phase in the process. Additionally, colleges are identifying students who are good candidates for their school in the search phase and sending them promotional material, thus "as students are searching for institutions, institutions are searching for students" (p.213)[26].

The variables pulled from research on the search phase for use in my own survey include: distance from home and academic quality, which is included tangentially through the inclusion of the *U.S. News and World Report* ranking,

[25] The authors do not control for income in finding the link between a student's SAT score and the distance the college they chose to attend is away from their home. Zemsky & Oedel (1983) did a market segmentation study; the study was designed to help college admissions officers. In fact, the student's family income level and SAT scores move in the same direction with distance from home; as the student's family income level increases the likelihood a student will attend a college farther from home increases.

[26] It should be noted that much of the research covered in this section was done before the advent of the Internet, which has fundamentally changed the college search process. See section 2.2.4.7 for more information on how students use the web in the college choice process.

2.2.3.3 The choice phase

After developing their choice sets, students enter the third phase, the choice phase, where they "evaluate their choice set" (Hossler & Gallagher, 1987, p. 215) and decide where to apply. In this stage, a different set of attributes becomes important to students. In particular, the quality of the campus environment and of the academic program have been shown to be important to students narrowing down their selection as to which HEI they will attend (Jackson and Chapman (1984); Murphy (1981); Spies (1978) In Hossler and Gallagher, 1987, p216, Cabrera & LaNasa, 2000)

As it relates to the present study, quality of the campus environment and of the academic program were included tangentially through the inclusion of the *U.S. News and World Report* ranking. It is also important to note that the students who were surveyed in my research were all juniors and seniors in high school; thus, they are likely currently in the third phase of the college choice process. The juniors that were surveyed were reached at the end of their junior year and the seniors surveyed were queried at the beginning of their senior year.

2.2.4 Broad correlates

Certain factors have been found by research to be strongly linked during the college choice and matriculation process. The following section will list these factors and how they relate to this study. However, not all of the factors listed as important to college choice were included in the study in order to simplify the survey.

2.2.4.1 Financial aid

Financial aid is an important aspect of the college choice process (Kim, 2004), and, as might be expected, has been found to be more important to students with lower

economic means. The relationship between financial aid offered and the decision to matriculate at a given institution is dependent on a number of factors. For example, students from high-income families that have high academic ability may be enticed to attend a given institution if they receive merit aid and if the institutional quality is high (See Hossler and Gallagher, 1987).

St. John (1999) and St. John and Noelle (1989) found that minority students tend to steer clear from loan aid (as cited in Kim 2004). St John (1990) (as cited in Kim 2004) also found that offers of grants or aid in the form of work-study subsidies, rather than loan aid, are more effective in persuading students to attend a given institution. In fact, Kim (2004) found that, unlike Caucasian and Asian-American students, African-American and Latino students are more willing to change from their first choice to another institution if they receive financial aid[27]. St. John (1991) (as cited in Kim, 2004) found that students from middle-income families are more responsive to loan aid when compared to low-income students, who are more responsive to grant aid (p. 50). Orfield (1992) (as cited in Kim 2004) found that, for low-income students, if the gap between the amount of financial aid (grants and work-study aid) they receive and the amount of tuition they have to pay is large, then they are unlikely to attend the institution. Hearn (1991) (as cited in Kim 2004) found that, after controlling for academic ability and "other factors" (p. 45), lower income students (which they equated to Latino and African-American students "given the disproportionate concentration" in this income status of these racial groups) apply to

[27] Kim (2004) warns that other variables could be affecting these results however such as SES or academic ability of the student.

HEI's that aren't as selective as the elite institutions that higher income students with similar ability are attending.

Avery & Hoxby (2004), who examined how students reacted to aid disbursed by the institution to which they were accepted (p. 265)[28], found that $1,000 in grant aid increases the probability that low income students (defined as families earning less than $40,000 annually[29]) will attend the institution by 11%, whereas $1,000 in grant aid increases the probability that middle income students (families earning between $40,000 and $140,000 annually) will attend the institution by 13%[30], and finally $1,000 in grant aid increases the probability that high income students (families earning more than $140,000 annually) will attend the institution by 8%. They also found that an additional $1,000 in work-study increases the probability a student will attend an institution by 13%. Finally, loan aid triggers similar results; an additional $1,000 in loan aid increases the probability a student will attend the institution by 7%[31] (p. 262).

For the present study, grant and loan aid offered were included as institutional attributes in the DCE portion of the survey. The preference data revealed by respondents' answers to the questions involving these attributes will be cross-analyzed with the income data respondents were asked to provide in the introductory

[28] Avery & Hoxby (2004) state that all of the respondents in their sample had "strong academic records", came from high-income families (p. 249), and had all been admitted into very selective institutions that charged high tuition rates.

[29] Income figure are assumed to be from the year 2000 when the survey was administered, see p. 246.

[30] Students from low-income families may be less responsive to $1,000 in grant aid, when compared to middle-income students, because $1,000 is not enough to pay for their tuition fully and they may be unable to pay the remainder. The authors do not explain exactly why low-income families are less responsive to $1,000 in grant aid when compared to middle-income families, however they state that middle-income families are more capable of paying the remaining tuition amount than students from low-income families. They also state that low-income families are insensitive to "difference in tuition" because they depend on "need based aid" and only rarely pay the "marginal tuition rate".

[31] These probabilities were not broken down by income group.

portion of the survey. However, it should be noted around a one-third of respondents answered that they were unsure of their family income level.

2.2.4.2 Room & board expenses

A student's reaction to a HEI's room and board charges highlights the importance of how far the institution is from the student's home. Avery & Hoxby (2004) found that students who attended public high schools responded more negatively (decrease of 19% in the probability of matriculation) to a $1,000 increase in room and board charges when compared to students from private high schools (who show a decrease of 5% in the probability of matriculation) (p. 35). The type of high school, whether public or private, is likely a proxy for family income level. This finding is relevant to the present research as family income level and distance from home are preliminary questions in the survey, so that the respondent's demographic information can be categorized with their college choice preferences.

Room and board expenses were not factored into the survey for this study, however they were included indirectly and tangentially in the varying levels of the attribute: how far the institution is from the respondent's home.

2.2.4.3 Family income level

While family income level has been mentioned before, it is worth further explication of how family income level interacts with other variables included in this study. Students from high-income families are linked with measures indicating greater student academic ability as they typically have higher test scores.

Chapman (1981) and ACT (2015) both show that students from families in a higher socio-economic status (SES) group both attend higher education institutions (HEI's) at a higher rate (when compared to students from low SES families) and are more likely to attend 4-year universities, whereas students from lower socio-economic groups: a) do not enter higher education at the same rate as higher income groups and tend to attend 2-year institutions. Savoca (1990) and Leslie & Brinkman (1987) also found that low-income groups are more sensitive to high tuition rates than are middle and high-income groups. Leslie & Brinkman did a meta-analysis of 25 quantitative studies to reach this conclusion and Heller (1997) updated these meta-analyses and came to the same conclusion. Additionally, cost is of greater concern to students from low-income families and for people of African-American, Hispanic and American Indian heritage[32].

Family income level also affects what students believe they can pay as students from higher income groups are more likely to attend private HEI's, students from middle income families on average will attend public 4-year institutions, and students from lower income groups on average will attend 2-year institutions (Davis & Van Dusen,1975). This pattern is still true today as shown by Hoxby & Avery (2013).

As relates to this study, family income level and race were included as demographic background questions in the survey. In terms of cost, gross tuition and loan aid were included in the survey, however, as stated earlier, the net tuition rate,

[32] Heller (1997) found a "disproportionate concentration" of these racial groups in lower-income quartiles and thus linked the two categories in his analysis.

was eliminated from the survey and all institutions presented to respondents offered a net tuition rate equal to $0. This is further explained in section 3.1: Internal Validity.

2.2.4.4 The importance of institutional rankings in the college choice process

Other institutional qualities that may influence whether a student includes a given HEI into their choice set are its level of prestige or ranking, especially as denoted by *U.S. News & World Report*. McDonough et al (1998) analyzed students who value college rankings and found that students who value highly ranked institutions do so because they see a degree from a highly ranked institution as helping them attain a stronger position both in the labor market and admission to graduate school. It is thought that a degree from a highly ranked institution also gives them a better "liberal education". However, students who are attending higher education in order to increase their value in the labor market are neither more or less likely to find the college rankings important[33].

McDonough et al (1998) used data from the CIRP (Cooperative Institutional Research Program at UCLA) 1995 data set, which surveyed 221,897 "first-time, full-time freshmen from 432 four-year colleges and universities". In the CIRP survey, students were asked whether they think the college rankings are important, somewhat important, or not important at all. The authors then tried to determine if there were any correlations between students who thought college rankings were important and other variables like: demographic group membership, whether they had plans of

[33] The authors regressed the dependent variable, "The importance of rankings" against a number of variables including: age, gender, race-white, race-African-American, public vs, private university, institutional selectivity, etc (p. 528).

attending graduate school, whether their parents went to college, whether they "sought guidance from a teacher" when they applied to college, whether they live with their parents, whether they applied to "four or more" institutions, etc (p. 520-522). Interestingly enough, only 10.5% thought the rankings were "very important" in applying and deciding upon which college to attend. Approximately 30% thought they were somewhat important, but the majority, approximately 60%, thought they were not important at all.

These authors' findings also show that those who deem the college rankings important are typically from high-income families. The reason why most students do not find the college rankings important is that most of these students are attending HEIs that are not selective, and these institutions make up the bulk of all institutions. The group of students who think college rankings are important, when regressed against other variables, was not correlated with "gender, age, college experience of parents, or the occupational level of parents". However, their regression analysis did find a correlation between those who thought the rankings were very important and both Asian-American students and high achieving students. Additionally, those students attending an institution farther than 10 miles from home were more likely to find rankings important than those students who lived within 10 miles of the institution they were attending; and students who found the rankings to be important were more likely to be from higher income families[34].

Overall, these authors had an ample number of individuals and great diversity of racial groups in their sample. The main problem with this study for my purposes is

[34] The authors threw out many variables for the analysis portion of their study after taking multi-collinearity into account (p. 519).

that the survey asks students their opinions on the college choice process after they have already selected an institution and enrolled. The regression analysis found that students who found the college rankings to be important are also more than likely to: have attended a private high school; to have consulted a teacher or counselor for advice, and, finally; to have a desire "to attend graduate school in fields like medicine, law, or to earn a doctoral degree" (p. 520). However the majority of full-time, first year freshmen, 60%, did not utilize the "newsmagazine rankings" when they applied to college (McDonough et al, p. 530).

Avery & Hoxby (2004) also found that the prestige or selectivity of the HEI is an important factor in the college choice process, however the importance of this characteristic differs by the background of the student. These authors found that if students attended a private secondary school, it reduces the probability that they will attend an institution that is not selective by 44%. However, if students attended a public secondary school, the probability of attending an institution that was not selective was reduced by only 21% (p. 272)[35].

A *U.S. News and World Report* hypothetical ranking was included as an institutional attribute for the DCE portion of my survey. The preference for highly ranked institutions will be cross-analyzed with characteristic variables like race and the family income level of the respondent.

[35] For this study, a set of HEI's was provided to students through a questionnaire.

2.2.4.4 Gender & college choice

In terms of gender differences in the college choice process, female students favor HEI's with better campus environments[36] and relied on communication from their parents, friends, etc. in choosing a particular HEI more so than males (Galotti & Mark, 1994)[37]. Female respondents also rated other campus attributes like "diversity" as important, in contrast to males. More male respondents rated "success of graduates" as important.

Avery & Hoxby (2004) used the conditional logit model in their analysis and found no relationship linking college choice with "race", "gender", size of high school, "region of the country" or if the student received a scholarship from a third party source like the National Merit scholarship. However, the authors observe that they only sampled students accepted into very selective colleges and universities like Brown, Harvard, Dartmouth, etc. Thus, the sample consisted largely of high achieving students who came from high-income families, which does not represent the average among high-school students many of whom would likely be price sensitive as shown earlier by Savoca (1990) and Leslie & Brinkman (1987).

The gender of the respondent is asked in the preliminary portion of the present survey so that it can be linked to preferences revealed in the DCE portion of the survey.

[36] Female respondents, in contrast to male respondents, rated the quality of the dormitories and "diversity of residential options" as important considerations in deciding which college they would attend.

[37] Galotti & Mark (1994) surveyed and interviewed 322 high school students at three different intervals. 124 juniors were surveyed and interviewed in the first round; 200 students, with 101 of these students coming from the first round, were surveyed and interviewed in the 2nd round, and 264 students participated in the third round, of which 99 were from the first round of surveys and interviews and 75 were from the 2nd round. They were paid $5 to participate to complete a survey wherein they self-reported responses to questions about their GPA, parents' income etc. They were then asked what information sources they used in the college search process and to list the factors they considered important in choosing a college/university.

2.2.4.5 The parents' level of education

The student's parents' level of education played a greater role in the college choice process than did race or gender (Galotti & Mark, 1994). Students with college educated parents both depend on their parents more in seeking out information about college and are more knowledgeable on financial aid and the costs of college than are students with parents who never attended college. Students with parents that have not attended college depend more on third party resources, i.e. marketing brochures from the colleges, and are less knowledgeable about financial aid and the costs of college (Galotti & Mark, 1994).

Parents' level of education was not asked in any portion of the present DCE survey. One reason why parents' level of education was not included was to reduce the length of the survey. As can be seen in this section, there are many factors that affect college choice thus certain questions had to be discarded in order to cut down the length of the survey so that respondents could stay focused throughout the survey. Additionally, questions that yield socio-demographic information like race and gender provide important insight into other factors pertinent to the validity of the survey itself, i.e. how representative the survey is of the college going population.

2.2.4.6 Students' efforts to increase their value in the labor market

A student's effort to increase their value in the labor market is the central issue being examined in this study, thus a review of the background research on this topic and how it relates to college choice is important. Maringe (2006) found that prospective students are becoming more consumer based in their search institutions in an effort to increase their

value in the labor market[38]. Maringe (2006) attributes this shift to additional fees introduced in the United Kingdom higher educational system. While this study was completed outside of the United States, Pryor et al (2011) found similar results in the U.S. The 2011 edition of the UCLA based CIRP (Cooperative Institutional Research Program) Freshman Survey (Pryor et. al 2011), based on surveying 203,967 freshmen at 270 four-year HEI's of "varying selectivity" rates, shows that, in 2009, 2010, and 2011, the number one reason freshmen decided to attend college was "to get a better job" (p.11).

Other authors have found that employment prospects are a key factor in a prospective student's decision to attend a particular HEI including Soutar & Turner, 2002 (this study was done in Western Australia); Chapman (1981). However, Hossler et al (1989), after doing a meta-analysis of college choice research published since the Great Depression, found that college enrollment up to that time was not related to the employment prospects of graduates at a certain HEI. In fact, enrollments would increase across the board in times of an economic downturn, thus many prospective students, in the past, evidently saw a college education as an investment that would pay off in the long-run (or, perhaps there was a blind trust that a degree would secure a well paying job in the long run). Litten (1982) also showed that students who have high academic ability are not as concerned with employment prospects after college as students with low academic ability. However, with increasing student debt, recent research has shown that employment prospects are important to students applying to college (Eagan et al, 2014).

[38] Consumer based strategy, put simply, means that consumers want the "biggest bang for their buck" according to *Higher Education Today* (Confronting Higher Education Consumerism Challenges, 2014). Students want to be able to get a high paying job after graduation.

Results from the CIRP (Cooperative Institutional Research Program) survey (2011) (Pryor et. al) given to over 270,000 freshmen nationwide, show an increased focus on post-graduate employment. Eagan et al (2015) found that the percentage of students indicating that post graduate employment was important to them increased from 50% in 1984 (Pryor et al, 2009) to 60% in 2015, an "all time high". Pryor et al (2013) shows that, when college freshmen were asked to rate which items were "very important" as reasons for attending a specific HEI, 86.3% said to "get a better job", 69.6% said to gain an "appreciation of ideas, and 45.9% said to "become a more cultured person" (p.35). Thus, one point gleaned from these responses is that students in this survey say they want to get a "better job" not specifically to earn more money but to pursue a career that will interest them wherein the monetary reward is not their most important goal. This analysis aligns with the findings by Arcidiacono (2004) who found that after controlling for ability, a student's "interest level" is most important in terms of which major of study they choose and not its monetary rewards.

However, an increased interest in gaining wealth should not be discounted. In 2009, 73% of college freshmen in the CIRP data survey stated that increasing their wealth was either "essential" or "very important". This was a huge increase compared to the results found in 1971 wherein only 37% stated that increasing their wealth was either "essential" or "very important". Additionally, the percentage of students who answered that "developing a meaningful philosophy of life" was important to them was 73% in 1971, but only 48% in 2009 (Zernike, 2009). Students are much more career focused today than they were in generations past where it was assumed a well paid, salaried job would be the natural result of completing a college degree.

2.2.4.7 How the Internet has affected college choice

As mentioned earlier, many of the landmark studies on college choice being discussed in this literature review were completed before the advent of the Internet. This does not negate the relevancy of the findings being reported here but it is important to know how students get their information today when they are deciding which college they will attend.

An example of how the findings in college choice have changed can be seen in Litten's (1982) discovery that students who were African-American, from low-income families or that have parents with lower levels of educational attainment were more likely than other demographic groups to utilize their high-school guidance counselor as an information source in their search for a college/university to attend. However, Burdette[39] (2013) found that, of the students she sampled, 96% were aware of the website: collegeboard.com, which is the source through which students register to take the SAT's. Additionally, this website was the most influential to them in searching for higher education institutions. This was true for Caucasian, Asian, Chicano and Hispanic students[40]. In terms of social media websites, most of the students applying to college utilized Facebook to interact with students attending the

[39] Burdette conducted a qualitative and quantitative study with a convenience sample at UC Irvine during class time wherein no incentives were given for completing the survey. The study was conducted in multiple stages. For the quantitative study, the first stage sampled 476 college freshmen (conducted during a class), while the second stage consisted of 876 college freshmen and was done via the Internet. The qualitative component of Burdette's dissertation investigated the psychological components of college choice. For example, she discovered that some students wait until the last minute to apply to college and this limits their choice set; and, not all students have all of the information available to them in order to make the most informed decision in choosing a college; and, some students apply to one college to reduce the anxiety of the application process.

[40] Students of African-American and Native American descent made up a small percentage of Burdette's sample, 2.8% and 1.8%, respectively, and were not included in her findings on the importance of websites in searching for high education institutions.

institution to find out more information about the school. However, only approximately 35% of the students surveyed said that the social networking sites were very or somewhat influential in searching for HEI's to attend.

The university websites were evidently utilized more in the college search and selection process as 74% of those surveyed reported utilizing at least 3 to 10 institutional websites in their research and 69% stated that the universities' websites were very or somewhat influential in their search and selection process. This was true for all racial groups as greater than two-thirds of students from each racial group rated the colleges' websites as somewhat or very influential in the search and selection process. These figures refer to all of the colleges students considered during their search process.

2.2.4.8 Other factors that affect college choice

Some other factors that heavily influence college choice not mentioned above are: perceptions about campus safety (Student Poll, 1997), quality of the dorms, campus life, and academic reputation (Soutar & Turner, 2002; Briggs, 2006). In terms of campus safety, the Student Poll (1997) surveyed a random sample of 400 seniors in high-school and their parents wherein they found that 64% of parents and 57% of students considered campus safety as "very important", more important than the beauty of the campus and universities' prestige, cost, and diversity. The authors state that this finding goes against the commonly held belief that campus safety is only important to parents.

In terms of campus life, Galotti & Mark (1994) found that the importance of "campus atmosphere" increases as the prospective student visits the campus and the time gets closer to making a decision on which college to attend. As mentioned

earlier, dorms and campus life seem to be more important for female students. Finally, students that deem academic reputation and prestige as important tend to be from high SES families. As Bourdieu states, families who are high in cultural capital know that if their kids attend a university high in academic prestige, this will pay off in the long run as attending such a university increases their cultural capital and helps them in the job market. Students from low-income families are not concerned with the academic prestige of a university as they are more concerned with how the university will train them for the labor market (McDonough, 1994; Delaney, 1998).

None of the attributes mentioned in this section were included in the survey for this study, however quality of the dorms and campus life are tangentially linked to the U.S. News & World Report ranking. Academic reputation is a key factor in determining the *U.S. News & World Report* ranking which was included as an attribute in the DCE portion of the present survey.

Some other attributes that were not included in the survey for this study are: quality of extracurricular activities at the HEI, size of the HEI in terms student population, nearness of the HEI to a major city, quality of the specific program or courses the student may be interested in, safety of the campus and surrounding areas, etc. These factors were not included in the survey in order to keep the survey short and minimize survey fatigue. The variables included in the survey were selected after a careful literature review showed these variables to be generally the ones deemed most important in influencing students' college choices.

CHAPTER 3 Research methods and materials

In making choices among colleges, Discrete Choice Experimental (DCE) methodology is utilized in this study in a controlled experiment to determine the part worth utility, or degree of student preference for, employment statistics (E.S.) relative to: information on institutions' graduation rates, gross tuition minus scholarship aid and loan aid which yields a net tuition price that stays constant at zero, admission selectivity, and distance from a subject's home[41].

DCE is widely recognized as helpful for choice research in marketing and other fields because it presents real life product or choice options and "mimics what consumers do in the market place".[42] Typically, survey respondents are given a list of products with a list of attributes with varying levels of the attribute (e.g. a 4 door versus a 2 door car, different colors, features, etc.) and are asked to choose the product option they most prefer (i.e. Do you prefer a BMW M3 with leather interior and a sun roof or a Corvette with leather interior and a sun roof?). Typically, in DCE, a product will be broken down into five attributes[43]; these five attributes are varied systematically by the analyst to determine how much value the respondent places on a particular attribute level.

3.1 Internal validity

A common question regarding this methodology (DCE) is, Will the findings of a study utilizing a DCE or "conjoint analysis" be generalizable to the population of interest

[41] A discussion on why these attributes were chosen is given in the next section.
[42] http://www.sawtoothsoftware.com/download/techpap/acbc.pdf
[43] DCE's and conjoint analysis studies with more than five attributes tend to cause cognitive dissonance and yield less reliable results; see Section 3.6.3 for more information on how many choice tasks yield more reliable results.

(students applying to college here) given the fact that, in most DCE and conjoint studies, decisions are made in a very short time period, i.e. 30 seconds to 3 minutes. In comparison, decisions on which a student will apply to, be accepted to, and finally decide to attend a HEI are multi-stage decisions that may take several months and even years to complete.[44]. Although a random sample was not used for this study, which would disallow the results to be generalized to the population of prospective college students currently in U.S. high schools, the experimental design mimics a real-world decision process for the students applying to college, insofar as possible. Although the survey method does not mimic the amount of time a typical student would take in deciding on which college to attend, the survey respondents in this study are all high school juniors and seniors and at a point in their life where they should have finalized the choice sets and are presumably very knowledgeable, or as knowledgeable as they ever will be, in what characteristics they desire most in a college/university. Thus, the experimental design of this study does mimic a real-world decision process in important ways.

Attribute levels were varied systematically within "plausible ranges" (Bakken & Frasier, 2006)[45] of values for each attribute to a sample of survey respondents who were

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[44] Most of the studies using conjoint analysis in the context of higher education were based outside the U.S. Dunnett & Morehouse (2012) utilized conjoint analysis to examine which attributes were most important to prospective students choosing among universities after a change in the fee structure at universities in the United Kingdom. Maringe (2006) utilized conjoint analysis to conduct a study in the United Kingdom to determine which factors students value most in choosing a university. Maringe found that most prospective students took a "consumerist" approach in choosing institutions on the basis of their perceptions about prospective employment prospects after graduation. Beggs et al (2008) utilized conjoint analysis to determine which factors influenced students' choice of major in the United States. Klein (2017) used conjoint analysis to determine whether college choice in the U.S. is determined mostly by students or by parents and which factors are important to each.

[45] 'Plausible ranges' is a potentially loaded term in that it is based on the subjective criteria of the researcher. The ranges of employment statistics given, between good and bad performance or what would give the institution a higher utility rating or a lower utility rating, should be manipulated so that the researcher can truly measure the value respondents place on E.S that are likely to be found in practice. Would respondents be willing to move far away to attend an institution that provides moderate E.S.? What if the institution provides excellent E.S.? This study defines excellent, moderate, and low E.S. in terms of the probability

asked to respond to various attribute combinations embodied in the institutional choices. The strategy for sampling was to obtain at least 200 responses[46] from juniors and seniors in high school as a large majority of this group of individuals would be applying to various colleges and universities nationwide and thus attuned to college decision-making. Students were screened beforehand so that only students applying and going to college took the survey. For the surveys taken online, teachers and administrators were instructed to only give the survey link out to students who were in the process of applying to college. The strategy for sampling is further explained in the section, "Sampling Strategy".

Bakken & Frasier (2006) state that the attributes chosen for the study should be "collectively exhaustive" and "mutually exclusive". Collectively exhaustive means that all possible options are provided, for example when rolling a 2-sided coin, heads and tails would encompass all of the options. In order to meet this exhaustiveness requirement, Bakken & Frasier (2006) recommend including the option, "none of the above" or placing the respondent in the hypothetical situation asking them, [in the case of a choice among vacation travel destinations] 'If you were going to travel, which option would be most preferable?' A "none" option was given in the second half of each DCE scenario presented to respondents in this study.

graduates receive employment and their salary level after graduation. These two attributes and their levels can be viewed in Appendix 5 at the end of this document. These ranges should not in theory be limited by prohibitions based on subjective plausibility criteria, however some combination of attribute levels may be viewed as so unrealistic that respondents doubt the real-world application of the examples and are unable to place themselves in the hypothetical scenarios given. Overall, a balance must be reached between plausibility and random variability of the attribute levels shown to respondents (Bakken & Frasier, 2006).

[46] See section 3.5 for an explanation on how the sample size was determined.

Finally, attribute levels should be set by finding the point at which the consumer would change their mind, or alter their "preference"[47] (p. 297). This point is approximated with plausible combinations of levels after a careful examination of the ranges in value for each attribute level in the marketplace and through a pre-test of the survey; all of which was completed for this study and is described in further detail in section 3.6.3. An example of setting appropriate price levels for a DCE scenario can be given in the case of testing prices for a Toyota Camry wherein prices would not be set to extreme values such as $0, $1 million and $2 million, rather they would be set to price points at which the consumer would likely make tradeoffs between attribute levels. For a BMW M3, price points where consumers would be likely to make tradeoffs would be set at around $60,000, $80,000 and $100,000 because the price ranges for a new BMW M3, at a local BMW dealership in Delaware, in April of 2019, are listed at $66,500, $69,400 and $98,250. Thus, respondents have to make "trade-offs" between a lower-price, lower-quality product and a higher-price, higher-quality product in a realistic context. Respondents must decide how much they value a high-quality product in terms of how much they are willing to pay or trade off across attributes.

In this study, the trade-off points were roughly estimated after considering the range of possibilities and doing some pre-testing. For example, the range of possible annual gross tuition prices can range between approximately $6,000 (e.g. Chadron State College in the state of Nebraska) to around $60,000 (e.g. Columbia University). Thus,

[47] For this study, salary levels for the attribute, E.S., are based on the salary amounts given at the Internet address below. These projected salary estimates from *The Wall Street Journal* are broken down by major of study and are given as "starting median salary" and "mid-career median salary". These figures, compiled by wsj.com and sourced from payscale.com, surveyed "1.2 million" students who only attained a bachelors degree. The site does not indicate the graduation date the figures presented are based on however. http://online.wsj.com/public/resources/documents/info-Degrees_that_Pay_you_Back-sort.html

price options for gross tuition were set at $46,000, $23,000 and $13,000. The price points were guided by using the average national tuition price for different types of institutions as reported by the National Center for Education Statistics. The average gross tuition amount in 2015-16 for private colleges was around $35,830 per year while, for public universities, the average tuition equaled $10,230[48] (The College Board, 2018).

Thus, setting the price points for the gross tuition attribute in this study somewhat above the average for private and public universities makes sense for the upper and lower level price points, which would symbolize a university options that are high in quality as students often perceive higher tuition amounts to be associated with higher quality (Rao and Monroe, 1989). The lowest price point for the attribute, gross tuition, was set to be slightly above the average public 4-year tuition amount, at $13,000. The middle price point for gross tuition, $23,000 was set by roughly doubling the lowest price point. This mid-level price point could have been set halfway between the high and low price point, however $29,500 seemed far too high for the mid-price point as $29,500 is nearly equal to the average gross tuition amount for private colleges. Overall, a price point of $23,000 was deemed a more reasonable tuition amount for the mid-price point, in terms of setting prices around trade-off points, and individuals interviewed in the pre-testing stage agreed.

Finally, the highest price point was set at double middle price point, or slightly above the average tuition amount for private colleges. Each price level was doubled from the previous price point; this strategy was in line with the national averages and provided reasonably different HEI's with price points that had sensible trade-off points on the

[48] The College Board calculates a weighted average for published tuition prices, wherein both in-state and out of state tuition amounts are included in the average tuition price for public HEI's and weighted depending on enrollment levels of each type of student.

attribute, gross tuition. All of the attributes and levels were pre-tested to determine if these price points were in fact trade-off points; pre-test respondents affirmed that the price points for gross tuition were set at levels that forced most of them to switch to another choice option.

The internal consistency of the survey will also be checked to see if there is a large difference between "the observed and predicted data"[49] [50]. Based on research covered in earlier sections on college choice, it is theorized that respondents will choose options that give them the highest utility, i.e., in terms of the part-worth utility, high E.S. would dominate and have the highest part-worth utility. Given the levels that were set in designing the survey, one example of a tradeoff would be between: a) an institution having the highest gross price and that involves travelling a greater distance to attend a higher ranked institution that provides better employment statistics and a better graduation rate; and b) a college having the lowest gross tuition rate, but involves travelling a lesser distance to attend a lower ranked institution that provides the poorest E.S.'s and graduation rates, out of the options provided. In this study, what is titled as the net tuition amount, is actually initial out of pocket costs, and it always equals zero by design, so the student in this example would have to make a tradeoff as to whether they want to travel a greater distance to attend a school with better E.S. and a higher graduation rate that is ranked higher, keeping all other attributes constant.

[49] http://g82.cz/dcm/pg_Conjoint_Method_Overview.html

[50] Other validity issues with conjoint analysis include whether all of the attributes included in the study are the attributes consumers actually consider to be important in their decision, and, in conjoint studies utilizing self-explicated questions, i.e. asking respondents to rate given attributes, the fact that respondents are forced to consider each attribute as this does not necessarily accurately simulate a real world purchasing environment. It was determined that the attributes chosen for this study were the most relevant to students applying to college after a pre-test was completed wherein students applying to go to college were interviewed.

One might expect students to favor a HEI that has the lowest cost. However, higher education is an investment good thus students and their families are not necessarily looking for the cheapest option. The elasticity of demand for high education is in part more dependent on the student's ability to pay as proxied by their family income level (Bryan and Whipple, 1995). Students from high-income families may actually prefer a school with a high tuition price, perceiving it as a quality signal, and not be concerned about the higher price. For this study, all choice options have a listed amount the respondent would have to pay with loans or other means[51], (i.e. after financial aid grants). Thus, it is unknown *a priori* as to whether respondents will prefer options that have the highest gross tuition price because students tend to equate higher price with higher quality, or the option that has the lowest debt level.

3.1.1 How the survey differs from the real world

There are aspects of the hypothetical scenario set up in this study that do not match the real world. For example, normally students have to apply to each school and may or may not be accepted where they apply. However, in this study, respondents assume that they have been accepted into each school, which is very unlikely for most respondents for the institutional option that includes a *U.S. News & World Report* ranking of #7, or even #46, because these colleges are quite selective. Additionally, fees, and room and board costs were not included in the survey; these costs can add $10,000 to the annual tuition (National Center for Education Statistics, 2015). Finally, the names of each college/university were not included in the survey. Brand names can carry an important

[51] Students were not told they had to incur the specified loan amount through the federal loan program. Respondents were told that they could either incur the loan amount shown in the survey or pay it off immediately.

influence on a prospective student's desire to attend a given institution. For example, Dartmouth carries a stronger brand influence than Delaware Technical Community College. Or, a Historically Black University, like Howard University, may attract prospective students of African-American descent but not students who are Caucasian, Asian, or Hispanic. Overall, higher education is a very complicated product involving many attributes. As a researcher studying what influence E.S. may have on a prospective student's desire to attend a given institution, it was necessary to simplify the institutional options presented to survey respondents in order to keep the survey short and reduce confusion in order to focus on testing the variable of interest, the importance of E.S. in students' college decision making.

3.1.1.1 Net price as it is defined in this study

For the purposes of this study 'net tuition' equals the initial out of pocket cost. Thus, net tuition, as communicated in the survey equals gross tuition minus grants and scholarship aid, minus the annual loan amount distributed. Normally, in the field of higher education, net tuition equals gross tuition minus grants or scholarship aid only. This definition of net tuition for the survey in this study was clearly explained to each respondent before they took the survey as simply the net cost they would have to pay initially, or out of pocket. For respondents who took the survey online, this definition was explained to the teachers and administrators who administered the survey. These teachers and administrators then communicated this definition of net tuition to students taking the survey online.

Figure 3, shown below, gives all of the attributes and their levels for this study. The attribute net price, as defined in this survey, always equals zero for each attribute

level. However, loans, have attribute levels of $9,000, $13,000, and $26,000 – these amounts can be considered as the net tuition amounts, under the definition given in most of the literature in higher education, because it is the amount the student would be expected to pay either initially or at a later date. Respondents were informed the loans were under the federal student loan program.

Figure 3a - Attributes & levels given in survey

	Institution 1	Institution 2	Institution 3
Average number students that start and graduate within 6 years:	3 out 10 people	5 out 10 people	9 out 10 people
Distance from home:	500 miles or greater	150 miles	under 50 miles
Gross Tuition -Scholarships -Loans net tuition:	$13,000 $5,000 $9,000 $0	$23,000 $10,000 $13,000 $0	$46,000 $20,000 $26,000 $0
Average number of students who obtained employment within 1 year after graduating	2 out of 10 people	5 out of 10 people	9 out of 10 people
U.S. News & World Report ranking	above 100	#46	#7
Average salaries for graduates within majors like English, History, Education etc.	$23,000	$33,000	$42,000
Average salaries for graduates within majors like Science, Math, Business, Computer Engineering etc.	$34,000	$46,000	$80,000
Average salaries for graduates within majors like Nursing & other professional fields etc.	$31,000	$41,000	$56,000

Net tuition was set to zero in order to eliminate the variable of out of pocket cost; the importance of out of pocket cost is, in part, dependent on the student's family income level. Students from higher income families will generally use more of their current income or family savings to pay for tuition, while students of lower economic means will

qualify for need based aid, as Baum (2018) explains below. However, students of lower economic means are not attending HEI's with higher tuition rates in large numbers. Figure 1, in section 3.2.3.3, shows the average family income level for students at each type of institution; it clearly shows that students of lower economic means are not attending highly selective public and private HEI's very often as a higher tuition cost is not as burdensome to upper income students as it is for students of lower economic means.

The delayed cost associated with loans is included in the study, which reflects the reality many students face. Depending on family income level, many students will qualify for loan aid and thus their initial out of pocket cost will be reduced. In 2015-16, 47.4% of undergraduates at public 4-year institutions received loan aid, 64.8% received grant aid and 77% received some form of aid (NCES, 2016). For private 4-year institutions, 68% of undergraduates received loan aid, while 80% received some form of grant aid, and 89.5% received some form of aid. The average amount of loans taken out per student, in 2015-16, was $7,500 for students at public 4-year institutions and $7,200 for private 4-year institutions. Additionally, 38% of all undergraduates in 2015-2016 took out some form of loan aid; this percentage is down from 42% in 2011-2012 (Radwin et al, 2018). Thus, the inclusion of loan and grant aid in the survey for this study reflects the financial reality that much of the undergraduate population of students faces in the college market place.

3.1.2 Average net tuition in HE

Net tuition, as it is defined in higher education literature, equals gross tuition minus grants and scholarship aid, and differs greatly for each individual.

Baum et al. (2018) found that the average net tuition paid for in-state public 4-year institutions in was $3,800 in 2018-2019 (p. 18), while for private institutions the average net tuition price paid equaled $14,600 (p. 19)[52]. Net tuition paid also varies greatly depending on family income level because much grant aid is need-based. For example, 58% of families who earned less than $35,000, and 32% of families who earned between $35,000 and $70,000 annually, paid $0 in net tuition at the public four-year institutions their student attended (Baum et al, 2018).

3.1.3 Rationale for setting net tuition equal to zero

It should first be noted that in this study, loan amounts were listed to varying degrees in the survey ($9,000, $13,000, and $26,000; please see Figure 3a above) and these loan amounts could be thought of as the net tuition because prospective students eventually have to pay the amount chosen, either when the tuition or loan comes due. Still, in every DCE scenario, net tuition was set to $0. One may question why net tuition was set to zero as this doesn't reflect the reality many students face. My reasoning is as follows.

Some students may be knowledgeable on the details of their family's finances while others may not be very knowledgeable at all. For example, sixty-three percent of students had parents who had prepared the finances for their children's post-secondary education, in terms of setting aside money for their children's college fund (Horn et al, 2003). How knowledgeable can students be about the cost of college if their parents are paying for it[53]? Bell et al. (2009) found that 11th and 12th grade students' knowledge on

[52] These figures were used as a reference in determining the loan amount listed in the survey for this study.
[53] There were no discernable differences in the responses to the question of whether respondents knew about their family income level across my survey locations with high vs. low average household income

college costs is limited and their knowledge on financial aid is very general and limited. They also found that the amount of knowledge students had on issues of financial aid varied depending on their high school's resources and the family income level of the students.

Overall, the main variable this study is focused on is the importance students place on E.S. in college decision-making. Thus, eliminating the complexity as to how much out of pocket costs the student/family has to pay may better measure the utility rating *students* give to E.S. since paying for college may often be handled by the student's parents, at least for upper middle and high income households. Bell et al. (2009) also state that students of lower economic means may not be well informed about financing of a college education either. High school students' parents who were of low and middle economic means were less knowledgeable on the financing of a college education than high school students' parents of high economic means (Tornatzy et al, 2002), and students attain much of their knowledge on the costs of a college education through their parents (MacAllum et al, 2007). Knowledge on the financing of college costs also varies by race wherein African-American and Hispanic families are less informed on the costs of a college education and the aid available (De La Rosa & Tierney, 2006).

While slightly less than a third of respondents in this study indicated that their family income level was above $100,000 per year (27%), it was still unclear how knowledgeable the students surveyed were on the finances of their family and how they

levels, based on the census data reviewed in Figure 1.

would pay for college. As discussed earlier, around a third of respondents in this study stated that they were unsure of their family's income level.

An explanation of the checks used to ensure that the survey has internal validity is provided in subsequent sections, in the "Procedures for data analysis" section. Next, I explore external validity considerations with this study.

3.2 External validity of this study

3.2.1 Introduction

This section will cover the various reasons why this study is not generalizable to the general population, but first a brief description of the three main locales that were used for this study is given. For a detailed view of the how the convenience sample was obtained, please see section 3.4, 'Sampling Strategy'.

3.2.2 An introduction to how the convenience sample was procured

This section will cover how survey respondents were obtained and how the survey was administered. The survey was administered to high school juniors and seniors in Chittenden County, Vermont; Smyrna, Delaware; Frisco City, Texas; and Seaford, DE. I visited two of the high schools that administered the survey; these are in Vermont (Champlain Valley Union High School in Chittenden County) and Delaware (Smyrna High School). Methods for obtaining additional survey responses are described in section 3.4.

