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What Impact does Education and Undergraduate Degree Field Have on Earnings?

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Abstract

My paper analyzes the impact that different levels of education and undergraduate degree fields have on earnings. I use Census data from the 2017 American Community Survey and employ OLS regression specifications that include control variables such as gender, age and industry of job. Overall, I find that a professional degree and an undergraduate degree in a STEM field have the highest returns on earnings. My research can be used to better understand the returns from the different levels of education and degree fields from a comparative perspective. This is especially important at a time when the costs of higher education are increasing.

1. Introduction

Education has been well studied from a variety of perspectives within labor economics. Obtaining more education is viewed as an investment, in which it is believed to have a high rate of return (Becker, 1962). Higher education has become more prevalent over time within the United States. In 1970, only approximately 11 percent of the US population had completed tertiary education, whereas in 2010 more than 26 percent of the US population had completed tertiary education (Roser, & Ortiz-Ospina, 2013). With an increase in the number of people continuing through higher education, studying the impact that obtaining additional education has is more relevant.

The general belief is that obtaining a higher level of education should lead to a higher earning potential, and therefore should result in a higher wage. The rate of return for education has been extensively studied by Becker (1962), Card (1999) and Park (1994). Not only does the increased prevalence make education relevant to study, but so does the increased cost of education. The average cost of tuition and fees for the 2018-2019 at a private college was $35,676. At public colleges, the average in-state student pays $9,716 and out-of-state students pay $21,629 (Powell, 2018). The cost of college tuition has been increasing over time. With such a high cost associated with college tuition, it is more important than ever to understand what returns continuing education has, with a focus on the monetary gains. This topic is relevant to understand what the optimal level of education is, in relation to returns to earnings.

With more individuals continuing on and obtaining tertiary education, another aspect that is interesting to investigate is what impact undergraduate degree field has on earnings. More than just understanding the level of education individuals should obtain to optimize earnings, it is important to know what impact various degrees have. Through this study, I hope to better understand what field of bachelor's degrees have the highest payoffs. This might be able to give some insight into why an individual chooses to pursue further education within certain fields of study.

To carry out this analysis, I use the American Community Survey Data of 2017. I look at cross-sectional data from the year 2017. I investigate the impact that different levels of education have on the wages of individuals, by looking at the impact of obtaining certain degrees. This allows me to investigate how obtaining an additional degree at a certain level will impact earnings. Using data from 2017 will make my study as up to date as possible, since it is the most recent data at the time of my study. This is important as most of the studies that looked at the relationship between education and income were done more than twenty years ago, such as by Park (1994) and Card (1999). I also add undergraduate degree fields to my study, and then also look at how bachelor's degree fields impact the returns for furthering education.

In the first part of the paper, I use ordinary least squares regression (OLS) to assess the impact that obtaining different levels of education has on the earnings of individuals. I use the log of wages to represent earnings within my model. I add a variety of levels of education. I use the base level of high school because I do not expect individuals below high school to be a large part of the labor market, because individuals mostly get full time jobs after they have finished compulsory education. Therefore, I want to study the impact that different levels of higher education have (beyond compulsory education). I do include GED (General Education Development tests) within my regression to see what impact an alternative high school degree has. In addition, I expect to find that after a certain level of education returns start to diminish. Most studies such as Park (1994) and Card (1999) find that after a given number of years of education an additional year of education does not have an increased return on wages.

In my study, I find that a professional degree has the highest return, earning 102.2 percent more than a high school diploma. Although a doctorate degree is a higher level of education, it does not have as high of a return as a professional degree. Thus, my findings confirm those of Park (1994) and Card (1999) who also found that there exists a point of diminishing returns. The wage maximizing level of education being a professional degree is not unexpected as types of degrees that fall under professional degree are highly correlated to high earning jobs.

There are studies that differ in how they view the value of education. Becker (1962) introduced the idea that education should be viewed as human capital, as investing in education is a way in which you can invest yourself. Like a capital investment, education should be invested in as long as it pays off. However, other studies have the contradictory belief that education is merely a signal. This was first explored by Spence (1973) in his development of the signaling model in context of the labor market. In contrast to the human capital approach to education, signaling suggests that education is merely a signal of one's ability and therefore has less of a real gain from additional education. Education level just shows employers what an individual's given ability is. In my study I will not be able to differentiate between the impact of signaling and human capital.

A considerable number of existing studies do not investigate the impact or relationship between degree field, level of education obtained and wages. Therefore, in the second part of my paper, I attempt to investigate the impact that degree field has on earnings. Staniec (2004) classifies degree fields and sets up his study to examine how returns differ among degrees depending on race and sex. I classify degree fields into six categories: humanities, art, social science, education, business and STEM (science, technology, engineering, and math). I aim to explore how returns differ among these degree fields. I find that individuals with a degree in a STEM field have the highest returns, earning 29.7 percent more than an undergraduate degree in humanities. Individuals with an art degree are found to have the lowest earnings.

In the third part, I attempt to merge the first two areas of my study. I investigate how a chosen bachelor's degree field impacts the returns from an additional degree. I look at how bachelor's degree field impact the returns from obtaining a master's degree, professional degree and a doctorate degree. This again is done looking at the same six categories of bachelor's degree fields. In this part of my study, I regress the different levels of education by the various degree fields, including control variables that might be of interest to my study. I want to see what impact different degree fields also have on gender and experience.

In this part of the study, I find that having different degree fields within a bachelor's degree does affect the returns for increasing education. My results show that the highest return from a master's degree is for those with an undergraduate degree in business. The highest returns from a professional degree are for those with an undergraduate humanities degree. The highest returns from a doctorate degree are for those with an undergraduate degree in education. This result is not unexpected as an undergraduate degree in education would allow individuals to teach at a higher level. My results also show that gender impacts the returns from degree field. There were variations within these results, however with the business undergraduate degree men were found to earn the most compared to women. Within the various degree fields, the effect of age was not found to differ largely.

This paper contributes to the existing literature by trying to combine the research done on different levels of education and the impact that the different fields of degrees have. Firstly, my paper adds to the existing literature by being an updated study on the relationship between furthering education and income, such as Park (1994) and Card (1999). Furthermore, my paper combines two aspects of the existing research, firstly, the relationship between education and income and secondly, the impact of degree field. I also look at how the field of studies of one's bachelor's degree impacts one's earnings if one chooses to continue on to higher levels of education.

This paper is organized as follows: Section 2 reviews the previous literature, looking at the general relationship between education and income, ability bias and signaling as well as degree field. Section 3 discusses the data that I used in my empirical analysis and my methodology. Section 4 discusses the results and findings from my multiple regression. Section 5 discusses my results and what they mean. Section 6 concludes, provides suggestions for future research and discusses some potential implications of my results.

2. Literature Review

I review existing studies that examine the relationship between individuals' income and their educational level. The literature has found ability bias and signaling to be central in examining the income-education nexus. In addition, I review studies that examine the impact that field of study has on earnings.