3.2.2.1 The locales that were surveyed

While four locales comprised the convenience sample, these locales can be aggregated into three for purposes of analysis because Smyrna and Seaford are very

similar in terms of their demographics and will hereinafter be covered in the analysis for Smyrna, DE, unless otherwise stated[54].

At Central Valley Union (CVU) High School in Chittenden County, Vermont, approximately 47 surveys were completed, from a total of 660 seniors and juniors at this locale. At Smyrna High School, approximately 115 surveys were completed; there are a total of 700 juniors and seniors at this high school. At Seaford High School in Delaware, approximately 23 surveys were completed; there are a total of 409 seniors and juniors in Seaford High School. Finally in Frisco, TX, a total of 73 surveys were completed. Frisco TX has ten high schools. It is unknown which high schools in Frisco were attended by the students who completed the surveys because an email request for survey respondents, with instructions, was sent out to the superintendent of the district, who in turn sent out the link to students in her district. The high schools in Frisco have a total population of 18, 215 thus it is hypothesized that there are approximately 9, 000[55] juniors and seniors in Frisco, TX. A description on how each convenience sample was found, is provided in the next section; a description of the survey respondents and how they compare to the general college going population is described in section 3.2.3.3.

3.2.2.2 How survey respondents were obtained

In trying to obtain survey responses, three avenues were explored. In the first avenue, I contacted teachers in Delaware who were contacts through my friends and family. This avenue yielded the most surveys, approximately 130 surveys from Delaware in Smyrna and Seaford, DE.

[54] Seaford is 50 miles south of Smyrna.
[55] This figure has been rounded down to account for the possible attrition of the student population that occurs as students progress from the 9th to the 12th grade.

In the second avenue, over 100 survey participation requests via email were sent out to high schools in Pennsylvania, Maryland, Delaware, and Vermont explaining the study's purpose and how easy it was to administer, and asking principals, administrators and teachers if they would be interesting in conducting the survey in their schools. This avenue yielded 47 survey responses from Vermont, all from CVU High School in Chittenden County.

For the third avenue, at the direction of a teacher from Smyrna High School who helped me to conduct the pre-testing, I attended a national case competition in Orlando, Florida in order to obtain more survey respondents. At the conference, I spoke with superintendents of several school districts around the United States and asked them if they would distribute my survey to their high schools via an online link. Approximately five out of the sixteen superintendents I spoke with agreed to distribute my survey to their schools. The five superintendents were from Texas, Illinois, Wisconsin, Alaska, and Ohio. However, of these states, aside from Texas, only five surveys were finally submitted. This avenue yielded 73 surveys from Texas, all from Frisco City. The few surveys, five in total, from Alaska, Illinois Wisconsin, and Ohio were discarded.

In the end, thus the completed surveys came from Frisco City, Texas (70), Smyrna and Seaford, Delaware (130), and Chittenden County, Vermont (46).

3.2.3 Instructions for administering the survey

Principals and superintendents were instructed to send out the survey to seniors and juniors who were entertaining the idea of going to college. I have little information on how the surveys were administered in Frisco, TX as I merely sent out the google link to the superintendent who had agreed to help and she passed it on to her subordinates.

This is true of the surveys sent out in Vermont as well. However, I am aware of the location of each survey that was filled out there because respondents were asked in the preliminary section to list the zip code where they were located[56].

3.2.4 Biases introduced into the study

Below are the reasons why this study is not generalizable to the entire U.S. population of juniors and seniors interested in attending college.

3.2.5 A convenience sample was used

Selection bias was potentially introduced into the study because a convenience sample was used, not a random sample. It should be noted that the students who actually completed the survey were not chosen out of convenience, however the administrators and teachers who allowed me to survey their students were chosen out of "convenience" because they agreed to conduct the survey in their schools/classrooms. As already reported, the respondents represented only small minorities of all juniors and seniors in the participating schools and districts. Please see Figure 1 in section 3.2.3.3 for a breakdown of the demographics of each survey locale and how they compare to the national college going population.

3.2.6 Self-selection bias

In many of the surveys that were completed online, the link to the survey was given to the principal or superintendent who then agreed to pass this link on to the students and teachers in their school or district. Thus, there may have been an element of

[56] As a note, even though respondents entered in their zip code information, it is still difficult to determine which high school each respondent attended because the zip codes: 75033, 75034, 75035, 75036, 75038, 75070, and 75078 are given by respondents as their zip codes, however Frisco City has 4 different high schools.

self-selection that took place wherein students who found the topic interesting were the ones more likely to complete the survey. The problem of self-selection most likely occurred at CVU in Vermont, and possibly in Frisco TX where the survey was administered online.

However, in Smyrna, Delaware there was little self-selection as teachers and guidance counselors told students to fill out the survey. For example, all of the paper surveys (84 in total) were filled out at a large gathering, on one morning, of many of the seniors wherein a guidance counselor I spoke with told all of her seniors fill out the survey. The juniors and seniors at Smyrna who didn't fill out the survey were either never aware of the survey because they weren't in the room that morning, or if they were present, they stated that they weren't going to college. I was not present during the administration of this survey so I am unaware of the proportion of students in the room who took the survey because they were planning to go to college relative to those who did not take the survey because they were not going to college. I did receive two paper surveys that were incomplete so there was some self-selection as not every senior chose to fill out the survey completely.

3.2.7 A comparison of demographics

The second reason why this study is not generalizable to the population is that the sample used is not entirely representative of the population of students applying to college in the U.S. While juniors and seniors in high school from several states (Delaware, Vermont, and Texas) were sampled, and all represented a group that is seeking to go to college/university, the sample used did not adequately tap into all segments of the college-going population. Appendix 2, at the end of this document,

shows the demographics of each locale sampled. Figure 1, below, compares the demographics of each locale surveyed to all U.S. college students in terms of race and household income level.

Figure 1: Demographics for survey locations vs. the college going population

	White	Black	Hispanic	Asian	Mean household income	Median household income
Survey Locations						
Smyrna, DE	67.7%[f]	27.6%[f]	3.7%[f]	0.9%[f]	$77,725[h]	$53,941[a]
Chittendon County, VT	90.6%[a]	2.6%[a]	2.3%[a]	4.3%[a]	$88,995[b]	$66,414[a]
Frisco City, TX	69.4%[e]	7.4%[e]	12.4%[e]	16.8%[e]	$143,193[g]	$117,642[a]
U.S. Undergraduate HEI's						
Public	62%[d]	13%[d]	14%[d]	7%[d]		
Private non-profit	65%[d]	13%[d]	10%[d]	7%[d]		
Private for-profit	51%[d]	27%[d]	14%[d]	3%[d]		
All colleges	58%[d]	16%[d]	16%[d]	6%[d]	$116,093[c]	$80,500[c]
Ivy Plus						$171,000[c]
Other elite colleges						$141,900[c]
Highly selective public						$107,300[c]
Highly selective private						$124,700[c]
Selective public						$87,100[c]
Selective private						$90,700[c]
Non-Selective 4-year public						$61,200[c]
Non-Selec. 4-year priv non-prof						$80,500[c]
2-year non-profit						$66,900[c]
4-year for-profit						$51,500[c]
2-year for-profit						$51,500[c]
Less than two-year colleges						$53,000[c]

a= U.S. Census Bureau (2018a)
b= World Population Review (2019a)
c= Chetty et al (2017)
d= Albeit & Horn (2017)
e= U.S. Census Bureau (2018b)
f= U.S. Census Bureau (2018c)
g= World Population Review (2019b)
h= World Population Review (2019c)

As can be seen from Figure 1, Smyrna, DE is well above average in terms of the percentage of African-Americans, and well below average in the percentage of Hispanic and Asians compared to the average college going population. Chittenden County, VT, a rural area 10 minutes outside of Burlington, and a 1-hour drive south from the Canadian border, is overrepresented in terms of the white population and underrepresented and in terms of the Asian, Hispanic, and black populations, compared to the average U.S. college-going population. Finally, Frisco City Texas has population percentages that are more in line with the college going population, however they are slightly overrepresented in terms of the Asian population and underrepresented in both black and Hispanic populations.

The average household income in Frisco, TX is above the average household income for undergraduate college students in the U.S., while the average household income in both Chittenden County, Vermont and Smyrna, DE is below the average household income for undergraduate college students. However, as can be seen from the figure 1, household income varies greatly by the type of HEI.

In sum, the set of communities from which my sample was drawn is more white and less composed of underrepresented students (except for blacks in Smyrna and Asians in Frisco, TX) than the overall U.S. college population. In terms of income, the sample is split with the students from Texas coming from a substantially higher than average income community while the other two communities have lower than average median incomes.

3.2.8 Representativeness of sample

As mentioned earlier, the results of this study are not generalizable to the general population, because a convenience sample is being used. The sample represents mainly high school students from suburban and rural areas. These three locales (Smyrna, DE, Frisco City, TX, and Chittenden County, VT) from which students responded to the survey contain thirteen high schools[57]. If we consider the population per square mile, wherein the Census Bureau defines an urbanized area as an area having at least 50,000 people, the high school in Hinesburg, VT (Chittenden County) is in a rural area because it has only 4,396 people. The high school in Smyrna, DE is also in a rural area as it has only 11,584 people, and those in Frisco City, TX are in an urban area because it has 177,296 people. As stated earlier, extrapolating results to the U.S. population of high school juniors and seniors is not strictly possible because this study did not utilize a random sample of this population. As can be seen in Figure 1, members of all racial groups completed the survey, however Asian-American and Hispanic students were under-represented compared to the college-going population nationally. Additionally, there was an imbalance between male and female respondents with females representing nearly 60% of the surveys returned. See Appendix 3 at the end of this document for a breakdown of the racial makeup of the survey respondents, their gender mix, and their household income levels. Overall, since the non- random sample of students is from mainly rural and urban areas and concentrated in a few states, I am unable to make inferences for the whole U.S. population. Still, there is some diversity in the sample, its

[57] Approximately five surveys were from Ohio, Illinois and Alaska but because these responses from diverse areas made up such a small fraction of the total number of completed surveys received, they were discarded.

characteristics are not too far from national patterns and its overall size is not trivial. Therefore, my results about these several hundred students' college decision-making should be of some general interest, although not strictly generalizable.

3.3 Choosing attributes

In terms of choosing attributes and levels, Dr. Jordan Louviere, an expert in DCE, states that choosing attributes for a DCE study is something of an "art-form", although within the context of scientific research. The validity of the study depends on the choice of meaningful attributes and levels. It is necessary to base the choice of attributes and levels on both an extensive literature review and qualitative field study of the decision context. A qualitative field study involves having in-depth interviews with persons similar to the sample of interest as this is the group who will be making the choices being tested. This interview group can express which attributes of the product they deem most important in order to aid in constructing the survey instrument (Coast and Horrocks, 2007). It is also necessary to determine in this way if the attributes are understandable to the type of individuals taking the survey (Coast et al. 2012; Louviere et al. 2000). There should also be a give and take between attributes built into the decision scenario so that respondents will have to sacrifice one attribute for another in making their choices (as described earlier). The attributes and the levels given are such that respondents make "trade-offs" in choosing which product they want. This is called "compensatory" decision-making. The attributes and levels should be clearly understood by the respondent.

In order to maintain internal validity of the experimental design, it is also important to know the correlation between attributes to make sure they are not correlated and are orthogonal, as this will affect how the attributes are perceived by the respondent, the accuracy of the utility rating (Blamey & Bennett, 2002), and allow for reducing issues of multicollinearity. Additionally, the choices must resemble real life decisions to ascertain the true "motivations" of the subject.

The product or institutional profiles (mixes of attributes for a given institutional choice in the present case) chosen by a sufficient number of respondents allow an accurate estimation of the utility, or βI of each attribute because of the following design strategies. The design for this study utilizes discrete choice experimental design principles (DCE). The design of each question, in particular which attribute levels to include in each question posed to a given respondent, uses random pairing.

In choosing a design for a DCE study, there must also be "orthogonality", which means that the "correlation" between attribute levels should be "as close to zero as possible". This requirement is similar to the assumption in multiple regression analysis that the independent variables must be largely independent of one another; if sufficient independence between the independent variables is not present, accurate inference from the analysis may be compromised by issues of multi-collinearity[58] (Bakken & Frasier, 2006). This study uses OMEP, orthogonal main effects plan, to address this issue, as is described in section 3.6.2.

[58] http://www.sawtoothsoftware.com/download/techpap/acbc.pdf

3.4 Sampling strategy

3.4.1 Methods of survey administration

A majority of the students surveyed, roughly 140, completed and submitted the survey online, however the remaining portion, approximately 84 students (in Smyrna, DE), completed and returned a paper and pencil version of the survey as administrators in Smyrna did not have the computers available for their students to take the survey online. For a majority of the surveys taken on-line and with paper and pencil, I was not physically present to administer the survey. I was present only for the pre-test and the first 25 surveys given in in Smyrna, DE. The pre-test was done in two groups of approximately 20 students each. The first group was completed at Smyrna High School and the second was at Polytech High School in Woodside, DE. The surveys completed in the pre-test stage will not be used in the final analysis.

3.4.2 Administering the survey

Administrators were told to only give out the survey to juniors and seniors in high school. Teachers and administrators were also instructed to only give the survey to students who were planning on going to college after high school.

3.4.3 Response rates

The response rate (relative to the schools' population of juniors and seniors) for every location surveyed is given below:

Central Valley Union High School, VT: 47/660 = 16.4%

Smyrna High School, DE: 115/700 = 16.4%

Seaford, High School, DE: 23/409 = 5.6%

Frisco, TX high schools: 73/9,000 = .8%

Total response rate from all locations: 258/10,769=2.4%

It is unknown how many high school juniors and seniors at the high schools that were surveyed actually intend to go to college. However, according to the NCES (2019), 70% of all students who attend high school nationally, eventually go to college, thus the relevant response rate can be recalculated to roughly, 258/(7,538)=3.4%.

3.5 Adequate sample size

There is no agreed upon method for developing the minimum sample size for a DCE (De Bekker-Grob et al, 2015). After conducting a literature review of both DCE and conjoint analysis studies of "patient preference analysis" in the health care field, De Bekker-Grob et al (2015), found that a majority of the studies utilized sample sizes of between 100-300. Pearmain et al. (1991) recommended a sample size of over 100 for DCE studies.

Louviere (2000) (in De Bekker-Grob et al, 2015) recommends using the parametric approach, which depends on assumptions of normality and on the hypothesis being tested, to determine the appropriate sample size. Louviere (2017) advised, "As for sample sizes, use at least 200. However, the larger the sample size the better for testing differences between people. Because we have no idea which of those effects will be significant, much less how significant, it is impossible to specify the "correct" sample size with precision, so the more the better (Louviere, Personal Communication, 2017)". The sample size attained for this study overall is close to 220 respondents.

3.6 Survey instrument

See Appendix 1 to view the survey instrument, which utilizes Discrete Choice Experimental (DCE) methodology to elicit preference data for the attribute levels of the product being tested, in the case of this study, HEI's preferred by prospective college students. It should be noted that Appendix 1 only shows the introductory questions and the first DCE scenario for reasons explained next.

The survey is made up of a questionnaire presented to respondents. The questionnaire contains seven questions on the demographics of the student (see Appendix 1 –part A) and 18 choice scenarios (see Appendix 1 –part B), each of which present two colleges with randomized attribute levels from the sets chosen for study. For each scenario, the attributes of the college/university listed remain the same, however the attribute *level* (e.g., distance from home or E.S.) shown is randomized from a possible three levels for each attribute. Then, this process is repeated 18 times for each respondent. The three levels for each attribute used in this study can be seen in Appendix 5. An example of a scenario or question on the survey can be seen in Appendix 1 – part b.

3.6.1 Designing the choice tasks

With DCE's the literature indicates that it is necessary to pose the optimal amount of choice options to the respondent as too few questions will yield unrefined utility values while too many can create "noisy" survey results as the respondents may become

"fatigued"[59]. Twenty choice tasks was agreed upon by Pinnell & Englert (1997) as the ideal number of questions. Johnson and Orme (1996) found that with 20 choice tasks, "there is no degradation in data quality" as measured by the amount of "random error" introduced into the model (Pinnell & Englert, 1997) even though respondents "paid more attention" in the first few questions but resorted to "simplifying heuristics" in latter parts of the survey. While these studies were conducted over 20 years ago, and even though most surveys are taken online now, researchers still find that twenty choice tasks is the optimal amount of decision scenarios as respondents become "fatigued" after 20 choice tasks (Sawtooth Software, 2017). Additionally, the choice experiment needs to have a design that satisfies the requirements of the "Huber-Zwerina criteria of orthogonality, level balance, and minimal overlap" (Johnson & Orme, 1996, p. 3). Please see section 3.3 for additional information on the method I used to create an experimental design that is orthogonal. Finally, how many questions are asked also depends greatly on the size of the sample, the number of attributes, and how the attribute levels are presented. The next section discusses the 'presentation' aspects of each DCE scenario.

3.6.2 How are attribute levels presented in this study?

Veldwijk et al (2015) found that DCE's presented in words as opposed to graphics produce more consistent results as respondent are better able to gauge the difference between attribute levels. Additionally, Johnson & Orme (2003) recommended that conjoint studies, which are comparable to DCE studies in terms of survey design and aesthetics, should be kept simple in order to yield the most valid results. In this study, all

[59] Like the third stage in the college choice process (Hossler & Gallagher, 1987) discussed earlier, this survey technique recreates the decision context where students have narrowed down their choice set and decide which college they want to attend in the hypothetical scenario presented to them.

attribute levels were presented with clear wording so the respondent could easily differentiate between attribute levels. In addition, both the attribute levels and survey were designed to be very simple, straightforward and comprehensible to the respondent. The pre-test, as described below shows that the survey was indeed simple, straightforward and comprehensible to respondents.

3.6.3 How many choice tasks to include

In determining how many choice tasks to present to respondents; "choice set complexity" must be taken into consideration (Chung et al, 2011). There has been little research examining to what extent the number of choice tasks affects "study outcome" (Carlsson & Martinsson, 2008). Chung et al, after doing a literature review examining the precise amount of choice sets in DCE and conjoint studies, found that there is no exact science to determine the number of choice sets to include. The number of choice sets may be dependent on the "perspective" of the target audience (Hall et al, 2004). In this study, the target audience is high school juniors and seniors who plan on going to college. Getting the perspective of college-going juniors and seniors was the primary goal of the pre-test as is described in more detail below.

Carlson and Martinsson (2008) tested whether there were any differences in the results of studies using 12 and 24 choice sets or tasks. They found a 16% increase in the no-response rate with surveys that included 24 choice sets compared to surveys with 12 choice sets[60]. Overall, Chung et al conclude that, in order to determine the precise amount of choice tasks posed and the complexity level of these choice tasks in terms of

[60] Carlson and Martinsson (2008) did not control background variables, however they controlled for the unequal variances of the responses. The authors tested four different survey designs that differed in the number of choice tasks and sampled individuals aged 18-74 years old in Sweden.

the number of attributes presented and how these attributes are worded and displayed, it is necessary to pre-test the survey and test different versions of the survey that vary the number of choice tasks and complexity level of the choice tasks[61].

Dr. Jordan Louviere, my consulting expert in DCE studies, initially recommended using two different surveys with 9 choice sets, but after pre-testing showed respondents experienced no cognitive strain in answering 18 choice sets, it was decided to include 18 choice sets as this would yield more information about preferences. As stated earlier, research shows that the right amount of choice sets in a given experiment is best determined through pilot testing primarily by asking participants in the pre-test whether they are losing focus given the number of choice tasks presented, by checking the response rate of each survey to see if respondents left choice scenarios blank, by examining whether respondents used simplifying heuristics which could be determined, (for example, if they answered every choice scenario with the same response), and finally, by asking respondents if they could have answered more choice scenarios.

3.6.4 Survey design

In a discrete choice experiment (DCE), the individual respondent is presented with choice profiles with options. The individual is asked to select an option, which represent combinations of levels of the attributes. In this study there are six attributes of HEI's each having three levels. The six attributes (A_1, A_2, A_3, A_4, A_5 and A_6) and the three levels of each are given in Figure 3a. The three levels are coded 0, 1 and 2. For one replicate of this experiment with six attributes, each with three levels, there are 3^6 =729

[61] The steps described by Chung et al were not completed for the pre-test in this study because access to student classrooms was very limited; I was given only a short window of time in the classroom to test my survey.

combinations. This design will give all the main effects and high order interactions of the attributes.

Given the size of this experiment, and since we are only interested in the main effects of the attributes as the interactions are negligible by the design of the experiment, the experimental design used for this study is an orthogonal main effects plan (OMEP) (Addelman and Kempthorne, 1961; and Addelman, 1962). The OMEP, which is a table used to develop the fractional factorial design, was used to develop the survey questions or the random combination of attribute levels used for each survey question, can be viewed in Hahn and Shapiro (1966), and Hamada and Wu (2000). An explanation of this process as to how to develop each survey question is at the end of this section. Burgess, Street, and Louviere (2005) discussed how to use the OMEP in constructing discrete choice experiments (DCE). OMEP estimates the orthogonal main effects of the attributes and the interactions among the attributes, which in this case are negligible by design. Following, Burgess, Street, and Louviere (2005) and the specific advice of Dr. Louviere, the DCE for this study was constructed. The OMEP here uses 18 combinations of the 3^6=729 combinations in one replicate of the experiment as shown in Table 1, below. The runs may also be blocked following the last column of Table 1. Each block represents an institution. For example, each student was administered a questionnaire with eighteen attribute questions which are the eighteen choice sets in Table 4 (on pages 69-70). Each choice set has two blocks, which are the two institutions in each question.

Table 1

Runs	A1	A2	A3	A4	A5	A6	Block
1	0	0	0	0	0	0	0
2	0	0	1	1	2	2	1
3	0	1	0	2	2	1	2
4	0	1	2	0	1	2	3
5	0	2	1	2	1	0	4
6	0	2	2	1	0	1	5
7	1	0	0	2	1	2	5
8	1	0	2	0	2	1	4
9	1	1	1	1	1	1	0
10	1	1	2	2	0	0	1
11	1	2	0	1	2	0	3
12	1	2	1	0	0	2	2
13	2	0	1	2	0	1	3
14	2	0	2	1	1	0	2
15	2	1	0	1	0	2	4
16	2	1	1	0	2	0	5
17	2	2	0	0	1	1	1
18	2	2	2	2	2	2	0

Table 1: 18 runs of the OMEP

To obtain Table 2 from the original design of Table 1, we change the levels of every other column of the attributes by replacing 0 with 2 and 2 with 0 with level 1 unchanged.

Table 2

Runs	A_1	A_2	A_3	A_4	A_5	A_6	Block
1	2	0	2	0	2	0	0
2	2	0	1	1	0	2	1
3	2	1	2	2	0	1	2
4	2	1	0	0	1	2	3
5	2	2	1	2	1	0	4
6	2	2	0	1	2	1	5
7	1	0	2	2	1	2	5
8	1	0	0	0	0	1	4
9	1	1	1	1	1	1	0
10	1	1	0	2	2	0	1
11	1	2	2	1	0	0	3
12	1	2	1	0	2	2	2

13	0	0	1	2	2	1	3
14	0	0	0	1	1	0	2
15	0	1	2	1	2	2	4
16	0	1	1	0	0	0	5
17	0	2	2	0	1	1	1
18	0	2	0	2	0	2	0

In Table 3, the columns of the attributes are rotated with column A_6 becoming column A_1, and column A_1 becoming column A_2, etc. Table 2 and 3 are thus two equivalent OMEP's.

Table 3

ID	A_1	A_2	A_3	A_4	A_5	A_6	Block
1	0	2	0	2	0	2	0
2	0	1	1	0	2	2	1
3	1	2	2	0	1	2	2
4	1	0	0	1	2	2	3
5	2	1	2	1	0	2	4
6	2	0	1	2	1	2	5
7	0	2	2	1	2	1	5
8	0	0	0	0	1	1	4
9	1	1	1	1	1	1	0
10	1	0	2	2	0	1	1
11	2	2	1	0	0	1	3
12	2	1	0	2	2	1	2
13	0	1	2	2	1	0	3
14	0	0	1	1	0	0	2
15	1	2	1	2	2	0	4
16	1	1	0	0	0	0	5
17	2	2	0	1	1	0	1
18	2	0	2	0	2	0	0

After pairing a randomly selected row from Table 2 and another from Table 3, we obtain the first pair of attributes with levels for comparison of the discrete choice experiment (DCE). Then we continue the process without replacement to obtain the 18 pairs of profiles for the DCE, which are given in Table 4. Table 4 is then used in the

questionnaire design for the attribute variables (Louviere, 2016), personal communication, (October 29, 2016).

Table 4

Profiles/Choice Sets	Row #	A_1	A_2	A_3	A_4	A_5	A_6	Block
1	11	1	2	2	1	0	0	3
1	7	0	2	2	1	2	1	5
2	6	2	2	0	1	2	1	5
2	5	2	1	2	1	0	2	4
3	18	0	2	0	2	0	2	0
3	12	2	1	0	2	2	1	2
4	3	2	1	2	2	0	1	2
4	13	0	1	2	2	1	0	3
5	14	0	0	0	1	1	0	2
5	2	0	1	1	0	2	2	1
6	7	1	0	2	2	1	2	5
6	3	1	2	2	0	1	2	2
7	12	1	2	1	0	2	2	2
7	10	1	0	2	2	0	1	1
8	10	1	1	0	2	2	0	1
8	18	2	0	2	0	2	0	0
9	9	1	1	1	1	1	1	0
9	9	1	1	1	1	1	1	0
10	5	2	2	1	2	1	0	4
10	16	1	1	0	0	0	0	5
11	17	0	2	2	0	1	1	1
11	11	2	2	1	0	0	1	3
12	15	0	1	2	1	2	2	4
12	14	0	0	1	1	0	0	2
13	8	1	0	0	0	0	1	4
13	1	0	2	0	2	0	2	0
14	13	0	0	1	2	2	1	3
14	4	1	0	0	1	2	2	3
15	2	2	0	1	1	0	2	1
15	6	2	0	1	2	1	2	5
16	4	2	1	0	0	1	2	3
16	15	1	2	1	2	2	0	4
17	1	2	0	2	0	2	0	0
17	17	2	2	0	1	1	0	1
18	16	0	1	1	0	0	0	5
18	8	0	0	0	0	1	1	4

The conditional logit models, with parameters (β_i , γ_I described below), the orthogonal main effects design in the DCE.

3.7 Analysis

The conditional logit model is based in random utility theory (RUT) and basic utility theory wherein it is theorized that a rational individual will make choices that maximize his/her utility.

The RUT representation, as seen here:

$$I_{in} = V_{in} + \varepsilon_{in}$$

has both a deterministic element and a random element. In the model above, I_{in} is the "unexplainable" utility that person n chooses for choice i, V_{in} is the "explainable" utility that person n chooses for choice i, and ε_{in} is the "random component" of person n's utility for choice i (Carson et al, 2007).

For the conditional logit model shown below as equation x.1, the deterministic part of conditional logit model, x_{itj}, is an additive function and quantifies the utility for each attribute; z_{it} represents the characteristics of the individuals. The individual characteristics for this study are student's grade level, race/ethnicity, family income level, gender, planned major in college, SAT math score, whether the respondent had taken any AP courses in high school, and zip code[62]. These characteristics are data points that are requested from respondents in the survey[63]. The random element in the equation, ε_{ijt}

[62] Zip code is an identifier representing which high school/ community the respondent came from.
[63] Surveys with missing data points were omitted from the analysis portion of the study. In total, four paper

consists of all of the unobservable aspects of choice, other than the attributes and characteristics of the individuals in the model.

The conditional logit model is detailed below by (Greene, 2018 and McFadden, 1974):

$$U_{itj} = \alpha_{ij} + \boldsymbol{\beta}_i' \mathbf{x}_{itj} + \boldsymbol{\gamma}_{ij} \mathbf{z}_{it} + \boldsymbol{\varepsilon}_{ijt} \quad \text{(x.1)}$$
$$i = 1,\ldots,N;\ j = 1,\ldots,J(i,t);\ t = 1,\ldots,T(i)$$

U_{itj} is the utility for the i^{th} individual with j^{th} choice set and the t^{th} choice situation. In this study T(i) =1, wherein x_{itj} are the attributes of the choices and z_{it} are the characteristics of the individuals.

The unobservable aspects are factors other than the attributes and characteristics that are measured. The characteristics of the individuals are also dummy variables. For example, for this study gender, grade level, family income level, etc. are the dummy variables (see the full list above). β_i is the partial regression coefficient vector of the attributes, while γ_{ij} is the partial regression coefficient vector of the characteristics.

On a final note, the conditional logit model is dependent on the fact that the error term, $\varepsilon_{ijt,}$ is independent of irrelevant (IIA) assumptions (Greene, 2018). Thus, each attribute is assumed to be mutually exclusive and independent from one another.

Greene (2018) and McFadden (1974)) assumed:

a) Individual i will choose alternative j in choice setting t if and only if $U_{itj} \geq U_{itk}$) for all $k \neq j$,

b) the smoothness of the individual utility function and

surveys were incomplete. Online survey respondents were not able to submit their survey until they answered all of the questions in the survey, thus there were no missing data points for the surveys completed online.

c) utility maximization is the individual's goal.

Smoothness of the utility function is necessary to take derivatives and maximize the likelihood function to obtain estimates of β_i and γ_{ij}. These are reasonable and usual assumptions to obtain estimates of the conditional logit model.

Below, equation (x.3) is the conditional logit model or the multinomial logit model (MNL), which has the same equation.

$P(Y_{itj}=j) =$

$$P[\text{choice}=j \mid \mathbf{x}_{itj}, \mathbf{z}_{it}, i, t] = \text{Prob}[U_{i,t,j} > U_{i,t,k}],\ k = 1,\ldots,J(i,t)$$

$$= \frac{\exp(\alpha_j + \boldsymbol{\beta}'\mathbf{x}_{itj} + \gamma_j'\mathbf{z}_{it})}{\sum_{j=1}^{J(i,t)} \exp(\alpha_j + \boldsymbol{\beta}'\mathbf{x}_{itj} + \gamma_j'\mathbf{z}_{it})} \qquad \text{(x.3)}$$

In equation (x.3), if $x_{itj} = 0$ for all i, t and j then the MNL depends on the characteristics of the respondents. If $z_{it} = 0$ for all i and t then MNL depends on the attributes. Equation (x.3), shows that the probability of selecting the j choice set given the attributes, x_{itj}, and characteristics z_{it} is equal to the probability that the utility of j is greater than the utility of k, with k not equal to j.

Using the maximum likelihood method of estimation, we can estimate the parameters or partial regression coefficients in the MNL in equation (x.3).

To obtain maximum likelihood estimates of β_i and γ_{ij}, McFadden (1974) assumed that the U_{itj} and the ε_{ijt} are independent and identically distributed functions with equal variances (IID), with a Gumbel distribution (type I generalized extreme value distribution), which is given in equation (x.4)

$$F(\varepsilon_{ijt}) = \text{Exp}(-\text{Exp}(-\varepsilon_{ijt})) \qquad \text{(x.4)}$$

I use SPSS and STATA, which assume the generally accepted Gumbel distribution for estimating the parameters in conditional logit choice models that maximize utility.

3.8 Validity

The validity of a DCE study is dependent on many factors. First is ensuring that the product attributes chosen for study are important to the consumer (Hall et al, 2004). The attributes chosen for this study were derived from the literature review (see 'Summary of College Choice" section of this paper), which discusses the attributes deemed by the literature to be most influential in the college choice process. Additionally, qualitative research was conducted at the pre-test stage to determine whether the attributes included in the survey were in fact important to prospective students (Hall et al, 2004). During the pre-test, approximately twenty students were interviewed individually and asked after the survey was administered whether the attributes presented were clear and understandable and if the attributes presented were important in their thinking about their selection of colleges to attend. Students were given the opportunity to offer examples of attributes they deemed important in their choice of colleges/ universities. Every student interviewed said the survey was easy to understand, not too long, and overall did not cause any cognitive strain. They did not offer any examples of additional attributes they would have included when prompted.

Another important aspect in improving the validity of a DCE/conjoint study is limiting the number of attributes in order to reduce the cognitive strain for respondents and thus increase the likelihood that respondents answer with their optimal choice for

maximizing their utility, according to rational choice theory. There must also be "choice consistency" within the survey (DeShazo, 2002). Choice consistency requires that the design be both orthogonal and balanced. For the design to be orthogonal, the researcher must minimize the correlation between attributes (Huber & Zwerina, 1996). A balanced design means that each attribute level among the levels used in the experiment is shown to respondents with equal probability. Finally, the range of attribute levels used should be appropriate and based on a literature review. For example, in this study it would inappropriate to list the attribute levels for annual gross tuition as $0, $20,000, and $1,000,000 per year for zero gross tuition is unheard of and $1,000,000 per year is far beyond any possible annual tuition rate anywhere in the world. So, the values or levels used must be realistic.

Pretesting was also done for the following reasons: to ensure basic comprehensibility of the survey and choices to subjects; to ensure there is enough of a difference between numeric attribute levels so that respondents can see a difference between product profiles (Rao, 2013); to determine how many product profiles or scenarios (or hypothetical choices of institutions with particular sets of attributes) should be included per question so as not to create an information overload for respondents; and, finally, to determine the attributes that are considered to be important to consumers so that these attributes can be included in the study.

As discussed earlier, follow up interviews with respondents were undertaken after the pre-test to address these issues and ensure that the final survey was constructed in accordance with these guidelines. Pertinent attributes not included in the survey were listed and students were asked if the attributes not included were more or less important

than the attributes included in the survey. Overall, students stated that the attributes included in the original survey were the most important attributes to them in choosing a college. However, students seemed timid in speaking up, which may have been because these interviews were conducted in a group setting.

3.9 Procedures for data analysis

The choice platform in JMP[64] (2016) (a statistical software program) will be used to analyze the data from the DCE. Descriptive statistics and Chi-squared contingency tables will be presented to show the frequencies of particular responses and to identify any significant relationships among the attributes and the socioeconomic variables.

Additionally, the main effects, the log worth[65], the P-values; parameter estimates, the P-values for each attribute, notably E.S. and the socioeconomic factors, will also be shown. The likelihood ratio test will be computed for the main effects of the attributes and the seven socio-economic factors. This will tell me which attributes, characteristics, and interactions between the attributes and characteristics are significant with respect to HEI choice. I will also compute the utility profile and optimal setting for of the socio-economic factors. The assumptions underlying the models will also be checked.

With the seven individual characteristic variables and eighteen combinations of the six institutional attributes, the P- values or log-worths will tell which characteristic variables, attribute variables and their interaction are significant and hence the importance of E.S.'s in comparison to other attributes in the students' decision making.

[64] JMP stands for John's Macintosh Project (Shipp, 2012).

[65] The log worth= -log 10 (p value) . The log worth, as indicated in the JMP software, adjusts the p values for an appropriate graphing scale. Since -log 10 (.01) = 2, we can infer an effect is significant at the .01 level if the effect > 2.

If the interactions are significant, for example between high income respondents and respondents that showed a preference for the highest level of E.S., this would show a link between the characteristic (categorical) variable, income level, and the attribute variable, better E.S. Thus it would show that high-income respondents have a preference for institutions with better E.S.

3.9.1 Paper surveys vs. online surveys

On a final note, as mentioned earlier, surveys were completed both on-line and with paper and pencil, thus, the analysis will split the survey results into two groups to account for the results of the surveys taken on-line vs. the surveys taken with paper and pencil; i.e., a separate analysis for each group will be provided in order to determine if the results differ by group.

3.10 Human subjects consideration

Consideration for the welfare of the respondents to this survey is important because all of the respondents are minors, 16-17 years old. All surveys were conducted either online or in person. The survey was conducted only after the principal or teachers from each high-school gave their approval. For the on-line surveys, after high school administrators gave me the approval to survey their students, I sent an on-link to the administrators. The administrators then sent this link out to either the teachers in their district or directly to students. While personal questions asking about a student's ethnicity, academic-class, and family income level were asked in the introductory portion of the survey, which can be seen in Appendix 1, the respondent never gave their name,

thus the personal information provided cannot be linked to any individual (see Appendix 1). The remainder of the survey asks purely hypothetical questions.

An application for human subjects approval of this design was submitted to the University of Washington's Human Subjects Division (HSD) because the group to be surveyed in this study are below the age of 18. HSD stated that human subjects approval was not necessary for this study as this study would not "produce results that are generalizable" and thus does not meet the definition of research, as defined by federal guidelines. The findings in this study are not generalizable because this research does not use randomized sampling and thus has potential "sample selection bias" (Carson et al, 2007) as was described earlier. See Appendix 6 to view the letter sent to me by the Human Subjects Division at The University of Washington in response to my application for approval.

3.11 Conclusion

This research aims to determine how much value prospective college students (high school juniors and seniors) place on data about the employment prospects of attending a given HEI in comparison to other attributes of the HEI deemed to be important by students applying to colleges. Determining how much value students place on the employment statistics associated with a HEI may lend some insight into whether employments statistics are of greater value than, for example, the national rankings (like those from the *U.S. News & World Report*) to students applying to college. Such a finding may then lend fuel to the argument that HEI's should be required to publish the

E.S. of their graduates; wherein E.S. are broken down by major and show the employment rates and 1 and 10-year earnings rates of its graduates.

Higher education is seemingly operating within a bubble wherein there is a lack of transparency on one of the key outputs of the organization, since employment statistics (in terms of how many graduates obtained full time employment and their average salary level) are not provided accessibly to students choosing among schools, although students indicate in large scale surveys that preparation for employment is a key reason for attending college. Instead, students must rely on broad statistics, which state that going to college is better than not attending, on average, and a ranking system which values prestige indicators and the research an institution produces[66] over student-centered outputs, like the probability they will be able to secure a job with good career and earnings prospects after graduation. Changes in labor markets due to offshoring of jobs and technology advancements have eroded the earnings of college graduates who do not have a high skill major (e.g. engineering, science, or math) or advanced degree (e.g. a masters or Ph D)[67] while demand for higher education, in large part, has not eroded, especially in the 4-year HEI's[68]. The fact that demand for higher education has not waned could be the result of information asymmetries as one of the key outputs a HEI produces, i.e., the E.S. for specific majors at specific institutions, are obscured from the public.

[66] The White House's College Scorecard only gives broad data that is nationally based, i.e. the average earnings for employed lawyers equals around $93,000 per year. It also gives the average annual earnings of graduates from a particular college, as in the case of The University of Colorado at Boulder, where the average salary listed is $50,800. However after digging through the Excel data on earnings provided by the White House's College Scorecard, much of the earnings data for each university is missing and is listed as "PrivacySuppressed," presumably due to small numbers of cases with data.

[67] Acemoglu & Autor (2010) refer to these types of degrees as low-skill degrees.

[68] Enrollment levels for private for-profit HEI's and community colleges have decreased in the last few years.

Chapter 4: DATA ANALYSIS

This first section of the Data Analysis chapter analyzes the subjects' (N=220) completed questionnaires to determine which attribute levels respondents most preferred. Determining which attribute levels had the highest utility[69] levels for certain respondent groups (e.g. African-American seniors) is obtained by first examining where there are significant interactions[70] (at the $p<.05$ level or better) between the respondents' characteristics (i.e. their race, grade, income level, etc.) and their choices among institutional attribute levels. The significant interactions between attribute levels and characteristic variables (race, gender, etc.) will be shown through a series of JMP[71] outputs: the effects summary table, parameter estimates, and likelihood ratio tests. Finally, the utility profiler shows utilities by respondent characteristics. JMP averages out the utility levels across all respondents and tells us which attribute levels (tuition level, distance from home, etc.), based on the characteristic variables (race, gender, etc.[72]), have the maximum utility for the cohort entered into JMP[73].