2.1 Education and Income

i. What is the Relationship between Education and Income?

Houthakker (1959) was one of the first to examine the relationship between years of education and earnings. He looked at the benefits of education using calculations based on median income. He used 1950 census data. He took a cross-sectional approach to estimate lifetime income, in which he analyzed incomes earned by individuals of different ages and educational backgrounds in 1950. The study examined only males, regardless of color. He applied representative incomes before tax to persons in age-education group estimates. The variability in income was seen to be greater in younger age groups; the oldest age groups had less variability. Within all education groups, annual income increased with age until maximum earnings were reached in the 45-54 age group. In contrast, individuals who never attended school achieved their maximum earnings first in their 55-64 age group. The median income starts by decreasing slowly, then decreases more rapidly.

The capital value of lifetime income was found to increase uniformly with the level of schooling. Each successive level of education had a positive increase in the associated capital value. The only exception that he found was in the "College 1-3" group, which had a lower capital value of lifetime income than the "High School, 4 years". It was expected that completing four or more years of college was likely to have resulted in greater acquired intelligence. Furthermore, individuals completing four or more years of college were more likely to come from families with higher incomes.

This pioneering study was performed nearly 60 years ago; therefore, the findings may be outdated. Houthakker's research was one of the early studies done investigating the benefits of education. The study has some shortcomings. The sample only includes males and thus cannot represent the whole population. For the results to be more relevant in the current time period, one would need to extend the study to include females. The paper also lightly addresses the idea of a degree bias, which is the impact that a degree has on income. This can be observed in the capital value increase not being as large with one to three years of college, implying having not completed the degree.

Becker (1962) introduced the notion that education should be treated as a capital investment. Through schooling, training and skill improvement individuals invest in their own human capital.

The cost of an investment is foregone earnings. To measure schooling as a capital investment, Becker took into account the direct and indirect cost of schooling subtracting it from potential earnings. He touched upon the impact ability has on the distribution of earnings which I further explore in section ii. He found that there exist a positive correlation between schooling and ability; therefore, the ability of an individual is viewed to skew the distribution of earnings. Earnings are determined by human capital and the extent people invest in themselves. Individuals with more ability tend to invest more in themselves which can skew earnings.

Becker's (1962) study is important for understanding returns to education. Education, like capital investment, is beneficial as long as the investment returns keep increasing. This motivates my study, in which I try to determine the level of education after which there is a diminishing return on the investment, looking specifically at the marginal returns. My focus will be on general schooling, rather than on specialized skills.

In an influential paper, Mincer (1974) developed the foundational Mincer earnings function. Mincer expresses earnings as a function of experience and years of schooling in a log-linear relationship. The Mincer model is written as:

$$w = \alpha + \gamma S + \beta_1 X + \beta_2 X^2 + \varepsilon_1 \quad (1)$$

where w is the log hourly earnings, S is the number of years of schooling, X is the number of years of experience in the labor market or potential experience as defines as age - schooling, and ε_1 an error term. Mincer's model is built on the theory of human capital where individuals increase their stock of human capital, through investing in schooling and training. This model assumes that each additional year of schooling results in a γ percent increase in hourly earnings on average. Consequently, γ can be interpreted as the rate of return of schooling. The work experience variable is squared because he expected that experience has a non-linear relationship with log earnings.

Mincer's model is useful for understanding the basic model of earnings. It displays the belief that experience is nonlinear and leads to diminishing returns at a certain point. My aim is to find the point at which additional years of education show diminishing returns and see if this differs by degree field. Using the Mincer model, I want to show that education like experience is non-linear at a certain level of education. Mincer's model has been used in many studies that have looked at the impact schooling has on earnings, such as Park (1994) and Card (1999).

Park (1994) examined whether returns-to-schooling exhibit a particular departure from log-linearity. The log-linearity model assumes that each additional year of schooling should bring an equal percentage increase in earnings. Park built off Mincer's model, using a dummy variable for

$$w = \alpha_0 + \sum_{i=9}^{18} \alpha_i S_i + \beta_1 X + \beta_2 X^2 + \varepsilon_2 \quad (2)$$

each year of schooling completed. Park's model is written as (2). He used the merged 'Outing Rotation Group' files of the Current Population Survey data from 1979 to 1991. In this model, $S_i = 1$, if the highest grade completed is i, α_{12} is restricted to be 0. The estimate of α_i is used to examine the shape of the return-to-schooling profile. Park further expanded on this model in the paper by adding additional dummy variables and finds that people with 15 years of schooling do not appear to earn more than those with 14 years of schooling.

Card (1999) further explored the effect of education on earnings. Card started by looking at the Mincer (1974) model. The study collected data from 1994 to 1996 using the Current Population Survey. The results showed that for men aged 40 to 45, the mean years of education appear to have an overall linear effect. However, for males with 17 to 18 years of education, the additional year of education may not bring as large a return in wages on average. This is similar to Park's 1994 results. Both papers find that there exists a point where education exhibits diminishing returns. The results show that additional years of education are not always associated with an increase in wages. I want to investigate whether their results still hold using more contemporary data, given the increased cost and prevalence of education.

These existing studies have examined how education impacts the earnings and potential earnings of an individual. The previous studies all find that education has a positive effect on an individual's earnings because it is a way in which an individual can invest in themselves. Whether the relationship between education and earnings is linearly increasing or has diminishing returns has also been studied. I plan to explore this further, determining when education starts to display diminishing returns.

ii. Ability Bias

There are a variety of factors, such as age and family background, that impact the effect education has on an individual's earnings. A factor that can skew the impact that education has on earnings is ability. Ability bias is the idea that natural ability and intelligence affects an individual's earnings and can affect how education impacts their earnings. There is a large body of literature that considers ability bias and how it impacts an individual's earnings.

Angrist (1990) tried to capture ability bias through the draft lottery. He used the randomly assigned risk of induction generated by the draft lottery to build estimates of the effect of veteran status on civilian earnings. He examined the five draft random lotteries that occurred during the period of the Vietnam War. The earnings data was aggregated data coming from the Social Security Administration's Continuous Work History Sample. Angrist studied how military service affected civilian earnings compared with their cohort during the same time period. The random assignment of lottery numbers attempted to overcome the ability bias. By using the random characteristic, the estimates are not biased by the fact that certain types of men are more likely than others to serve in the military. He found that military experience is a poor substitute for lost experience in the civilian labor market. The results indicated that ten years after their discharge from service, the white veteran who served during the Vietnam era earned less than nonveterans. This study was extended further by Angrist and Krueger (1994) who investigated why World War II veterans earned more and had lower unemployment than their non-veteran cohort. However, the study found that World War II veterans do not actually earn more than their non-veteran cohort.