4.1 Research Problem

[69] Utility measures how valuable something is to the person.
[70] Main effects and interactions are the partial regression coefficients or part worth of the independent variables which are the attributes and attributes by covariates in the random utility model (RUM).
[71] JMP (2019) is a statistical software program from the SAS Institute Inc., Cary, NC, 1989-2019.
[72] See Appendix 1, part A, to view the first portion of the survey, which lists all respondent characteristic variables.
[73] For example, a cohort for this study would include: senior Caucasians who have a reported family income level above $100,000, who are male, know what they will be majoring in college, have a SAT math score above 600, and have taken AP courses. If this cohort is entered into the utility profiler, the utility profiler will produce graphs showing which attribute levels are most preferred for this cohort. As a note, only interactions and main effects that are statistically significant will be analyzed.

This study aims to determine the value, as measured by the part-worth utility, students place on HEI's that offer better employment statistics after graduation, relative to the utility of other institutional attributes. The research problem is discussed in detail in Section 1.2.

4.2 Survey Choice Design

As discussed in Section 3.6 and following Louviere (2008), the fractional factorial, orthogonal main effect plan for six attributes, each at three levels was used to design the survey questionnaire. In the questionnaire for this study, there were 18 trials, with two choice sets per trial, which contain combinations of the six institutional attributes. For example, for the first trial or question, as seen in in Appendix 1, part B, respondents are asked whether they would prefer to attend institution 1 or institution 2 wherein both institutions have three possible attribute levels for the attributes: average graduation rate, distance from home, tuition, U.S. News & World Report ranking, and average salary. The second choice set in the trial acted as a check on the first trial and asked respondents whether they would, 'realistically', stay with the choice they made in the first choice set. Additionally, the introductory questions, which asked participants their race, gender, etc., provided seven individual (respondent) characteristic variables (covariates). The individual covariates analyzed were: high school grade level of the respondent, race, family income, gender, major, SAT math score and whether or not at least one AP course was taken by the respondent in high school. Details of the design are discussed in section 3.6. As stated earlier, the six attribute variables, and the three levels of each, are shown in Appendix 5.

As mentioned above, for each trial, there were two choice sets. The first choice set, has two options, made up of colleges with various combinations of levels of the six attributes, while the second choice set has three options. For each trial there are five

possible answers, two from choice set 1 and three from choice set 2. The first choice set asked each respondent:

Which of the two colleges would you be most likely to choose if you had offers only from these two?

1. **Institution 1** ☐
2. **Institution 2** ☐

The second choice set posed a follow up question:

Now, thinking realistically, if these were your only offers would you choose neither college and either do something else or wait and apply next year? (Please check only one):

I would choose the college I chose in this question ☐
I would NOT choose either college ☐

The questionnaire, which is shown in Appendix 1-part A, is discussed in detail in Section 3.6.

4.3 Data Collection

Section 3.4.1 gives a description of how the copies of the questionnaire were administered and a description of the population sampled.

As indicated above, for choice set 1 there were two possible responses and for choice set 2, there were 3 possible responses. In choice set 2, while it appears that there are only 2 responses, there are actually 3 possible responses for the purposes of analysis: Keep Institution 1 (A), Keep Institution 2 (B), or neither. Since each student answered 18 trials[74], with two choice sets per trial, plus 7 introductory questions pertaining to their race, gender, etc. (the covariates), there are 220*18*5=19,800 rows of data. Specifically, since N=220, there were 18 discrete choice experiments (DCE) scenarios in the questionnaire, and there

[74] Approximately 96% of the surveys returned answered all 18 trials, the few surveys that were returned incomplete were discarded.

are five possible responses, two for the first DCE scenario, and three for the second DCE scenario. There are also the columns of the alternative specific constants (ASC[75]) dummy variable, OneA, the main effects of the six attributes, and seven characteristic variables with their first-order interactions.

The alternative specific constant (ASC) estimates are given as the coefficients of OneA[76], and No Choice[77]. The ASC is labeled "No Choice".

4.4 Data Analysis

Using JMP 14 (2019), descriptive statistics for the covariates are shown with mosaic plots and frequency tables, with counts and percentages for each characteristic variable which are given in Figures 4.1A and 4.2B. The nine covariates are: an individual's race, gender, grade level, whether they took any AP courses, estimated family income level, ethnicity, whether they know their college major or not, if their SAT scores were above or below 600, what state they are from, and the zip code of their school. However, for the analysis portion of this study I only utilize the first 7 covariates listed.

4.5 Analysis

As given in Section 3.7, the conditional logit model (CLM) of McFadden (1974) is used to model the utility as a function of the attribute variables, the characteristics variables, the interactions between characteristics and the attribute variables, and the ASC.

As mentioned, there are 18 trials with two choice sets per trial. In choice set 1 there are two options while in choice set 2 there are two choice options plus a no-choice option.

[75] The ASC is a constant term in the random utility model (RUM). ASC is the base utility of an individual with no attributes and no attribute by covariates' terms in the RUM.
[76] OneA, is a dummy variable obtained by letting Option A=1 and Option B=0.
[77] 'No Choice' represents the option wherein respondents select, "I would not pick either college".

The random utility model (RUM) was fitted using JMP (2019) which uses the Maximum Likelihood Method (MLM) to estimate the marginal utility coefficients in the RUM model and uses Firth's (1993) method to reduce the bias in the maximum likelihood estimates (MLE). The Firth maximum likelihood estimates and tests are better than the MLE without this bias correction (JMP, 2019).

The model fitted by the MLE (with the Firth correction where necessary) describes the utility as a function of the attributes, and their interactions with the covariates, plus the error distribution as given in section 3.7. As mentioned, the ASC is the coefficient of the variable, OneA, and the No Choice variable.

4.6 Description of the Data

The distributions of the individual respondent characteristics or covariates are given in Figures 4.6.1A and Figures 4.6.1B, with mosaic plots and frequency distributions. From the tables in Figures 4.6.1A and 4.6.1B, it can be seen that 60% of the student respondents are seniors, 37% juniors and 2% are sophomores. The predominant race is Caucasian, at 53%, with 13% African American, 16% Hispanic, and 11% other/mixed races. Asians are 4% of the sample. Twenty-eight percent of respondents reported that they have an annual income above $100,000 while 30% said their family's income level is below $100,000, and 42% said, "I don't know" in reference to their family income level. Fifty-six percent of the students are females with 44% males. Seventy-five percent of respondents say they know what their major will be in college/university while twenty-five percent do not know what they will be majoring in during college/university studies. Forty-eight percent took at least one AP course while 51% had not taken any AP courses. Fifty-eight percent of respondents said their SAT math score was above 600 and 42% said it was below 600.

The following are the national statistics as they relate to the percentages presented in the previous paragraph. Nationally, in the fall of 2015, 49% of all high school students were white, 15% black, 26% Hispanic, 5% Asian/Pacific Islander, 1% American-Indian, and 3% two or more races[78]. While I could not find statistics stating the percentage of family household income levels above $100,000 for families with children in high-school, the median household income level for households, in the age group that typically has children in high-school in the Northeast is $83,640[79] in 2017. In 2015, 56% of all college students were female, while 44% were male[80], exactly the same percentages as the sample for this study. In 2007, around 24% of high-school students took at least one AP course[81], while my sample has about twice as many AP takers. The mean SAT math score for all students in 2016 was 508, for male students it was 524, and for female students, 494. Those who scored a 590 in the SAT portion were in the 75th percentile[82], thus my sample is relatively high-scoring. Information on the percentage of high-school students who know what they will major during college was unavailable.

[78] https://nces.ed.gov/programs/raceindicators/indicator_rbb.asp
[79] https://trends.collegeboard.org/college-pricing/figures-tables/family-income-selected-characteristics-2017
[80] https://nces.ed.gov/fastfacts/display.asp?id=98
[81] https://www.insidehighered.com/quicktakes/2018/02/21/record-numbers-take-advanced-placement-courses
[82] https://secure-media.collegeboard.org/digitalServices/pdf/sat/total-group-2016.pdf

Figure 4.6.1A: Distribution of the Characteristics Variables: Grade (Senior, Junior, or Sophomore), Income (estimated family income level above or below $100,000), and SAT (above 600 or not on SAT math exam)

Frequencies

Level	Count	Prob
1	133	0.60455
2	82	0.37273
3	5	0.02273
Total	220	1.00000

N Missing 0
3 Levels

Frequencies

Level	Count	Prob
1	61	0.27727
2	67	0.30455
3	92	0.41818
Total	220	1.00000

N Missing 0
3 Levels

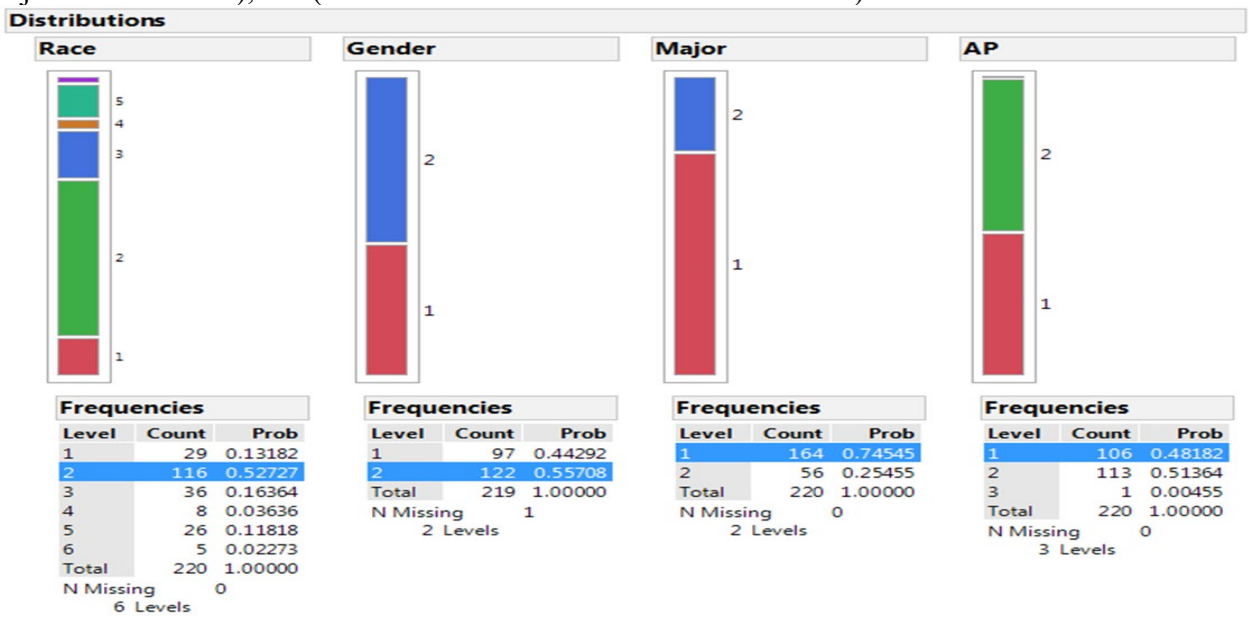
Frequencies

Level	Count	Prob
1	126	0.57534
2	93	0.42466
Total	219	1.00000

N Missing 1
2 Levels

Grade Codes: 1=Senior, 2=Junior, 3= Sophomore
Income Codes: 1=Above $100,000, 2= Below $100,000, 3 =I do not know
SAT Math Codes: 1=Above 600, 2=Below 600

Figure 4.6.1B: Distribution of the Characteristic Variables Race, Gender, Major (college major known or not), AP (whether the student has taken AP courses)



Race Codes: 1= African-American, 2=Caucasian, 3=Hispanic, 4=Asian, 5=Other/Mixed Race, 6= I chose not to answer
Gender Codes: 1=Male, 2=Female
Major Codes: 1=Yes, 2=No
AP Codes: 1=Yes, 2=No, 3=I choose not to answer

4.7 Choice Analysis

The CLM fitted the utility as a function of all six institutional attributes, the ASC, and grade, race, income, gender, major, SAT math score, and AP courses taken and their interactions. The abbreviations used below are defined in Appendix 7. Given the size of the data set with N=220, and the number of effect estimates with 6 attributes and their interactions with seven covariates, I will only present tables in the text where there were significant attributes or significant attributes* covariates interactions for each level of the attributes and covariates. The full set of tables is given in Appendices 8-10.

Appendices 8, 9 and 10, the Effect Summary, Parameter Estimates and the Likelihood Ratio Tests results, respectively, show the results for the main effects and the interactions. In addition to using the P Values < .05 or better to assess significance, we

can also look at cases where the Log Worth is greater than 1.30, since Log Worth=-$\log_{10}$ (P-Value=.05)=1.30l, thus these measures give equivalent results. The full Effect Summary table[83], which is in Appendix 8, shows the ordering of the attribute and attribute by covariate effects with the most significant effects listed first, i.e. those showing the longest bar or the smallest P-Value or largest Log Worth. Table 4.1 below gives only the significant effects from Appendix 8.

Appendix 9, which shows all of the parameter estimates, gives the main effects of the attributes, the attributes' interactions with the characteristics, and the standard errors with the P Values.

4.7.1 The meaning of significance

A significant attribute means that the null hypothesis, i.e., that the average utility for each of the levels of the attribute are equal, is rejected and the alternative hypothesis, that the average utilities for each level are different, is accepted. The direction of the relationship will be seen in the utility profiler.

A significant interaction between, for example, tuition level and gender, means that a plot of the average utility for males over the levels (values) of the attributes for the tuition variable will be significantly different than that for females. By identifying which variables and interactions between variables are significant we then know which variables to focus on when examining the utility profiler, which shows which attribute levels had the greatest utility for the respondents based on their characteristics.

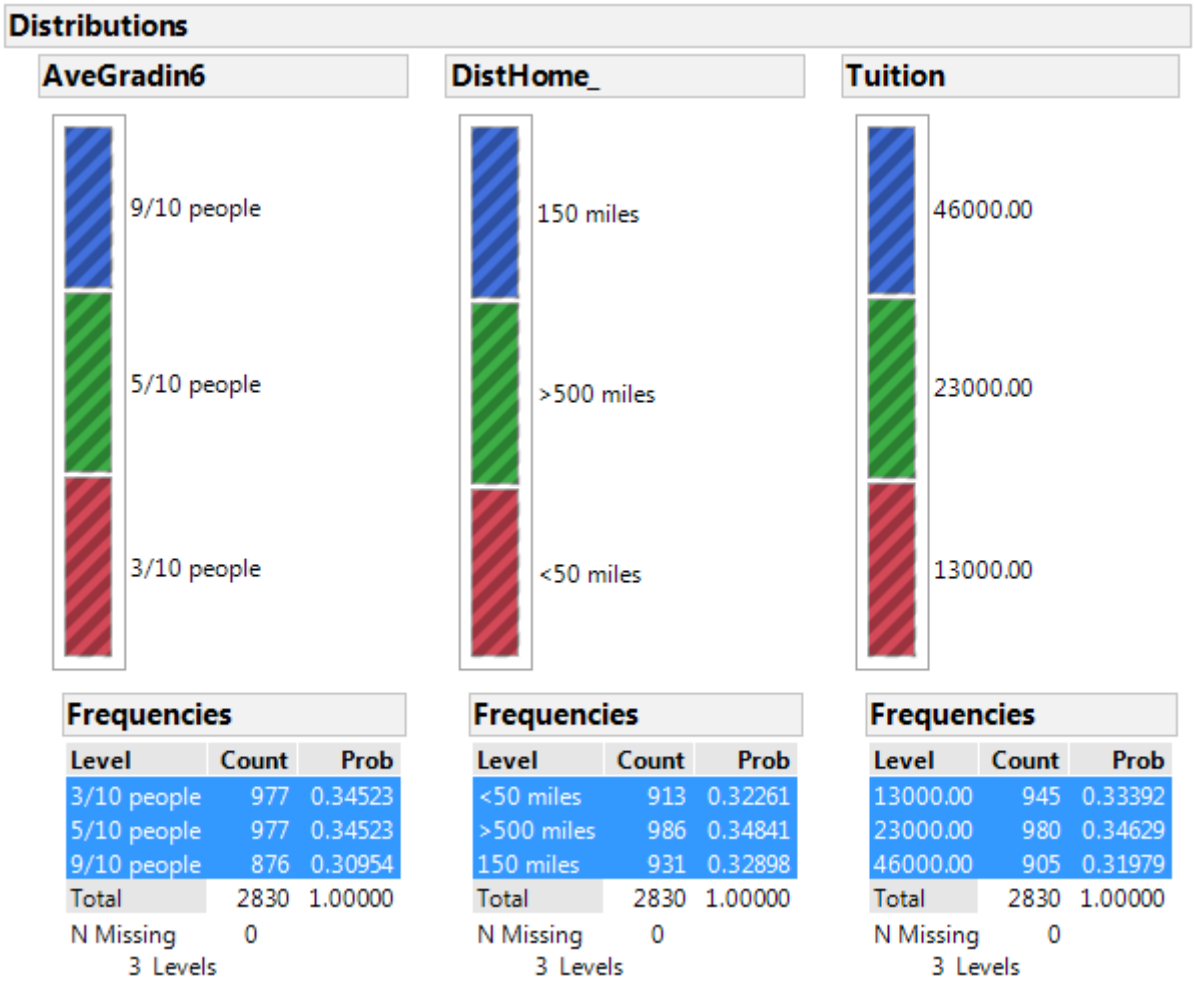
[83] The Effects Summary table is simply a table in JMP, a statistical program, which lists out the significant main effects and interactions by showing the p-values and the equivalent Log Worths.

The effects estimates with the standard errors and the large sample z statistics (where z= estimate / SE) are also presented. The significant effects are shown as follows:

* are p values, <.05, ** are p values<.0.1 and *** are p values<.001.

I will now discuss the No Choice (of institution) response by an examination of Figures 4.7.2.1 and 4.7.2.2, respectively. The entries to the right of the bars show the levels of each institutional attribute that were presented to respondents.

Figure 4.7.2.1: Distribution of Attributes for No Choice



Frequencies

Level	Count	Prob
3/10 people	977	0.34523
5/10 people	977	0.34523
9/10 people	876	0.30954
Total	2830	1.00000

N Missing 0
3 Levels

Frequencies

Level	Count	Prob
<50 miles	913	0.32261
>500 miles	986	0.34841
150 miles	931	0.32898
Total	2830	1.00000

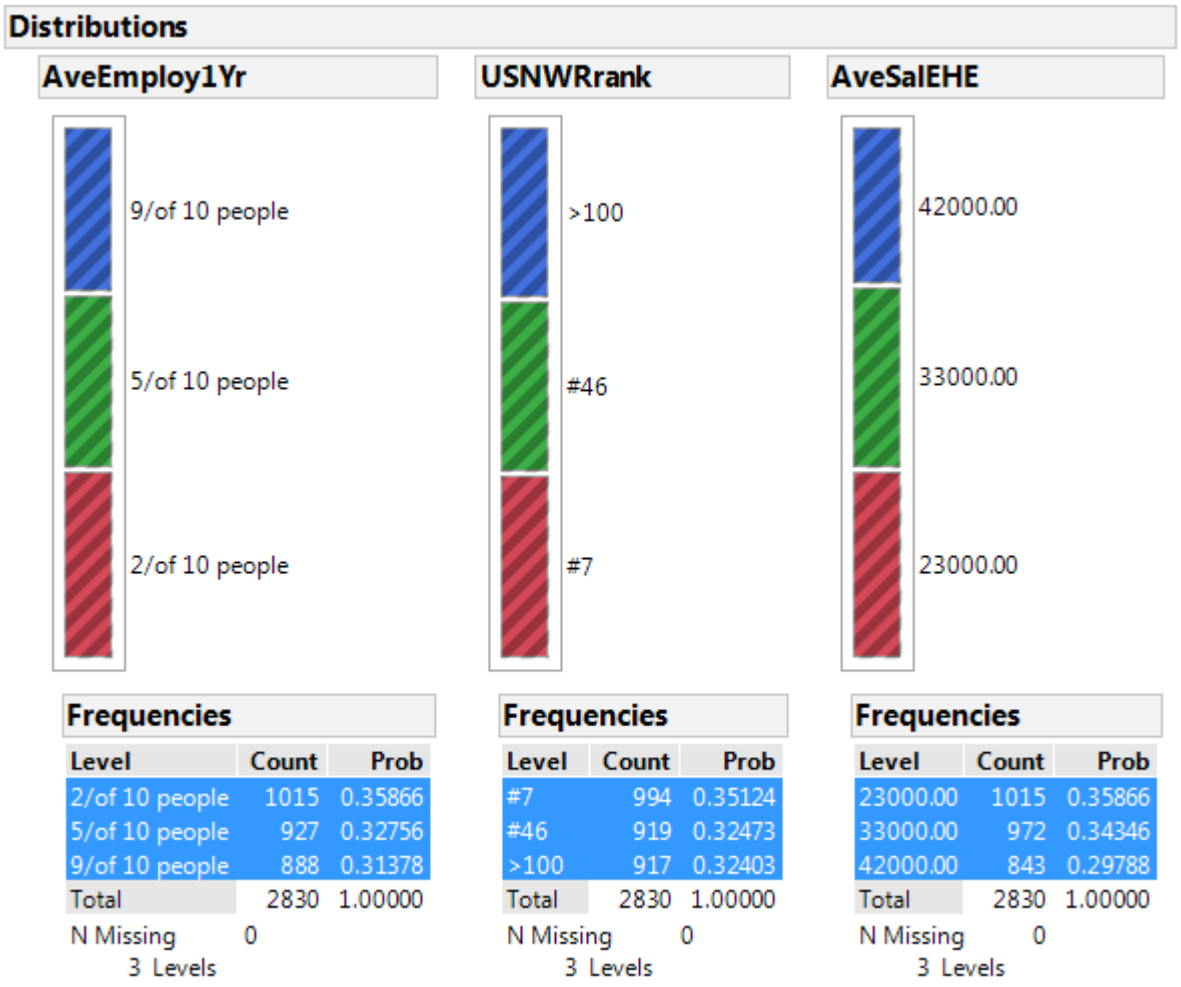
N Missing 0
3 Levels

Frequencies

Level	Count	Prob
13000.00	945	0.33392
23000.00	980	0.34629
46000.00	905	0.31979
Total	2830	1.00000

N Missing 0
3 Levels

Figure 4.7.2.2: Distribution of Attributes for No Choice



In choice set 2, the response 'I would NOT choose either college' is coded as the 'No Choice Indicator' in the RUM. The Effect Summary tables in sections 4.9, 4.10, and 4.11 show the No Choice Indicator model effect is highly significant at the p value <.00. The summary, mosaic plots and frequencies, of the No Choice responses for the six attributes are given in Figures 4.7.2.1 and 4.7.2.2, respectively. Figures 4.7.2.1 and 4.7.2.2 show that the relative frequencies or probabilities for each level of the attributes are almost equal; thus the probability of selecting "No Choice" is very similar across the

three levels of each attribute. The analysis which considered the No Choice Indicator concludes that the attribute by characteristic variables' interactions are significant in spite of the significant No Choice Indicator.

4.8 Interactions of the Attributes with no Covariates

Table 4.8.1 Effect Summary for all survey respondents[84]

Effect Summary

Source	LogWorth	PValue
No Choice Indicator	207.171	0.000
AveSalEHE	98.359	0.000
AveEmploy1Yr	73.938	0.000
AveGradin6	19.081	0.000
USNWRrank	2.122	0.008
DistHome_	1.531	0.029
Tuition	1.276	0.053

The Effects Summary, Table 4.8.1, shows which institutional attributes are significant overall when no respondent characteristics are included. The next paragraph simply puts Table 4.8.1 into words so the reader has a better understanding of how to read the Effects Summary table.

The Effects Summary, Table 4.8.1, shows the main effects in order of significance. For example, it tells us, firstly, that the No choice indicator was very significant. Additionally, in terms of the attributes, the average salary of an institution's graduates, its average employment rate 1-year after graduation, its average graduation rate, U.S. News & World Report ranking, and distance from home were all significant;

[84] The numbers in red for all of the Figures in this paper represent significance only when under the "p-value" column, otherwise the colors should be ignored.

tuition was also very close to being significant, thus I will include tuition in the list of main effects that were significant.

Overall, while the No-Choice Indicator was highly significant, this parameter will be ignored when entering information into the utility profiler as this option merely served the purpose of being a check on whether respondents were sure of their answer on the first choice set. However, all of the attributes included in the study, including tuition, were significant (or very nearly so) when no respondent characteristic variables were included in the model. Put another way, all respondents were included as the sample was not yet broken down into market segments (i.e., by respondent characteristics). The Effects Summary table will guide us in analyzing the utility profiler and identifying the attributes that should be given attention, as these are the parameters that are significant.

Table 4.8.2: Parameter Estimates for all survey respondents[85]

Term	Estimate	Std Error	Lower 95%	Upper 95%	Z Value	P Value	Significance
AveGradin6[3/10 people]	-0.2273	0.0278	-0.2817	-0.1729	-8.1763	0.0000	***
AveGradin6[5/10 people]	0.0225	0.0298	-0.0359	0.081	0.7550	0.2251	
DistHome_[<50 miles]	0.0578	0.0285	0.002	0.1137	2.0281	0.0213	*
DistHome_[>500 miles]	-0.0675	0.0266	-0.1197	-0.0155	-2.5376	0.0056	**
Tuition[13000.00]	0.0666	0.0274	0.0129	0.1202	2.4307	0.0075	**
Tuition[23000.00]	-0.0318	0.0287	-0.088	0.0246	-1.1080	0.1339	
AveEmploy1Yr[2/of 10 people]	-0.3358	0.0262	-0.3873	-0.2845	-12.8168	0.0000	***
AveEmploy1Yr[5/of 10 people]	-0.0672	0.0317	-0.1292	-0.0051	-2.1199	0.0170	*
USNWRrank[#7]	0.0257	0.0256	-0.0246	0.0759	1.0039	0.1577	
USNWRrank[#46]	0.0465	0.027	-0.0063	0.0995	1.7222	0.0425	*
AveSalEHE[23000.00]	-0.5183	0.0303	-0.5778	-0.4589	-17.1056	0.0000	***

[85] The numbers in red and yellow in this table represent significance wherein the significant effects are shown as follows: * or red are p values <.05, ** or yellow are p values<.01 and *** or yellow are p values<.001

AveSalEHE[33000.00]	-0.0188	0.0256	-0.069	0.0314	-0.7344	0.2314	
No Choice Indicator	-0.8519	0.03	-0.9111	-0.7935	-28.3967	0.0000	***

AICc	15654.71
BIC	15745.37
-2*LogLikelihood	15628.67
-2*Firth LogLikelihood	15532.18
Converged in Gradient	
Firth Bias-Adjusted Estimates	

The parameter estimates, Table 4.8.2 above, is much like the Effects Summary table in that they both guide us by indicating which attribute levels are significant.

Focusing on the column marked "Estimate", all of the p-values colored in red and orange are significant[86], i.e. where the confidence interval doesn't not contain zero. From this we can see that almost all of the attribute levels listed, except AveGradin6[5/10 people], Tuition[23000.00], and AveSalEHE[33000.00] are significant. The Parameter Estimates table, like the Effects Summary table, is only used to determine which parameters are significant so that we know what to focus on in the utility profiler. Since almost all of the attribute levels are significant, the readouts from the utility profiler will be very informative in showing which attribute levels were favored most.

4.8.3 Utility Profiler for all survey respondents

The utility profiler averages out the utility levels across all respondents and tells us which attribute levels, based on the characteristic variables (race, gender, grade level, etc.), have the maximum utility values. This section will first show which attribute levels

[86] The numbers highlighted in red were significant wherein the p-value fell between .01 and .05, while the numbers in orange indicate that the p-value was less than .01.

have the highest utility levels for all of the survey respondents. This model does not break the survey down into sub samples or market segments. Thus N=220.

Figure 4.8.3.1: Utility Profiler for all survey respondents[87]

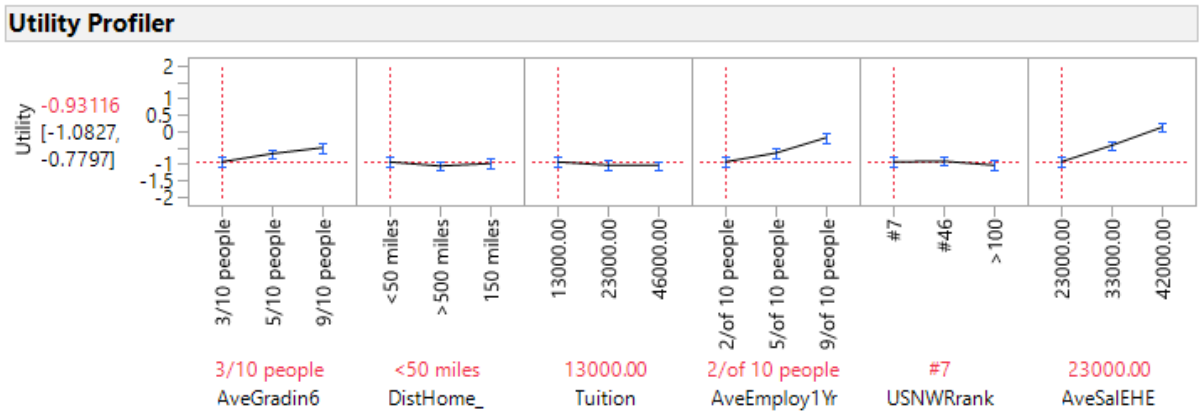
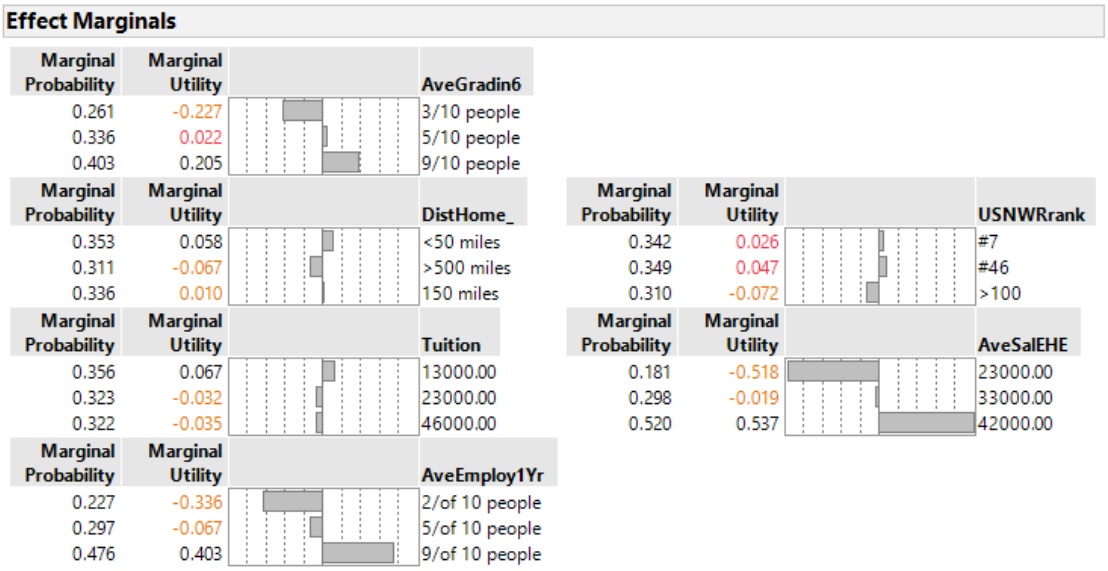


Figure 4.8.4: Effect Marginals for all survey respondents



[87] As stated in footnote 16, the red numbers in all of the Figures in this paper represent significance only when under the "p-value" column, otherwise the colors should be ignored.

Above, in Figure 4.8.3.1 and Figure 4.8.4, are the utility profiler and effect marginals tables. The effect marginals table gives similar results to the utility profiler section. The Effect marginals table shows the marginal probabilities or "marginal utilities for the main effects" for each attribute level, or put another way, it shows which attribute levels an individual would prefer when all of the other attribute levels are held at their "default" level (JMP, 2019).

The utility profiler shows that for all of the survey respondents, N=220, the attribute levels that respondents got the most utility out of were: Average graduation rate in 6 years (AveGradin6)=9/10 people (i.e. a 90% graduation rate), Average Employment rate 1 Year after graduation (AveEmploy1Yr)=9/10 people (i.e., 90% employed), and Average Salary after graduating =$42,000 for social science majors like English, History, Education; $80,000 for majors like Business, Science, Math, Computer Engineering; and $56,000 for professional degrees like nursing (AveSalEHE=$42000[88]).

While these attribute levels were designed to be the best/most favorable attribute levels so the results are not surprising, this cohort of respondents chose these attribute levels after going through the entire DCE survey wherein they had to make trade-offs among attribute levels in each DCE scenario presented to them. So the results show their relative importance to the respondents.

There are no significant differences in the average utility among the remaining attribute levels for the entire group of respondents for the other three institutional

[88] 'AveSalEHE=$42000' symbolizes the previously mentioned listing 'Average Salary after graduating =$42,000 for social science majors like English, History, Education; $80,000 for majors like Business, Science, Math, Computer Engineering; and $56,000 for professional degrees like nursing'. These symbols are listed out in Appendix 7. The symbol, 'AveSalEHE=$42000' will be used henceforth in the text to symbolize this attribute level for average salary.

attributes: Distance from home (DistHome), tuition level, and the *U.S. News & World Report* ranking (USNWRank); this can be seen above as the utility profiler shows a relatively flat line across the attribute levels for these attributes. However, the Effect Marginals table shows that respondents had a slight preference among the choices given for a distance from home that was less than 50 miles away, a tuition price that was the lowest at $13,000, and a *U.S. News & World Report* ranking of #46[89]. The preference for these attribute levels (distance from home, ranking, and tuition) was less pronounced than were preferences for the other three attributes (graduation rate, average employment rate 1 year after graduation, and average salary after graduation), which may show that the latter attributes were more important to survey respondents[90].

4.9 Interactions of the attributes with two covariates: Race and gender

The Effects Summary, Table 4.9.1, tells which attributes have significant interactions with covariates. Two characteristic variables, or covariates were included in this model run: race and gender. Race and gender were chosen because these are important characteristics for analysis purposes.

[89] While this result is not in line with what is expected or what the research on college choice would say, it should be noted that students from students from higher income families generally prefer higher ranked institutions, and these utility levels are the result of students making choices and trade-offs in 18 DCE scenarios.

[90] It should be noted that the length of the bars in the Effect Marginals table does not show respondents utility levels as they relate to the different attribute levels; the bars show the difference in the utility means between attribute levels.

Table 4.9.1: Effect Summary- RACE AND GENDER

Effect Summary

Source	LogWorth	PValue
No Choice Indicator	78.038	0.000
AveSalEHE	30.378	0.000
AveEmploy1Yr	30.190	0.000
AveGradin6	8.634	0.000
Race*No Choice Indicator	4.032	0.000
Race*AveEmploy1Yr	2.209	0.006
Race*AveSalEHE	2.115	0.008
Gender*No Choice Indicator	1.538	0.029
Tuition	0.843	0.143
Race*DistHome_	0.614	0.243
Gender*AveSalEHE	0.560	0.276
USNWRrank	0.539	0.289
Race*USNWRrank	0.388	0.409
Gender*DistHome_	0.339	0.458
Gender*AveGradin6	0.296	0.506
Race*AveGradin6	0.242	0.573
DistHome_	0.198	0.633
Gender*USNWRrank	0.189	0.648
Race*Tuition	0.151	0.706
Gender*Tuition	0.078	0.836
Gender*AveEmploy1Yr	0.033	0.927

Note: Only the colors in red and orange under the column 'p-values' should be read as significant. The text color is red if the p-value <.05 and orange if the p-value is <.01.

The table shows the main effects and interactions in order of significance. All of the significant main effects and interactions have a p-value color coded in orange and red[91]. For example, the Effects Summary table tells us, firstly, that the No choice indicator was highly significant with a p value=.00, which means that the no choice responses among students may need to be examined in the utility profiler. However, as shown earlier, for the "No Choice" responses the relative frequencies for each level of the attributes are almost equal; thus the probability of selecting "No Choice" is very similar across the three levels of each attribute. Therefore, we will only examine main effects and

[91] The number in red, .033, for 'Gender*AveEmploy1Yr' can be ignored as the coloring does not symbolize anything.

interactions without the "No Choice" effect. In terms of the attributes only, the average salary, average employment rate 1-year after graduation, and average graduation rate were significant. Additionally, the interactions that were significant include: Race and the No choice indicator, Race and average salary, Race and average employment rate 1-year after graduation, and Gender and the No choice indicator. Race is not broken down in the Effects Summary table in JMP; the different levels of race are only broken down in the parameter estimates table.

Again, while the No-Choice Indicator was highly significant, this parameter will be ignored when entering information into the utility profiler as this option merely served the purpose of being a check on whether respondents were sure of their answer on the first choice set presented to them in each trial.

Table 4.9.2: Parameter Estimates Table- RACE AND GENDER[92]

Term	Estimate	Std Error	Lower 95%	Upper 95%	Z Values	P Value	Signif
AveGradin6[3/10 people]	-0.2464	0.0451	-0.334	-0.1593	-5.4634	0.0000	***
AveGradin6[5/10 people]	0.0181	0.048	-0.075	0.1113	0.3771	0.3531	
DistHome_[<50 miles]	0.0455	0.047	-0.045	0.137	0.9681	0.1665	
DistHome_[>500 miles]	-0.0273	0.0436	-0.112	0.0567	-0.6261	0.2656	
Tuition[13000.00]	0.0921	0.0451	0.0047	0.1791	2.0421	0.0206	*
Tuition[23000.00]	-0.0475	0.0465	-0.137	0.0428	-1.0215	0.1535	
AveEmploy1Yr[2/of 10 people]	-0.3542	0.0436	-0.439	-0.2707	-8.1239	0.0000	***
AveEmploy1Yr[5/of 10 people]	-0.0574	0.0514	-0.157	0.0423	-1.1167	0.1321	
USNWRrank[#46]	-0.0052	0.0441	-0.091	0.0803	-0.1179	0.4531	
USNWRrank[#7]	0.0557	0.042	-0.026	0.1366	1.3262	0.0924	
AveSalEHE[23000.00]	-0.4589	0.0498	-0.556	-0.3629	-9.2149	0.0000	***
AveSalEHE[33000.00]	-0.0287	0.0423	-0.111	0.0532	-0.6785	0.2487	
No Choice Indicator	-0.8169	0.0484	-0.913	-0.7244	######	0.0000	***

[92] The significant effects are shown as follows: * (red) are p values, <.05, ** (yellow) are p values<.01 and *** (yellow) are p values<.001.