Behrman and Tauban (1976) studied the intergenerational transmission of income and wealth. They examined genetic endowments, through genetic indices, which provide useful skills in the labor market that are genetically supplied by biological parents. They look at the impact that genetics play in how natural ability impacts income. The paper looked at the impact genetics and common environment had on years of education, socioeconomic status of initial occupation, socioeconomic status of occupation in 1967 (around age 45) and earnings in 1973 (around age 50). They found that 90 percent of the variance in socioeconomic status of initial occupation and 50 percent of the variance of everything else is explained by genetics and the common environment. The common environment had the greatest impact on education as it explains 36 percent of its variability, while only 11 percent or less for the other three variables. Genetics accounted for roughly 30 to 40 percent of everything except initial occupation. They found that the contribution of education is significantly overstated by most estimates in regard to both occupational status and earnings. The results imply that genetics and common environment determine almost four-fifths of the variance in years of education.

A shortfall of the Behrman and Tauban (1976) study is that the results cannot be generalized to the population as a whole, because the distribution of genetics and fixed environmental factors differ. Although individuals are tracked over time, the common environment may vary across cohorts. This study is helpful in understanding the impact of genetics and environment on individuals' earnings.

Ashenfelter and Krueger (1994) used a survey to contrast the wages of genetically identical twins with different levels of schooling. They used multiple measurements of schooling levels to assess the effect of reporting an error in the estimated economic returns to schooling. The study used twins to be able to see how different schooling impacts individuals that are genetically equal. Thus, they were able to determine the impact different levels of schooling had. The data was collected from questionnaires distributed at "twin festivals" held throughout the United States. It included self-reported wages, education level, and parents' educational level. Each twin was asked to self-report the education level of their twin sibling. They recorded data on both identical twins and fraternal twins.

The study used the classical model of measurement error. They estimated the effect of schooling on earnings controlling only for demographic variables. Ashenfelter and Krueger found no evidence that conventional estimates of the returns to schooling are biased upward due to imperfect family-related factors that may impact earnings and that the measurement error of conventional estimates of the returns to schooling had a substantial downward bias. They estimated that increased schooling increases average wage rates by about 12-16 percent per year completed. The study found that unobserved factors do not cause an upward bias in simple estimates of the economic returns to schooling. This study has been built on by Bonjour et al. (2003) looking at twins in the U.K, finding similar results.

The use of twin studies is interesting because it is a way to compare individuals that are most genetically similar. The assumption in a twin study is that individuals are expected to have the same ability so that one can examine how levels of education affect the wages of these individuals.

Within the Ashenfelter and Krueger (1994) study there is found to be a high level of bias. This is interesting because they found the magnitude of increase to be greater than what had been found in the past.

Blackburn and Neumark (1993) studied omitted-ability bias and the increase in the return to schooling. They explored whether the relationship between ability and schooling changed over the 1980s when there was a sharp increase in the return to schooling. They investigated their claim using conventional wage regressions. They assumed a log model of earnings where the log of wages is explained by educational variation, ability, and error. Test scores were used as a potential indicator of ability to explore whether the omission of ability had been important in explaining large increases in education-earning differentials.

For over ten years, a longitudinal survey was collected which included test scores for a variety of cognitive and mechanical aptitudes. They used the first wage available after the respondent had completed schooling as the response variable in order to exclude the learning once in the job. They included year dummies to control for variation in wages due to inflation and other productivity factors. Blackburn and Neumark found little or no evidence to support the hypothesis that increases in the return to schooling, due to change in the ability-schooling relationship, led to an increased upward bias in the schooling coefficient estimate. However, they did find that the increase in the return to education had only affected workers with relatively high levels of "academic" ability. This suggests that existing studies overstate the benefit of acquiring an education for the marginal individual.

These studies have taken different angles at the issue of ability bias. It raises the interesting question of how ability affects the impact of schooling. In my study I will not be able to capture the impact that ability bias has.

iii. Signaling

There exists also a literature that explores the role of signaling in the labor force. Signaling asks whether education actually increases productivity or if increased education signals preexisting productivity. Spence (1973) was influential in the development of the signaling model and understanding the role signaling plays in the labor force and how it is related to education. He explored the notion of "market signaling" in the context of asymmetric information between employers and employees. Employers will never have complete information about employees. Employees know more about themselves than employers do. Therefore, there is an uneven distribution of information He discussed how employers believe that some level of education can be a signal of an individual's productivity, and how this would relate to the wage offered. Individuals will choose the optimal amount of education and employers use the education level as a signal. Signaling assumes that individuals of a high-productivity group have a higher education level whereas individuals of a low-productivity group have less education. The study also found that the results differ for men and women.

Signaling is further explored by Hungerford and Solon (1987) who looked at how obtaining a degree makes an additional year of education more significant. They explore the "sheepskin" effect in the returns to education. The "sheepskin" prediction states that wages will increase more when an additional year of education is accompanied by a certificate. Hungerford and Solo (1987) used Current Population Survey data from 1978. Specifically, they employ a large sample size of male nonagricultural workers between 25 and 64 and estimate nonlinear returns to education. They look to address whether the returns to education increase discontinuously in diploma years. They also use the Mincer model. However, their model differs from Card (1999) and Park (1994). In particular, they add dummy variables at certain years of education at which a degree is generally obtained. They estimated positive sheepskin effects from college graduation, finding that controlling for ability measures or family background did not reduce the estimated effects.

Obtaining a degree signals more than an additional year of education. Employers are able to use a certificate as a signal of a worker's productivity because it is viewed to better quantify what an individual has achieved through education.

Distinguishing between human capital and signaling theories raised the question of the value of an education. Kroch and Sjobolm (1994) address this question as follows. If education is a signal, then the signal should be concentrated in the position of an individual in the distribution of education for his cohort. They test the two competing theories using the Current Population Survey-Social Security Administration-Internal Revenue Service Exact Match File (EMF) and the Michigan Panel Study on Income Dynamics (PSID). They estimate an earnings equation that includes two measures of education: grade level and class rank. They find the schooling-year measure to have a statistically significant positive coefficient in all eight of their specification. The rank measure is found to only have a significantly positive coefficient in two cases: nonwhite males and white females PSID. In two other cases, the coefficient is found to be positive, but not significantly different from 0. However, in their remaining four specifications the coefficient is found to be significantly negative. The negative findings are unexpected and might stem from the negative effects of the estimated equation being mis-specified. Kroch and Sjobolm infer from their results that the signaling effect is weak compared to human capital investment.

I assume that education adds value and increases productivity. I examine whether there is a level of education at which the investment made in human capital no longer has a greater payout. But within my study I will not be able to distinguish between education being an investment in human capital and signaling.

2.2 Degree Field

Several studies look at how levels of education affect the earnings of an individual. I intend to go further than just looking at how much education an individual obtains effects earnings. I want to investigate how the field of study impacts earnings. Adding the field of study in which a degree is obtained will help us understand the significance of the content of a degree. Some of the existing studies have looked at how the field of study in education impacts earnings.

Berger (1988) examines the relationship between predicted future earnings and the choice of college major. He looks at five broad fields of study and college students' choice of major. Berger tested competing models by estimating conditional logit models that incorporate alternative predicted future earnings measures. The data, obtained from the National Longitudinal Survey of Young Men (NLS), allows the individual's choice of major to be observed along with subsequent experiences in the labor market. The study also takes ability into consideration by using ability measures as an explanatory variable. This is to try and capture the impact the ability in an individual's choice of major. The study found evidence suggesting a positive self-selection bias. The results suggest that individuals are aware of some of the factors that determine earnings and individual human capital investment decisions. Berger finds that controlling for background characteristics, the probability that an individual will choose one major, relative to another depends on the present value of the predicted future earnings. He finds the probability of choosing a major is significantly affected by the differences in expected start earnings amongst the majors. The results he finds reinforce the view that individuals consider future earnings when making educational investments.

The study by Berger has limitations. Firstly, major choices are aggregated into five categories which means that not all disciplines in majors are captured. Another limitation is uncertainty surrounding earnings estimates and the choice of major, taking into account an individual's risk preference. In my study I will expand the classification of degree and field of study, especially broadening the scope of what is classified as Liberal Arts.

Some studies look at expected returns on the choice of college in relation to race and sex. Staniec (2004) examines the determinants of college major choices, with an emphasis on choosing a major in science or engineering disciplines, and if this varies significantly by race and gender. They investigate whether women and underrepresented minorities are less responsive to the wage premiums of certain fields. The study uses data from the National Education Longitudinal Study of 1998, which surveyed students from 1988 in two-year increments until 2 years after the cohort graduated from high school. Majors were broadly grouped into four fields: science, engineering and math (SEM); humanities and fine arts (HFA); and social science/other (including business, education, and undeclared majors). The study also included variables for ability, which are measured by test quartiles, and variables for student characteristics, such as ability. They model a student's choice of college major that yields her highest utility, given their individual, family, and high school characteristics. The empirical implementation employs a multinomial logit model. They find that the difference in enrollment probability cannot be explained by greater science ability or differences within a family. They also find the expected effects of ability: students who score higher in math and science are significantly more likely to choose an SEM major, compared with a social science/other majors. Staniec then concluded that females are significantly less likely than males to select an SEM major. However, once returns have added the difference between male and female major choice is no longer significant. From these results, they infer that women are less likely than men to choose SEM majors because women's expected returns are lower than men.

The Staniec (2004) study is very relevant to my study because it also includes degree classification. I will include gender as a variable and hope to investigate the differences in male and females' earnings. In particular, I will observe the fields of studies and how it impacts earnings. In my study, I will not use racial classifications, as racial classification is not included within my data set. The effects of ability show the expected results. However, using test scores is a limitation, as test scores are not the most reliable representation of ability. The findings that women are less likely to choose majors because they expect lower returns is of interest to my study. I want to investigate this further and see if this has changed over time and how it differs among different age groups.

Kim, Tamborini, and Sakamoto (2015) investigate the trajectories of annual earnings following the same individual over 20 years and then estimate the long-term earning effects of field of study on earnings for U.S. men and women. They find evidence of large lifetime earning gaps across fields of study. Their data considers a sample of college and high school graduates, looking at four birth cohorts. The four birth cohorts are used to represent different career stages. They assess 10-year cumulative earnings by field of study over different life stages. They use quantile regression at the median of logged cumulative earning as their multivariate model. They find that men's earning trajectories demonstrate an inverted-U-curve, however, the field of studies impacts the depth of the curve. Women's earning trajectories demonstrate similar findings, but the depth of the curve is much shallower. Kim, Tamborini, and Sakamoto (2015) find that the field of study is critical in determining lifetime earnings. They also find that field of study can have age-differentiated effects on the careers of men and women, as well as significant gender differences associated with the field of degree and earnings by age.

I hope to build on these studies and also investigate the impact of age and gender. I will expand on these studies using a slightly broader classification of the degree of study. Within my study I will use six classifications of degree fields. Within my study I will also examine how degree fields impacts the returns to additional education.

3. Data

3. 1 Data and Variables

i. Education and Income

The data in my study is from the American Community Survey of 2017. In my study, I consider males and females between the ages of 22 and 65. I chose to look at this age range because it is thought to be when individuals participate in the labor market, I look at individuals within their prime working life and retirement (OECD Data). The linear log of wage and earnings salary (*lnwage*) is my dependent variable. Wage is transferred to the natural log of wage because it is a variance stabilizing transformation. I investigate how obtaining different levels of education affects salary. I use: (1) high school degree (*hs*), (2) having passed the General Education Development tests (*ged*), (3) having completed some college (*coll*), (4) completing an associate degree (*ass*), (5) completing a bachelor's degree (*bach*), (6) completing a master's degree (*master*), (7) completing some type of professional degree (*profdeg*) and (8) doctorate degree (*doct*). Gender and age are dummy variables that are added as controls. I include age squared (age^2) to represent diminishing returns of experience. I use age as a proxy for experience, as I do not have experience as a defined variable. I include experience building off the Mincer model (1974).

The levels of education are the variables of interest in the first part of my study. Table 1 displays the descriptive statistics for levels of education and other factors that impact earnings. The descriptive statistics show the prevalence of each level of education within my dataset. The most prevalent degree is a bachelor's degree. 27.1 percent of individuals had a bachelor's degree as their highest level of education. The least prevalent education attained is GED, which consists of 4.5 percent of individuals in the study.

Table 1: Descriptive Statistics for Education and Earnings Variables

	Mean	Std. dev.	Min.	Max.
Variables of Interest				
Wage	50104.6	64725.34	0	736000
GED	0.045	0.207	0	1
Highschool	0.237	0.425	0	1
Associates Degree	0.115	0.319	0	1
Some College	0.171	0.377	0	1
Bachelors	0.271	0.445	0	1
Masters	0.115	0.319	0	1
Professional Degree	0.028	0.164	0	1
Doctorate	0.018	0.132	0	1
Variables of control				
Age	43.630	12.631	22	65
Gender	0.502	0.500	0	1
Observations	1,130,454			

In my study I look at how wage is affected by different levels of education. In Table 1 the descriptive statistics for wage are displayed. The mean wage in my study is $50,104.60. The wages range from 0 to $736,000. In my study I only look at individuals who are employed, therefore having a minimum wage of 0 I expect may represent individuals who are volunteers or perhaps unpaid interns. Wage has a high standard deviation of $64,725.34, this indicates that in my data sample wage has a wide spread. I also look at control variables such as gender and age. The gender distribution in the dataset is almost equal. The mean age is approximately 43 and is within the narrowed down age range of working-age adults. I will look at how much of an impact age and gender have on the wages of an individual. I also add a control for industry, to be able to differentiate the impact of education, controlling for the fact that some industries pay higher wages per se.

ii. Degree Field

To study the impact of degree field I generate dummy variables. I look what the degree field of an individual's bachelor's degrees is. I narrowed down the degree field to six categories and subjects of degree. I look at degrees that fall under humanities (*hum*), arts (*art*), social science (*ss*), education (*ed*), business (*bus*) and STEM (science, technology, engineering, and math) (*stem*). I choose these categories because they encompass a variety of degrees, but are diverse enough to expect a difference. The degree fields are dummy variables, in which a 1 is assigned to those with that field of degree and 0 if your degree is not in that field. I exclude individuals whose degrees do not fall under my degree field categories.