Race[1]*AveGradin6[3/10 people]	-0.0449	0.0769	-0.195	0.1046	-0.5839	0.2797	
Race[1]*AveGradin6[5/10 people]	-0.0572	0.0819	-0.217	0.1026	-0.6984	0.2425	
Race[1]*DistHome_[<50 miles]	-0.1554	0.0778	-0.307	-0.0039	-1.9974	0.0229	*
Race[1]*DistHome_[>500 miles]	0.0991	0.0733	-0.044	0.2418	1.3520	0.0882	
Race[1]*Tuition[13000.00]	0.0012	0.0759	-0.147	0.1488	0.0158	0.4937	
Race[1]*Tuition[23000.00]	-0.0068	0.0795	-0.162	0.1483	-0.0855	0.4659	
Race[1]*AveEmploy1Yr[2/of 10 people]	0.208	0.0728	0.0663	0.3498	2.8571	0.0021	**
Race[1]*AveEmploy1Yr[5/of 10 people]	-0.0096	0.0876	-0.18	0.161	-0.1096	0.4564	
Race[1]*USNWRrank[#46]	0.1768	0.0746	0.0319	0.3225	2.3700	0.0089	**
Race[1]*USNWRrank[#7]	-0.0739	0.0715	-0.213	0.0651	-1.0336	0.1507	
Race[1]*AveSalEHE[23000.00]	0.0547	0.0846	-0.111	0.2194	0.6466	0.2590	
Race[1]*AveSalEHE[33000.00]	0.0417	0.0724	-0.099	0.1826	0.5760	0.2823	
Race[1]*No Choice Indicator	0.0623	0.0821	-0.099	0.2217	0.7588	0.2240	
Race[2]*AveGradin6[3/10 people]	0.0466	0.0551	-0.06	0.1538	0.8457	0.1989	
Race[2]*AveGradin6[5/10 people]	0.0138	0.059	-0.101	0.1284	0.2339	0.4075	
Race[2]*DistHome_[<50 miles]	0.0383	0.0574	-0.074	0.1499	0.6672	0.2523	
Race[2]*DistHome_[>500 miles]	-0.0889	0.0533	-0.192	0.0149	-1.6679	0.0477	*
Race[2]*Tuition[13000.00]	-0.0235	0.0549	-0.13	0.0833	-0.4281	0.3343	
Race[2]*Tuition[23000.00]	0.019	0.057	-0.092	0.1297	0.3333	0.3694	
Race[2]*AveEmploy1Yr[2/of 10 people]	-0.0505	0.053	-0.153	0.0529	-0.9528	0.1703	
Race[2]*AveEmploy1Yr[5/of 10 people]	0.002	0.0629	-0.12	0.1242	0.0318	0.4873	
Race[2]*USNWRrank[#46]	0.0365	0.0539	-0.068	0.1411	0.6772	0.2491	
Race[2]*USNWRrank[#7]	-0.0266	0.0512	-0.126	0.0728	-0.5195	0.3017	
Race[2]*AveSalEHE[23000.00]	-0.1627	0.0606	-0.28	-0.0445	-2.6848	0.0036	**
Race[2]*AveSalEHE[33000.00]	0.0241	0.0513	-0.076	0.1237	0.4698	0.3193	
Race[2]*No Choice Indicator	-0.0997	0.0595	-0.215	0.0172	-1.6756	0.0469	*
Race[3]*AveGradin6[3/10 people]	0.0202	0.071	-0.118	0.1584	0.2845	0.3880	
Race[3]*AveGradin6[5/10 people]	-0.0125	0.0753	-0.159	0.1343	-0.1660	0.4341	
Race[3]*DistHome_[<50 miles]	0.0518	0.0726	-0.09	0.1932	0.7135	0.2378	
Race[3]*DistHome_[>500 miles]	-0.0188	0.068	-0.151	0.1135	-0.2765	0.3911	
Race[3]*Tuition[13000.00]	-0.1137	0.0702	-0.251	0.0228	-1.6197	0.0527	
Race[3]*Tuition[23000.00]	0.0825	0.0725	-0.059	0.2238	1.1379	0.1276	
Race[3]*AveEmploy1Yr[2/of 10 people]	0.083	0.0679	-0.049	0.2152	1.2224	0.1108	
Race[3]*AveEmploy1Yr[5/of 10 people]	-0.0217	0.0799	-0.178	0.1339	-0.2716	0.3930	
Race[3]*USNWRrank[#46]	0.0975	0.0689	-0.036	0.2317	1.4151	0.0785	
Race[3]*USNWRrank[#7]	-0.0783	0.0661	-0.207	0.05	-1.1846	0.1181	
Race[3]*AveSalEHE[23000.00]	0.1018	0.0771	-0.049	0.2519	1.3204	0.0934	

Race[3]*AveSalEHE[33000.00]	-0.1154	0.0664	-0.245	0.0136	-1.7380	0.0411	*
Race[3]*No Choice Indicator	0.2422	0.0739	0.098	0.3861	3.2774	0.0005	***
Race[4]*AveGradin6[3/10 people]	-0.1993	0.1299	-0.454	0.0507	-1.5343	0.0625	
Race[4]*AveGradin6[5/10 people]	0.1965	0.1403	-0.073	0.4725	1.4006	0.0807	
Race[4]*DistHome_[<50 miles]	0.0194	0.1389	-0.25	0.2915	0.1397	0.4445	
Race[4]*DistHome_[>500 miles]	0.1817	0.1239	-0.06	0.4212	1.4665	0.0713	
Race[4]*Tuition[13000.00]	0.2747	0.1311	0.0205	0.5301	2.0953	0.0181	*
Race[4]*Tuition[23000.00]	-0.0876	0.1374	-0.353	0.1811	-0.6376	0.2619	
Race[4]*AveEmploy1Yr[2/of 10 people]	-0.2415	0.1255	-0.489	-0.0025	-1.9243	0.0272	*
Race[4]*AveEmploy1Yr[5/of 10 people]	0.053	0.1475	-0.233	0.3405	0.3593	0.3597	
Race[4]*USNWRrank[#46]	-0.0495	0.13	-0.3	0.205	-0.3808	0.3517	
Race[4]*USNWRrank[#7]	0.1435	0.1205	-0.091	0.3762	1.1909	0.1169	
Race[4]*AveSalEHE[23000.00]	-0.2914	0.1522	-0.593	-0.0004	-1.9146	0.0278	*
Race[4]*AveSalEHE[33000.00]	0.1994	0.1222	-0.036	0.4383	1.6318	0.0514	
Race[4]*No Choice Indicator	0.0027	0.1396	-0.276	0.2677	0.0193	0.4923	
Race[5]*AveGradin6[3/10 people]	-0.0193	0.0804	-0.176	0.1371	-0.2400	0.4051	
Race[5]*AveGradin6[5/10 people]	0.0618	0.0854	-0.104	0.2286	0.7237	0.2346	
Race[5]*DistHome_[<50 miles]	0.0524	0.0822	-0.108	0.213	0.6375	0.2619	
Race[5]*DistHome_[>500 miles]	-0.0464	0.0774	-0.197	0.104	-0.5995	0.2744	
Race[5]*Tuition[13000.00]	-0.0057	0.0795	-0.161	0.1488	-0.0717	0.4714	
Race[5]*Tuition[23000.00]	-0.0391	0.0827	-0.2	0.1224	-0.4728	0.3182	
Race[5]*AveEmploy1Yr[2/of 10 people]	0.1053	0.0755	-0.042	0.2521	1.3947	0.0816	
Race[5]*AveEmploy1Yr[5/of 10 people]	-0.07	0.0926	-0.25	0.1105	-0.7559	0.2248	
Race[5]*USNWRrank[#46]	-0.0287	0.078	-0.18	0.1236	-0.3679	0.3565	
Race[5]*USNWRrank[#7]	0.0187	0.0742	-0.126	0.1629	0.2520	0.4005	
Race[5]*AveSalEHE[23000.00]	0.0214	0.0887	-0.152	0.1938	0.2413	0.4047	
Race[5]*AveSalEHE[33000.00]	0.0343	0.0745	-0.111	0.1795	0.4604	0.3226	
Race[5]*No Choice Indicator	-0.2641	0.0908	-0.443	-0.0888	-2.9086	0.0018	**
Gender[1]*AveGradin6[3/10 people]	-0.0289	0.0283	-0.084	0.0264	-1.0212	0.1536	
Gender[1]*AveGradin6[5/10 people]	0.0312	0.0304	-0.028	0.0907	1.0263	0.1524	
Gender[1]*DistHome_[<50 miles]	0.001	0.0291	-0.056	0.0578	0.0344	0.4863	
Gender[1]*DistHome_[>500 miles]	0.0276	0.0271	-0.025	0.0805	1.0185	0.1542	
Gender[1]*Tuition[13000.00]	-0.0093	0.0279	-0.064	0.0453	-0.3333	0.3694	
Gender[1]*Tuition[23000.00]	-0.0081	0.0292	-0.065	0.0491	-0.2774	0.3907	
Gender[1]*AveEmploy1Yr[2/of 10 people]	-0.0101	0.0267	-0.062	0.0421	-0.3783	0.3526	
Gender[1]*AveEmploy1Yr[5/of 10 people]	0.0054	0.0322	-0.058	0.0684	0.1677	0.4334	
Gender[1]*USNWRrank[#46]	-0.0238	0.0275	-0.078	0.03	-0.8655	0.1934	

Gender[1]*USNWRrank[#7]	0.0068	0.0261	-0.044	0.0578	0.2605	0.3972	
Gender[1]*AveSalEHE[23000.00]	-0.0171	0.0309	-0.078	0.0433	-0.5534	0.2900	
Gender[1]*AveSalEHE[33000.00]	-0.0249	0.0261	-0.076	0.0262	-0.9540	0.1700	
Gender[1]*No Choice Indicator	0.0666	0.0305	0.0068	0.1262	2.1836	0.0145	*
AICc	15684.22						
BIC	16317.01						
-2*LogLikelihood	15500.09						
-2*Firth LogLikelihood	14957.26						
Converged in Gradient							
Firth Bias-Adjusted Estimates							

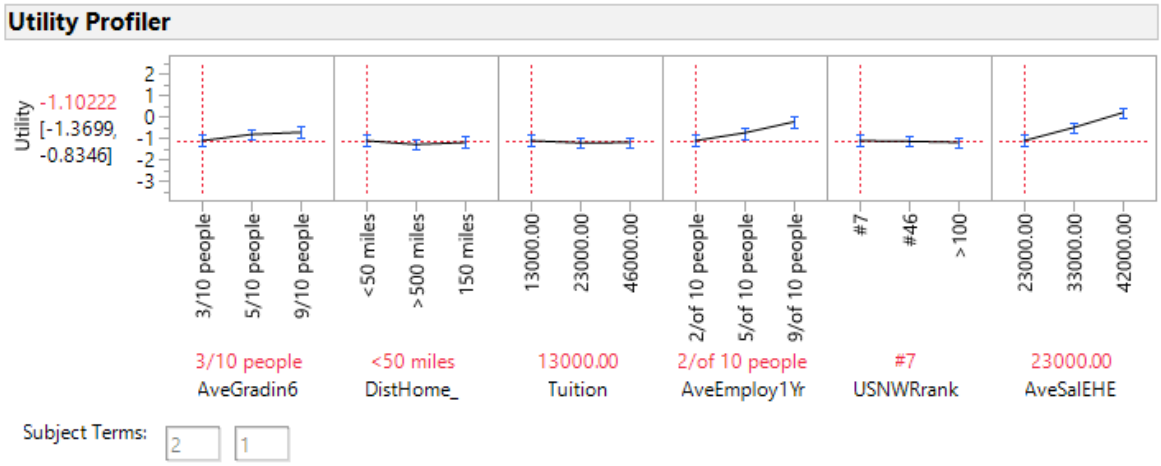
The parameter estimates table, Table 4.9.2, is much like the Effects Summary table in that they both guide us by indicating which attribute levels are significant. Focusing on the rows collared in yellow or red, or the column marked “Significance”, all of the rows with stars (*) are significant.

4.9.3 Utility Profiler: Race & Gender

The utility profiler, as stated earlier, averages out the utility levels across all respondents and tells which institutional attribute levels, based on the characteristic variables (race, gender, grade level, etc.), have the maximum utility. This section will show which attribute levels have the highest utility levels for the survey respondents based on race and gender only.

Figure 4.9.3.1: Utility for African-American respondents, who are male[93]

Figure 4.9.3.2: Utility for Caucasian respondents, who are male



[93] The 'subject terms' at the bottom of the utility profiler in Figure 4.8.1 show the characteristic variables that were entered into the utility profiler.

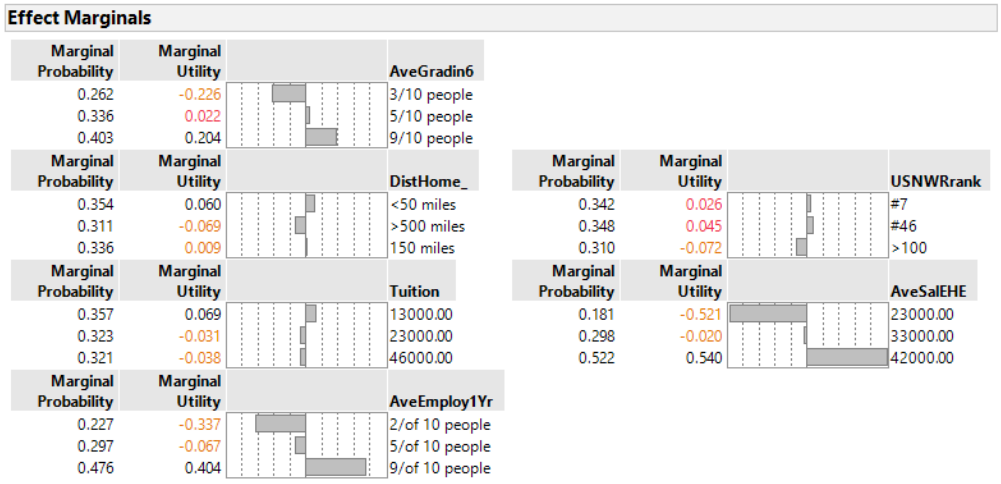
Figure 4.9.3.3: Utility for Caucasian respondents, who are female

Above, in Figures 4.9.3.1-4.9.3.3, respectively, are the utility profiles for survey respondents who are African-American male, Caucasian male, and Caucasian female[94]. The attribute levels that respondents in all three of these subgroups got the most utility out of were: Average graduation rate in 6 years (AveGradin6) = 9/10 people, Average Employment rate 1 Year after graduation (AveEmploy1Yr) = 9/10 people, and Average Salary after graduating =$42000 for social science majors like English, History, Education; $80,000 for majors like Business, Science, Math, Computer Engineering; and $56,000 for professional degrees like nursing (AveSalEHE=$42000). As explained, while these attribute levels were designed to be the best/most favorable attribute levels, these cohorts of respondents chose these attribute levels after going through the entire DCE survey wherein they had to make trade-offs in each DCE scenario presented to them. These cohorts shown in figures 4.9.3.1-4.9.3.3 had similar preferences. There aren't significant differences in the average utility among the remaining attribute levels for the subgroups of respondents shown in figures 4.9.3.1-4.9.3.3 for the other three attributes:

[94] There are a multitude of characteristic variables that could be included for analysis in the utility profiler, however in this section I will focus on respondents with the largest representation in the sample.

Distance from home (DistHome), tuition levels, and the *U.S. News & World Report* ranking (USNWRank). This can be seen above as the utility profiler shows a relatively flat line between the attribute levels for these attributes.

Figure 4.9.4: Effect Marginals with Covariates Race and Gender



The Effect Marginals, Figure 4.9.4, show that respondents had a slight preference for a distance from home that was less than 50 miles away, a tuition price that was the lowest at $13,000, and a *U.S. News & World Report* ranking of #46. The preference for these attribute levels was less pronounced than it was for the other three attributes (Graduation rate, Average employment rate 1 year after graduation, and Average salary after graduation) which may show that the latter attributes were more important to survey respondents. However, the marginal utilities for some of these attribute levels did not show as being significant.

4.10 Interactions of the attributes with all the covariates; Grade, Race, Income, Gender, Major, SAT and AP

From the Effects Summary, Table 4.10.1, we can see that the following attributes and first order interactions are significant: The full table of results is given in Appendix 8.

The effects in Table 4.10.1 are ranked by P-Values, LogWorth, and length of bar (or number of plus signs) in the bar chart. The most significant effect, which is given first, has the largest LogWorth, the longest bar or row of plus signs, and the smallest p-value. As stated earlier, the reason why these attributes, interactions, and attribute levels are significant is because there are significant differences between groups for these parameters. Table 4.10.2, the Parameter Estimates, shows the interactions and attribute levels that were significant.

Table 4.10.1: Effect Summary- Grade, Race, Income, Gender, Major, SAT and AP

Effect Summary			
Source	LogWorth		PValue
AP*AveSalEHE	12.51	+++++++++	0.0000
Grade*No Choice Indicator	9.52	+++++++++	0.0000
No Choice Indicator	6.56	+++++++	0.0000
AP*No Choice Indicator	6.55	+++++++	0.0000
Income*No Choice Indicator	5.63	++++++	0.0000
Grade*AveSalEHE	5.62	++++++	0.0000
SAT*AveSalEHE	5.41	++++++	0.0000
Gender*No Choice Indicator	3.48	++++	0.0000
Grade*DistHome_	3.25	++++	0.0010
Income*AveSalEHE	2.88	+++	0.0010
Race*No Choice Indicator	2.47	+++	0.0030
Income*AveEmploy1Yr	2.37	+++	0.0040
Race*AveEmploy1Yr	2.34	+++	0.0050
AP*AveEmploy1Yr	2.18	++	0.0070
Race*AveSalEHE	2.16	++	0.0070
Major*AveSalEHE	2.08	++	0.0080
SAT*AveGradin6	1.33	+	0.0470

The Effects Summary, Table 4.10.1, demonstrates which attributes and characteristics have significant interactions and thus shows which attributes and characteristics to manipulate in the utility profiler, which is shown below[95]. The next paragraphs simply summarize Table 4.10.1 in words so the reader has a better understanding of how to read the Effects Summary table.

The Effects Summary table shows the main effects and interactions in order of significance. For example, it tells us, firstly, that individuals who took AP courses (AP) and the attribute indicating the average salary of graduates within a given field of study

[95] Note: the point of this section is not to look for the direction of the interactions between a characteristic variable and an attribute level as the utility profiler tells us the direction of the relationship in terms of the value respondents placed on each attribute level.

(AveSalEHE) have a significant interaction (and the largest LogWorth value). This indicates that the choice of the attribute AveSalHe is associated with whether the respondent indicated that they have taken AP courses. Whether the respondent scored above or below 600 on their SAT Math section (SAT) and the attribute AveSalEHE is also significant. The remaining significant interactions in the Effects Summary table can be seen in the table and by using Appendix 7, which lists out what each abbreviation symbolizes.

Table 4.10.2: Parameter Estimates- Grade, Race, Income, Gender, Major, SAT and AP

Parameter Estimates	Estimate	Std Error	z-value	p-value
AveSalEHE[33000.00]	0.59	0.29	2.04	0.02
No Choice Indicator	-1.81	0.36	-5.01	0.00
Grade[1]*AveSalEHE[23000.00]	0.19	0.09	2.24	0.01
Grade[2]*DistHome_[<50 miles]	-0.16	0.08	-2.03	0.02
Grade[2]*No Choice Indicator	0.46	0.09	5.10	0.00
Race[1]*DistHome_[<50 miles]	-0.16	0.08	-2.00	0.02
Race[1]*AveEmploy1Yr[2/of 10 people]	0.24	0.08	3.23	0.00
Race[1]*USNWRrank[#46]	0.19	0.08	2.45	0.01
Race[2]*AveSalEHE[23000.00]	-0.17	0.07	-2.62	0.00
Race[3]*No Choice Indicator	0.17	0.08	2.13	0.02
Race[5]*No Choice Indicator	-0.23	0.09	-2.45	0.01
Income[1]*AveEmploy1Yr[2/of 10 people]	0.09	0.04	2.14	0.02
Income[1]*AveSalEHE[23000.00]	0.11	0.05	2.20	0.01
Income[2]*AveEmploy1Yr[2/of 10 people]	-0.15	0.04	-3.66	0.00
Income[2]*AveSalEHE[23000.00]	-0.13	0.05	-2.77	0.00
Income[2]*No Choice Indicator	-0.16	0.05	-3.40	0.00
Gender[1]*No Choice Indicator	0.11	0.03	3.53	0.00
Major[1]*AveSalEHE[23000.00]	-0.10	0.04	-2.78	0.00
SAT[1]*AveGradin6[3/10 people]	-0.06	0.03	-2.00	0.02
SAT[1]*AveSalEHE[23000.00]	-0.13	0.03	-3.94	0.00
AP[1]*AveGradin6[3/10 people]	-0.69	0.29	-2.37	0.01
AP[1]*Tuition[13000.00]	0.67	0.25	2.62	0.00
AP[1]*AveEmploy1Yr[2/of 10 people]	-0.60	0.28	-2.14	0.02
AP[1]*AveSalEHE[33000.00]	-0.69	0.28	-2.43	0.01
AP[2]*DistHome_[>500 miles]	-0.56	0.28	-1.99	0.02
AP[2]*Tuition[13000.00]	0.61	0.25	2.40	0.01
AP[2]*AveSalEHE[33000.00]	-0.69	0.28	-2.43	0.01
AP[2]*No Choice Indicator	0.86	0.35	2.45	0.01

Note: The coding for this table can be viewed in Appendix 7

The Parameter Estimates table, Table 4.10.2, is much like the Effects Summary table in that they both guide us by indicating which attribute levels and interactions between characteristic variables and attribute levels are significant, so we will know: a) which characteristics variables to enter into the utility profiler; and b) the attribute levels that should be given attention, as these are parameters that are significant. The estimates

are the coefficients of the levels (values) of the attributes and the attribute by covariate interactions in the RUM. As an example, the first estimate for AveSalEHE[33000.00] says that the marginal utility of AveSalEHE[33000.00], the middle level of the given levels (values) for the attribute average salary, is .59 which is significant at the p-value <.05. The z- value, which is the parameter estimate divided by the standard error, for AveSalEHE[33000.00] is .59/.29= 2.04 . Whether a main effect or interaction is significant does not tell us the direction of the relationship between the characteristic and the independent variables, i.e. the attribute levels; significance only tells us that the relationship did not happen by chance and that these are the variables to pay attention to in the utility profiler.

The parameter estimates from Table 4.10.2 tell us that two main effects are significant: the attribute level: AveSalEHE=$33000 (Average Salary after graduating =$33,000 for social science majors like English, History, Education; $46,000 for majors like Business, Science, Math, Computer Engineering; and $41,000 for professional degrees like nursing), and the no choice option. The fact that AveSalEHE=$33000 is significant means that we keep it in the random utility model (RUM), and analyze it in the utility profiler. The no-choice option can be ignored as explained earlier. The remaining listings in the above table show interactions that are significant, for example, Senior class members (Grade1) and the lower value for the attribute average graduate salary: Average Salary after graduating =$23,000 for social science majors like English, History, Education; $34,000 for majors like Business, Science, Math, Computer Engineering, and $31,000 for professional degrees like nursing (AveSalEHE[23000]).

Please refer to Appendix 7 for a full listing of all of the abbreviations in order to understand each of the significant interactions shown in the table.

4.10.3 Utility Profiler

The utility profiler averages out the utility levels across all respondents and tells us which attribute levels, interacted with the characteristic variables (race, gender, grade level, etc.), have the maximum utility. The utility profiler works by having the analyst enter in different levels of characteristic variables, i.e. Caucasian or African-American or Hispanic for race/ethnicity; and senior, junior or sophomore, etc. for class level and, based upon the pattern of respondent answers to the questions posed, gives the utility levels of each attribute level for respondents with the characteristic settings entered. This section explains which attribute levels have the highest utility for given groups of respondents, e.g. senior, African-American students who have a reported family income level above $100,000, who are male, know what they will be majoring in during college, have an SAT math score above 600, and have taken AP courses. The N, or the number of respondents that fit into this cohort (i.e. have this set of characteristics), is also given.

Throughout the survey, with each trial or DCE scenario, respondents were given two college options with varying attribute levels as described previously. The levels or values presented for each attribute varied randomly. With each DCE scenario presented, respondents were forced to make trade-offs between options that had both desirable and undesirable attribute levels. For example, one college option presented may have excellent employment statistics but be ranked very low by *U.S. News* and be very far from home while the other option may have poor employment statistics, but be very close to home and be ranked very high. While this particular scenario is unlikely in the real

world, the random nature of the selection of attribute levels for each college choice presented to respondents was necessary to ensure an unbiased survey. The respondent then would have to decide how important good employment statistics in a university/college are to them relative to other attributes presented. After the respondent has finished the survey and completed the 18 DCE scenarios presented to them, they have made a number of trade-offs. The utility profiler, based on the choices and trade-offs made by the respondent, attaches a utility level to each choice among attributes and their levels and eventually averages out the utilities of these across all of the respondents and their characteristics.

With seven characteristics there are many combinations that could be analyzed in the utility profiler, so I will focus on the attribute levels that are significant (with a p-value<.05 or better) as shown by the parameter estimates table and the likelihood ratio test.

From these tables, I will focus on the characteristic variables that showed up as significant in the Effects Summary and Parameter Estimates tables. These characteristic variables are significant based on the Effects Summary and Parameter Estimates tables: Seniors (Grade1), Juniors (Grade2), African-Americans (Race1), Caucasians (Race2), estimated family income level above $100,000 (Income1), estimated family income level below $100,000 (Income2), respondent indicated that they know what they will be majoring in (Major1), respondent indicated they scored above 600 on their SAT math section (SAT1), respondent has taken AP courses (AP1) and respondents have not taken AP courses (AP2). Whether respondents knew or didn't know their family income level showed up as statistically significant as Income1 and AveEmploy1yr[2/10 people],

Income1 and AveSalHE[23000], Income2 andAveEmploy1Yr[2/10 people], and Income2 and AveSal[23000] were all significant.

Figure 4.10.3.1: Utility for Senior, African-Americans, who have a reported family income level above $100,000, who are male, know what they will be majoring in in college, have a SAT math score above 600, and have taken AP courses

Above, in Figure 4.10.3.1, are the utility results for Senior African-American students who have a reported family income level above $100,000, who are male, know what they will be majoring in during college, report a SAT math score above 600, and have taken AP courses. For this cohort of respondents, N=3 and produces 270 rows of data. The attribute levels that showed the highest utility for this cohort were: Average graduation rate in 6 years (AveGradin6) = 9/10 people, Average Employment rate 1 Year after graduation (AveEmploy1Yr) = 9/10 people, and Average Salary after graduating =$42000 for social science majors like English, History, Education; $80,000 for majors like Business, Science, Math, Computer Engineering; and $56,000 for professional degrees like nursing (AveSalEHE=$42000). While these attribute levels were designed to be the best/most favorable attribute levels, the utility profiler tells us that this cohort of

respondents preferred these attribute levels after going through the entire DCE survey wherein they had to make trade-offs across attributes and levels in each DCE scenario presented to them. There aren't any considerable differences in the average utility among the attribute levels for this group of students based on the characteristics (grade level, race, level of income, gender, etc.) entered into the utility profiler for the other three attributes: Distance from home (DistHome), tuition levels, and the *U.S. News & World Report* ranking (USNWRank); this can be seen above as the utility profiler shows a relatively flat line between the attribute levels for these attributes. Thus, respondents did not have strong preferences across the levels for these attributes.

Figure 4.10.3.2: Utility for Senior, Caucasians, who have a reported family income level above $100,000, who are male, know what they will be majoring in in college, have a SAT math score above 600, and have taken AP courses

Above, in Figure 4.10.3.2, are the utility readouts for Senior Caucasians who have a reported family income level above $100,000, who are male, know what they will be majoring in college, have a SAT math score above 600, and have taken AP courses. For this cohort of respondents, N=5 and produces 450 rows of data. The attribute levels that respondents in this subgroup got the most utility from were: AveGradin6=9/10 people,

AveEmploy1Yr=9/10 people, and Average AveSalEHE=$42000. Again, like with previous group shown in Figure 4.10.3.1, there are no significant differences in the average utility among the attribute levels for this subgroup of students based on the characteristics variables entered into the utility profiler (grade level, race, level of income, gender, etc.) for the other three attributes: DistHome, Tuition levels, and USNWRank. This can be seen above as the utility profiler shows a relatively flat line between the attribute levels for these attributes.

Figure 4.10.3.3: Utility for Junior Caucasians who have a reported family income level above $100,000, who are male, know what they will be majoring in in college, have a SAT math score above 600, and have taken AP courses

Above, in Figure 4.10.3.3, are the utility readouts for Junior Caucasians who have a reported family income level above $100,000, who are male, know what they will be majoring in college, have a SAT math score above 600, and have taken AP courses. For this cohort of respondents, N=3 and produces 270 rows of data. Like Figures 4.10.3.1 and 4.10.3.2, the settings wherein the utility levels were highest were: AveGradin6=9/10 people, AveEmploy1Yr=9/10 people, and Average AveSalEHE=$42000. Again, like the previous groups shown in Figures 4.10.3.1 and 4.10.3.2, there are no significant

differences in the average utility among the attribute levels for this group of students based on the characteristics put into the utility profiler (grade level, race, level of income, gender, etc.) for the other three attributes: DistHome, Tuition levels, and USNWRank. This can be seen above as the utility profiler shows a relatively flat line between the attribute levels for these attributes. These three groups (Senior African-Americans, Senior Caucasians, and Junior Caucasians who have a reported family income level above $100,000, who are male, know what they will be majoring in in college, have a SAT math score above 600, and have taken AP courses) were chosen because they were both statistically significant in the parameter estimates and effects summary tables and they represented a relatively large portion of the sample.

Table 4.10.4: Effect Marginals

Effect Marginals

Marginal Probability	Marginal Utility	AveGradin6
0.259	-0.24	3/10 people
0.334	0.018	5/10 people
0.407	0.218	9/10 people

Marginal Probability	Marginal Utility	DistHome_
0.355	0.066	<50 miles
0.312	-0.06	>500 miles
0.332	-0.00	150 miles

Marginal Probability	Marginal Utility	Tuition
0.355	0.063	13000.00
0.323	-0.03	23000.00
0.322	-0.03	46000.00

Marginal Probability	Marginal Utility	AveEmploy1Yr
0.223	-0.35	2/of 10 people
0.296	-0.07	5/of 10 people
0.481	0.419	9/of 10 people

Marginal Probability	Marginal Utility	USNWRrank
0.343	0.030	#7
0.349	0.046	#46
0.308	-0.08	>100

Marginal Probability	Marginal Utility	AveSalEHE
0.174	-0.55	23000.00
0.297	-0.01	33000.00
0.529	0.564	42000.00

Table 4.10.4 gives the overall marginal utility levels at each level for each attribute as well as the marginal probabilities of occurrence of each attribute level. The marginal probability gives the overall probability a given respondent would choose an institution with a certain attribute level, given all other attribute levels are at their "mean

values" (JMP, 2019). The marginal probabilities are the sum of the probabilities for each cohort of individuals, i.e. males/females, juniors/seniors, etc. and thus give the probability for all respondents. For example, the probability is .529 that respondents overall chose the highest value of graduate average salary (AveSalEHHE) over the other attribute levels for average salary when all the other attributes are held constant at their mean values, after going through 36 DCE scenarios in which they had to make tradeoffs between more and less favorable levels for the six institutional attributes. Thus, the marginal probability tells us that the probability a respondent would choose the highest available level in the case of the graduate salary attribute, after making a number of tradeoffs in going through 36 DCE scenarios, is .529, or respondents would make this choice a little over half the time. The maximum marginal utility is achieved for the following values of the 6 attributes, which are listed in order of highest to lowest marginal utility: Average AveSalEHE=$42000, AveEmploy1Yr=9/10 people, AveGradin6[9/10 people], DistHome_[<50 miles], Tuition[13000.00], and USNWRrank[#46].

Clearly, respondents' preferences for some attributes' preferred values, namely graduate salary and chances for employment, were much stronger than for other attributes.

4.11 Interactions of the attributes with three covariates: Race, Gender, and income

Table 4.11.1: Effect Summary- RACE, GENDER, and income

Effect Summary			
Source	LogWorth		PValue
No Choice Indicator	84.359	+++++++++	0
AveSalEHE	31.819	+++++++++	0
AveEmploy1Yr	31.588	+++++++++	0
AveGradin6	7.956	++++	0
Income*No Choice Indicator	6.928	+++	0
Race*No Choice Indicator	3.886	++	0.00013
Income*AveSalEHE	3.175	+	0.00067
Income*AveEmploy1Yr	2.938	+	0.00115
Race*AveEmploy1Yr	2.447	+	0.00357
Gender*No Choice Indicator	2.093	+	0.00807
Race*AveSalEHE	2.053	+	0.00885
Tuition	1.053		0.08858
USNWRrank	0.808		0.15549
Race*DistHome_	0.678		0.20998
Gender*AveSalEHE	0.397		0.4009
Race*USNWRrank	0.381		0.41634
Income*AveGradin6	0.336		0.46164
Income*Tuition	0.317		0.48149
Income*USNWRrank	0.309		0.49126
Gender*AveGradin6	0.307		0.4928
Gender*DistHome_	0.3		0.50065
DistHome_	0.287		0.51656
Gender*USNWRrank	0.215		0.60898
Race*AveGradin6	0.213		0.61298
Race*Tuition	0.19		0.64545
Income*DistHome_	0.116		0.765
Gender*Tuition	0.085		0.82209
Gender*AveEmploy1Yr	0.009		0.9796

Note: p-values in yellow are significant

The Effects Summary, 4.11.1, shows the main effects and interactions in order of significance. For example, the Effects Summary table tells us, firstly, that the AveSalEHE indicator was highly significant with a p value=.00. Additionally,

AveEmploy1Yr, AveGradin6, etc. were all significant. It should be noted that AveSalEHE and AveEmploy1Yr had a logworth values that were almost equivalent and much higher in value than the other attributes and interactions listed in the Effects Summary table, which means these two attributes were more statistically significant than the other main effects and interactions listed. Some of the interactions that were very significant in terms of having a high logworth value include: Race and AveEmploy1Yr, Income and AveEmploy1Yr, and Income*AveSaleEHE.

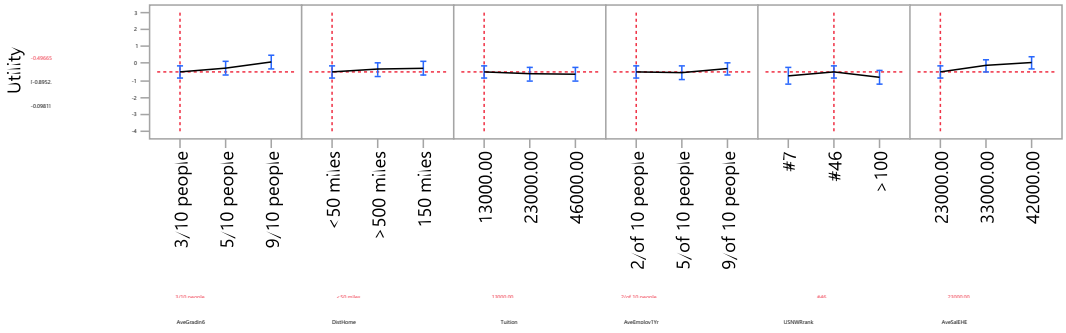
The parameter estimates table in Appendix 36 is much like the Effects Summary table in that they both guide us by indicating which attribute levels are significant. Focusing on the column marked "Sig", all of the rows with stars (*) are significant.

4.11.3: Utility Profiler Results: Race, Gender, and Income

The utility profiler, as stated earlier, averages out the utility levels across all respondents and tells which institutional attribute levels, interacted with based on the characteristic variables (race, gender, grade level, etc.), have the maximum utility. This section shows which attribute levels have the highest utility for the survey respondents based on race, income and gender only. These three covariates were chosen because research shows that race, gender, and family income level are important determinants in terms of college choice.

Figure 4.11.3.1: Utility for African-American respondents, who have a reported family income level above $100,000, who are male[96]. N=4.

Figure 4.11.3.2 Utility for African-American respondents, who do not know their family income level, who are female, N=9.



Subject Terms: 132

[96] The 'subject terms' at the bottom of the utility profiler in Figure 4.8.1 show the characteristic variables that were entered into the utility profiler.

Figure 4.11.3.3: Utility for African-American respondents, who have a reported family income level below $100,000, who are male, N=2

Figure 4.11.3.4: Utility for Caucasian respondents, who have a reported family income level above $100,000, who are male, N=20

Figure 4.11.3.5: Utility for Caucasian respondents, who have a reported family income level below $100,000, who are male, N=19.

Figure 4.11.3.6: Utility for Caucasian respondents, who do not know their family income level, who are male, N=14.

Figure 4.11.3.7: Utility for African-American respondents, and have a reported family income level above $100,000, who are female, N=2.

Figure 4.11.3.8: Utility for African-American respondents, and have a reported family income level below $100,000, who are female, N=8.

Figure 4.11.3.9: Utility for Hispanic respondents, and have a reported family income level above $100,000, who are male, N=4.

Figure 4.11.3.10: Utility for Hispanic respondents, and have a reported family income level below $100,000, who are male, N=5.

Figure 4.11.3.11: Utility for Hispanic respondents, who do not know their family income level, who are male, N=7.

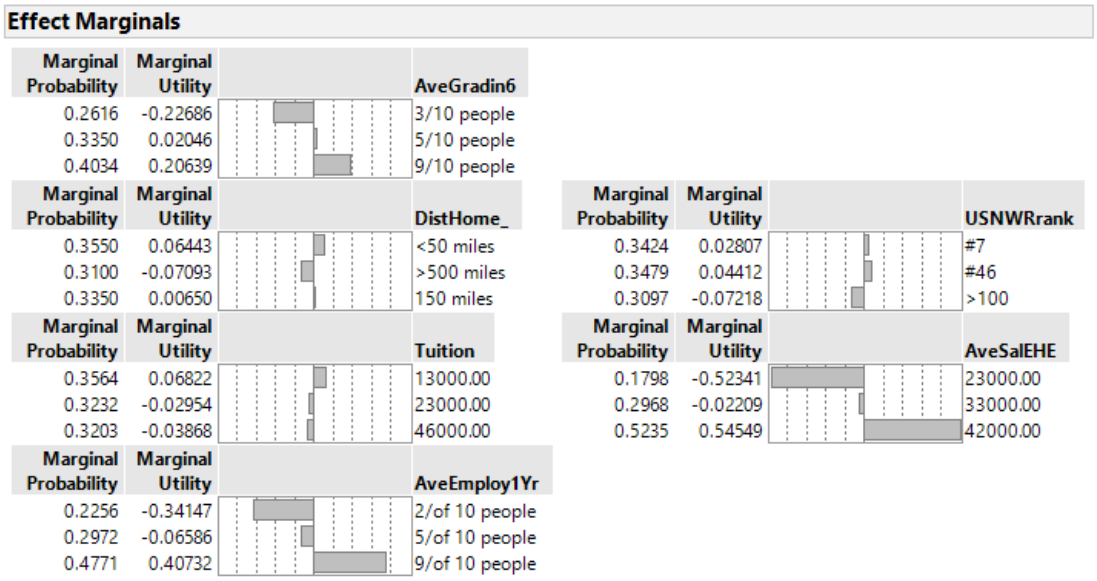
Figure 4.11.3.12: Utility for Hispanic respondents, who do not know their family income level, who are female, N=9

Above, in Figures 4.11.3.1-4.11.3.12, respectively, are the utility profiles for survey respondents who are African-American male, African-American female, Caucasian male, Caucasian female, Hispanic male, and Hispanic female who either have a reported family income level above $100,000, below $100,000 or who don't know their family income level[97]. The attribute levels that respondents in these subgroups got the most utility out of were: Average graduation rate in 6 years (AveGradin6) = 9/10 people,

[97] There are a multitude of characteristic variables that could be included for analysis in the utility profiler, however in this section I focus on respondents with the largest representation in the sample, in terms of one characteristic, race. When this characteristic is combined with two other variables however, the number of respondents represented by this new subgroup, N, is dramatically reduced. The N of these subgroups is still above what it would have been for racial groups that were not represented well in the sample.