Table 2 displays the summary statistics for the various degree fields. It shows the prevalence of each degree field in the dataset. The most prevalent degree field is STEM, which is not unexpected because STEM encompasses a wide range of degrees. 30.9 percent of individuals in my study have a degree in a STEM field. The degree that is least studied is Arts, only 4.7 percent of individuals have an Arts degree. When only looking at bachelor's degrees or higher the average wage increased. It can be seen in Table 2, that the mean wage is $71,546.67. This is not unexpected because a more educated cohort is expected to earn more. The range of wage is the same as in

Table 1. The standard deviation for wage is also higher in Table 2, meaning there is even greater wage discrepancies among individuals with a minimum of a bachelor's degree.

These statistics seem to be as expected, in relation to what the popular majors are. From Table 1 and Table 2 it can be seen that the number of observations decreased. I remove individuals with degrees that do not fall within my classifications of degree fields, such as Physical Fitness, Parks, Recreation, and Leisure. By removing all individuals that do not have a minimum of a bachelor's degree and individuals that do not have degrees that fall within my classifications, the number of observations decreased by two-thirds.

Table 2: Descriptive Statistics for Degree Field

	Mean	Std. dev.	Min.	Max.
Variables of Interest				
Wage	71546.67	83311.03	0	736000
Humanities	0.096	0.294	0	1
Arts	0.047	0.213	0	1
Social Science	0.216	0.411	0	1
Education	0.110	0.313	0	1
Business	0.222	0.416	0	1
STEM	0.309	0.462	0	1
Variables of control				
Age	43.393	12.225	22	65
Gender	0.466	0.499	0	1
Observations	529,566			

3.2 The Population Regression Function

i. Education and Earnings

$$lnwage_i = \beta_0 + \beta_1 \text{ged}_i + \beta_2 \text{coll}_i + \beta_3 \text{ass}_i + \beta_4 \text{bach}_i + \beta_5 \text{masters}_i \quad (3)$$

$$+ \beta_6 \text{profdeg}_i + \beta_7 \text{doct}_i + \beta_8 \text{X}_i + \varepsilon_i$$

My model (3) is derived from previous studies. It builds on the Mincer (1974) model. However, I assign dummy variables to each of the different levels of education, similar to Houthakker (1959). I use the different levels of education completed, to see what receiving an additional level of education/degree does on the wage of an individual. My base level of education is high school. I add additional variables, such as gender and experience, into a second regression.

I construct this function using the variables that I believe to contribute to wage. I expect that all education functions to be positive after college. However, I expect that the value of the coefficient of the functions to increase up to a certain level of education, then display diminishing marginal returns. I expect that a GED will decrease earnings in comparison with a high school degree. I presume the sign of the age variable to be positive. In my model X represents all control variables, such as gender, age, age^2 and industry. The gender variable is a dummy variable, where male = 1 and female = 0 and I expect the sign to be positive. Furthermore, I expect the experience variable (age^2) to be nonlinear because other studies have found that experience has diminishing returns (Mincer, 1974). I expect that controlling for industry of jobs will reduce the magnitude of education.

ii. Degree Field

I build on my model (3) by adding degree field dummy variables, which results into model (4).

$$lnwage_i = \beta_0 + \beta_1 \text{art}_i + \beta_2 \text{ss}_i + \beta_3 \text{ed}_i + \beta_4 \text{bus}_i + \beta_5 \text{stem}_i + \beta_6 \text{masters}_i \quad (4)$$

$$+ \beta_7 \text{profdeg}_i + \beta_8 \text{doct}_i + \beta_9 X_i + \varepsilon_i$$

In model (4) I regress the log of wages on individuals whose minimum education is a bachelor's degree. For the regression function bachelor's degrees are not included because it caused multicollinearity and all individuals with degrees beyond bachelor's degrees would have a bachelor's degree as well, as this is not reflected in the dummy variable. The model includes the same control variables X (gender, age, age^2 and industry). In model (4) the fields of degree are added. However, the regression is run without humanities to avoid multicollinearity. Humanities is being used as my base variable for degree fields. Therefore, I regress the log of wage on arts, social science, education, business, and STEM. The regressed degree fields will all be compared to a humanities degree. It is not known if all degree fields will be positive when compared to humanities. However, I expect STEM to have the greatest return, based on the findings of Staniec (2004). It is expected that gender and experience will have similar results as those predicted for model (3).

I go further to explore the impact that undergraduate degree field has on wages by regressing the different degree fields on levels of education, gender, and experience. I am doing this to investigate the impact that different degrees have on the return received from a master's degree, a professional degree and a doctorate degree, as well as seeing how different degrees affect gender, age, and experience. I expect to find differences among the degree fields. For example, I expect to find that women in STEM fields earn less than women in other degrees, based on the findings by Staniec (2004).

4. Results

4.1 Education and Earnings

Table 3 shows the results of the regressions looking at the different levels of education. The first column shows the results of only regressing the levels of education. All values regressed were found to be statistically significant, at all levels. As expected, the results show that lower levels of education do not have large returns on wages. I use high school as the base level of education and compare all levels of education to high school. Obtaining a GED has an 18.8 percent decrease in wages compared with a high school diploma. A professional degree will increase wages 126.3 percent more than just having a high school diploma. A doctorate degree will have a 111.9 percent greater return to wages. An individual who obtains a doctorate degree will earn 14.4 percent less than an individual with a professional degree. These finding are similar to those of Park (1994). Park found a professional degree to have the highest returns, with a 76 percent higher return than a high school diploma. The finding of Park had a lower magnitude than my study, implying that returns to education have increased over time. Card (1999) found that a professional degree had approximately a 0.1 higher return to mean hourly wage than a PhD and approximately a 0.2 higher return to mean hourly wage than a master's degree. Although using a different measurement on trend compared to my study, it shows again a lower magnitude to the difference.

In the second column the control variables, gender, age, and experience are added. When the control variables are added, the returns on some college, an associate degree, a bachelor's degree, and a master's degree all display a slight increase. Where obtaining a GED, a professional degree and a doctorate degree all lead a slight decrease in the returns to wages. The results also show that gender and experience impact wages. The gender variable displays the expected results, as men are estimated to earn 44.2 percent more than women.

Table 3: Education Regressed

Dependent Variable lnwage	(1)	(2)	(3)
GED	-0.188***	-0.219***	-0.214***
	(0.005)	(0.005)	(0.005)
Some College	0.068***	0.141***	0.080***
	(0.003)	(0.003)	(0.003)
Associates Degree	0.222***	0.270***	0.189***
	(0.004)	(0.003)	(0.003)
Bachelor's Degree	0.545***	0.612***	0.442***
	(0.003)	(0.003)	(0.003)
Master's Degree	0.817***	0.822***	0.710***
	(0.003)	(0.003)	(0.003)
Professional Degree	1.263***	1.214***	1.022***
	(0.006)	(0.006)	(0.006)
Doctorate Degree	1.119***	1.052***	0.835***
	(0.007) ***	(0.007)	(0.007)
Gender (male)		0.442***	0.476***
		(0.002)	(0.002)
Age		0.141***	0.138***
		(0.001)	(0.001)
Age²		-0.001***	-0.001***
		(0.000)	(0.000)
Constant	10.160***	6.730***	7.128***
	(0.002)	(0.012)	(0.012)
N	1,140,303	1,140,303	1,140,303
$\bar{R}^2$	10.51%	21.31%	23.19%
Control for Industry	No	No	Yes

Standard errors are in parentheses
*** significant at 1% level, ** significant at 5% level, * significant at 10% level

Although the sign is as expected, the magnitude is greater than expected. Especially as I exclude individuals who aren't employed, I would have expected that the gender difference is not as large as the results show. Experience increases wages by 14.1 percent; this is not an unexpected result. Experience^2 was found to be negative, but at a very small magnitude, as experience decreases wages by 0.1 percent. This is not unexpected, because the experience variable is expected to be nonlinear. It has a positive impact until a certain point, then it exhibits diminishing returns.

In Table 3 I also add industry as a control in my third regression (column 3). Adding industry as a control changes the magnitude of each degree. I find that it decreases the impact that all levels of education have on wages. The most significant change is seen among professional degrees and doctorate degrees. This is not unexpected because both a professional degree and a doctorate degree are expected to lead to jobs in industries that pay more. This shows that the impact of some degrees is diminished when industry is controlled for.

4.2 Degree Field

The results from regressing degree field on levels of education can be seen in Table 4. Table 4 shows the results from three regressions, in which I build upon the factors tested. The first regression includes only degree fields (column 1). To investigate the impact of different bachelor's degree fields I regress art, social science, business, education, and STEM on wages. Because I use Humanities as the base degree, I compare all other degree fields to humanities. The results show that an art degree and a degree in education earn less than a degree in humanities. Specifically, an art degree earns 23.4 percent less and education degrees earn 16.5 percent less. A degree in the social sciences, business or in STEM all earn more than a humanities degree. A social science

Table 4: Degree Field and Education Regressed

Dependent Variable lnwage	(1)	(2)	(3)	(4)
Art	-0.234***	-0.138***	-0.082***	-0.070***
	(0.009)	(0.009)	(0.008)	(0.008)
Social Science	0.064***	0.098***	0.132***	0.122***
	(0.006)	(0.006)	(0.006)	(0.005)
Education	-0.165***	-0.144***	-0.073***	-0.086***
	(0.007)	(0.007)	(0.006)	(0.006)
Business	0.266***	0.368***	0.297***	0.254***
	(0.006)	(0.005)	(0.006)	(0.005)
STEM	0.335***	0.353***	0.326***	0.297***
	(0.006)	(0.006)	(0.005)	(0.005)
Master's Degree		0.311***	0.235***	0.159***
		(0.003)	(0.003)	(0.003)
Professional Degree		0.710***	0.594***	0.558***
		(0.006)	(0.006)	(0.006)
Doctorate Degree		0.546***	0.416***	0.340***
		(0.008)	(0.008)	(0.007)
Gender (male)			0.399***	0.390***
			(0.003)	(0.003)
Age			0.159***	0.150***
			(0.001)	(0.001)
Age^2			-0.002***	-0.002***
			(0.000)	(0.000)
Constant	10.701***	10.508***	6.864***	7.383***
	(0.005)	(0.005)	(0.019)	(0.020)
N	473,034	473,034	473,034	473,034
$\overline{R}^2$	3.04%	7.01%	17.20%	21.73%
Control for Industry	No	No	No	Yes

Standard errors are in parentheses
*** significant at 1% level, ** significant at 5% level, * significant at 10% level

degree earns 6.4 percent more than a degree in the humanities, a business degree earns 26.6 percent more and a degree in a STEM field earns 33.5 percent more than a degree in the humanities. These results are as expected. However, in column (1) only 3.04 percent of the model can be explained by the education variables.

When running the second regression, I added education levels as additional variables to look at the impact of including levels of education (column 2). As the base level of education is a bachelor's degree, I compare the various levels of education to a bachelor's degree. I chose a bachelor's degree as a base because it is the most prevalent level of higher education. Obtaining either a master's degree, professional degree or a doctorate degree all increase wages more than a bachelor's degree. A professional degree still has the highest return on wages, having a professional degree increases wages by 71 percent more than just a bachelor's degree. Having a master's degree increases wages by 31.1 percent more than just a bachelor's degree. Having a doctorate degree increases wage by 54.6 percent more than a bachelor's degree. Through adding master's degrees, professional degrees, and doctorate degrees, the magnitude of each degree fields changed. However, the signs did not change. Art and Business had the largest change in magnitude, a degree in the arts earns 13.8 percent less than a humanities degree, almost 10 percent more than in the first regression. However, a business degree earns 36.8 percent more than a humanities degree, which is almost 10 percent more than in the first regression. The other degree fields only have minor changes to the magnitudes.

In the third regression, I add the control variables of gender, age, and age^2 to variables regressed in the second regression (column 3). The magnitude of the degree fields, both an art and education degree earn less than a degree in the humanities. An undergraduate art degree was found to result in earning 8.2 percent less than a degree in the humanities and an undergraduate education degree resulted in earning 7.3 percent less than a degree in the humanities. An undergraduate degree in the social science, business, and STEM all had greater returns than a degree in the humanities. A social science degree is found to have a 13.2 percent greater increase in wages when compared to humanities. It also earns 20.5 percent more than a degree in education and 21.4 percent more than an art degree. A business degree was found to earn 2.97 percent more than a humanities degree. However, a business degree earns 10.23 percent less than a social science degree. The degree found to have the highest return is within STEM. A degree in the STEM fields is found to earn 32.6 percent more than a degree in the humanities. A degree in STEM fields also earns 19.4 percent more than a social science degree, 40.8 percent more than an art degree, 39.9 percent more than a degree in education and 29.63 percent more than a degree in business.

In Table 4, I run a fourth regression (column 4). I use all the same variables as in my previous regressions; however, I use industry of job as an additional control. I find similar results to Table 3. Including a control for industry changes the magnitudes of all levels of education and field of degrees. Surprisingly, unlike in Table 3, controlling for industry only minimally changed the magnitude of a professional degree. Controlling for industry caused the magnitude of degree field impact to decrease. Social science and education had the largest decrease when adding industry as a control. This is surprising because I would not have expected that these degree fields would go into industries that are extremely lucrative. Interestingly, an art degree increased the wages when adding an industry control. Including the industry control, an undergraduate degree in STEM still has the greatest return, earning 29.7 percent more than an undergraduate humanities degree. Surprisingly, when including the industry control, an undergraduate degree in business only earns 4.3 percent less than a STEM degree.