Average Employment rate 1 Year after graduation (AveEmploy1Yr) = 9/10 people, and Average Salary after graduating =$42000 for social science majors like English, History, Education; $80,000 for majors like Business, Science, Math, Computer Engineering; and $56,000 for professional degrees like nursing (AveSalEHE=$42000). As explained, while these attribute levels were designed to be the best/most favorable attribute levels, these cohorts of respondents chose these attribute levels after going through the entire DCE survey wherein they had to make trade-offs in each DCE scenario presented to them and the cohorts with different characteristics shown in figures 4.11.3.1-4.11.3.12 had similar preferences. There aren't considerable differences in the average utility among the remaining attributes' levels for the subgroups of respondents shown in figures 4.11.3.1-4.11.3.12, namely: Distance from home (DistHome), tuition levels, and the *U.S. News & World Report* ranking (USNWRank); this can be seen above as the utility profiler shows a relatively flat line between the levels for these attributes.

Figure 4.11.4: Effect Marginals with Covariates Race, Income, and Gender



The Effect Marginals, Figure 4.11.4, show that respondents had a slight preference for a distance from home that was less than 50 miles, a tuition price that was the lowest at $13,000, and a *U.S. News & World Report* ranking of #46. The preference for these attribute levels was less pronounced than it was for the other three attributes (Graduation rate, Average Employment rate 1 year after graduation, and Average salary after graduation) which may show that the latter attributes were more important to survey respondents.

4.12: Conclusion

Table 4.12.1, which is obtained from the Effect Summary in Appendix 8 and the Likelihood Ratio Test results in Appendix 10, shows the p-values of the attributes and of the attributes by characteristic variables interactions. As can be seen, the top row is nearly empty, which means that none of the attributes have significant main effects except for the no choice alternative. Thus, when including all 7 covariates, or respondent

characteristic variables, only the no choice option is significant. However, as discussed earlier the no choice option, while still listed below can be ignored as it has no substantive meaning. Zero in a cell means that the interaction between the two variables, the attribute and the covariate was highly significant. For example, the interaction AveSalEHE*Income is significant at the .001 level. Blanks mean the effect or the interaction is not significant.

Table 4.12.1: P-Values of Significant Attributes and Covariates with their Interactions

Column1	AveGradein6	DistHome	Tuition	AvEmploy1yr	USNWRank	AveSalEHE	No Choice
Main effects							0
Interactions							
Grade		0.001				0	0
Race				0.005		0.007	0.003
Income				0.004		0.001	0
Gender							0
Major							
SAT						0	
AP				0.007		0	0

The significant effects with the p values in parentheses are:

-Grade*DistHome (.001),

-Grade*AveSalEHE (.000),

-Grade*NoChoice Indicator (.000),

-Race*AveEmploy1yr (.005),

-Race*AveSalEHE (.007),

-Race*No Choice Indicator (.003),

-Income* AveEmploy1yr (.004),

-Income*AVeSalEHE (.001),

-Income*No Choice Indicator (.000),

-Gender* No Choice Indicator (.000),

-SAT*AVeSalEHE (.000),

AP*AveEmploy1yr (.007),

AP*AveSalEHE (.000), and

AP*NoChoiceIndicator(.000).

The results show that the significant differences between the means for AveEmploy1yr are different for those who had and hadn't taken AP courses. The same could be said for Race and AveSalEHE as well as for Race and AveEmploy1yr. There were significant differences in means between the different racial groups surveyed when all of the seven covariates were included in the model. In reading the parameter estimates table, (Table 4.10.2), when Grade, Race, Income, Gender, Major, SAT and AP were included in the model, African-American respondents and distance from home less than 50 miles away, African-American and Average Employment 2 out of 10 people, Caucasian and Average Salary 23,000, Hispanic and the no choice indicator, and other/mixed race and the no choice indicator were all statistically significant interactions. In reading the effects summary table (Table 4.10.1), when all seven covariates were included Race and the no choice indicator, race and average salary, and race and average employment within 1 year, were significant effects.

When only race and gender were included in the model, as seen in section 4.9.3, the parameter estimates table (Table 4.9.2) shows that the following interactions were statistically significant: African-Americans and distance from home less than 50 miles

away, African-Americans and average employment 2 out of 10 people, Caucasian and Average Salary 23,000, Asians and average employment within 1 year[2/10 people], Asians and average salary HE[23,000], and other/mixed race and the no choice indicator. In terms of main effects, the Effects Summary table, (Table 4.9.1) shows that AveSalEHE, AveEmploy1Yr, and AveGradin6 are significant. In terms of interactions, Effects Summary table, (Table 4.9.1) shows race and the no choice indicator, race and average employment within 1 year, and race and average salaryEHE were all statistically significant with P< .008.

Finally, when three covariates (race, income, and gender) were included in the model (Section 4.11), the parameter estimates table, (Table 4.11.2), shows that the following interactions were significant: African-Americans and Distance from home less than 50 miles away, Caucasians and Distance from home greater than 500 miles away, Hispanics and Tuition[13,000], Hispanics and Average Salary [33,000], Asians and Tuition[13,000], Asians and Average Employment within 1 Year[2 out of 10 people], Asians and Average Salary HE [33,000], and Other/Mixed Race and Average Employment within 1 Year[2 out of 10 people]. In terms of Income levels, the significant interactions were: Those with a family income level above $100,000 (Income1) and Tuition[13,000], Those with a family income level less than $100,000 (Income2) and Average Employment within 1 Year[2 out of 10 people], Income2 and Average Employment within 1 Year[5 out of 10 people], Income2 and Average Salary HE [23,000]. The Effects Summary table (Table 4.11.1) showed that the following main effects and interactions were significant: Average SalaryEHE, Average Employment within 1 Year, Average Graduation rate in 6 years, Income and Average Salary HE,

Income and Average Employment within 1year, Race and Average Employment within 1year, and finally Race and Average Salary HE. All of these statistically significant main effects and interactions guided us in terms of what to focus on in the utility profiler.

The value participants with different characteristics gave to each attribute level is evident from the interactions that were significant, as was seen in the utility profiler results presented in sections 4.8.3, 4.9.3, and 4.10.3. From the utility profiler, it can be shown that the attribute levels that respondents in all of the subgroups followed a familiar pattern wherein the attribute levels from which they got the most utility were: AveGradin6=9/10 people, AveEmploy1Yr=9/10 people, and Average AveSalEHE=$42,000. This shows that, after going through the exercise of 36 DCE scenarios and making tradeoffs among attributes and their levels in each trial, respondents preferred institutions that offered the highest graduation rate, employment rate and salary level of graduates. Participants gave no significant preference towards the remaining attributes and their levels, i.e. *U.S. News & World report* ranking, tuition, and distance from home.

Thus, the results of this study, which aimed to determine what value (i.e. utility) prospective students place on the employment outcomes (E.S.) of a higher education institution (HEI), are in line with what McDonough et al (1998) found in utilizing the CIRP database and with the thrust of conclusions by other authors, i.e. Berger, 1988 Boudarbat, 2008; Antonji et al., 2011; Cannings et al., 2002; and Paulsen 1990, about the importance of post-graduation job prospects to prospective college students. In this experiment, students preferred HEI's with better employments statistics in terms of the average salary of graduates, and the average rate at which graduates obtained full time

employment after graduating even in comparison to other seemingly pertinent institutional attributes presented to them. Respondents also preferred HEI's wherein the historical graduation rates were better but to a considerably lesser degree. In addition, respondents showed some preference for HEI's that were better ranked in terms of the *U.S. News & World Report* rankings.

The next and concluding chapter will relate all of the findings of this study to some of the current research on college choice showing some of the similarities and differences between this research and studies on college choice. The chapter will also cover how this research has extended the knowledge base in this field. Finally, the chapter will indicate some of the implications and limitations of this research as well as offer some recommendations for future research.

Chapter 5

The purpose of this research was to answer the question: Would prospective college students value detailed employment information wherein the average employment rate of an entire HEI and the average salary of graduates is broken down by major of study? Would this employment information affect the college prospective students choose to attend? This chapter reviews the significance of the findings from this survey-based, discrete choice experimental research project in relation to the literature on prospective students' interest in viewing employment statistics about their potential college choices. The implications and limitations of this research project are also considered and, finally, some suggestions for future research on this topic are offered.

The primary research question addressed in this study aimed to determine what value, or "utility rating" (a measure of how useful something is to the person), prospective college students place on the employment outcome statistics (E.S.) of a higher education institution (HEI), taking account of major of study. The research was conducted via a Discrete Choice Experiments (DCE). The hypothetical employment data, broken down by major for each hypothetical HEI, included: a) average salary of graduates 1 year and 10 years after graduation, and b) average percentage of graduates who received full time employment 1 year and 10 years after graduation. The survey also included five other attributes describing this hypothetical HEI: its distance from home, *U.S. News & World Report* ranking, average graduation rate, and tuition rate, which is presented as gross tuition rates (varying by institution) minus loans and grants which are assumed to fully offset the gross tuition, thus equaling a net out-of-pocket tuition rate that is zero. Please see Appendix 1 – part B for an example of a survey question.

Much of the prevailing theory on college choice implies that, in choosing a HEI, employment statistics (E.S.) provided to students would be expected to have the highest average utility score of all institutional attributes across respondents (Berger, 1988; Boudarbat, 2008; Antonji et al., 2011; Cannings et al., 2002; Paulsen 1990). In terms of direction of preference for other attribute levels, students normatively or empirically are expected to, all else equal, prefer an institution that has the lowest net price (Savoca, 1990), is the most selective to which they gain admission (Hearn, 1991; McDonough et al, 1998), is closest to home (Zemsky & Oedel, 1983 in Hossler & Gallagher, 1987), and has the highest graduation rate[98]. In practice, of course, students must trade off among these dimensions when they choose among institutions with different values of each. This line of thinking is in line with economically-grounded research on college choice, which states that students aim to maximize their net expected utility in terms of the income earned from employment after graduation minus the costs of college. However, college choice is much more complicated and in some cases students may simply want to attend an institution they are most comfortable attending or the institution their parents attended.

Based on empirical research on college choice, students from higher income families are in general more willing than other students to attend HEI's that are far from

[98] It may be argued that the authors listed in this paragraph subscribe to economic decision theory. While I have not done a meta-analysis on all college choice literature I would say that, while some of the authors listed here do subscribe to economic decision theory wherein they assume that students want to maximize their returns on their college investment, this theoretical grounding is not applicable for all of the authors I researched. The studies I have read ranged widely methodologically but throughout all of the studies, there was a common thread found. That thread is that students are very concerned about their economic welfare as the cost of college continually increases as does the debt from college expenses. This concern was seen in McDonough et al (1998) who used the CIRP (Cooperative Institutional Research Program at UCLA) 1995 data set, which surveyed 221,897 "first-time, full-time freshmen from 432 four-year colleges and universities" and found that the number one reason freshmen decided to attend college was "to get a better job" (p.11). McDonough does not have economic decision theory as the basis for her research, she is just reporting the concerns of a large sample of freshmen.

home, very selective, have a high net price, and, concomitantly, high E.S. Thus, preferences among institutional attributes can be expected to be dependent in part on the socio-economic status of the respondent (Hoxby & Avery, 2013). Empirically, students from lower income families are generally more willing to attend less selective institutions, as they are more cost conscious. However, given the (perhaps unlikely) choice between an institution that is very selective and low in cost and an institution that is not selective and low in cost, low income students would most likely choose the HEI that is more selective. However, low income students rarely fully understand net cost after aid. This is why net cost, including loans, was set to zero for this study as a majority of respondents in this survey, particularly those from Delaware, stated that they were from households with family income levels below the national average. Students in general also tend to prefer HEI's that are closer to home.

This study found that, after weighing all these attributes in hypothetical choice scenarios, respondents preferred HEI's with highest E.S., in terms of the average employment rate and average salary of graduates 1 year after graduating. Additionally, they prefer, to a lesser extent, HEI's with a higher average graduation rate. There were no clear findings on preference for any of the other institutional attributes (distance from home, tuition rate, and *U.S. News & World Report* ranking).

5.1 Interpretations of the findings

This study surveyed 220 high school juniors and seniors from Vermont, Delaware, and Texas. Utilizing a survey-based discrete choice experiments (DCE), the students completed choice exercises to determine the utility they attributed to six

different attributes of hypothetical colleges/universities in pairwise comparisons wherein respondents were told to assume that they had gained admission into each of the choice options. Each choice scenario gave two university options listed with six 3-level attributes, such as different values for employment outcomes, graduation rate, gross tuition price, and the like.

I used the Orthogonal Main Effect Plan (OMEP) (Addelman and Kempthorne, 1961; and Addelman, 1962), which was created from a fractional factorial design, to design the survey. The OMEP resulted in 18 choice situations, or trials, for each participant. For each trial, there were two choice sets. The first choice set had two options (i.e. a choice between two hypothetical colleges with different values for the attributes) while the second choice set had three options. The second asks how sure participants were in regard to their first choice option in choice set one by giving them a choice to stay with the institution they chose in the first choice set or select a 'none of the above' option. The analysis was done using the McFadden (1973)'s conditional logit model in JMP. The entire survey is shown in Appendix 1.

Table 4.12.1, on page 129 of chapter 4, summarizes the significant main effects the study found in terms of identifying the significant relationships between respondent characteristic variables and the utilities of the various attribute levels. The dependent variable is the utility value.

The values participants gave to each attribute level among the interactions that were significant were seen in the utility profiler results given in sections 4.8.3, 4.9.3, 4.10.3, and 4.11.3, and from the Effects Marginals results in sections 4.8.4, 4.9.4, 4.10.4, and 4.11.4. From the utility profiler and the Effects Marginals, it can be seen that the

attribute levels that respondents in all of the subgroups and all survey participants preferred followed a similar pattern wherein the attribute levels they preferred most were:

Average number of students that start and graduate within 6 years equals 9 out of 10 people, average number of students who obtained employment within 1 year after graduating equals 9 out of 10 people, and Average salaries for graduates in majors like English, History, Education etc.=$33,000, Average salaries for graduates in majors like Science, Business, Computer Science etc. =$46,000; Average salaries for graduates in majors like Nursing and other prof. fields=$41,000. This shows that, after going through the exercise of 36 DCE scenarios and making tradeoffs among all six attributes and their varied levels in each scenario or trial, respondents preferred institutions that offered the highest salary level, employment rate and graduation rate (ordered in terms of the respective utility rating given by respondents).

Some important findings were gleaned from the results. Although response patterns were generally similar, some statistically significant differences were found between groups of respondents based on their characteristics, i.e. race, gender, SAT math score, family income level, AP courses taken, and whether they knew what they were going to major in during college[99]. While there are statistically significant differences among groups, as shown earlier in the utility profiler and Effects Marginals tables in Figure 4.8.3.1 and figure 4.8.4 for example, most of the respondents generally preferred the highest average salary, employment rate, and graduation rate, in that order, while they

[99] The significant attributes and significant attributes by covariates interactions are given in the Effect Summary tables in Chapter 4. The Parameter Estimates tables compare the quantitative levels of the attributes for each level of the covariates for significance. For the attributes with quantitative levels, further analyses of trends within the levels, are given in the Utility Profiler tables.

gave no preference among the different attribute levels for the remaining attributes: gross tuition, *U.S. News & World Report* ranking, and distance from home. On the whole, respondents answered as expected to the different university options presented to them.

5.1.1 How the model was fitted

This study found significant relationships between certain respondent characteristics and preferences for particular levels of the college attributes. As shown in tables 4.9.1 and 4.9.2, significant interactions between race and average employment and between race and average salary were found when race and gender were included as covariates. Significant interactions were found when race, income, and gender were included as covariates between: family income level and average salary, family income level and average employment, and race and average salary (See table 4.11.1 and Appendix 36). In tables 4.10.1 and 4.10.2 significant interactions were found as well when all of the respondent characteristics (grade, race, income, gender, major, SAT, and AP) were included as covariates. Significant interactions included: AP and average salary, SAT and average salary, and income and average salary, just to name a few. As stated in the last section, the utility profiler and Effects Marginals tables in each of these sections show survey participants preferred the attribute levels: AveGradin6=9/10 people, AveEmploy1Yr=9/10 people, and Average AveSalEHE=$42,000 consistently when confronted with the various choices systematically presented to them by the OMEP survey design.

Thus, it is fair to conclude that the students surveyed are focused on their employability after college in their decision-making about colleges. This finding is in line with the 2011 edition of the UCLA-based CIRP (Cooperative Institutional Research

Program) Freshman Survey (Pryor et. Al, 2011), which found the number one reason freshmen decided to attend university was, "to get a better job" (p.11). However, the present survey differed from the CIRP Freshman Survey in that, instead of directly asking students what they wanted to get out of college, this survey forced respondents to make trade-offs among key features of institutional choices. Students could have shown preference for HEI's that had a lower gross tuition price, or were ranked higher, or were closer to home, but this study showed that the attributes respondents truly valued when they weighed all these aspects systematically against each other were their employability after college in terms of average salary and the percentage of graduates who found work one year after graduation. The institution's graduation rate came in third, in terms of the respondents' preference ratings.

Thus, within the research field of college choice studies, this study extends the knowledge base in terms of using DCE to systematically analyze the importance of employment data for American high school students applying to college. In a study done in Western Australia, Soutar & Turner (2002) also found that employment prospects are a key factor in a prospective student's decision to attend a particular higher education institution. Soutar & Turner (2002) used adaptive conjoint analysis[100] to determine the factors most important to students applying to college. They found that the school's reputation, teaching quality, employment "prospects", and how well the school fit with the student's aims in terms of what they wanted to study were most important. Thus, this

[100] Adaptive conjoint analysis is very similar to DCE in terms of the layout of the products (here HEIs) and listing of a number of attribute levels. However, adaptive conjoint analysis (such as choice based conjoint or CBC) adjusts the utility levels of each question posed to respondents based on how they answered the previous question in an effort to calculate utility levels for each attribute level, while DCE uses fixed attribute levels presented in each question.

study differed from Soutar & Turner's study in that it studied students from the United States more recently and used attributes that forced respondents to make trade-offs, as well as in that it used the OMEP design and analysis.

Beggs, Bantham, and Taylor (2008) also conducted a conjoint analysis, in order to determine what factors were most important to students in choosing a college major. Dunnett et al (2012) conducted a conjoint analysis to determine what factors were important to students in choosing a university after a fee was added in the UK university system. Briggs (2006) conducted a study in Scotland to determine the effect "information sources" and added fees had on college choice for students in accounting and engineering. These studies in the same general area of the literature as the present study were all completed from the point of view of recruitment officers at universities, thus none of them tested the importance of more versus less favorable employment outcome statistics (E.S.). Nor did they measure the value students place on good E.S. when they are forced to make tradeoffs with other attributes known to be important to prospective students, like the school's reputation as measured by the *U.S. News & World Report* ranking, tuition levels, distance from home, graduation rate, etc. that were studied here.

5.2 Implications for future research

This study has shown that students applying to college favor institutions that produce graduates with higher average salaries, institutions that have a high percentage of their graduating class who receive full time employment within 1 year after graduation, and institutions that have a high graduation rate. Future research studying the value prospective students place on employment statistics should, ideally, use random samples

so that the results could be generalized to the population. Moreover, this study would likely have been benefitted if net tuition was not set to zero in each attribute level[101]. Net tuition levels (i.e. gross tuition minus average aid received) based on institutional figures reported by the NCES (National Center for Education Statistics) would have produced tuition attribute levels that better reflect the real world of students' college decision-making. Future research could also include other attributes that research has shown to be important in the college choice process, i.e. campus climate, campus safety, perhaps name of the institution, and specific location(s) of the institution. However, including the name and location would introduce new problems into the study which will be discussed below.

Specifically, regarding providing the university's name in the choice scenario and hence implying its reputation in the HE market: The image and reputation of the institution was found to be very important to prospective students in one of the earliest studies of college choice by Krampf & Heinlein (1981). However, including the "brand name" was nearly impossible here as there are some 5,300 colleges and universities in the United States. Still, certain universities could have been selected to be in the survey based on their ranking so that, for example, three tiers of universities by reputation or ranking were included. However, all sorts of idiosyncratic unknowable factors specific to the individual respondents (geography, where family members went to college, idiosyncratic perceptions, etc.) would be introduced if the university's name were included. Additionally, since this study surveyed students from disparate parts of the United States

[101] Net tuition was set to zero for each attribute level to simplify the survey. Research has shown that students at the age of those surveyed do not yet fully understand college financing and in many cases financing of college is handled by the student's parents. Please see section 3.1.3 for a further explanation on why net tuition was set to zero.

(Texas, Delaware and Vermont), this strategy would have introduced a new problem into the study as the universities chosen for the survey would be very far from some of the respondents' homes while close to others and distance from home has been found in other studies to be an important attribute to prospective students.

A list of some of the more important attributes excluded from the survey include: campus safety, location (urban or suburban vs rural), quality of campus environment, competitiveness of the athletics programs, etc.

Additionally, while this study was quantitative, future research could be improved by using a mixed method approach. Particularly in the pre-testing stage, studies like this one would be improved by conducting more in-depth interviews with more students. For this study, a group pre-test interview was done, however the scope of it did not allow in-depth interaction with participants to determine if the attributes and their levels included in the study were indeed comprehensive of those most important to students applying to college.

An additional improvement in generalizability could have been made if all survey respondents were in the same high school grade. I instructed teachers and administrators to give the survey to juniors and seniors[102]. While the collegiate institutions presented in this survey were completely hypothetical, juniors and seniors are at completely different stages in the college choice process in terms of which attributes students value in a HEI. Moogan et al (2001) surveyed students applying to college at two separate time periods to

[102] Teachers and administrators were instructed to only give the survey to students who were planning on going to college after high school. Beyond that, the survey was self-explanatory and no further instruction in terms of how to administer the survey was given except students were told that the type of loan mentioned in the survey was a Federal loan. Respondents were told that they could either accept the loan offered or pay the tuition directly out of pocket. During the pre-testing stage I interviewed 23 students after they took the survey and asked them if they had any problems understanding the survey and all students interviewed said the survey was easy to understand and self-explanatory.

assess whether the utility levels they gave to various attributes of a HEI changed as they got older. They found that students valued a university's reputation most when they were first surveyed in their junior year; however as they got closer to application deadlines and deciding which school they would attend, they valued distance from home more highly.

Since the literature identifies different decision-making processes at different ages, it would be best to concentrate the study's focus on one grade level, probably seniors in early fall. The validity of the data collected would probably be more robust if all of the students measured were in the same grade level. In practice, it was difficult to get schools and thus students to agree to administer the survey to their students, thus it was necessary to open the survey up to both juniors and seniors in order to obtain adequate numbers of participants.

Overall, higher education is a very complicated product with many attributes. In order to extract as much information as possible while keeping the institutional examples as realistic as possible, there was a need to keep the survey fairly simple. Thus, many attributes had to be excluded from the survey but I sought to retain those seen as most important by earlier researchers.

5.3 Limitations and recommendations for future research

As mentioned earlier, a major limitation of this study is that the results cannot be generalized to the population because a convenient sample was used. Future research on college choice as it relates to the role of detailed employment statistics in student decision-making would be improved if a random sample were taken so that the results could be generalized to the population. This is a difficult proposition to fulfill however

given that the researcher must first obtain permission from the school district before distributing a survey instrument to its students. A large number of schools and districts would need to be involved to produce an adequate national sample of students.

For the most part, the different demographics of the sample in this study represented the U.S. population reasonably well in terms of race, gender and family SES, but this is not the same as the generalizability from a truly random sample. Moreover, a majority of the respondents (largely those from the Delaware locations) reported a family SES that was well below the national average.

Additionally, the accuracy of the study may arguably have been improved if the survey were taken in the company of the student's parents, as research has shown that students at high school age are still largely unaware of the financial options available to them in order to pay for college and parents often have a big role in students' college choices. Students may also be unaware of their family's SES, and their family's ability or willingness to take on different levels of debt. Thus, if the survey were taken in the company of the students' parents, it would add more accuracy to some of the results. However, the results of the survey taken with the students' parents may also not accurately reflect the major field the student actually wants to study and the institution they want to attend. Additionally, including the student's parents might well have other distorting effects unless the idea is somehow to represent family decision-making.

Another improvement could have been made if the employment statistics shown in the survey included reference to employment based on the skills acquired in the major of study. Graduates may find employment at McDonald's, for example, but studying 4 to 5 years at a university and majoring in English was not necessarily required for acquiring

this type of job. Fogg & Harington (2011) would characterize this type of distinction in the nature of post-graduation employment as the difference between mal-employment and working in a job the students were trained to work in. However, in this research it was important to keep the survey as simple as possible so that respondents did not experience survey fatigue. Thus, this type of detail was excluded.

Finally, recall that this survey added a second question in each decision scenario asking whether respondents would actually attend the institution chosen in the first part of the survey or choose some other course of action. If the second question had not been included in the survey there would likely have been far more significant relationships found between the characteristic variables (race, gender, etc.) and the attribute levels included in the survey as only data from cases where the respondent confirmed their initial choice in the second question were used in the analysis. After including the second question, the only main effect that was significant was the no choice option.

While the second question added more credibility to the results in terms of representing true student preferences[103], higher education is a complicated product wherein students may only attend institutions that their parents attended or institutions they may already have already decided to attend if they applied for early admission. For example, students may only want to attend institutions that are perceived to have a safe and secure campus environment as research has shown that safety and security is an important consideration when students choose which college they will attend. Since the safety and security associated with the institution was not included as an attribute in this survey, some respondents may have felt that they would not actually attend the option

[103] The second question was recommended by Dr. Louvalier, a member of my dissertation committee and an expert in discrete choice experiments.

chosen in the first portion of the survey for this reason. One could make a similar point about other institutional characteristics not included here such as whether the school has a division I athletics program, or if the school has a world class gym and campus environment, etc.

Still, adding a second question asking if the respondent would actually attend the institution chosen in the first portion of the choice scenario could arguably take away insight about students' preferences in colleges and the characteristics laid out in this survey as so many more significant relationships were found without the second part of the survey scenario included. Perhaps, the survey could have been improved if a qualifying statement had been included at the beginning of the survey telling respondents to assume that all of the qualities they most desired in a school (campus safety, urban vs. rural location, athletics program, etc.) should be assumed to be included in all of the options presented.

5.4 Summary of suggestions for future research

Thus, based upon the points made in the previous section on the limitations of this study, future research could benefit from the following recommendations. Firstly, future research would benefit by using a random sample so that the results could be generalized to the national population of high school seniors contemplating college. Secondly, using a net tuition based on amounts listed by the National Center of Education Statistics (NCES) would make the hypothetical HEI's presented in the survey appear more realistic if these figures were then broken into upper and lower tiers to create the different levels for the tuition attribute. Thirdly, the institutional data set forth in the survey should include

whether or not the employment gained after college was in line with the subject that the student majored in.

Finally, while this may add more detail into the survey than is practical, if the graduation rates were broken down by major of study and showed the percentage of students who stayed in majors they started, it would add more detail so that students were aware of the degree of difficulty each major of study offers[104]. For example, between 2008-2015 the American Society for Engineering Education (ASEE) published the graduation and "persistence" rates through each year of an engineering student's path in trying to attain their degree and the data is broken down by race and gender[105]. The ASEE conducts this survey for HEI's that meet a specific criterion they set (in terms of accreditation, etc.) and for institutions willing to participate. Among the 400 institutions who qualified under the criteria set by the ASEE, 111 engineering programs in the U.S. and around 65,000 first-time full-time freshmen who declared their major in their first year, participated. Of the institutions surveyed, a little over 50% of all engineering students graduated within 6 years. Broken down by race, over 60% of Asian students, over 50% of white students and a little over 40% of Black and Hispanic students, graduated within 6 years in engineering; and these percentages remained steady for the racial groups listed between 2008-2014. Additionally, there was great variability in 6-year graduation rates between schools wherein the highest graduation rate was 100% and the lowest was 5%. Thus, many students may start a degree in engineering, for example,

[104] While there are a host of reasons why students switch majors, how graduation rates differ between schools may give prospective students insight into the degree of difficulty of similar programs across different schools. The above paragraph details how graduation rates in engineering programs between schools can differ greatly; one school had a graduation rate of 5% within 6 years while another had a graduation rate of 100% within 6 years.

[105] https://ira.asee.org/wp-content/uploads/2017/07/2017-Engineering-by-the-Numbers-3.pdf

but never graduate in this field presumably largely because the degree of difficulty of these courses is greater than in other areas of study. In the real world, graduation rates should be broken down by major of study.

The study described above measured the percentage of students who declared engineering as their major in their freshman year and how long and whether they graduated in engineering, and if so how many years they took. A graduation rate in any major that measures the percentage of students who declared a given major and finished in that major would give prospective students a signal as to the degree of difficulty of a given major. While there are many reasons why students may switch majors, (i.e. lack of interest, degree of difficulty, etc.), of the approximately 33% of students who switch majors, the majority of the students who switch majors are within the STEM majors[106]. Leading the list of majors that students switch out of is math wherein 52% of students who declare math as their major initially end up switching[107]. Students may not be aware of the degree of difficulty of college courses versus what they saw in high school, especially in STEM courses. This is of course dependent on the quality of preparatory courses each student took in high school but it also depends on the support system each HEI offers, the teacher to student ratio, and the degree of difficulty of the courses. As seen above, some schools have higher graduation rates, which may be due in part in to the selectivity of an institution, a better support system, lower degree of difficulty etc..

The institution's graduation rate within the major, while not a perfect measure, may thus give prospective students some insight into the probability that they will be able

[106] https://www.insidehighered.com/news/2017/12/08/nearly-third-students-change-major-within-three-years-math-majors-most
[107] https://www.studentresearchfoundation.org/blog/statistics-about-changing-college-majors/

to graduate in a given major from a particular institution. Ideally, prospective students can then ask current students why the graduation rate in a given major is so high or low at a given institution. It has been well documented that more STEM majors are needed in the United States labor market. If HEI's are forced to track and publish graduation statistics by major, it would be an important statistic for institutions to compete on, rather than which institution makes it into a Bowl game, or which institution increased it's *U.S. News* ranking.

5.5 Implication of the results

The results of this study show that students applying to college prefer HEI's that have higher E.S. in terms of the average salary of their graduates and employment rate, even when this institutional attribute is traded off against other relevant ones. Students also prefer HEI's that have higher graduation rates. No significant results, in terms of preference, were found for the other attributes included in the study: distance from home, *U.S. News & World Report* ranking and gross tuition cost[108]. This would suggest that HEI's and U.S. government agencies should see that detailed information on the employment statistics of their graduates in terms of graduates' average salary level, broken down by major, and the percentage of graduates who attain full time employment is provided to prospective students. Additionally, the results of this study would implicate regulators to require HEI's to provide graduation rate data.

[108] However, it should be noted that net tuition paid was not represented realistically in the survey, which may have affected the results.

As detailed in chapter 3, footnote 17, there are sources of information online that give the average salary of college graduates, however much of the information on these sites is not specific to a particular HEI. The BLS and the census.gov site only give broad data that is nationally based, e.g. the average salary for lawyers equals around $93,000 per year. The White House's College Scorecard (CS) gives the average annual earnings of graduates from a particular college who had received federal student aid. For example, as in the case of the University of Colorado at Boulder the average salary listed is $50,800. The CS advertises on its website that it gives the "post-school earnings" of each HEI in the United States, however, these figures only cover federally aided students. Additionally, after digging through the Excel data on earnings provided by the White House's CS, I found that much of the earnings data for each university is missing and is listed simply as "PrivacySuppressed", meaning that there were very few cases with data.

The College Scorecard does list the graduation rate and average salary by institution, however the graduation rate listed only covers students who initially enrolled full-time at the institution, which does not represent all of the students attending a given institution (and misses many at some schools). Further issues with the CS are that, in calculating average costs of the institution, the CS calculates the average costs as "average annual net price for federal financial aid recipients, after aid from the school, state, or federal government". Thus, the costs reported by the CS don't apply to students who do not receive federal aid, which can leave out a large portion of students attending a particular HEI and be misleading to them. Similarly, the earnings data only pertains to students who received federal aid, which may skew the results as students from lowest

income quartile "are more than twice as likely to receive federal aid"[109]. The CS earnings data also includes students who transferred out as salary data is attributed to all of the institutions a student attended; it is estimated that only 60% of all college students start and graduate from the same HEI[110]. Thus, the CS may not accurately reflect the earnings of all of the graduates of a given HEI. The CS allows a user to download all of the data via an Excel file, however this excel file is very dense with information. In this excel file, for each of the 7,113 rows there are 1,977 columns. Each HEI is listed in a row, and each column has data containing different categories of information listed as symbols, i.e. "LO_INC_COMP_2YR_TRANS_YR2_RT". Thus, the data in this form would be hard for most consumers to manage and utilize effectively.

The CS does offer a tool for simplifying the information called "college comparison", which is very user friendly. The user simply has to pick two or more colleges, hit compare and the CS lists out the average cost, graduation rate, average salary of graduates, etc of the two HEI's chosen side by side. The only drawback to the college comparison tool is that it shows school-wide information, so the average salary is not broken down by major of study.

Thus, while the CS advertises that it publishes the "post-school earnings" of each HEI annually, this information is school-wide and much of the detailed information contained in the downloadable Excel file is missing from the user-friendly comparison tool. Moreover, the CS Excel file has 1,977 columns of data wherein, as mentioned before, the majority of information is missing. If we compare the impact of the *U.S. News & World Report* ranking with the CS, the *U.S. News & World Report* ranking most likely

[109] https://www.brookings.edu/opinions/understanding-the-college-scorecard/
[110] https://www.brookings.edu/research/deconstructing-and-reconstructing-the-college-scorecard/

has a greater influence in terms of where students choose to go to school and the power of HEI's in terms of the tuition price they can set and the quality of academic scholars they can attract, etc. as the *U.S. News & World Report* ranking in more well known. Ehrenberg & Monks (1999) found that a decrease in rankings resulted in the institution accepting a higher percentage of applicants and having fewer students matriculating, which resulted in lower quality students attending the institution in terms of average SAT scores. While Ehrenberg & Monks (1999) study came before the introduction of the College Scorecard, Pontello's (2018) dissertation produced similar results in terms of the effect that The *U.S. News & World Report* rankings have on enrollment and quality indicators.

There have been few studies to date examining the effect the College Scorecard has had in terms of whether students applying to college use it to decide which college they want to attend and if the CS has impacted HEI's in terms of enrollment numbers, tuition level they can set, and the competitiveness of the institution in attracting higher quality students as measured by students' SAT scores. Klein (2016) studied the google search activity as it relates to the College Scorecard and found that the CS "led" users to search "high earnings", "high-graduation rate", and "low tuition colleges"[111].

Hurwitz & Smith (2017) examined whether the results of the CS influenced the number of applications sent in to institutions that posted higher average salaries, graduation rates, and lower average net cost. They were able to examine the trends of 36 million students who sent their SAT scores to various HEI's between 2010-2016. They

[111] Klein's analysis did not differentiate whether the users conducting these searches were students applying to college or not, however it can be assumed that a majority of the users analyzed in his study were students applying to college.

found that as the reported median earnings of their sample increased by 10%, the number of applications received by these HEI's increased by 2.4%, as measured by the number of SAT scores sent to the HEI; This relationship is significant at the p<.001 level. The authors translate these finding by stating that the median reported salary in the CS equals $50,000, when they look at institutions with a report earnings 1 standard deviation above the median, +$9,000, the number of applications received by these institutions increased by 100-150, or +4.3%. However, this increase in applications/SAT scores sent did not translate into an increase in enrollment numbers at these institutions, which the authors attribute to the fact that these institutions were probably already at capacity. The authors broke down their results further reporting that, while HEI's with reported salaries 10% above the median within their sample were sent more SAT scores, this response was greater for students attending private high schools (+4.2%) and students from more affluent public schools (as measured by the school's number of school lunch vouchers), than for students attending public high schools overall (+1.6%-1.9%[112]). They did not report on whether the average SAT scores of enrollees at the institutions that received more applications increased. Hurwitz & Smith found no relationship between CS-reported average cost or average graduation rate and the number of SAT scores sent to HEI's.

While the discussion in this section has gone beyond any measures tested in this study, the recommendations made in this chapter describe, in my view, the most ideal presentation of employment and graduation statistics. Ideally, graduation and employment statistics of each major of study would be presented via a chart, like the one

[112] This overall percentage increase for students attending public high schools was not statistically significant.

presented in this study. Additionally, unlike the CS, it is important that these statistics analyze all of the students who graduated and attended the institution accurately. Future research studying the effect E.S. have on students applying to college would be benefited if E.S. and graduation rates were presented with such an easy-to-use interface that also presents a greater level of detail than is now available. Graduation rates and E.S. had to be simplified in this survey so that students could more easily understand the survey questions.

5.6 Conclusion

Overall, as can be seen in the Utility Profiler results for all survey respondents shown in Table 4.8.3.1 (page 97 of chapter 4), this survey found that students applying to college showed significantly higher utility levels for the following institutional attributes and levels: a) the highest graduation rate (9/10 students), the highest average employment rate (9/10 graduates), and the highest average salary level ($42,000) among the levels offered in the survey. Utility levels were also slightly higher for the following values of the other attributes included in the survey: the lowest distance from home (<50 miles), the mid-level *U.S. News World Report* ranking (#46), and the lowest gross tuition level ($13,000). All of the attribute levels listed in this paragraph were statistically significant ($p<.05$) as shown in the Parameter Estimates Table in Table 4.8.2.

These results show that students at the point of applying to college want evidence to assure them that they will be able, with high probability, to graduate from college and secure a full-time job after they graduate, preferably in jobs that offer the highest average salary. While they do show a slight preference for universities that are ranked relatively

higher, are closer to home, and lower in cost, their preference for these attributes was not nearly as high as for attribute levels that relate to occupational and graduation security.

These results show, for the group surveyed in this study, that students care more about information that signals job and graduation security over the current predominant signal of quality utilized by students applying to college, typically the *U.S. News World Report* ranking. As seen earlier, Klein (2016) found that users of the CS were also interested in HEI that had "high earnings", "high-graduation rate", and "low tuition colleges", however his study could not extract whether the individuals conducting these google searches were students applying to college or not. Hurwitz & Smith (2016) found that an increase in earnings posted by the CS resulted in an increase in SAT scores sent to those institutions. However, this study found that only upper income students attending public and private high schools use the CS. It is also unknown whether HEI's take the CS into account in their resource allocation decisions as these studies only examined the CS from the student's perspective.

The College Scorecard and BLS do not provide detailed information on the employment success of all graduates from a particular institution by major, nor do they show annually what percentage of the graduating class is fully employed. Average salary of graduates of a particular HEI is provided by the CS, however this salary data only applies to students who received federal aid[113]. Also, most of the information on these sites, as in the case of the BLS, is not broken down by major of study and by race, gender, and age.

[113] According to the National Center for Education Statistics (NCES), approximately 85% of first time, full time freshmen at 4-year institutions, and 78% of students at two-year institutions receive federal aid (https://nces.ed.gov/fastfacts/display.asp?id=31)

In other policy developments related to the provision of employment outcome data to students, Democrats in Congress are trying to put provisions into the upcoming reauthorization of the Higher Education Act to restore Obama era rules on transparency wherein an institution must show in their advertisements the debt to earnings ratio of their graduates. Democrats are also trying to reenact, the Obama administration rule on gainful employment, which applied to private and vocational HEI's that offer career training programs[114]. These institutions would be penalized by losing "access to federal financial aid" if their graduates had a poor debt (from tuition) to earnings (after graduation) ratio[115]. However, as of July 1st, 2019, the earlier such "gainful employment" rule had been rescinded by the Education Secretary Betsy Devos and the Department of Education[116].