Table 5: Education and Degree Field by Gender

Dependent Variable lnwage	(1) Male	(2) Male	(3) Female	(4) Female
Master's Degree	0.194***	0.122***	0.268***	0.184***
	(0.005)	(0.005)	(0.005)	(0.005)
Professional Degree	0.567***	0.538***	0.612***	0.563***
	(0.008)	(0.008)	(0.009)	(0.009)
Doctorate Degree	0.307***	0.244***	0.527***	0.434***
	(0.010)	(0.010	(0.011)	(0.011)
Art	-0.098***	-0.090***	-0.077***	-0.058***
	(0.012)	(0.012)	(0.011)	(0.011)
Social Science	0.180***	0.171***	0.087***	0.0763***
	(0.008)	(0.008)	(0.008)	(0.008)
Education	-0.096***	-0.097***	-0.081***	-0.094***
	(0.011)	(0.010)	(0.008)	(0.008)
Business	0.344***	0.304***	0.254***	0.205***
	(0.008)	(0.007)	(0.008)	(0.008)
STEM	0.375***	0.325***	0.281***	0.285***
	(0.007)	(0.007)	(0.008)	(0.007)
Age	0.192***	0.184***	0.133***	0.124***
	(0.001)	(0.001)	(0.001)	(0.001)
Age²	-0.002***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	6.459***	6.927***	7.492***	8.078***
	(0.028)	(0.027)	(0.028)	(0.027)
N	223,554	223,554	249,480	249,480
$\overline{R}^2$	17.38%	21.97%	10.29%	15.38%
Control for Industry	No	Yes	No	Yes

Standard errors are in parentheses;
*** significant at 1% level, ** significant at 5% level, * significant at 10% level

The gender and age variables did not change much between Table 3 and Table 4. They all have the same sign; the magnitudes are fairly constant and do not change by more than a few percent. Being male increases wages by 39.9 percent and age increases wages by 15.9 percent. The age^2 variable has a negative 0.2 percent impact on wages, which is expected because experience is nonlinear with diminishing returns. This shows that having a bachelor's degree in humanities does not change the impact that gender and experience have on wages by very much. Adding the industry control had minimal impact on my other constants: gender, age and age^2.

I investigate further on how the returns from education and degree field differ by gender. These results are seen in Table 5. I run the regression by gender and then add a control for industry of job. In the male and female regression adding the industry control reduces the magnitude of continuing a degree as well as the field of degrees. The trends found in Table 3 and 4, hold true for both the male and female regression. The most surprising result is the gains from education that females gain. Getting a master's degree, a professional degree and a doctorate degree all have higher wage increases for females. When controlling for industry, a master's degree has a 6.2 percent higher return for females than males. A professional degree has a 2.5 percent higher return for females than males and a doctorate degree has a 19 percent higher return for females than males. It is interesting to observe that furthering education to obtain a higher degree has a higher return for women, because table 3 and 4 clearly show that males earn more. This may be a result of males having a higher starting salary than females.

In observing undergraduate degree fields, the returns are mostly higher for males. When controlling for industry, the returns from an undergraduate degree in education are almost the same for males and females. Females also have a higher return from an undergraduate degree in art than men. These discrepancies are interesting to observe. An undergraduate degree in business, STEM and social science all have higher returns for males. It should be noted that Staniec (2004) finds that women are less likely to choose to pursue an ungraduated degree in STEM. This may be one factor that explains the discrepancies in returns.

I go further into looking at the returns that each undergraduate degree field has. I investigate how gender and experience vary among the different undergraduate degree fields. The results of these regressions can be seen in Table 6. In regressing all degree fields, I control for industry. The impact of getting a master's degree varies amongst the different undergraduate degrees. The lowest return for getting a master's degree is for those with an art degree where a master's degree only results in a 9 percent increase in wages. The greatest return from a masters' degree is for those with a degree in education, where a master's degree increases wages by 24.7 percent. Pursing a master's degree with an undergraduate degree in education has almost double the increase in wages than all other undergraduate degree fields. A professional degree has the highest benefit for those with a humanities degree, increasing wages by 64.7 percent. A professional degree had the lowest returns for those with a business degree, increasing wages by only 33.6 percent. Those with an education degree also benefited the most from a doctorate, leading to a 48.7 percent increase in wages. A doctorate degree benefitted those with a business degree the least, with only a 21.1 percent increase in wages.

Those with an undergraduate degree in the arts would be least likely to pursue further levels of education because overall their returns are relatively low. This may also be a result of art degrees not needing further education to pursue job opportunities. Whereas, overall those with STEM undergraduate degrees have higher returns for pursing high levels of education, even when controlling for industry. This may be a result of many STEM fields requiring higher levels of education to have increased job opportunities.

Table 6: Education Regressed by Field of Degree

Dependent Variable lnwage	STEM (1)	Business (2)	Education (3)	Social Science (4)	Art (5)	Humanities (6)
Master's Degree	0.171***	0.162***	0.247***	0.128***	0.090***	0.102***
	(0.006)	(0.007)	(0.009)	(0.007)	(0.018)	(0.011)
Professional Degree	0.620***	0.336***	0.372***	0.550***	0.473***	0.647***
	(0.009)	(0.017)	(0.023)	(0.012)	(0.043)	(0.017)
Doctorate Degree	0.353***	0.211***	0.487***	0.364***	0.288***	0.256***
	(0.010)	(0.031)	(0.027)	(0.016)	(0.050)	(0.022)
Gender	0.358***	0.453***	0.361***	0.420***	0.298***	0.332***
	(0.005)	(0.006)	(0.010)	(0.006)	(0.015)	(0.010)
Age	0.163***	0.136***	0.122***	0.133***	0.156***	0.145***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.005)	(0.003)
Age²	-0.002***	-0.001***	-0.001***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	7.362***	7.904***	8.059***	7.405***	7.576***	7.487***
	(0.032)	(0.042)	(0.060)	(0.041)	(0.096)	(0.067)
N	148,682	105,859	51,238	101,737	21,111	44,407
$\bar{R}^2$	23.75%	18.15%	13.81%	19.87%	14.01%	18.12%
Control for Industry	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses; *** significant at 1% level, ** significant at 5% level, * significant at 10% level

Gender effects depend on the field of degree. A degree in arts see the smallest increase from being male, as men only earn 29 percent more than women. The largest increase in being a man is seen in having a business degree, in which men earn 44.6 percent more than women. That is followed by STEM, in which men earn 40.7 percent more than women. The non-linear experience variable does not seem to change much among the different majors. There are some variations among the experience variable, ranging between 12 and 18 percent.