The current Education Department, under the Trump administration, has said that they favor transparency. The findings in this study would seem to signal to lawmakers that perhaps they should consider under this rubric legislation that requires each HEI to show the graduation and employment rates of their institution's graduates as well as the average salary of their graduates up front on their websites similar to how tobacco companies are required to show the Surgeon Generals health warning on the packaging of their cigarettes. These metrics are far more important to students applying to college, at least in the case of the respondents in this study, than are the current main consumer metrics of quality provided by the *U.S. News World Report* ranking.

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[114] https://www.insidehighered.com/news/2019/10/16/house-democrats%E2%80%99-latest-higher-ed-plan-pushes-free-college-more-generous-loan

[115] https://www.nytimes.com/2019/06/28/us/politics/betsy-devos-for-profit-colleges.html

[116] https://www.acenet.edu/News-Room/Pages/Department-of-Education-Repeals-Gainful-Employment-Regulations.aspx

Providing graduation rates by institution would be relatively easy for the institution to post prominently on their websites, using government-provided definitions, so that students applying to the college are somewhat aware of the risks involved in attending the institution. While the College Scorecard does have this information, as mentioned earlier the information is institution-wide and only applies to students who received federal aid in the case of salary and cost data. This data is potentially misleading if users don't know how these two statistics are calculated and it is unknown whether it is used by a majority of students applying to college. Providing comparable employment statistics may prove to be more difficult as it would either require students to self-report or require institutions to calculate earnings through a graduate's tax records. Self-reporting may introduce faulty measures of an institution's employment statistics because of high non-response rates and biases in terms of who responded[117]. Employment statistics ideally would be gathered from an individual's tax records so that they are a more robust and credible measure of an institution's worth. This would, of course, introduce a whole industry of record keeping and accounting and require additional legislation allowing government institutions to access a student's tax records. Accessing a former student's tax records would raise a host of privacy issues, thus these records would need to be de-identified and the measure would still be controversial in the current climate.

Overall, though, this metric for evaluating a HEI's value may be much more valuable to society because the currently published rankings are largely based on input measures like amount spent per student instead of output and outcome measures like

[117] Many graduates may feel compelled to overstate their earnings to prove the worth of the institution as overstating earnings could also improve the value of their degree.

graduation rate and the employment rate of graduates. While the average salary after graduation is not the only benefit students obtain by attending college, as many may find their future spouse or attain a degree necessary to attend graduate school (not to mention a wide range of other demonstrated effects of college), making a living in the field they want to pursue is the stated goal for most applicants when they first apply to college. Additionally, HEI's advertise the earnings students can earn after graduation, thus they should be required to report accurately the earnings of their graduates to back up their claims that attending the institution will increase the graduate's earnings and land them a job in the field they want to pursue. This proof seems more important than ever given the massification of higher education and rise in mal-employment rates among college graduates[118].

Publishing employment statistics by major of study and requiring these figures to be in the forefront of a university's website may have the effect of creating a new but more socially desirable "arms race" wherein institutions, instead of competing to improve their rankings and thereby increasing the cost passed on to students through their tuition levels (Dill, 2009), could compete on the basis of outcomes, such as the best graduation rate, employment rate, and average salary level of graduates.

[118] In 2018, average mal-employment (Mal employment occurs when an individual is working in a job whose requirements are under the skill level they were trained for in college) rates of college graduates stand at 43.4% according to statista.com

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Appendices

Appendix 1 –part A - The survey

The following questions are completely optional and your answers will remain anonymous but if answered correctly will help towards the research in this field.

What grade are you in?

- Senior ☐
- Junior ☐
- Sophomore ☐

What is your race?

- African-American ☐
- Caucasian ☐
- Hispanic ☐
- Asian ☐
- Other/Mixed Race ☐
- I choose not to answer ☐

What is your estimated annual family income?

- Above $100,000 ☐
- Below $100,000 ☐
- I don't know ☐

What is your gender?

- Male ☐
- Female ☐

Do you know what you will be majoring in, in College/University?

- Yes ☐
- No ☐

What was your SAT Math score?

- Above 600 ☐
- Below 600 ☐

Have you taken any AP courses?

- Yes ☐
- No ☐
- I choose not to answer ☐

Appendix 1 – part B - Choice scenario example

1. Which of the two colleges would you be most likely to choose if you had offers only from these two?

	Institution 1	Institution 2
Average number students that start and graduate within 6 years:	5 out 10 people	3 out 10 people
Distance from home:	500 miles or greater	500 miles or greater
Gross Tuition -Scholarships -Loans **net tuition:**	$46,000 $20,000 $26,000 **$0**	$46,000 $20,000 $26,000 **$0**
Average number of students who obtained employment within 1 year after graduating	5 out of 10 people	5 out of 10 people
U.S. News & World Report ra	above 100	#7
Average salaries for graduates within majors like English, History, Education etc.	$23,000	$33,000
Average salaries for graduates within majors like Science, Math, Business, Computer Engineering etc.	$34,000	$46,000
Average salaries for graduates within majors like Nursing & other professional fields etc.	$31,000	$41,000

Institution 1 ☐
Institution 2 ☐

Now, thinking realistically, if these were your only offers would you choose neither college and either do something else or wait and apply next year? (Please check only one):

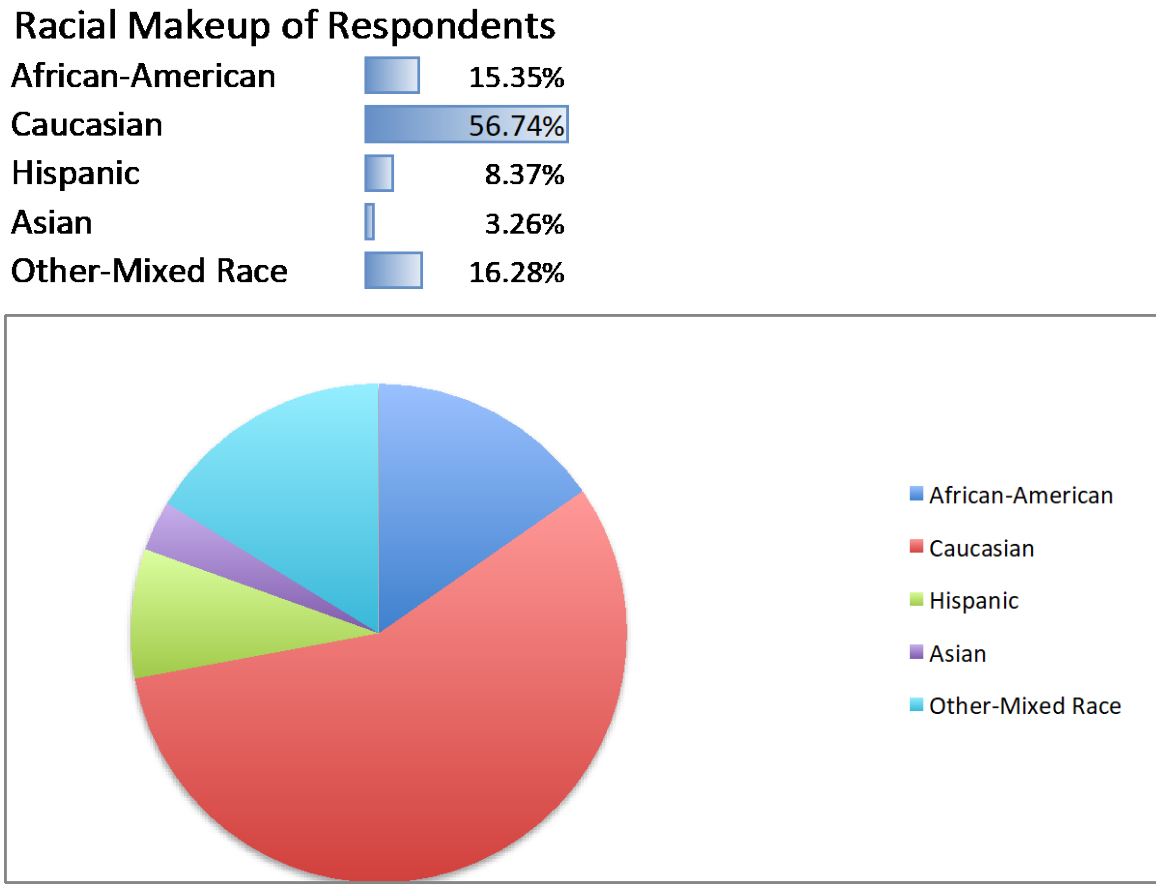
I would choose the college I chose in this question ☐
I would NOT choose either college ☐

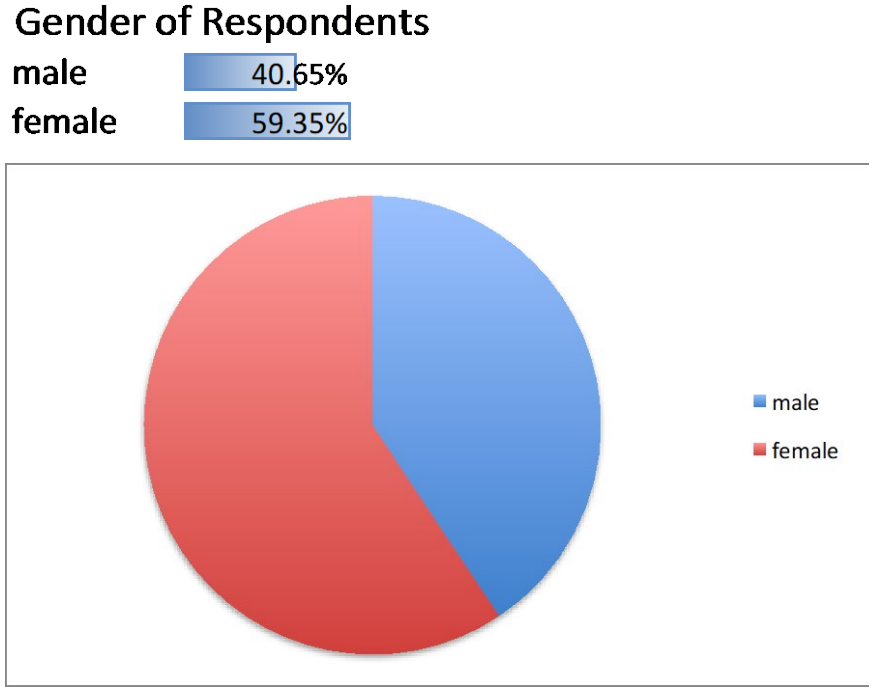
Appendix 2: U.S. Census Data, 2017[119]

		Smyrna City, DE		Chittendon County, VT		Frisco, TX
Population estimates, July 1, 2017, (V2017)		**11,584**		**162,372**		**177,286**
Persons under 18 years, percent		27.70%		18.00%		32.10%
Race and Hispanic Origin						
White alone, percent(a)		67.70%		90.60%		71.20%
Black or African American alone, percent(a)		27.60%		2.60%		7.60%
American Indian and Alaska Native alone, percent(a)		0.70%		0.30%		0.40%
Asian alone, percent(a)		0.90%		4.30%		15.20%
Native Hawaiian and Other Pacific Islander alone, percent(a)		0.10%	Z			0.10%
Two or More Races, percent		2.50%		2.30%		3.30%
Hispanic or Latino, percent(b)		3.70%		2.30%		11.90%
White alone, not Hispanic or Latino, percent		65.10%		88.60%		62.60%
Population Characteristics						
Veterans, 2012-2016		1,134		8,462		5,721
Foreign born persons, percent, 2012-2016		5.60%		8.20%		18.10%
Housing						
Housing units, July 1, 2017, (V2017)	X			69,710	X	
Owner-occupied housing unit rate, 2012-2016		60.60%		63.80%		74.80%
Median value of owner-occupied housing units, 2012-2016		$188,100		$275,000		$300,900
Median selected monthly owner costs -with a mortgage, 2012-2016		$1,534		$1,773		$2,258
Median selected monthly owner costs -without a mortgage, 2012-2016		$461		$751		$836
Median gross rent, 2012-2016		$922		$1,139		$1,313
Building permits, 2017	X			695	X	
Families & Living Arrangements						
Households, 2012-2016		4,321		64,012		48,664
Persons per household, 2012-2016		2.52		2.35		2.99
Living in same house 1 year ago, percent of persons age 1 year+, 2012-2016		84.30%		80.50%		84.10%
Language other than English spoken at home, percent of persons age 5 years+, 2012-2016		8.80%		9.50%		24.70%
Education						
High school graduate or higher, percent of persons age 25 years+, 2012-2016		90.20%		93.90%		96.00%
Bachelor's degree or higher, percent of persons age 25 years+, 2012-2016		22.10%		49.40%		59.90%
Health						
With a disability, under age 65 years, percent, 2012-2016		7.70%		8.10%		3.80%
Persons without health insurance, under age 65 years, percent		7.10%		4.20%		7.70%
Economy						
In civilian labor force, total, percent of population age 16 years+, 2012-2016		68.70%		70.20%		73.00%
In civilian labor force, female, percent of population age 16 years+, 2012-2016		70.50%		66.00%		63.90%
Total accommodation and food services sales, 2012 ($1,000)(c)	D			459,913		360,781
Total health care and social assistance receipts/revenue, 2012 ($1,000)(c)	D			1,652,397		644,981
Total manufacturers shipments, 2012 ($1,000)(c)	D			3,388,030		233,727
Total merchant wholesaler sales, 2012 ($1,000)(c)	D			3,133,942	D	
Total retail sales, 2012 ($1,000)(c)		211,241		2,959,434		2,468,696
Total retail sales per capita, 2012(c)		$19,727		$18,671		$19,260
Transportation						
Mean travel time to work (minutes), workers age 16 years+, 2012-2016		30.7		20.8		29.7
Income & Poverty						
Median household income (in 2016 dollars), 2012-2016		$53,941		$66,414		$117,642
Per capita income in past 12 months (in 2016 dollars), 2012-2016		$28,164		$34,658		$46,969
Persons in poverty, percent		8.30%		9.60%		3.80%
BUSINESSES						
Businesses						
Total employer establishments, 2016	X			5,680	X	
Total employment, 2016	X			90,777	X	
Total annual payroll, 2016 ($1,000)	X			4,086,430	X	
Total employment, percent change, 2015-2016	X			2.20%	X	
Total nonemployer establishments, 2016	X			14,420	X	
All firms, 2012		693		18,690		13,188
Men-owned firms, 2012		333		10,164		7,372
Women-owned firms, 2012		213		6,079		4,186
Minority-owned firms, 2012		185		826		3,554
Nonminority-owned firms, 2012		456		16,728		9,100
Veteran-owned firms, 2012		30		2,155		998
Nonveteran-owned firms, 2012		611		15,287		11,468
GEOGRAPHY						
Geography						
Population per square mile, 2010		1,690.50		291.7		1,892.90
Land area in square miles, 2010		5.93		536.58		61.8
FIPS Code		1067310		50007		4827684

[119] https://www.census.gov/quickfacts

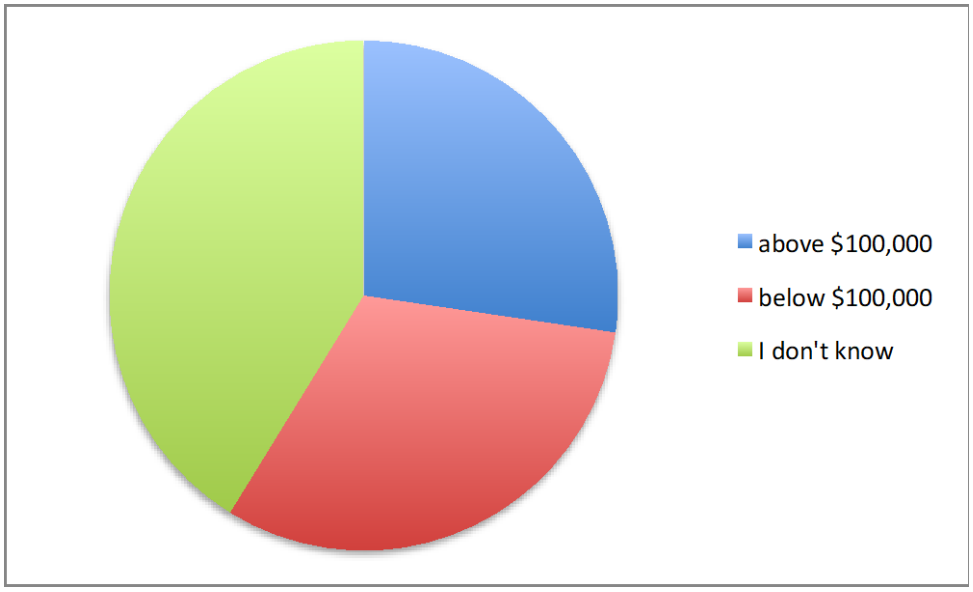
Appendix 3: Racial makeup, gender mix, and household income levels of respondents





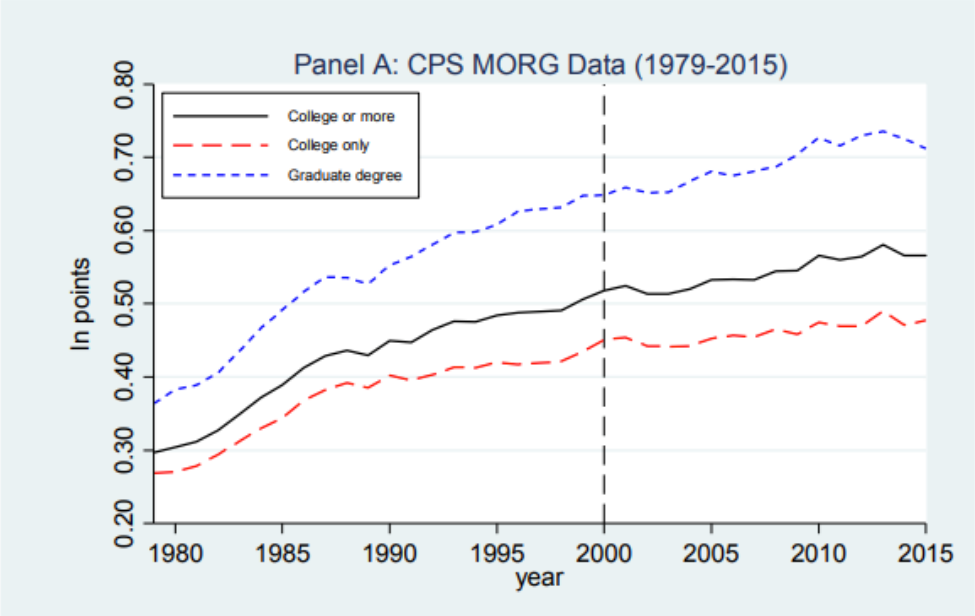
Household Income level of respondents

above $100,00	27.31%
below $100,00	31.48%
I don't know	41.20%



Appendix 4 –Higher education wage premium

Figure 1: Estimated Higher Education Wage Premium, 1979-2015



(Taken from Valetta, 2016)

Appendix 5 – Attribute levels

Average number of students who obtained employment within 1 year after graduating	2 out of 10 people	5 out of 10 people	9 out of 10 people
Average salaries for graduates within majors like English, History, Education etc.	$42,000	$33,000	$23,000
Average salaries for graduates within majors like Science, Math, Business, Computer Engineering etc.	$80,000	$46,000	$34,000
Average salaries for graduates within majors like Nursing & other professional fields etc.	$56,000	$41,000	$31,000

Appendix 6 - Letter from the IRB

Date: 5/1/2015

PI: Mr. David Aleong,
College of Education

CC: William Zumeta

Re: Human Subjects Application #49226,
"*The importance prospective students place on the historical employment statistics, given by major of study, of a College/University*"

Dear Mr. Aleong,

The Human Subjects Division received the above-named Human Subjects Application on 2/19/2015 and your responses to our initial screening request on 4/23/2015. This application has been assessed by Subcommittee EG. As the application describes, this activity involves conducting a one-time survey with high school students in two very specific regional locations in order to understand how students in these areas make decisions about college/university attendance.

As noted during the initial review, this activity will be limited in its ability to produce statistically significant, empirically generalizable results given the limited regional representation and sample size proposed. With this understanding, the subcommittee has determined that the specificity of the information obtained from these individuals, combined with the small sample size will not yield findings that are generalizable beyond the individuals and settings under study. You have confirmed your agreement that this project is not intended to be generalizable beyond the specific project setting.

Based on this information and the definition of "research" under 45 CFR 46.102(d), the UW Human Subjects Division has determined that this activity does not meet the federal definition of "research." This determination means that the activity is not subject to 45 CFR 46 and does not require review by the IRB. Please keep a copy of this letter for your records.

If you have further questions or concerns, feel free to contact me.

Best regards,

Bailey Bell
Human Subjects Review Administrator
(206) 221-7918
bbell3@u.washington.edu

APPENDIX 7: ABBREVIATIONS

Column1	Characteristic Variables
Symbol	**Meaning**
AP	Whether they took any AP courses
AP[1]	They have taken AP courses
AP[2]	They have not taken AP courses
SAT	If their SAT scores were above or below 600
SAT[1]	Respondents indicated that they scored above 600 on their SAT math section
SAT[2]	Respondents indicated that they scored below 600 on their SAT math section
Grade	grade level
Grade[1]	Senior
Grade[2]	Junior
Grade[3]	Sophomore
Race	Race
Race[1]	African-American
Race[2]	Caucasian
Race[3]	Hispanic
Race[4]	Asian
Race[5]	Other/Mixed Race
Race[6]	I choose not to answer
Gender[1]	Male
Gender[2]	Female
Major[1]	Respondents know what they will be majoring in, in college
Major[2]	Respondents don't know what they will be majoring in, in college
Income	Estimated annual family income
Income[1]	Estimated annual family income is above $100,000
Income[2]	Estimated annual family income is below $100,000
Income[3]	They don't know their estimated annual family income

Column1	Attributes
Symbol	**Meaning**
AveGradein6	Average number of students that start and graduate within 6 years
AveGradin6[3/10 people]	Average number of students that start and graduate within 6 years=3 out of 10 people
AveGradin6[5/10 people]	Average number of students that start and graduate within 6 years=5 out of 10 people
AveGradin6[9/10 people]	Average number of students that start and graduate within 6 years=9 out of 10 people
DistHome	Distance from home of the proposed HEI
DistHome[<50 miles]	Distance from home of the proposed HEI is less than 50 away
DistHome[<50 miles]	Distance from home of the proposed HEI is 150 away

DistHome[>500 miles]	Distance from home of the proposed HEI is 500 miles or greater than 500 miles away
USNWRrank	U.S. News & World Report ranking
USNWRrank[#7]	*U.S. News & World Report* ranking = #7
USNWRrank[#46]	*U.S. News & World Report* ranking = #46
USNWRrank[>100]]	*U.S. News & World Report* ranking = #46
Tuition[13000.00]	$13,000 (Gross tuition) - $5,000 (Scholarships) - $8,000 (loans) = $0 (net tuition)
Tuition[23000.00]	$23,000 (Gross tuition) - $10,000 (Scholarships) - $13,000 (loans) = $0 (net tuition)
Tuition[46000.00]	$46,000 (Gross tuition) - $20,000 (Scholarships) - $26,000 (loans) = $0 (net tuition)
AveEmploy1Yr	Average employment rate of the proposed HEI
AveEmploy1Yr[2/of 10 people]	Average number of students who obtained employment within 1 year after graduating = 2 out of 10 people
AveEmploy1Yr[5/of 10 people]	Average number of students who obtained employment within 1 year after graduating = 5 out of 10 people
AveEmploy1Yr[9/of 10 people]	Average number of students who obtained employment within 1 year after graduating = 9 out of 10 people
AveSalEHE	Average salary levels of the proposed HEI
AveSalEHE[23000.00]	Average salaries for graduates in majors like English, History, Education etc. =$23,000; Average salaries for graduates in majors like Science, Business, Computer Science etc. =$34,000; Average salaries for graduates in majors like Nursing and other prof. fields=$31,000
AveSalEHE[33000.00]	Average salaries for graduates in majors like English, History, Education etc. =$33,000; Average salaries for graduates in majors like Science, Business, Computer Science etc. =$46,000; Average salaries for graduates in majors like Nursing and other prof. fields=$41,000
AveSalEHE[42000.00]	Average salaries for graduates in majors like English, History, Education etc. =$42,000; Average salaries for graduates in majors like Science, Business, Computer Science etc. =$46,000; Average salaries for graduates in majors like Nursing and other prof. fields=$41,000

Symbol	Meaning
ASC	Alternative Specific Constant
CI	Confidence Intervals
DCE	Discrete Choice Experiment
ES	Educational Statistics
GRI	Grade, Race and Income
HED	Higher Education
MLT	Maximum Likelihood Ratio Tests
OMEPs	Orthogonal Main Effect Plans
RGMA	Race, Gender, Major, AP Courses
LL	Log likelihood
Df	degrees of freedom

APPENDIX 8: EFFECT SUMMARY FOR Q1 WITH GRADE, INCOME AND SAT

Effect Summary

Source	LogWorth	PValue
AveSalEHE	12.204	0.000
SAT*AveSalEHE	8.529	0.000
AveEmploy1Yr	4.860	0.000
DistHome	2.247	0.006
AveGradin6	1.826	0.015
Grade*AveSalEHE	1.776	0.017
Income*AveSalEHE	1.561	0.028
SAT*DistHome	1.468	0.034
Grade*DistHome	1.422	0.038
SAT*OneA	1.227	0.059
SAT*USNWRrank	0.980	0.105
SAT*AveEmploy1Yr	0.952	0.112
SAT*AveGradin6	0.900	0.126
OneA	0.820	0.151
SAT*Tuition	0.742	0.181
Grade*AveEmploy1Yr	0.700	0.199
Income*OneA	0.642	0.228
Grade*OneA	0.485	0.327
Income*AveGradin6	0.482	0.329
Income*AveEmploy1Yr	0.383	0.414
Tuition	0.378	0.419
Income*USNWRrank	0.184	0.654
Income*DistHome	0.105	0.785
Income*Tuition	0.099	0.797
Grade*USNWRrank	0.094	0.806
Grade*AveGradin6	0.081	0.830
USNWRrank	0.043	0.905
Grade*Tuition	0.039	0.914

APPENDIX 9: PARAMETER ESTIMATES FOR QUESTION 1 WITH GIS

Term	Estimate	Std. Error	Z-value	P-Value	
AveGradin6[3/10 people]	**-0.318**	**0.117**	**-2.726**	**0.006**	**
AveGradin6[5/10 people]	0.117	0.133	0.882	0.378	
DistHome[<50 miles]	**0.300**	**0.120**	**2.490**	**0.013**	*
DistHome[>500 miles]	-0.045	0.124	-0.366	0.715	
Tuition[13000.00]	0.127	0.134	0.952	0.341	
Tuition[23000.00]	0.003	0.142	0.019	0.985	
AveEmploy1Yr[2/of 10 people]	**-0.262**	**0.111**	**-2.361**	**0.018**	*
AveEmploy1Yr[5/of 10 people]	-0.192	0.165	-1.166	0.244	
USNWRrank[#7]	0.065	0.112	0.575	0.565	
USNWRrank[#46]	-0.037	0.118	-0.311	0.756	
AveSalEHE[23000.00]	**-0.734**	**0.150**	**-4.882**	**0.000**	***
AveSalEHE[33000.00]	-0.074	0.119	-0.620	0.535	
OneA[0]	-0.050	0.041	-1.217	0.223	
Grade[1]*AveGradin6[3/10 people]	-0.038	0.121	-0.312	0.755	
Grade[1]*AveGradin6[5/10 people]	0.110	0.138	0.799	0.425	
Grade[1]*DistHome[<50 miles]	-0.049	0.126	-0.391	0.696	
Grade[1]*DistHome[>500 miles]	-0.184	0.129	-1.427	0.153	
Grade[1]*Tuition[13000.00]	-0.060	0.139	-0.430	0.668	
Grade[1]*Tuition[23000.00]	0.110	0.148	0.747	0.455	
Grade[1]*AveEmploy1Yr[2/of 10 people]	-0.200	0.116	-1.733	0.083	
Grade[1]*AveEmploy1Yr[5/of 10 people]	0.191	0.172	1.113	0.266	
Grade[1]*USNWRrank[#7]	-0.027	0.116	-0.232	0.817	
Grade[1]*USNWRrank[#46]	0.097	0.123	0.787	0.431	
Grade[1]*AveSalEHE[23000.00]	0.062	0.156	0.398	0.691	
Grade[1]*AveSalEHE[33000.00]	0.106	0.123	0.859	0.391	
Grade[1]*OneA[0]	0.051	0.043	1.193	0.233	
Grade[2]*AveGradin6[3/10 people]	0.030	0.126	0.238	0.812	
Grade[2]*AveGradin6[5/10 people]	0.096	0.144	0.664	0.507	
Grade[2]*DistHome[<50 miles]	-0.012	0.130	-0.090	0.928	
Grade[2]*DistHome[>500 miles]	0.019	0.134	0.140	0.889	
Grade[2]*Tuition[13000.00]	-0.096	0.145	-0.665	0.506	
Grade[2]*Tuition[23000.00]	0.100	0.154	0.647	0.518	
Grade[2]*AveEmploy1Yr[2/of 10 people]	-0.102	0.120	-0.847	0.397	
Grade[2]*AveEmploy1Yr[5/of 10 people]	-0.066	0.179	-0.367	0.714	
Grade[2]*USNWRrank[#7]	-0.011	0.121	-0.091	0.928	
Grade[2]*USNWRrank[#46]	0.114	0.128	0.889	0.374	
Grade[2]*AveSalEHE[23000.00]	-0.141	0.162	-0.870	0.384	

Grade[2]*AveSalEHE[33000.00]	-0.041	0.128	-0.321	0.748	
Grade[2]*OneA[0]	0.049	0.044	1.106	0.269	
Income[1]*AveGradin6[3/10 people]	0.128	0.074	1.743	0.081	
Income[1]*AveGradin6[5/10 people]	-0.074	0.085	-0.867	0.386	
Income[1]*DistHome[<50 miles]	-0.046	0.080	-0.571	0.568	
Income[1]*DistHome[>500 miles]	0.054	0.080	0.677	0.498	
Income[1]*Tuition[13000.00]	0.044	0.086	0.515	0.607	
Income[1]*Tuition[23000.00]	-0.048	0.093	-0.521	0.602	
Income[1]*AveEmploy1Yr[2/of 10 people]	0.065	0.073	0.891	0.373	
Income[1]*AveEmploy1Yr[5/of 10 people]	-0.038	0.108	-0.352	0.725	
Income[1]*USNWRrank[#7]	0.035	0.070	0.505	0.614	
Income[1]*USNWRrank[#46]	-0.006	0.075	-0.085	0.932	
Income[1]*AveSalEHE[23000.00]	0.098	0.096	1.021	0.307	
Income[1]*AveSalEHE[33000.00]	-0.013	0.075	-0.170	0.865	
Income[1]*OneA[0]	0.018	0.026	0.710	0.478	
Income[2]*AveGradin6[3/10 people]	-0.076	0.073	-1.039	0.299	
Income[2]*AveGradin6[5/10 people]	0.114	0.084	1.362	0.173	
Income[2]*DistHome[<50 miles]	0.086	0.082	1.049	0.294	
Income[2]*DistHome[>500 miles]	-0.042	0.081	-0.524	0.600	
Income[2]*Tuition[13000.00]	-0.082	0.086	-0.950	0.342	
Income[2]*Tuition[23000.00]	0.113	0.093	1.224	0.221	
Income[2]*AveEmploy1Yr[2/of 10 people]	-0.137	0.073	-1.865	0.062	
Income[2]*AveEmploy1Yr[5/of 10 people]	0.119	0.107	1.117	0.264	
Income[2]*USNWRrank[#7]	-0.047	0.069	-0.676	0.499	
Income[2]*USNWRrank[#46]	0.080	0.075	1.072	0.284	
Income[2]*AveSalEHE[23000.00]	**-0.249**	**0.096**	**-2.605**	**0.009**	**
Income[2]*AveSalEHE[33000.00]	0.024	0.075	0.322	0.747	
Income[2]*OneA[0]	0.021	0.026	0.819	0.413	
SAT[1]*AveGradin6[3/10 people]	-0.086	0.050	-1.727	0.084	
SAT[1]*AveGradin6[5/10 people]	0.100	0.057	1.754	0.079	
SAT[1]*DistHome[<50 miles]	0.082	0.055	1.497	0.134	
SAT[1]*DistHome[>500 miles]	0.025	0.055	0.453	0.651	
SAT[1]*Tuition[13000.00]	-0.044	0.058	-0.767	0.443	
SAT[1]*Tuition[23000.00]	0.111	0.063	1.767	0.077	
SAT[1]*AveEmploy1Yr[2/of 10 people]	-0.052	0.049	-1.045	0.296	
SAT[1]*AveEmploy1Yr[5/of 10 people]	-0.032	0.073	-0.447	0.655	
SAT[1]*USNWRrank[#7]	-0.090	0.047	-1.910	0.056	
SAT[1]*USNWRrank[#46]	0.039	0.051	0.764	0.445	
SAT[1]*AveSalEHE[23000.00]	**-0.346**	**0.064**	**-5.385**	**0.000**	***
SAT[1]*AveSalEHE[33000.00]	0.054	0.051	1.073	0.283	
SAT[1]*OneA[0]	0.033	0.018	1.859	0.063	

*p<.05,**p<.01, ***p<.001

APPENDIX 10: LIKELIHOOD RATIO TESTS FOR Q1 FOR GIS

Likelihood Ratio Tests

Source	L-R ChiSquare	DF	Prob>ChiSq
AveGradin6	8.409	2.000	0.015
DistHome	10.349	2.000	0.006
Tuition	1.741	2.000	0.419
AveEmploy1Yr	22.382	2.000	0.000
USNWRrank	0.199	2.000	0.905
AveSalEHE	56.202	2.000	0.000
OneA	2.059	1.000	0.151
Grade*AveGradin6	1.480	4.000	0.830
Grade*DistHome	10.156	4.000	0.038
Grade*Tuition	0.974	4.000	0.914
Grade*AveEmploy1Yr	5.997	4.000	0.199
Grade*USNWRrank	1.614	4.000	0.806
Grade*AveSalEHE	12.081	4.000	0.017
Grade*OneA	2.233	2.000	0.327
Income*AveGradin6	4.612	4.000	0.329
Income*DistHome	1.731	4.000	0.785
Income*Tuition	1.666	4.000	0.797
Income*AveEmploy1Yr	3.943	4.000	0.414
Income*USNWRrank	2.447	4.000	0.654
Income*AveSalEHE	10.917	4.000	0.028
Income*OneA	2.955	2.000	0.228
SAT*AveGradin6	4.146	2.000	0.126
SAT*DistHome	6.762	2.000	0.034
SAT*Tuition	3.418	2.000	0.181
SAT*AveEmploy1Yr	4.385	2.000	0.112
SAT*USNWRrank	4.511	2.000	0.105
SAT*AveSalEHE	39.276	2.000	0.000
SAT*OneA	3.558	1.000	0.059

APPENDIX 11: EFFECT MARGINALS FOR Q1FOR GIS

Effect Marginals

Marginal Probability	Marginal Utility	AveGradin6
0.227	-0.352	3/10 people
0.406	0.228	5/10 people
0.366	0.124	9/10 people

Marginal Probability	Marginal Utility	DistHome
0.431	0.276	<50 miles
0.283	-0.145	>500 miles
0.287	-0.131	150 miles

Marginal Probability	Marginal Utility	Tuition
0.350	0.055	13000.00
0.370	0.113	23000.00
0.280	-0.168	46000.00

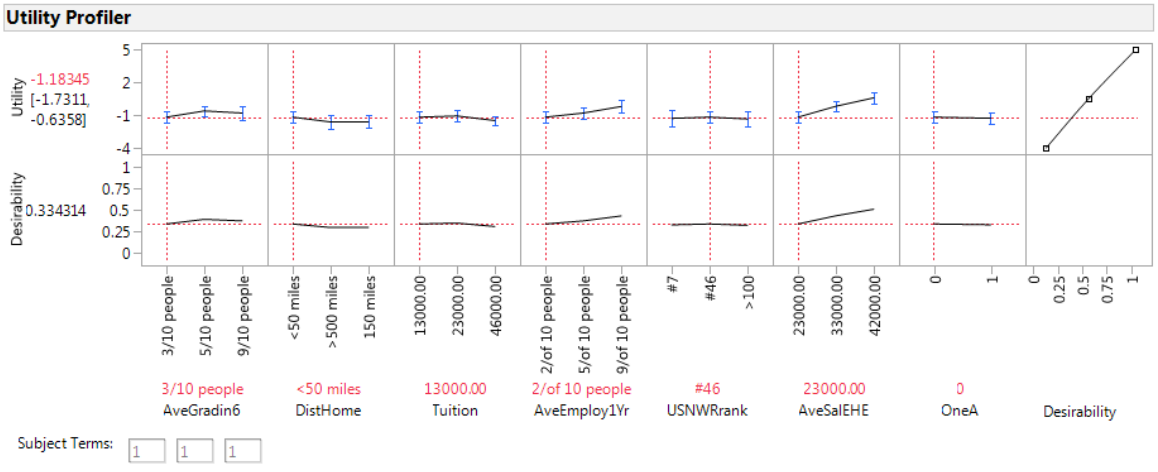
Marginal Probability	Marginal Utility	AveEmploy1Yr
0.203	-0.416	2/of 10 people
0.273	-0.117	5/of 10 people
0.524	0.533	9/of 10 people

Marginal Probability	Marginal Utility	USNWRrank
0.343	0.031	#7
0.352	0.057	#46
0.305	-0.088	>100

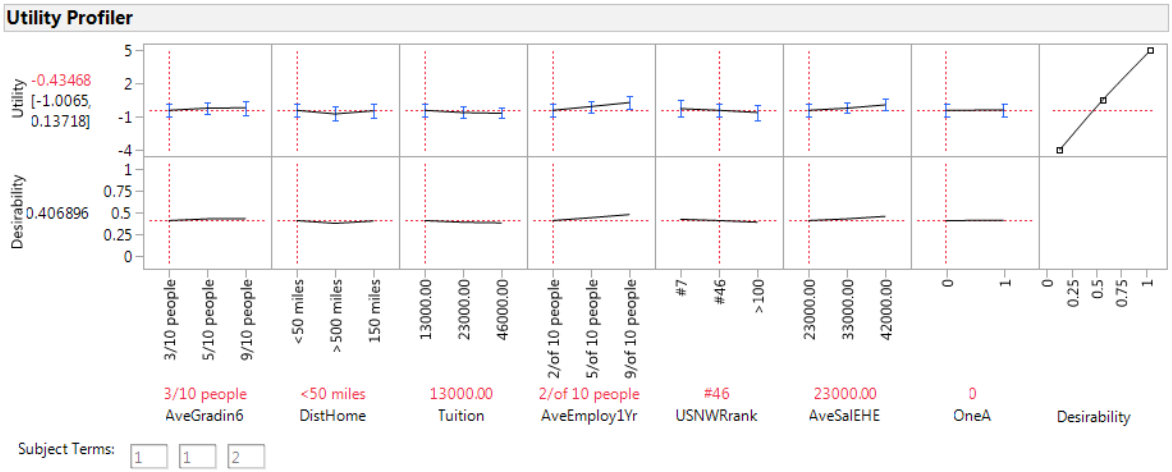
Marginal Probability	Marginal Utility	AveSalEHE
0.124	-0.786	23000.00
0.267	-0.019	33000.00
0.609	0.805	42000.00

Marginal Probability	Marginal Utility	OneA
0.498	-0.003	0
0.502	0.003	1

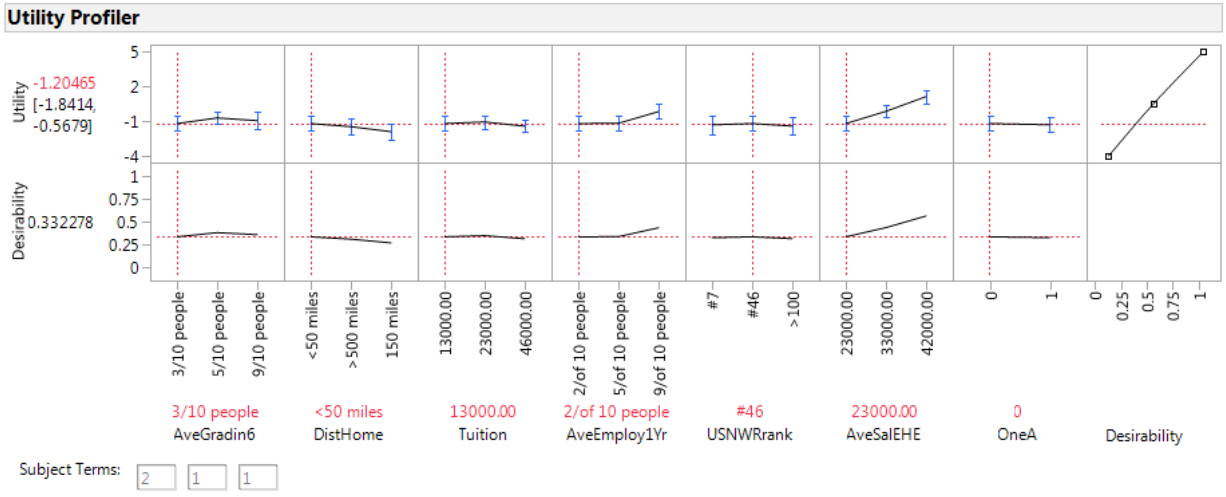
APPENDIX 12: UTILITY PROFILER FOR Q1 FOR GIS



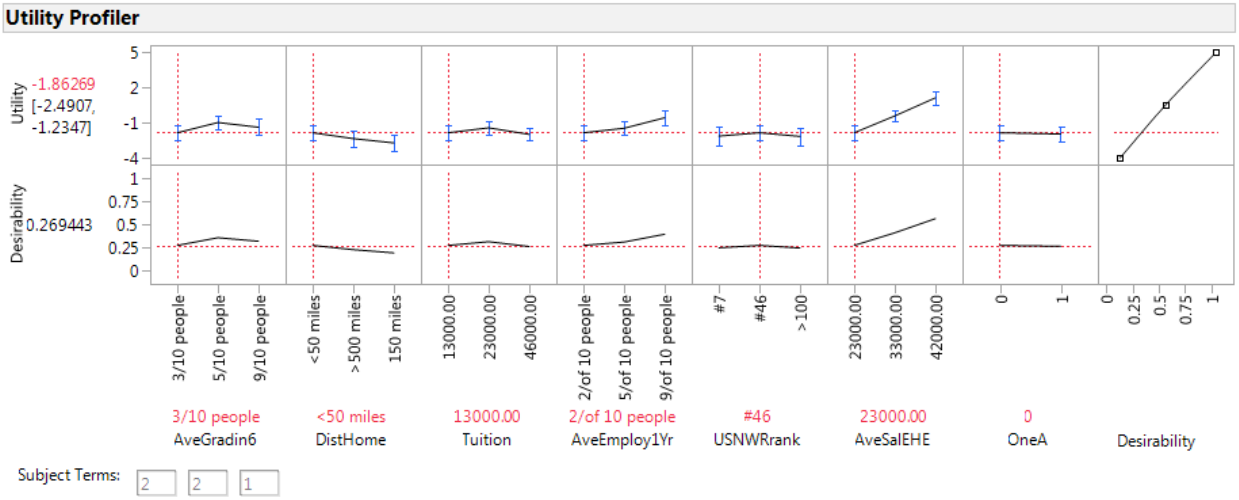
APPENDIX 13: UTILITY PROFILER FOR Q1 FOR GIS INTERACTIONS WITH SAT



APPENDIX 14: UTILITY PROFILER FOR Q1 FOR GIS INTERACTION WITH GRADE



APPENDIX 15: UTILITY PROFILER FOR Q1 FOR GIS INTERACTION WITH INCOME AND GRADE



Appendix 16: Effect Summary for Q1 for Race, Gender, Major and AP (RGMA)

Effect Summary

Source	LogWorth	PValue
AP*AveSalEHE	13.766	0.000
AP*OneA	4.005	0.000
AP*AveEmploy1Yr	2.595	0.003
AP*DistHome	1.841	0.014
Race*DistHome	1.344	0.045
Race*AveEmploy1Yr	1.317	0.048
Major*AveSalEHE	1.196	0.064
Race*OneA	1.103	0.079
AP*Tuition	0.844	0.143
AP*AveGradin6	0.547	0.284
AP*USNWRrank	0.532	0.294
Major*AveEmploy1Yr	0.486	0.326
Race*AveSalEHE	0.480	0.331
OneA	0.425	0.375
Major*Tuition	0.383	0.414
Gender*AveEmploy1Yr	0.370	0.426
Gender*OneA	0.367	0.429
Race*AveGradin6	0.363	0.434
Major*DistHome	0.362	0.434
Race*Tuition	0.361	0.436
USNWRrank	0.257	0.554
AveSalEHE	0.219	0.604
Gender*DistHome	0.187	0.651
Gender*Tuition	0.176	0.666
Major*AveGradin6	0.140	0.725
Race*USNWRrank	0.124	0.751
Gender*AveGradin6	0.106	0.784
Gender*AveSalEHE	0.091	0.811
Major*OneA	0.090	0.813
Gender*USNWRrank	0.085	0.822
Major*USNWRrank	0.050	0.892
DistHome	0.000	1.000
Tuition	0.000	1.000
AveEmploy1Yr	0.000	1.000
AveGradin6	0.000	1.000

Appendix 17: Parameter Estimates for Q1 RGMA

Term	Estimate	Std. Error	Z-value	P Value	
AveGradin6[3/10 people]	0.116	0.358	0.324	0.746	
AveGradin6[5/10 people]	-0.130	0.365	-0.356	0.722	
DistHome[<50 miles]	-0.010	0.322	-0.030	0.976	
DistHome[>500 miles]	0.173	0.305	0.568	0.570	
Tuition[13000.00]	-0.141	0.339	-0.416	0.678	
Tuition[23000.00]	0.152	0.367	0.415	0.678	
AveEmploy1Yr[2/of 10 people]	-0.027	0.296	-0.090	0.928	
AveEmploy1Yr[5/of 10 people]	-0.338	0.452	-0.747	0.455	
USNWRrank[#7]	-0.119	0.303	-0.392	0.695	
USNWRrank[#46]	-0.064	0.299	-0.213	0.831	
AveSalEHE[23000.00]	-0.469	0.367	-1.277	0.201	
AveSalEHE[33000.00]	0.375	0.355	1.056	0.291	
OneA[0]	-0.060	0.110	-0.544	0.587	
Race[1]*AveGradin6[3/10 people]	-0.076	0.139	-0.548	0.584	
Race[1]*AveGradin6[5/10 people]	-0.109	0.162	-0.674	0.500	
Race[1]*DistHome[<50 miles]	**-0.414**	**0.148**	**-2.797**	**0.005**	**
Race[1]*DistHome[>500 miles]	0.269	0.146	1.842	0.066	
Race[1]*Tuition[13000.00]	-0.061	0.162	-0.376	0.707	
Race[1]*Tuition[23000.00]	-0.124	0.173	-0.720	0.471	
Race[1]*AveEmploy1Yr[2/of 10 people]	**0.343**	**0.135**	**2.542**	**0.011**	*
Race[1]*AveEmploy1Yr[5/of 10 people]	-0.074	0.206	-0.357	0.721	
Race[1]*USNWRrank[#7]	-0.195	0.131	-1.480	0.139	
Race[1]*USNWRrank[#46]	0.241	0.144	1.673	0.094	
Race[1]*AveSalEHE[23000.00]	0.250	0.179	1.398	0.162	
Race[1]*AveSalEHE[33000.00]	0.102	0.143	0.710	0.478	
Race[1]*OneA[0]	0.024	0.049	0.482	0.630	
Race[2]*AveGradin6[3/10 people]	0.110	0.101	1.088	0.277	
Race[2]*AveGradin6[5/10 people]	0.050	0.119	0.424	0.672	
Race[2]*DistHome[<50 miles]	-0.064	0.114	-0.557	0.578	
Race[2]*DistHome[>500 miles]	-0.101	0.112	-0.904	0.366	
Race[2]*Tuition[13000.00]	-0.179	0.117	-1.526	0.127	
Race[2]*Tuition[23000.00]	0.105	0.127	0.828	0.408	
Race[2]*AveEmploy1Yr[2/of 10 people]	-0.037	0.101	-0.368	0.713	
Race[2]*AveEmploy1Yr[5/of 10 people]	0.142	0.148	0.959	0.338	
Race[2]*USNWRrank[#7]	-0.091	0.096	-0.951	0.342	
Race[2]*USNWRrank[#46]	0.140	0.105	1.336	0.181	
Race[2]*AveSalEHE[23000.00]	-0.102	0.131	-0.779	0.436	
Race[2]*AveSalEHE[33000.00]	0.137	0.105	1.299	0.194	
Race[2]*OneA[0]	-0.034	0.036	-0.959	0.338	

Race[3]*AveGradin6[3/10 people]	-0.062	0.131	-0.477	0.634	
Race[3]*AveGradin6[5/10 people]	0.108	0.150	0.717	0.473	
Race[3]*DistHome[<50 miles]	0.038	0.147	0.261	0.794	
Race[3]*DistHome[>500 miles]	-0.062	0.146	-0.426	0.670	
Race[3]*Tuition[13000.00]	-0.236	0.153	-1.537	0.124	
Race[3]*Tuition[23000.00]	0.228	0.164	1.390	0.164	
Race[3]*AveEmploy1Yr[2/of 10 people]	0.078	0.132	0.586	0.558	
Race[3]*AveEmploy1Yr[5/of 10 people]	0.000	0.192	0.001	0.999	
Race[3]*USNWRrank[#7]	-0.181	0.124	-1.463	0.143	
Race[3]*USNWRrank[#46]	0.224	0.135	1.654	0.098	
Race[3]*AveSalEHE[23000.00]	-0.012	0.168	-0.070	0.944	
Race[3]*AveSalEHE[33000.00]	-0.021	0.134	-0.160	0.873	
Race[3]*OneA[0]	-0.099	0.046	-2.141	0.032	*
Race[4]*AveGradin6[3/10 people]	-0.264	0.261	-1.013	0.311	
Race[4]*AveGradin6[5/10 people]	0.159	0.320	0.496	0.620	
Race[4]*DistHome[<50 miles]	0.161	0.286	0.564	0.573	
Race[4]*DistHome[>500 miles]	0.318	0.263	1.209	0.227	
Race[4]*Tuition[13000.00]	0.608	0.292	2.084	0.037	
Race[4]*Tuition[23000.00]	-0.359	0.308	-1.166	0.243	
Race[4]*AveEmploy1Yr[2/of 10 people]	-0.091	0.242	-0.377	0.706	
Race[4]*AveEmploy1Yr[5/of 10 people]	-0.392	0.382	-1.026	0.305	
Race[4]*USNWRrank[#7]	0.202	0.234	0.864	0.388	
Race[4]*USNWRrank[#46]	-0.270	0.273	-0.986	0.324	
Race[4]*AveSalEHE[23000.00]	-0.270	0.352	-0.767	0.443	
Race[4]*AveSalEHE[33000.00]	-0.005	0.278	-0.017	0.986	
Race[4]*OneA[0]	0.199	0.091	2.189	0.029	*
Race[5]*AveGradin6[3/10 people]	-0.050	0.146	-0.341	0.733	
Race[5]*AveGradin6[5/10 people]	0.173	0.168	1.034	0.301	
Race[5]*DistHome[<50 miles]	0.148	0.169	0.880	0.379	
Race[5]*DistHome[>500 miles]	-0.111	0.166	-0.669	0.503	
Race[5]*Tuition[13000.00]	-0.038	0.167	-0.225	0.822	
Race[5]*Tuition[23000.00]	0.011	0.182	0.059	0.953	
Race[5]*AveEmploy1Yr[2/of 10 people]	-0.066	0.147	-0.450	0.653	
Race[5]*AveEmploy1Yr[5/of 10 people]	0.079	0.212	0.374	0.709	
Race[5]*USNWRrank[#7]	0.061	0.138	0.438	0.662	
Race[5]*USNWRrank[#46]	-0.029	0.148	-0.195	0.845	
Race[5]*AveSalEHE[23000.00]	-0.139	0.189	-0.739	0.460	
Race[5]*AveSalEHE[33000.00]	0.019	0.151	0.123	0.902	
Race[5]*OneA[0]	-0.043	0.052	-0.828	0.407	
Gender[1]*AveGradin6[3/10 people]	-0.032	0.051	-0.620	0.535	
Gender[1]*AveGradin6[5/10 people]	0.033	0.058	0.573	0.566	
Gender[1]*DistHome[<50 miles]	-0.017	0.057	-0.292	0.770	
Gender[1]*DistHome[>500 miles]	0.046	0.056	0.821	0.412	

Gender[1]*Tuition[13000.00]	-0.034	0.059	-0.580	0.562
Gender[1]*Tuition[23000.00]	-0.010	0.064	-0.163	0.871
Gender[1]*AveEmploy1Yr[2/of 10 people]	-0.039	0.051	-0.775	0.439
Gender[1]*AveEmploy1Yr[5/of 10 people]	0.094	0.074	1.265	0.206
Gender[1]*USNWRrank[#7]	0.027	0.048	0.560	0.575
Gender[1]*USNWRrank[#46]	-0.031	0.052	-0.594	0.552
Gender[1]*AveSalEHE[23000.00]	-0.024	0.066	-0.370	0.712
Gender[1]*AveSalEHE[33000.00]	-0.009	0.052	-0.175	0.861
Gender[1]*OneA[0]	-0.014	0.018	-0.781	0.435
Major[1]*AveGradin6[3/10 people]	-0.036	0.057	-0.635	0.526
Major[1]*AveGradin6[5/10 people]	0.049	0.065	0.758	0.448
Major[1]*DistHome[<50 miles]	0.074	0.062	1.194	0.232
Major[1]*DistHome[>500 miles]	-0.073	0.062	-1.183	0.237
Major[1]*Tuition[13000.00]	-0.036	0.066	-0.541	0.589
Major[1]*Tuition[23000.00]	0.090	0.071	1.262	0.207
Major[1]*AveEmploy1Yr[2/of 10 people]	-0.085	0.056	-1.501	0.133
Major[1]*AveEmploy1Yr[5/of 10 people]	0.087	0.083	1.042	0.297
Major[1]*USNWRrank[#7]	0.000	0.054	-0.002	0.998
Major[1]*USNWRrank[#46]	0.020	0.058	0.346	0.730
Major[1]*AveSalEHE[23000.00]	-0.153	0.073	-2.102	0.036
Major[1]*AveSalEHE[33000.00]	0.028	0.058	0.492	0.623
Major[1]*OneA[0]	0.005	0.020	0.252	0.801
AP[1]*AveGradin6[3/10 people]	-0.560	0.354	-1.580	0.114
AP[1]*AveGradin6[5/10 people]	0.363	0.358	1.014	0.311
AP[1]*DistHome[<50 miles]	0.508	0.316	1.608	0.108
AP[1]*DistHome[>500 miles]	-0.324	0.299	-1.082	0.279
AP[1]*Tuition[13000.00]	0.382	0.333	1.149	0.251
AP[1]*Tuition[23000.00]	-0.040	0.361	-0.111	0.911
AP[1]*AveEmploy1Yr[2/of 10 people]	-0.563	0.291	-1.936	0.053
AP[1]*AveEmploy1Yr[5/of 10 people]	0.201	0.444	0.453	0.651
AP[1]*USNWRrank[#7]	0.318	0.299	1.065	0.287
AP[1]*USNWRrank[#46]	-0.040	0.293	-0.136	0.891
AP[1]*AveSalEHE[23000.00]	-0.620	0.360	-1.720	0.085
AP[1]*AveSalEHE[33000.00]	-0.514	0.350	-1.467	0.142
AP[1]*OneA[0]	0.162	0.108	1.499	0.134
AP[2]*AveGradin6[3/10 people]	-0.426	0.353	-1.207	0.228
AP[2]*AveGradin6[5/10 people]	0.237	0.356	0.666	0.505
AP[2]*DistHome[<50 miles]	0.184	0.314	0.585	0.559
AP[2]*DistHome[>500 miles]	-0.221	0.297	-0.742	0.458
AP[2]*Tuition[13000.00]	0.330	0.331	0.998	0.318
AP[2]*Tuition[23000.00]	-0.254	0.359	-0.709	0.478
AP[2]*AveEmploy1Yr[2/of 10 people]	-0.235	0.289	-0.814	0.416
AP[2]*AveEmploy1Yr[5/of 10 people]	0.073	0.442	0.164	0.869

AP[2]*USNWRrank[#7]	0.198	0.297	0.667	0.504
AP[2]*USNWRrank[#46]	0.008	0.291	0.027	0.978
AP[2]*AveSalEHE[23000.00]	0.161	0.357	0.449	0.653
AP[2]*AveSalEHE[33000.00]	-0.497	0.348	-1.426	0.154
AP[2]*OneA[0]	0.018	0.108	0.164	0.869

*p<.05,**p<.01, ***p<.001

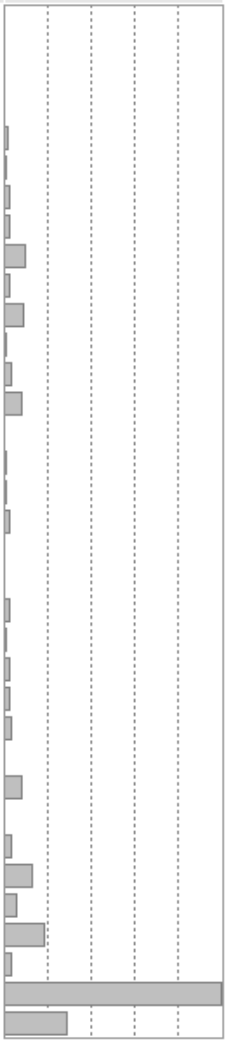
AICc	5022.557
BIC	5830.581
-2*LogLikelihood	4753.661
-2*Firth LogLikelihood	4100.150

Converged in Gradient
Firth Bias-Adjusted Estimates

Appendix 18: Likelihood Ratio Tests for Q1 for RGMA

Likelihood Ratio Tests

Source	L-R ChiSquare	DF	Prob>ChiSq
AveGradin6	0.000	2.000	1.000
DistHome	0.000	2.000	1.000
Tuition	0.000	2.000	1.000
AveEmploy1Yr	0.000	2.000	1.000
USNWRrank	1.182	2.000	0.554
AveSalEHE	1.007	2.000	0.604
OneA	0.785	1.000	0.375
Race*AveGradin6	10.076	10.000	0.434
Race*DistHome	18.626	10.000	0.045
Race*Tuition	10.052	10.000	0.436
Race*AveEmploy1Yr	18.424	10.000	0.048
Race*USNWRrank	6.721	10.000	0.751
Race*AveSalEHE	11.345	10.000	0.331
Race*OneA	9.875	5.000	0.079
Gender*AveGradin6	0.487	2.000	0.784
Gender*DistHome	0.860	2.000	0.651
Gender*Tuition	0.813	2.000	0.666
Gender*AveEmploy1Yr	1.706	2.000	0.426
Gender*USNWRrank	0.392	2.000	0.822
Gender*AveSalEHE	0.418	2.000	0.811
Gender*OneA	0.625	1.000	0.429
Major*AveGradin6	0.644	2.000	0.725
Major*DistHome	1.668	2.000	0.434
Major*Tuition	1.763	2.000	0.414
Major*AveEmploy1Yr	2.239	2.000	0.326
Major*USNWRrank	0.230	2.000	0.892
Major*AveSalEHE	5.506	2.000	0.064
Major*OneA	0.056	1.000	0.813
AP*AveGradin6	5.033	4.000	0.284
AP*DistHome	12.431	4.000	0.014
AP*Tuition	6.865	4.000	0.143
AP*AveEmploy1Yr	16.386	4.000	0.003
AP*USNWRrank	4.939	4.000	0.294
AP*AveSalEHE	70.580	4.000	0.000
AP*OneA	18.442	2.000	0.000



Appendix 19: Effect Marginals for Q1 for RGMA

Effect Marginals

Marginal Probability	Marginal Utility	AveGradin6
0.227	-0.352	3/10 people
0.408	0.232	5/10 people
0.365	0.120	9/10 people

Marginal Probability	Marginal Utility	DistHome
0.443	0.309	<50 miles
0.274	-0.172	>500 miles
0.283	-0.138	150 miles

Marginal Probability	Marginal Utility	Tuition
0.354	0.070	13000.00
0.371	0.117	23000.00
0.274	-0.187	46000.00

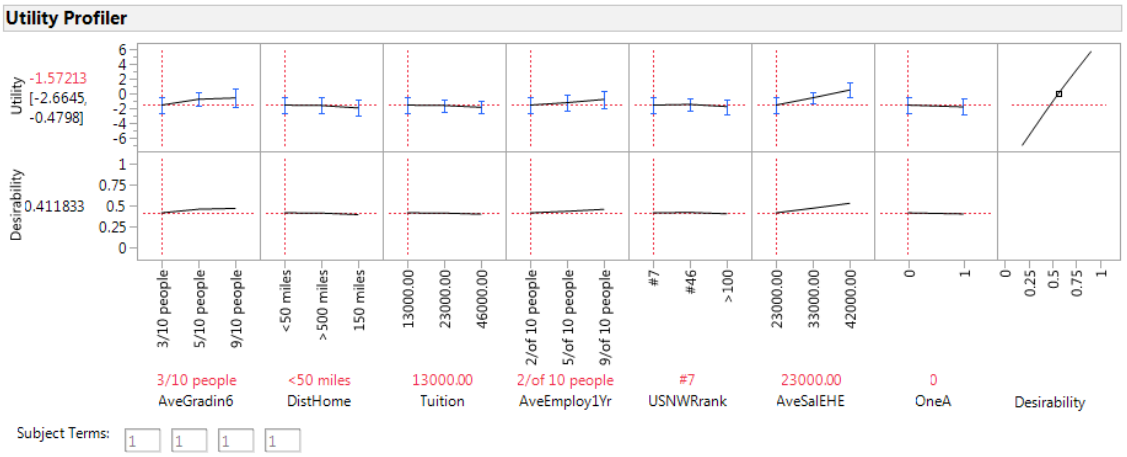
Marginal Probability	Marginal Utility	AveEmploy1Yr
0.199	-0.430	2/of 10 people
0.276	-0.107	5/of 10 people
0.525	0.537	9/of 10 people

Marginal Probability	Marginal Utility	USNWRrank
0.348	0.047	#7
0.352	0.056	#46
0.300	-0.103	>100

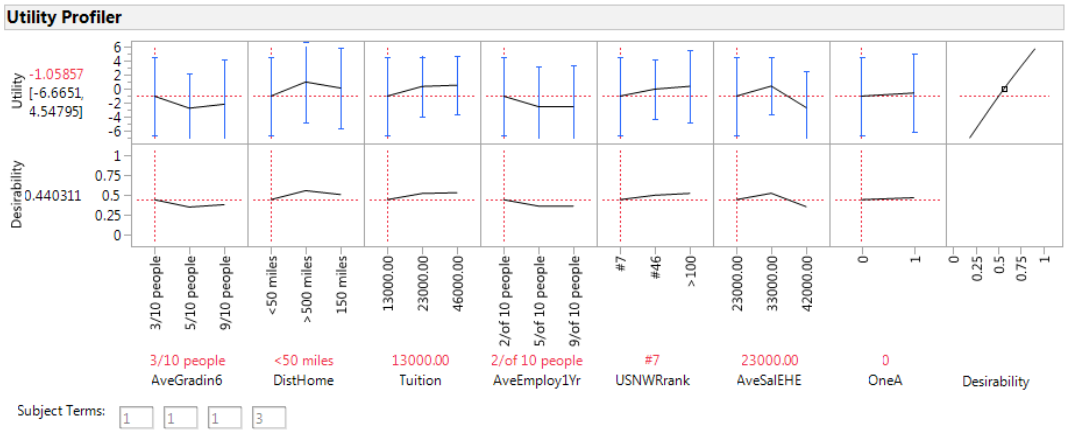
Marginal Probability	Marginal Utility	AveSalEHE
0.121	-0.798	23000.00
0.262	-0.029	33000.00
0.617	0.828	42000.00

Marginal Probability	Marginal Utility	OneA
0.500	0.001	0
0.500	-0.001	1

Appendix 20: Utility Profiler for Q1 for RGMA



Appendix 21: Utility Profiler for Q1 for RGMA and AP Interaction



Appendix 22: Effect Summary for Q2 for GIS

Effect Summary

Source	LogWorth	PValue
Grade*No Choice Indicator	15.523	0.000
AveSalEHE	13.942	0.000
AveEmploy1Yr	7.427	0.000
Income*No Choice Indicator	7.148	0.000
SAT*AveSalEHE	3.340	0.000
Grade*AveSalEHE	2.736	0.002
AveGradin6	2.731	0.002
Income*AveSalEHE	2.458	0.003
Income*AveEmploy1Yr	2.281	0.005
SAT*AveGradin6	1.742	0.018
Grade*DistHome_	1.437	0.037
SAT*No Choice Indicator	1.338	0.046
Income*AveGradin6	0.956	0.111
SAT*AveEmploy1Yr	0.732	0.185
Tuition	0.519	0.303
Grade*USNWRrank	0.466	0.342
No Choice Indicator	0.448	0.357
Income*Tuition	0.328	0.470
Grade*Tuition	0.275	0.531
SAT*USNWRrank	0.219	0.603
SAT*Tuition	0.194	0.640
Grade*AveGradin6	0.176	0.666
Income*USNWRrank	0.148	0.712
USNWRrank	0.096	0.801
DistHome_	0.069	0.853
Grade*AveEmploy1Yr	0.068	0.855
SAT*DistHome_	0.060	0.872
Income*DistHome_	0.028	0.937

Appendix 23: Parameter Estimates for Question 2 GIS

Term	Estimate	Std Error	z-value	p-value	
AveGradin6[3/10 people]	**-0.271**	**0.095**	**-2.853**	**0.004**	**
AveGradin6[5/10 people]	0.006	0.098	0.061	0.951	
DistHome_[<50 miles]	0.026	0.094	0.277	0.782	
DistHome_[>500 miles]	0.019	0.086	0.221	0.825	
Tuition[13000.00]	0.107	0.090	1.189	0.234	
Tuition[23000.00]	-0.132	0.093	-1.419	0.156	
AveEmploy1Yr[2/of 10 people]	**-0.326**	**0.085**	**-3.835**	**0.000**	***
AveEmploy1Yr[5/of 10 people]	-0.114	0.101	-1.129	0.259	
USNWRrank[#7]	0.048	0.084	0.571	0.568	
USNWRrank[#46]	0.002	0.090	0.022	0.982	
AveSalEHE[23000.00]	**-0.538**	**0.105**	**-5.124**	**0.000**	***
AveSalEHE[33000.00]	-0.127	0.086	-1.477	0.140	
No Choice Indicator	-0.081	0.091	-0.890	0.373	
Grade[1]*AveGradin6[3/10 people]	0.085	0.099	0.859	0.391	
Grade[1]*AveGradin6[5/10 people]	-0.062	0.102	-0.608	0.543	
Grade[1]*DistHome_[<50 miles]	0.027	0.097	0.278	0.781	
Grade[1]*DistHome_[>500 miles]	-0.167	0.089	-1.876	0.061	
Grade[1]*Tuition[13000.00]	-0.007	0.093	-0.075	0.940	
Grade[1]*Tuition[23000.00]	0.047	0.097	0.485	0.628	
Grade[1]*AveEmploy1Yr[2/of 10 people]	-0.046	0.088	-0.523	0.601	
Grade[1]*AveEmploy1Yr[5/of 10 people]	0.106	0.104	1.019	0.308	
Grade[1]*USNWRrank[#7]	-0.009	0.088	-0.102	0.919	
Grade[1]*USNWRrank[#46]	0.027	0.093	0.290	0.772	
Grade[1]*AveSalEHE[23000.00]	0.127	0.108	1.176	0.240	
Grade[1]*AveSalEHE[33000.00]	0.130	0.090	1.444	0.149	
Grade[1]*No Choice Indicator	-0.023	0.094	-0.245	0.807	
Grade[2]*AveGradin6[3/10 people]	0.129	0.102	1.265	0.206	
Grade[2]*AveGradin6[5/10 people]	-0.040	0.106	-0.377	0.706	
Grade[2]*DistHome_[<50 miles]	-0.144	0.101	-1.426	0.154	
Grade[2]*DistHome_[>500 miles]	0.042	0.093	0.452	0.652	
Grade[2]*Tuition[13000.00]	-0.131	0.097	-1.351	0.177	
Grade[2]*Tuition[23000.00]	0.085	0.101	0.842	0.400	
Grade[2]*AveEmploy1Yr[2/of 10 people]	-0.026	0.093	-0.280	0.780	
Grade[2]*AveEmploy1Yr[5/of 10 people]	0.040	0.108	0.370	0.711	
Grade[2]*USNWRrank[#7]	-0.054	0.091	-0.593	0.553	
Grade[2]*USNWRrank[#46]	0.166	0.096	1.729	0.084	
Grade[2]*AveSalEHE[23000.00]	-0.052	0.112	-0.464	0.642	
Grade[2]*AveSalEHE[33000.00]	0.021	0.093	0.226	0.821	
Grade[2]*No Choice Indicator	**0.547**	**0.096**	**5.698**	**0.000**	***
Income[1]*AveGradin6[3/10 people]	0.025	0.058	0.431	0.666	

Income[1]*AveGradin6[5/10 people]	0.075	0.061	1.230	0.219	
Income[1]*DistHome_[<50 miles]	0.035	0.060	0.583	0.560	
Income[1]*DistHome_[>500 miles]	0.012	0.056	0.214	0.830	
Income[1]*Tuition[13000.00]	0.089	0.057	1.561	0.118	
Income[1]*Tuition[23000.00]	-0.045	0.059	-0.763	0.446	
Income[1]*AveEmploy1Yr[2/of 10 people]	0.057	0.056	1.018	0.309	
Income[1]*AveEmploy1Yr[5/of 10 people]	-0.095	0.063	-1.508	0.132	
Income[1]*USNWRrank[#7]	0.047	0.055	0.855	0.393	
Income[1]*USNWRrank[#46]	-0.033	0.056	-0.589	0.556	
Income[1]*AveSalEHE[23000.00]	0.005	0.063	0.079	0.937	
Income[1]*AveSalEHE[33000.00]	-0.022	0.054	-0.407	0.684	
Income[1]*No Choice Indicator	-0.071	0.053	-1.340	0.180	
Income[2]*AveGradin6[3/10 people]	-0.027	0.058	-0.466	0.642	
Income[2]*AveGradin6[5/10 people]	-0.123	0.062	-1.984	0.047	
Income[2]*DistHome_[<50 miles]	-0.013	0.060	-0.217	0.828	
Income[2]*DistHome_[>500 miles]	-0.020	0.055	-0.364	0.716	
Income[2]*Tuition[13000.00]	-0.045	0.056	-0.804	0.422	
Income[2]*Tuition[23000.00]	-0.019	0.059	-0.322	0.747	
Income[2]*AveEmploy1Yr[2/of 10 people]	**-0.182**	**0.057**	**-3.193**	**0.001**	***
Income[2]*AveEmploy1Yr[5/of 10 people]	0.103	0.062	1.661	0.097	
Income[2]*USNWRrank[#7]	0.013	0.054	0.241	0.810	
Income[2]*USNWRrank[#46]	0.022	0.055	0.400	0.689	
Income[2]*AveSalEHE[23000.00]	-0.121	0.062	-1.952	0.051	
Income[2]*AveSalEHE[33000.00]	-0.042	0.054	-0.778	0.437	
Income[2]*No Choice Indicator	**-0.186**	**0.052**	**-3.577**	**0.000**	***
SAT[1]*AveGradin6[3/10 people]	-0.076	0.040	-1.900	0.057	
SAT[1]*AveGradin6[5/10 people]	-0.029	0.041	-0.707	0.479	
SAT[1]*DistHome_[<50 miles]	0.015	0.040	0.375	0.708	
SAT[1]*DistHome_[>500 miles]	0.005	0.038	0.132	0.895	
SAT[1]*Tuition[13000.00]	-0.035	0.038	-0.921	0.357	
SAT[1]*Tuition[23000.00]	0.026	0.040	0.650	0.516	
SAT[1]*AveEmploy1Yr[2/of 10 people]	-0.065	0.039	-1.667	0.096	
SAT[1]*AveEmploy1Yr[5/of 10 people]	0.017	0.042	0.405	0.686	
SAT[1]*USNWRrank[#7]	0.007	0.037	0.189	0.850	
SAT[1]*USNWRrank[#46]	-0.035	0.038	-0.921	0.357	
SAT[1]*AveSalEHE[23000.00]	**-0.115**	**0.042**	**-2.738**	**0.006**	**
SAT[1]*AveSalEHE[33000.00]	-0.029	0.037	-0.784	0.433	
SAT[1]*No Choice Indicator	**-0.070**	**0.035**	**-2.000**	**0.046**	*

*p<.05,**p<.01, ***p<.001

AICc	8232.458
BIC	8719.435
-2*LogLikelihood	8073.283
-2*Firth LogLikelihood	7605.074

Converged in Gradient
Firth Bias-Adjusted Estimates

Appendix 24: Likelihood Ratio Tests for Q2 for GIS

Likelihood Ratio Tests

Source	L-R ChiSquare	DF	Prob>ChiSq
AveGradin6	12.575	2.000	0.002
DistHome_	0.319	2.000	0.853
Tuition	2.388	2.000	0.303
AveEmploy1Yr	34.204	2.000	0.000
USNWRrank	0.444	2.000	0.801
AveSalEHE	64.207	2.000	0.000
No Choice Indicator	0.849	1.000	0.357
Grade*AveGradin6	2.381	4.000	0.666
Grade*DistHome_	10.239	4.000	0.037
Grade*Tuition	3.164	4.000	0.531
Grade*AveEmploy1Yr	1.335	4.000	0.855
Grade*USNWRrank	4.506	4.000	0.342
Grade*AveSalEHE	17.112	4.000	0.002
Grade*No Choice Indicator	71.486	2.000	0.000
Income*AveGradin6	7.521	4.000	0.111
Income*DistHome_	0.810	4.000	0.937
Income*Tuition	3.552	4.000	0.470
Income*AveEmploy1Yr	14.754	4.000	0.005
Income*USNWRrank	2.131	4.000	0.712
Income*AveSalEHE	15.678	4.000	0.003
Income*No Choice Indicator	32.918	2.000	0.000
SAT*AveGradin6	8.021	2.000	0.018
SAT*DistHome_	0.275	2.000	0.872
SAT*Tuition	0.891	2.000	0.640
SAT*AveEmploy1Yr	3.373	2.000	0.185
SAT*USNWRrank	1.010	2.000	0.603
SAT*AveSalEHE	15.380	2.000	0.000
SAT*No Choice Indicator	3.985	1.000	0.046

Appendix 25: Effect Marginals for Question 2 GIS

Effect Marginals

Marginal Probability	Marginal Utility	AveGradin6
0.272	-0.189	3/10 people
0.314	-0.045	5/10 people
0.415	0.234	9/10 people

Marginal Probability	Marginal Utility	DistHome_
0.329	-0.010	<50 miles
0.313	-0.062	>500 miles
0.358	0.072	150 miles

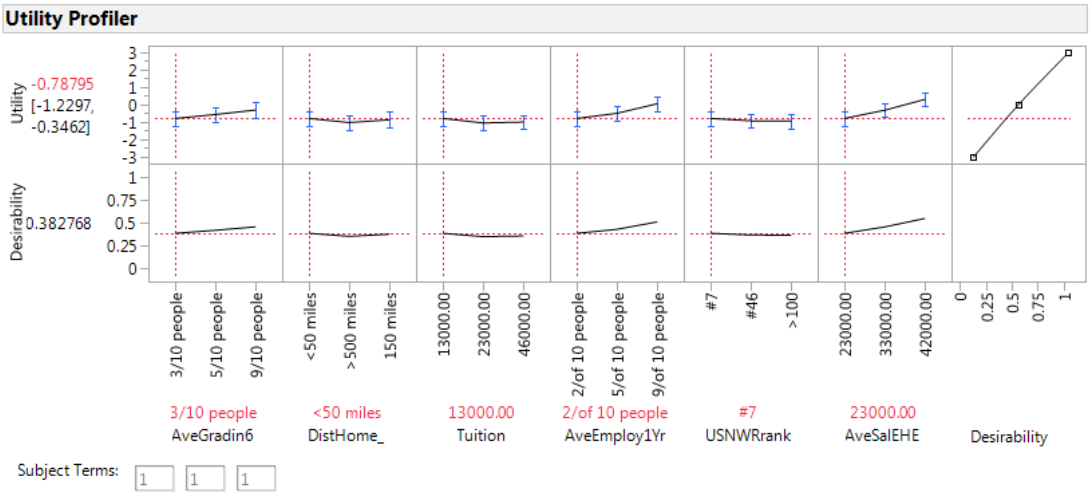
Marginal Probability	Marginal Utility	USNWRrank
0.338	0.017	#7
0.358	0.072	#46
0.304	-0.089	>100

Marginal Probability	Marginal Utility	Tuition
0.348	0.045	13000.00
0.313	-0.063	23000.00
0.339	0.018	46000.00

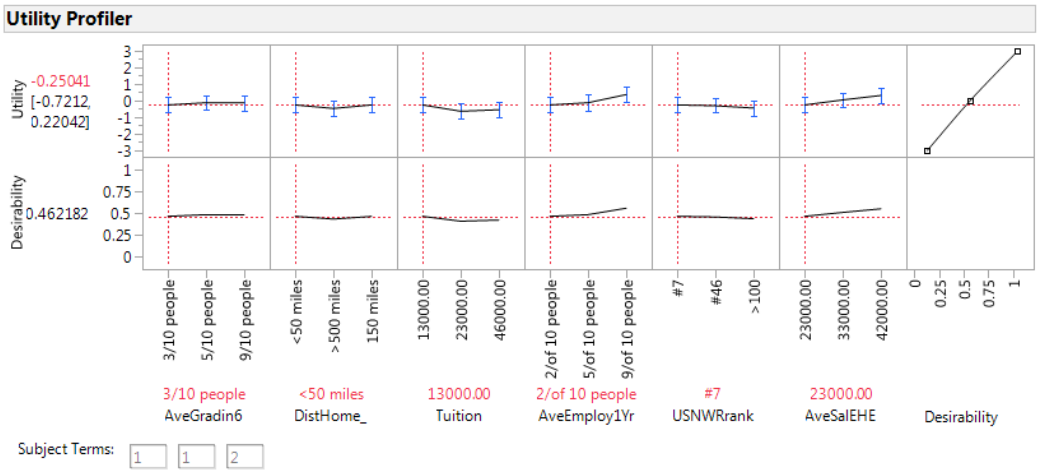
Marginal Probability	Marginal Utility	AveSalEHE
0.188	-0.487	23000.00
0.294	-0.041	33000.00
0.519	0.528	42000.00