5. Discussion

The results of my study have given some insights into understanding some of the monetary payoffs for various aspects of education. When looking at the returns from different levels of education all regressions found that the highest payoffs to earnings come from obtaining a professional degree. Even though a doctorate degree is considered the highest level of education, it does not have the highest payoff. These results are not unexpected, as both Park (1994) and Card (1999) found that at a certain level of education the gains from additional education are no longer as great as before. A professional degree having the highest returns is not unexpected, because degrees such as Medicine and Law are classified as professional degrees. A doctorate degree is also expected to have lower returns, as individuals with doctorate degrees are often in academia which generally has lower returns than the private sector. Surprisingly, when adding a control for industry a professional degree still had a higher return than a doctorate degree. A professional degree having the highest returns on earnings may display signaling because it of the magnitude of returns even when controlling for industry.

In comparison to the studies conducted by both Park (1994) and Card (1999), I find what degree has the highest return. Using degree rather than years of schooling, I find it more informative to understand the effect of an additional degree. An individual may also seek a higher degree of education after a few years of work experience and that may lead to different results too. This also leads to the main aim of my study, which is evaluating the impact of various degree fields.

The degree field findings are not unexpected. Having an undergraduate degree in a STEM field was expected to have the highest returns and my results support this finding (Staniec, 2004). That a degree in arts would have the lowest return is also not unexpected, as artists are often freelance and do not earn a steady wage. The most unexpected finding was the returns to a business degree, in that a business degree only earned a bit more than a humanities degree. However, this finding may be skewed by only looking at bachelor's degree (undergraduate studies). Business is not offered as an undergraduate degree at all colleges or universities with in the United States.

Degree field is further explored when I look at returns from each degree field. It is interesting to see how returns differ on continuing education based on what a field of undergraduate study is. The results are mostly what I expected them to be. Individuals with a degree in education are most likely to get a master's degree. This may be a result of states requiring a master's degree to teach higher grades in school. Education also has the highest returns to a doctorate degree. This may be a result of individuals with a degree in education who are more likely to continue on and get a doctorate degree so that they are able to continue on in academia.

A professional degree has the highest returns for those with a degree in the humanities. I would attribute this to the types of professional degrees that an individual who majored in humanities is most likely to get. It would be expected that these individuals are most likely to go on to get law degrees. An undergraduate degree within the STEM fields has the second highest returns from a professional degree. This is probably related to medical degrees, as they are a professional degree that has very high returns in the long run. It would be expected that individuals pursuing a medical degree would most likely have an undergraduate degree in a STEM field because the requirements to go into medical school require a large amount of science.

Unsurprisingly, a degree in business had the lowest returns in both continuing to get a professional degree and a doctorate degree. Those with an undergraduate degree in business would be most likely to obtain an MBA which would be classified as a master's degree. This may be the reason why an undergraduate degree in business has the second highest returns from a master's degree.

An unexpected result in my study is the impact that gender has on the earnings of an individual. Although I expected men to earn more than women, I did not expect the magnitude to be as large as it is, with males earning 39 percent more than females. It is well known that men earn more than women on average. Findings show that when looking only at levels of education men will earn 44 percent more than women and 40 percent more than women if one includes degree fields. The magnitude of this result is shocking. Especially, because within my study I exclude individuals who are not employed. Therefore, my statistics are not skewed by counting non-working individuals, which are more likely to be women. This is interesting since Staniec (2004) finds that women are less likely to choose majors where they expect lower returns. STEM and business degrees had the lowest returns for women. It would be interesting to study this further to see if this is true among all the age groups, or if over time the difference in earnings based on gender is decreasing.

In my study, an experience variable is included based on the findings of Mincer (1974) that experience is needed to be able to model the returns to education. A shortcoming of my study is that I do not have an experience function within my data source. Therefore, I have to generate a proxy for experience. I did this by using the age variable, as age and experience are believed to be highly correlated. The issue is that age may not be a perfect proxy. I assume that age represents experience, but that may not always be a fact. Pursuing further education at a later point in life may impact this experience variable. Experience may also not be transferable within different jobs; this cannot be captured within my study.

6. Conclusion

Previous studies examined the relationship between education and earnings. However, the most influential studies are more outdated. Park (1994) was a very influential study that investigated the log-linear model that built off the work of Mincer (1974). However, this study was conducted using data from 1979 to 1991, which is now outdated. Thus, building on this model, I am able to investigate if these findings hold true. Card (1999) also extensively studies education from a variety of perspectives. Again, this study was performed in the late 1990s and thus the findings may be outdated. The outdated nature of existing studies makes my study interesting as I am able to apply current data to an existing idea.

Unlike previous literature, my study examines how the field of one's bachelor's degree impacts the returns an individual will get if they pursue a degree beyond a bachelor's degree. Unlike in Park (1994), I show the returns in regard to field of study. I also use a different degree as my educational levels rather than years. Using only the years of education an individual has its shortcomings because education is not always continuous and obtaining degrees does not always take a uniform amount of time. The issue with using only degrees is that I only see the effect of degrees, rather than education on a whole. However, using only degrees may capture a signaling effect in my study. Only looking a degree does not capture the investment value of an additional year of schooling. But for my study, I am interested in observing the impact of additional degrees.

For the breakdown of degree fields, I try to expand on the existing literature. Other papers such as Staniec (2004) only look at four classifications of degree fields and broadly lump some degrees together. I expanded on this using six different degree fields. While only minorly better, I believe that by further separating some degree fields and excluding others I am better able to get a more accurate representation of degree fields. However, my study could be further improved by looking more in-depth within a variety of degree fields. In particular, looking further into the breakdown of the STEM field. Given that the STEM field had the highest monetarily return, I would be interested to know how it further breaks down. I would expect those with technology or engineering degree to have a higher return to wages than those with a math degree. My study could be further expanded by looking what impact field of degree has for an advanced degree.

Understanding the payoff from education is very important. With college education getting more and more expensive each year, it raises the question of whether the cost is worthy or not. Being able to identify which degree fields have the highest returns is beneficial when choosing a field to study within a college. With higher education becoming more expensive, it is important to know which undergraduate degrees have higher payoffs. It also helps to understand the benefits of continuing education. Of course, within my study, I only look at the earnings that an individual has when more factors determine the jobs individual will choose. My study could be further expanded by including the cost of college, such as Becker (1962) does.

A shortcoming of my study is the inability to differentiate between the impact of signaling, human capital and ability bias. My study does not have an instrumental variable that I am able to use to capture ability bias. Therefore, I am not able to capture the real returns from education. I am also not able to determine the full return of additional education, because I cannot differentiate if additional degrees are a signal or if they increase an individual's human capital.

Based on my finding, future researchers can go further into investigating how time has impacted the wages and education choices of individuals. It would be interesting to explore how time has impacted the choices that individuals make regarding their education. Given how attitudes have changed towards higher education in the past 40 years, it would be interesting to examine what educational decisions are millennials making. In addition, the role of gender could be further explored. My results show that men earn more than women. I would be interested to see where this discrepancy comes from. Furthermore, it would be interesting to try to study this change over time, with a focus on the degree fields. This field of study can be explored in a multitude of ways and will remain relevant or become even more relevant over time.

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