Marginal Probability	Marginal Utility	AveEmploy1Yr
0.222	-0.359	2/of 10 people
0.307	-0.034	5/of 10 people
0.471	0.393	9/of 10 people

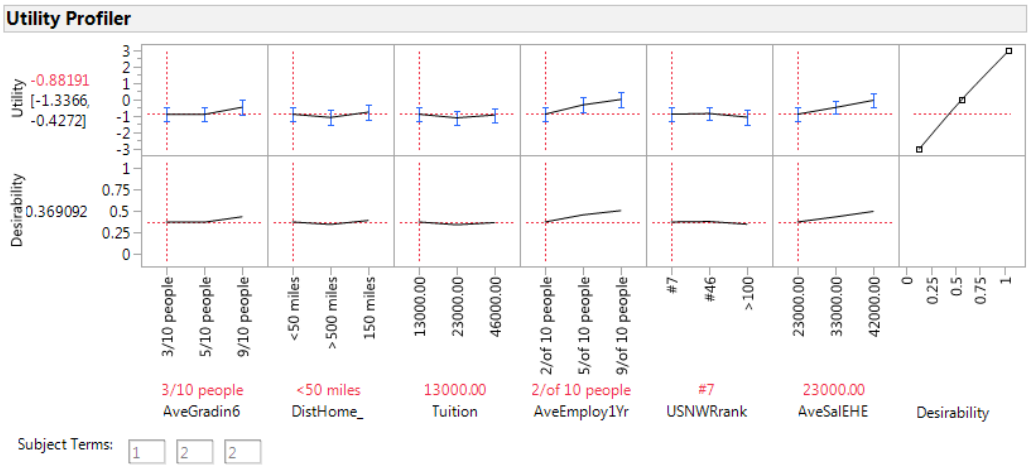
Appendix 26: Utility Profiler for Question 2 GIS



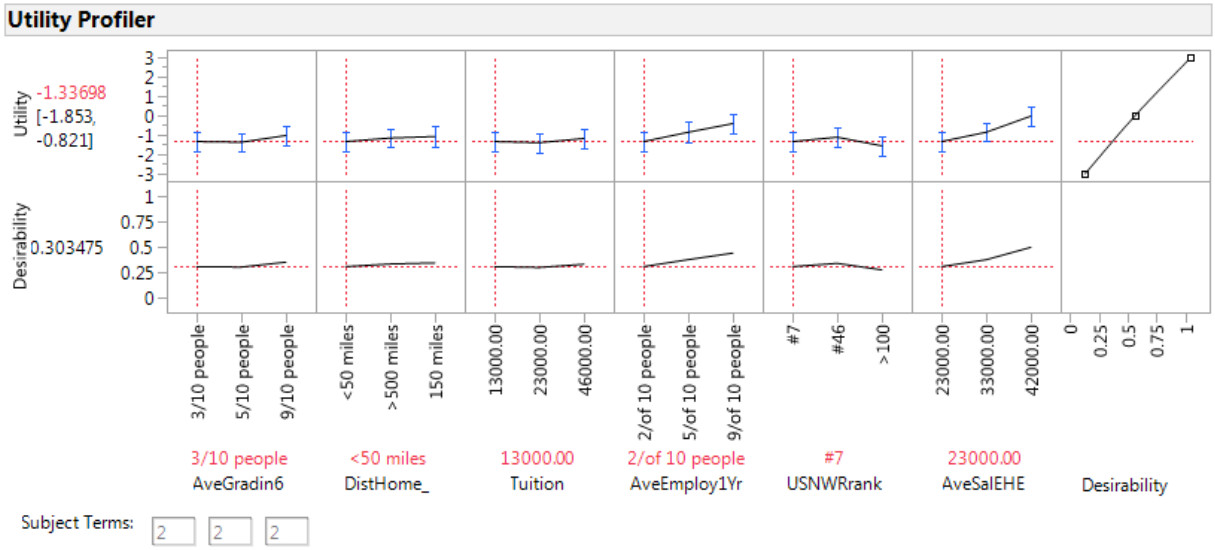
Appendix 27: Utility Profiler for Question 2 GIS with SAT Interaction



Appendix 28: Utility Profiler for Question 2 with Income and SAT Interaction



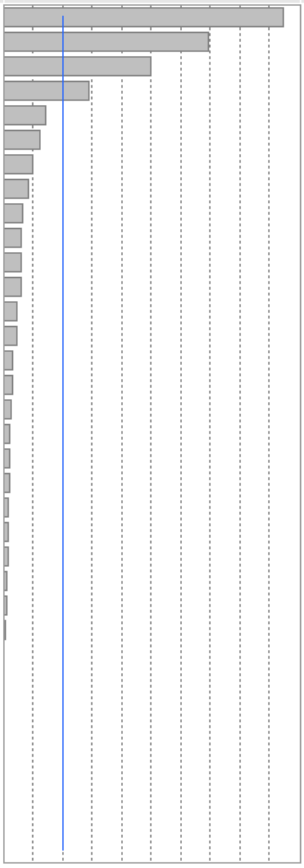
Appendix 29: Utility Profiler for Question 2 with Grade, Income and SAT Interaction



Appendix 30: Effect Summary for Q2 with Race, Gender, Major and AP Courses (RGMA)

Effect Summary

Source	LogWorth	PValue
AP*No Choice Indicator	9.499	0.000
AP*AveSalEHE	6.936	0.000
Race*No Choice Indicator	4.980	0.000
Gender*No Choice Indicator	2.916	0.001
No Choice Indicator	1.451	0.035
Race*AveSalEHE	1.230	0.059
AP*AveGradin6	0.981	0.104
Major*Tuition	0.851	0.141
Race*AveEmploy1Yr	0.643	0.228
Gender*AveSalEHE	0.632	0.233
Tuition	0.598	0.252
AP*AveEmploy1Yr	0.587	0.259
Major*DistHome_	0.445	0.359
Major*AveSalEHE	0.440	0.363
Gender*AveEmploy1Yr	0.339	0.458
AP*Tuition	0.313	0.486
Gender*AveGradin6	0.249	0.564
AveSalEHE	0.239	0.577
Major*USNWRrank	0.216	0.608
Race*USNWRrank	0.203	0.626
Major*AveGradin6	0.174	0.670
Gender*USNWRrank	0.167	0.681
Race*DistHome_	0.155	0.700
AP*USNWRrank	0.140	0.725
Major*No Choice Indicator	0.113	0.771
Race*AveGradin6	0.075	0.842
Major*AveEmploy1Yr	0.048	0.895
Gender*Tuition	0.045	0.902
Race*Tuition	0.017	0.962
USNWRrank	0.008	0.981
Gender*DistHome_	0.001	0.998
AP*DistHome_	0.000	0.999
DistHome_	0.000	1.000
AveEmploy1Yr	0.000	1.000
AveGradin6	0.000	1.000



Appendix 31: Parameter Estimates for Q2 with Race, Gender, Major and AP(RGMAP)

Term	Estimate	Std Error	Z test	P Value	
AveGradin6[3/10 people]	0.133	0.286	0.465	0.642	
AveGradin6[5/10 people]	-0.217	0.310	-0.700	0.484	
DistHome_[<50 miles]	-0.148	0.276	-0.536	0.592	
DistHome_[>500 miles]	0.353	0.281	1.256	0.209	
Tuition[13000.00]	-0.361	0.276	-1.308	0.191	
Tuition[23000.00]	0.096	0.250	0.384	0.701	
AveEmploy1Yr[2/of 10 people]	-0.026	0.289	-0.090	0.928	
AveEmploy1Yr[5/of 10 people]	-0.049	0.342	-0.143	0.886	
USNWRrank[#7]	-0.088	0.269	-0.327	0.744	
USNWRrank[#46]	-0.045	0.242	-0.186	0.852	
AveSalEHE[23000.00]	-0.304	0.259	-1.174	0.240	
AveSalEHE[33000.00]	0.371	0.284	1.306	0.191	
No Choice Indicator	-0.534	0.338	-1.580	0.114	
Race[1]*AveGradin6[3/10 people]	-0.020	0.108	-0.185	0.853	
Race[1]*AveGradin6[5/10 people]	-0.035	0.113	-0.310	0.757	
Race[1]*DistHome_[<50 miles]	-0.103	0.109	-0.945	0.345	
Race[1]*DistHome_[>500 miles]	0.088	0.102	0.863	0.388	
Race[1]*Tuition[13000.00]	0.013	0.105	0.124	0.901	
Race[1]*Tuition[23000.00]	0.038	0.110	0.345	0.730	
Race[1]*AveEmploy1Yr[2/of 10 people]	**0.220**	**0.105**	**2.095**	**0.036**	*****
Race[1]*AveEmploy1Yr[5/of 10 people]	-0.033	0.116	-0.284	0.776	
Race[1]*USNWRrank[#7]	-0.043	0.102	-0.422	0.673	
Race[1]*USNWRrank[#46]	0.150	0.104	1.442	0.149	
Race[1]*AveSalEHE[23000.00]	0.057	0.116	0.491	0.623	
Race[1]*AveSalEHE[33000.00]	0.058	0.103	0.563	0.573	
Race[1]*No Choice Indicator	0.084	0.095	0.884	0.377	
Race[2]*AveGradin6[3/10 people]	0.074	0.078	0.949	0.343	
Race[2]*AveGradin6[5/10 people]	0.003	0.081	0.037	0.970	
Race[2]*DistHome_[<50 miles]	0.075	0.080	0.938	0.349	
Race[2]*DistHome_[>500 miles]	-0.108	0.075	-1.440	0.150	
Race[2]*Tuition[13000.00]	-0.011	0.076	-0.145	0.885	
Race[2]*Tuition[23000.00]	0.032	0.079	0.405	0.685	

Race[2]*AveEmploy1Yr[2/of 10 people]	-0.051	0.077	-0.662	0.508	
Race[2]*AveEmploy1Yr[5/of 10 people]	-0.017	0.083	-0.205	0.838	
Race[2]*USNWRrank[#7]	-0.040	0.074	-0.541	0.589	
Race[2]*USNWRrank[#46]	-0.015	0.076	-0.197	0.844	
Race[2]*AveSalEHE[23000.00]	-0.160	0.084	-1.905	0.057	
Race[2]*AveSalEHE[33000.00]	0.015	0.074	0.203	0.839	
Race[2]*No Choice Indicator	-0.070	0.069	-1.014	0.310	
Race[3]*AveGradin6[3/10 people]	0.107	0.101	1.059	0.289	
Race[3]*AveGradin6[5/10 people]	-0.051	0.105	-0.486	0.627	
Race[3]*DistHome_[<50 miles]	0.082	0.102	0.804	0.421	
Race[3]*DistHome_[>500 miles]	-0.003	0.097	-0.031	0.975	
Race[3]*Tuition[13000.00]	-0.131	0.099	-1.323	0.186	
Race[3]*Tuition[23000.00]	0.070	0.103	0.680	0.497	
Race[3]*AveEmploy1Yr[2/of 10 people]	0.077	0.100	0.770	0.441	
Race[3]*AveEmploy1Yr[5/of 10 people]	-0.004	0.108	-0.037	0.970	
Race[3]*USNWRrank[#7]	-0.071	0.097	-0.732	0.464	
Race[3]*USNWRrank[#46]	0.066	0.098	0.673	0.501	
Race[3]*AveSalEHE[23000.00]	0.216	0.107	2.019	0.044	
Race[3]*AveSalEHE[33000.00]	-0.162	0.098	-1.653	0.098	
Race[3]*No Choice Indicator	**0.352**	**0.088**	**4.000**	**0.000**	***
Race[4]*AveGradin6[3/10 people]	-0.271	0.183	-1.481	0.139	
Race[4]*AveGradin6[5/10 people]	0.226	0.191	1.183	0.237	
Race[4]*DistHome_[<50 miles]	-0.032	0.190	-0.168	0.866	
Race[4]*DistHome_[>500 miles]	0.203	0.172	1.180	0.238	
Race[4]*Tuition[13000.00]	0.185	0.177	1.045	0.296	
Race[4]*Tuition[23000.00]	-0.069	0.192	-0.359	0.719	
Race[4]*AveEmploy1Yr[2/of 10 people]	-0.258	0.182	-1.418	0.156	
Race[4]*AveEmploy1Yr[5/of 10 people]	0.135	0.196	0.689	0.491	
Race[4]*USNWRrank[#7]	0.175	0.171	1.023	0.306	
Race[4]*USNWRrank[#46]	0.075	0.180	0.417	0.677	
Race[4]*AveSalEHE[23000.00]	-0.296	0.208	-1.423	0.155	
Race[4]*AveSalEHE[33000.00]	0.264	0.172	1.535	0.125	
Race[4]*No Choice Indicator	0.019	0.162	0.117	0.907	

Race[5]*AveGradin6[3/10 people]	-0.035	0.113	-0.310	0.757	
Race[5]*AveGradin6[5/10 people]	0.009	0.117	0.077	0.939	
Race[5]*DistHome_[<50 miles]	0.010	0.113	0.088	0.929	
Race[5]*DistHome_[>500 miles]	-0.093	0.108	-0.861	0.389	
Race[5]*Tuition[13000.00]	0.050	0.109	0.459	0.646	
Race[5]*Tuition[23000.00]	-0.052	0.115	-0.452	0.651	
Race[5]*AveEmploy1Yr[2/of 10 people]	0.136	0.108	1.259	0.208	
Race[5]*AveEmploy1Yr[5/of 10 people]	-0.097	0.122	-0.795	0.427	
Race[5]*USNWRrank[#7]	0.002	0.106	0.019	0.985	
Race[5]*USNWRrank[#46]	-0.008	0.109	-0.073	0.941	
Race[5]*AveSalEHE[23000.00]	0.020	0.121	0.165	0.869	
Race[5]*AveSalEHE[33000.00]	0.028	0.106	0.264	0.792	
Race[5]*No Choice Indicator	-0.301	0.103	-2.922	0.003	
Gender[1]*AveGradin6[3/10 people]	-0.036	0.040	-0.900	0.368	
Gender[1]*AveGradin6[5/10 people]	0.040	0.042	0.952	0.341	
Gender[1]*DistHome_[<50 miles]	0.005	0.041	0.122	0.903	
Gender[1]*DistHome_[>500 miles]	-0.002	0.038	-0.053	0.958	
Gender[1]*Tuition[13000.00]	0.002	0.039	0.051	0.959	
Gender[1]*Tuition[23000.00]	-0.017	0.041	-0.415	0.678	
Gender[1]*AveEmploy1Yr[2/of 10 people]	-0.022	0.039	-0.564	0.573	
Gender[1]*AveEmploy1Yr[5/of 10 people]	-0.024	0.043	-0.558	0.577	
Gender[1]*USNWRrank[#7]	-0.008	0.038	-0.211	0.833	
Gender[1]*USNWRrank[#46]	-0.022	0.039	-0.564	0.573	
Gender[1]*AveSalEHE[23000.00]	-0.023	0.043	-0.535	0.593	
Gender[1]*AveSalEHE[33000.00]	-0.038	0.038	-1.000	0.317	
Gender[1]*No Choice Indicator	**0.113**	**0.036**	**3.139**	**0.002**	**
Major[1]*AveGradin6[3/10 people]	0.018	0.045	0.400	0.689	
Major[1]*AveGradin6[5/10 people]	-0.042	0.047	-0.894	0.372	
Major[1]*DistHome_[<50 miles]	-0.016	0.046	-0.348	0.728	
Major[1]*DistHome_[>500 miles]	-0.043	0.043	-1.000	0.317	
Major[1]*Tuition[13000.00]	0.069	0.044	1.568	0.117	
Major[1]*Tuition[23000.00]	-0.079	0.046	-1.717	0.086	
Major[1]*AveEmploy1Yr[2/of 10 people]	-0.022	0.044	-0.500	0.617	

Major[1]*AveEmploy1Yr[5/of 10 people]	0.012	0.048	0.250	0.803
Major[1]*USNWRrank[#7]	0.027	0.043	0.628	0.530
Major[1]*USNWRrank[#46]	-0.042	0.043	-0.977	0.329
Major[1]*AveSalEHE[23000.00]	-0.064	0.048	-1.333	0.182
Major[1]*AveSalEHE[33000.00]	0.013	0.043	0.302	0.762
Major[1]*No Choice Indicator	0.012	0.040	0.300	0.764
AP[1]*AveGradin6[3/10 people]	-0.470	0.283	-1.661	0.097
AP[1]*AveGradin6[5/10 people]	0.204	0.307	0.664	0.506
AP[1]*DistHome_[<50 miles]	0.096	0.273	0.352	0.725
AP[1]*DistHome_[>500 miles]	-0.318	0.278	-1.144	0.253
AP[1]*Tuition[13000.00]	0.413	0.273	1.513	0.130
AP[1]*Tuition[23000.00]	-0.144	0.247	-0.583	0.560
AP[1]*AveEmploy1Yr[2/of 10 people]	-0.426	0.286	-1.490	0.136
AP[1]*AveEmploy1Yr[5/of 10 people]	0.032	0.339	0.094	0.925
AP[1]*USNWRrank[#7]	0.170	0.266	0.639	0.523
AP[1]*USNWRrank[#46]	0.110	0.238	0.462	0.644
AP[1]*AveSalEHE[23000.00]	-0.307	0.255	-1.204	0.229
AP[1]*AveSalEHE[33000.00]	-0.427	0.281	-1.520	0.129
AP[1]*No Choice Indicator	0.449	0.336	1.336	0.181
AP[2]*AveGradin6[3/10 people]	-0.302	0.282	-1.071	0.284
AP[2]*AveGradin6[5/10 people]	0.221	0.306	0.722	0.470
AP[2]*DistHome_[<50 miles]	0.134	0.272	0.493	0.622
AP[2]*DistHome_[>500 miles]	-0.383	0.277	-1.383	0.167
AP[2]*Tuition[13000.00]	0.386	0.272	1.419	0.156
AP[2]*Tuition[23000.00]	-0.163	0.246	-0.663	0.508
AP[2]*AveEmploy1Yr[2/of 10 people]	-0.257	0.285	-0.902	0.367
AP[2]*AveEmploy1Yr[5/of 10 people]	0.014	0.338	0.041	0.967
AP[2]*USNWRrank[#7]	0.064	0.265	0.242	0.809
AP[2]*USNWRrank[#46]	0.127	0.238	0.534	0.594

APPENDIX 32: LIKELIHOOD RATIO TESTS FOR Q2 WITH RACE, GENDER, MAJOR AND AP COURSES

Likelihood Ratio Tests

Source	L-R ChiSquare	DF	Prob>ChiSq
AveGradin6	0.000	2.000	1.000
DistHome_	0.000	2.000	1.000
Tuition	2.753	2.000	0.252
AveEmploy1Yr	0.000	2.000	1.000
USNWRrank	0.038	2.000	0.981
AveSalEHE	1.100	2.000	0.577
No Choice Indicator	4.424	1.000	0.035
Race*AveGradin6	5.668	10.000	0.842
Race*DistHome_	7.270	10.000	0.700
Race*Tuition	3.640	10.000	0.962
Race*AveEmploy1Yr	12.928	10.000	0.228
Race*USNWRrank	8.028	10.000	0.626
Race*AveSalEHE	17.777	10.000	0.059
Race*No Choice Indicator	30.753	5.000	0.000
Gender*AveGradin6	1.146	2.000	0.564
Gender*DistHome_	0.004	2.000	0.998
Gender*Tuition	0.206	2.000	0.902
Gender*AveEmploy1Yr	1.561	2.000	0.458
Gender*USNWRrank	0.769	2.000	0.681
Gender*AveSalEHE	2.912	2.000	0.233
Gender*No Choice Indicator	10.472	1.000	0.001
Major*AveGradin6	0.801	2.000	0.670
Major*DistHome_	2.050	2.000	0.359
Major*Tuition	3.919	2.000	0.141
Major*AveEmploy1Yr	0.222	2.000	0.895
Major*USNWRrank	0.996	2.000	0.608
Major*AveSalEHE	2.025	2.000	0.363
Major*No Choice Indicator	0.085	1.000	0.771
AP*AveGradin6	7.669	4.000	0.104
AP*DistHome_	0.085	4.000	0.999
AP*Tuition	3.447	4.000	0.486
AP*AveEmploy1Yr	5.287	4.000	0.259
AP*USNWRrank	2.059	4.000	0.725
AP*AveSalEHE	37.929	4.000	0.000
AP*No Choice Indicator	43.745	2.000	0.000

APPENDIX 33: EFFECT MARGINALS FOR Q2 WITH RACE, GENDER, MAJOR AND AP COURSES

Effect Marginals

Marginal Probability	Marginal Utility	AveGradin6
0.272	-0.188	3/10 people
0.316	-0.038	5/10 people
0.412	0.226	9/10 people

Marginal Probability	Marginal Utility	DistHome_
0.332	-0.003	<50 miles
0.312	-0.066	>500 miles
0.357	0.069	150 miles

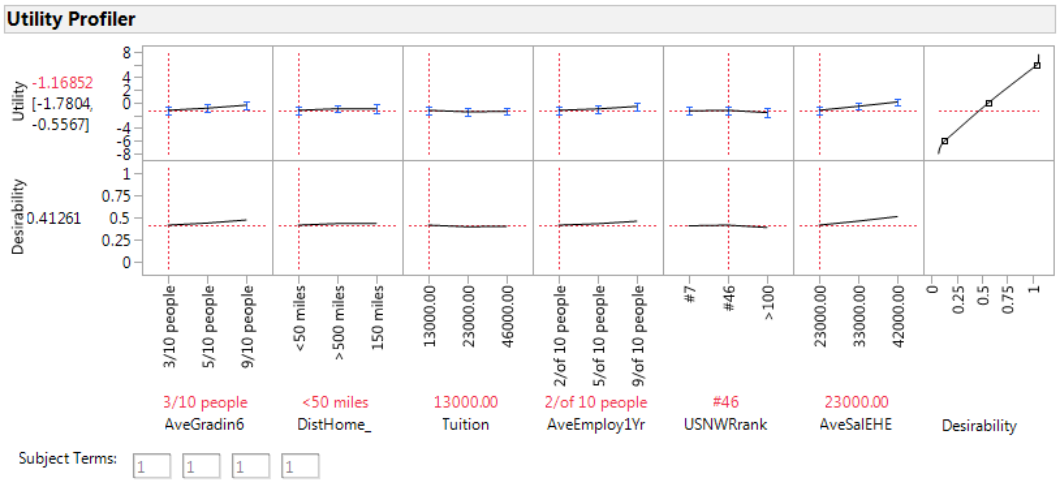
Marginal Probability	Marginal Utility	USNWRrank
0.335	0.007	#7
0.358	0.072	#46
0.307	-0.079	>100

Marginal Probability	Marginal Utility	Tuition
0.350	0.051	13000.00
0.311	-0.068	23000.00
0.339	0.017	46000.00

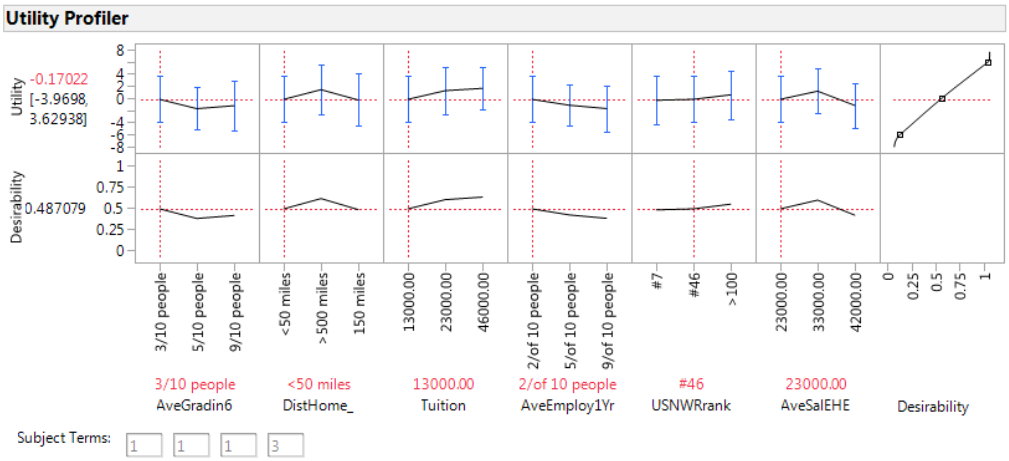
Marginal Probability	Marginal Utility	AveSalEHE
0.189	-0.485	23000.00
0.296	-0.034	33000.00
0.515	0.518	42000.00

Marginal Probability	Marginal Utility	AveEmploy1Yr
0.224	-0.350	2/of 10 people
0.307	-0.037	5/of 10 people
0.469	0.387	9/of 10 people

APPENDIX 34: UTILITY PROFILER.FOR Q2 WITH RACE, GENDER, MAJOR AND AP COURSES



APPENDIX 35: UTILITY PROFILER FOR Q2 WITH RACE, GENDER, MAJOR, AP COURSES AND AP INTERACTION



APPENDIX 36 - PARAMETER ESTIMATES TABLE- RACE, GENDER, AND INCOME

Term	Estima	Std Erro	Lower	Upper	Z Value	P value
AveGradin6[3/10 people]	-0.241	0.0466	-0.3315	-0.1509	-5.1717	0.0000
AveGradin6[5/10 people]	0.0128	0.0497	-0.0832	0.1095	0.2575	0.3984
DistHome_[<50 miles]	0.0568	0.0486	-0.0373	0.1515	1.1687	0.1213
DistHome_[>500 miles]	-0.0256	0.0451	-0.1134	0.0613	-0.5676	0.2851
Tuition[13000.00]	0.1061	0.0465	0.0157	0.1959	2.2817	0.0113
Tuition[23000.00]	-0.0556	0.0481	-0.1486	0.0379	-1.1559	0.1239
AveEmploy1Yr[2/of 10 people]	-0.3747	0.045	-0.4626	-0.2884	-8.3267	0.0000
AveEmploy1Yr[5/of 10 people]	-0.0578	0.0532	-0.1607	0.0454	-1.0865	0.1386
USNWRrank[#46]	-0.0067	0.0455	-0.0947	0.0815	-0.1473	0.4415
USNWRrank[#7]	0.0701	0.0433	-0.0138	0.1535	1.6189	0.0527
AveSalEHE[23000.00]	-0.4768	0.0515	-0.5772	-0.3775	-9.2583	0.0000
AveSalEHE[33000.00]	-0.0415	0.0436	-0.1258	0.0428	-0.9518	0.1706
No Choice Indicator	-0.8863	0.0505	-0.9862	-0.7895	-17.5505	0.0000
Race[1]*AveGradin6[3/10 people]	-0.0448	0.0772	-0.1951	0.1054	-0.5803	0.2809
Race[1]*AveGradin6[5/10 people]	-0.053	0.0823	-0.213	0.1074	-0.6440	0.2598
Race[1]*DistHome_[<50 miles]	-0.1581	0.0781	-0.3103	-0.0061	-2.0243	0.0215
Race[1]*DistHome_[>500 miles]	0.1003	0.0736	-0.043	0.2435	1.3628	0.0865
Race[1]*Tuition[13000.00]	-0.0001	0.0762	-0.1486	0.148	-0.0013	0.4995
Race[1]*Tuition[23000.00]	-0.0044	0.0797	-0.1595	0.1511	-0.0552	0.4780
Race[1]*AveEmploy1Yr[2/of 10 people]	0.2242	0.0732	0.082	0.3665	3.0628	0.0011
Race[1]*AveEmploy1Yr[5/of 10 people]	-0.015	0.0879	-0.1862	0.1562	-0.1706	0.4323
Race[1]*USNWRrank[#46]	0.1753	0.0749	0.0298	0.3214	2.3405	0.0096
Race[1]*USNWRrank[#7]	-0.0769	0.0718	-0.2167	0.0625	-1.0710	0.1421
Race[1]*AveSalEHE[23000.00]	0.0682	0.0849	-0.0975	0.2334	0.8033	0.2109
Race[1]*AveSalEHE[33000.00]	0.0481	0.0727	-0.0933	0.1895	0.6616	0.2541

Race[1]*No Choice Indicator	0.0876	0.0824	-0.0741	0.2476	1.0631	0.1439
Race[2]*AveGradin6[3/10 people]	0.0394	0.0562	-0.0697	0.1486	0.7011	0.2416
Race[2]*AveGradin6[5/10 people]	0.0137	0.0602	-0.1035	0.1305	0.2276	0.4100
Race[2]*DistHome_[<50 miles]	0.0315	0.0585	-0.0825	0.1452	0.5385	0.2951
Race[2]*DistHome_[>500 miles]	-0.0942	0.0543	-0.1995	0.0116	-1.7348	0.0414
Race[2]*Tuition[13000.00]	-0.0403	0.056	-0.1489	0.0685	-0.7196	0.2359
Race[2]*Tuition[23000.00]	0.0288	0.0581	-0.0843	0.1416	0.4957	0.3101
Race[2]*AveEmploy1Yr[2/of 10 people]	-0.0448	0.054	-0.1492	0.0605	-0.8296	0.2034
Race[2]*AveEmploy1Yr[5/of 10 people]	0.0093	0.0641	-0.1153	0.1338	0.1451	0.4423
Race[2]*USNWRrank[#46]	0.039	0.0549	-0.0677	0.1456	0.7104	0.2387
Race[2]*USNWRrank[#7]	-0.0395	0.0522	-0.1405	0.0617	-0.7567	0.2246
Race[2]*AveSalEHE[23000.00]	-0.1561	0.0617	-0.2759	-0.0358	-2.5300	0.0057
Race[2]*AveSalEHE[33000.00]	0.0313	0.0523	-0.0702	0.1328	0.5985	0.2748
Race[2]*No Choice Indicator	-0.0485	0.0606	-0.1659	0.0705	-0.8003	0.2118
Race[3]*AveGradin6[3/10 people]	0.0159	0.0714	-0.123	0.1548	0.2227	0.4119
Race[3]*AveGradin6[5/10 people]	-0.0128	0.0757	-0.1601	0.1346	-0.1691	0.4329
Race[3]*DistHome_[<50 miles]	0.0491	0.0729	-0.0929	0.1911	0.6735	0.2503
Race[3]*DistHome_[>500 miles]	-0.0216	0.0684	-0.1547	0.1113	-0.3158	0.3761
Race[3]*Tuition[13000.00]	-0.1222	0.0706	-0.2597	0.0149	-1.7309	0.0417
Race[3]*Tuition[23000.00]	0.0881	0.0728	-0.0536	0.2299	1.2102	0.1131
Race[3]*AveEmploy1Yr[2/of 10 people]	0.0851	0.0683	-0.0477	0.2178	1.2460	0.1064
Race[3]*AveEmploy1Yr[5/of 10 people]	-0.0182	0.0803	-0.1746	0.138	-0.2267	0.4103
Race[3]*USNWRrank[#46]	0.0991	0.0692	-0.0354	0.2338	1.4321	0.0761
Race[3]*USNWRrank[#7]	-0.085	0.0664	-0.2141	0.0438	-1.2801	0.1003
Race[3]*AveSalEHE[23000.00]	0.1043	0.0774	-0.0465	0.2549	1.3475	0.0889

Race[3]*AveSalEHE[33000.00]	-0.1123	0.0667	-0.242	0.0173	-1.6837	0.0461
Race[3]*No Choice Indicator	0.2654	0.0742	0.1206	0.41	3.5768	0.0002
Race[4]*AveGradin6[3/10 people]	-0.1943	0.1304	-0.4494	0.0565	-1.4900	0.0681
Race[4]*AveGradin6[5/10 people]	0.2027	0.1407	-0.0675	0.4794	1.4407	0.0748
Race[4]*DistHome_[<50 miles]	0.0216	0.1393	-0.2482	0.2943	0.1551	0.4384
Race[4]*DistHome_[>500 miles]	0.1859	0.1244	-0.0568	0.4263	1.4944	0.0675
Race[4]*Tuition[13000.00]	0.2833	0.1316	0.0283	0.5395	2.1527	0.0157
Race[4]*Tuition[23000.00]	-0.0904	0.1377	-0.3567	0.1789	-0.6565	0.2558
Race[4]*AveEmploy1Yr[2/of 10 people]	-0.2247	0.126	-0.4731	0.0151	-1.7833	0.0373
Race[4]*AveEmploy1Yr[5/of 10 people]	0.041	0.148	-0.2457	0.3293	0.2770	0.3909
Race[4]*USNWRrank[#46]	-0.0554	0.1304	-0.307	0.1998	-0.4248	0.3355
Race[4]*USNWRrank[#7]	0.1486	0.1209	-0.0862	0.3819	1.2291	0.1095
Race[4]*AveSalEHE[23000.00]	-0.2776	0.1525	-0.5801	0.0141	-1.8203	0.0344
Race[4]*AveSalEHE[33000.00]	0.2025	0.1226	-0.0338	0.442	1.6517	0.0493
Race[4]*No Choice Indicator	0.0068	0.1399	-0.2728	0.2724	0.0486	0.4806
Race[5]*AveGradin6[3/10 people]	-0.0107	0.0812	-0.1688	0.1471	-0.1318	0.4476
Race[5]*AveGradin6[5/10 people]	0.0714	0.0863	-0.0961	0.2399	0.8273	0.2040
Race[5]*DistHome_[<50 miles]	0.0542	0.083	-0.1072	0.2163	0.6530	0.2569
Race[5]*DistHome_[>500 miles]	-0.0401	0.0782	-0.1926	0.1118	-0.5128	0.3040
Race[5]*Tuition[13000.00]	0.009	0.0804	-0.1477	0.1651	0.1119	0.4554
Race[5]*Tuition[23000.00]	-0.0452	0.0835	-0.2076	0.1178	-0.5413	0.2941
Race[5]*AveEmploy1Yr[2/of 10 people]	0.1335	0.0764	-0.0153	0.2818	1.7474	0.0403
Race[5]*AveEmploy1Yr[5/of 10 people]	-0.0896	0.0935	-0.2717	0.0926	-0.9583	0.1690
Race[5]*USNWRrank[#46]	-0.0374	0.0788	-0.1906	0.1164	-0.4746	0.3175
Race[5]*USNWRrank[#7]	0.0267	0.075	-0.1191	0.1723	0.3560	0.3609
Race[5]*AveSalEHE[23000.00]	0.0436	0.0895	-0.1312	0.2175	0.4872	0.3131
Race[5]*AveSalEHE[33000.00]	0.0387	0.0753	-0.1076	0.1853	0.5139	0.3036
Race[5]*No Choice Indicator	-0.2613	0.0914	-0.4419	-0.0847	-2.8589	0.0021
Income[1]*AveGradin6[3/10 people]	0.0393	0.0431	-0.045	0.1235	0.9118	0.1809
Income[1]*AveGradin6[5/10 people]	0.0213	0.0464	-0.0693	0.1121	0.4591	0.3231

Income[1]*DistHome_[<50 miles]	0.0169	0.0444	-0.0697	0.1038	0.3806	0.3517
Income[1]*DistHome_[>500 miles]	0.0312	0.0413	-0.0496	0.1118	0.7554	0.2250
Income[1]*Tuition[13000.00]	0.0775	0.0425	-0.0055	0.1605	1.8235	0.0341
Income[1]*Tuition[23000.00]	-0.0426	0.0444	-0.1294	0.0443	-0.9595	0.1687
Income[1]*AveEmploy1Yr[2/of 10 peop	0.0563	0.0406	-0.0232	0.1355	1.3867	0.0828
Income[1]*AveEmploy1Yr[5/of 10 peop	-0.069	0.0492	-0.1652	0.0273	-1.4024	0.0804
Income[1]*USNWRrank[#46]	-0.0265	0.0417	-0.1079	0.0551	-0.6355	0.2626
Income[1]*USNWRrank[#7]	0.0489	0.0396	-0.0285	0.1263	1.2348	0.1084
Income[1]*AveSalEHE[23000.00]	0.0394	0.0471	-0.0528	0.1313	0.8365	0.2014
Income[1]*AveSalEHE[33000.00]	-0.0074	0.0395	-0.0846	0.0699	-0.1873	0.4257
Income[1]*No Choice Indicator	-0.1074	0.0475	-0.201	-0.0149	-2.2611	0.0119
Income[2]*AveGradin6[3/10 people]	-0.026	0.042	-0.1081	0.056	-0.6190	0.2679
Income[2]*AveGradin6[5/10 people]	-0.0459	0.0458	-0.1353	0.0437	-1.0022	0.1581
Income[2]*DistHome_[<50 miles]	0.0092	0.0437	-0.0762	0.0948	0.2105	0.4166
Income[2]*DistHome_[>500 miles]	-0.0255	0.0404	-0.1047	0.0533	-0.6312	0.2640
Income[2]*Tuition[13000.00]	-0.0403	0.0417	-0.122	0.0411	-0.9664	0.1669
Income[2]*Tuition[23000.00]	0.0133	0.044	-0.0726	0.0995	0.3023	0.3812
Income[2]*AveEmploy1Yr[2/of 10 peop	-0.1498	0.04	-0.2282	-0.0719	-3.7450	0.0001
Income[2]*AveEmploy1Yr[5/of 10 peop	0.0856	0.0481	-0.0085	0.1797	1.7796	0.0376
Income[2]*USNWRrank[#46]	0.0349	0.041	-0.045	0.1152	0.8512	0.1973
Income[2]*USNWRrank[#7]	-0.0097	0.0386	-0.0852	0.0657	-0.2513	0.4008
Income[2]*AveSalEHE[23000.00]	-0.1217	0.0461	-0.2122	-0.0317	-2.6399	0.0041
Income[2]*AveSalEHE[33000.00]	-0.0373	0.0386	-0.1127	0.0382	-0.9663	0.1669
Income[2]*No Choice Indicator	-0.1226	0.0464	-0.2139	-0.0324	-2.6422	0.0041
Gender[1]*AveGradin6[3/10 people]	-0.0294	0.0284	-0.085	0.0262	-1.0352	0.1503
Gender[1]*AveGradin6[5/10 people]	0.032	0.0306	-0.0277	0.0918	1.0458	0.1478
Gender[1]*DistHome_[<50 miles]	-0.0003	0.0292	-0.0574	0.0568	-0.0103	0.4959
Gender[1]*DistHome_[>500 miles]	0.0267	0.0273	-0.0266	0.0799	0.9780	0.1640
Gender[1]*Tuition[13000.00]	-0.0121	0.0281	-0.067	0.0428	-0.4306	0.3334
Gender[1]*Tuition[23000.00]	-0.0056	0.0294	-0.063	0.0518	-0.1905	0.4245

Gender[1]*AveEmploy1Yr[2/of 10 peop	-0.0056	0.0269	-0.0582	0.0469	-0.2082	0.4175
Gender[1]*AveEmploy1Yr[5/of 10 peop	0.0054	0.0324	-0.058	0.0687	0.1667	0.4338
Gender[1]*USNWRrank[#46]	-0.0242	0.0277	-0.0782	0.0298	-0.8736	0.1912
Gender[1]*USNWRrank[#7]	0.0043	0.0263	-0.047	0.0556	0.1635	0.4351
Gender[1]*AveSalEHE[23000.00]	-0.0126	0.0311	-0.0734	0.0481	-0.4051	0.3427
Gender[1]*AveSalEHE[33000.00]	-0.0225	0.0263	-0.0738	0.0289	-0.8555	0.1961
Gender[1]*No Choice Indicator	0.081	0.0306	0.021	0.1409	2.6471	0.0041

The significant effects are shown as follows: * are p values, <.05, ** are p values< .01 and *** are p values<.001.

AICc	15660.011
BIC	16472.798
-2*LogLikelihood	15422.472
-2*Firth LogLikelihood	14703.514
Converged in Gradient	
Firth Bias-Adjusted Estimates	