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How Much Of The Heterogeneity In Returns To College Major Can Be Explained By Institution Type?

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Abstract

Rising post-secondary education costs have increased the importance of undergraduate students' institution and field of study choices, two aspects of higher education that affect post-graduation earnings. This paper analyzes the impact of the interaction between college major and attending a liberal arts institution on post-graduation wages. Using data on Minnesota bachelor's degree completers who were employed at Minnesota firms 6 to 18 months after graduation, I find robust evidence that the interaction is significant. Liberal arts students are disadvantaged when other institutional and individual characteristics are controlled for, but they may be relatively less so depending on field of study.

Keywords: major, field of study, liberal arts, Minnesota

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INTRODUCTION

The choice of where to attend college and whether to pursue a particular field of study has become more important as post-secondary education costs and subsequent student debt have sky-rocketed. Between the 2000-2001 and 2010-2011 academic years, the inflation-adjusted prices of tuition, room, and board at public, private not-for-profit, and private for-profit undergraduate institutions rose 42 percent, 31 percent, and 5 percent, respectively (U.S. Department of Education, 2012). Increasing costs has meant that understanding the returns to an investment in undergraduate education has become increasingly important.

In order to maximize the returns to such an investment, one must first understand the benefits associated with obtaining a bachelor's degree. Perhaps the most notable benefit of receiving an undergraduate education is increased earning potential[1]. Full-time, full-year workers with a bachelor's degree earn 84 percent more over their lifetimes than their counterparts with high school diplomas (Carnevale, Rose, & Cheah, 2011). While it certainly pays to obtain a bachelor's degree, post-graduation earnings variation exists among graduates. As a result, it is important to analyze qualitative aspects of undergraduate education, rather than focusing solely on quantitative measures.

College major is one qualitative aspect of higher education that has been researched extensively. Controlling for field of study accounts for a portion of the

[1] The post-secondary education earnings premium is often attributed to the accumulation of human capital. Initial analyses focused on the returns associated with the quantity of human capital accumulated, measured as each additional year of schooling. Later analyses, however, showed that credentialing or the receipt of a diploma provided a "sheepskin effect" on earnings (Hungerford & Solon, 1987). A "sheepskin effect" is when an individual with a diploma or credential earns more than an individual with equivalent years of schooling who does not hold a diploma (Jaeger & Page, 1996).

earnings variation among graduates[2], yet within-major wage heterogeneity exists. Some of this variation can be explained by individual characteristics and institutional selectivity, but unexplained heterogeneity remains[3]. The type of school—whether public, private, or liberal arts—may be a contributing factor to within-major wage variation. Liberal arts in particular merits further investigation due to the recent debate over the value of these institutions.

Critics of the liberal arts and the focus on non-technical skills cite higher unemployment and lower earnings as pitfalls of pursuing a liberal arts education (Carnevale, Cheah, & Strohl, 2013; Rich, 2011). Though some claim liberal arts degrees, and therefore liberal arts institutions, are less valuable than others, a recent study by the Association of American Colleges and Universities (2014) finds that students with liberal arts degrees are not disadvantaged in the long-run in terms of earnings. Even proponents of liberal arts education acknowledge that the growing emphasis on vocational education threatens liberal arts institutions and has pressured some of these institutions to change their curricular structure (Baker, Baldwin, & Makker, 2012).

Reconciling the disagreement over the value of liberal arts institutions rests on understanding their impact on graduates. Liberal arts colleges excel at teaching soft skills (Astin, 1999). Soft skills include ability to communicate effectively, cultural awareness, and critical thinking. Service-based knowledge and technical skills are examples of hard skills. According to the comparative advantage framework, students in soft-skill-

[2] Rumberger and Thomas (1993) find a model controlling for demographic characteristics, institutional selectivity and college major explains 17.8% of log annual earnings variation.
[3] Rumberger and Thomas (1993) find the percentage of within-major earnings variation explained by individual and institutional characteristics varies by major as follows: Business (42.2%), Health (48.2%), Education (98.8%), Social Science (65.6%), Science/Mathematics (53.9%).

intensive fields who study at liberal arts institutions should have higher earnings than students in the same field who study at institutions that do not emphasize the development of soft skills. Similarly, theory suggests students in hard-skill-intensive fields who attend non-liberal arts institutions should earn more than their counterparts at liberal arts institutions. Therefore, comparative advantage theory suggests the value of a liberal arts institution to an individual depends on the field of study he or she chooses, and how he or she values hard and soft skills.

This paper analyzes the interaction between college major and attendance of a liberal arts institution, and the resulting impact on post-graduation earnings for bachelor's degree holders. I use data on bachelor's degrees recipients in Minnesota who graduated from institutions in the state during the 2010-2011 and 2011-2012 academic years and were employed at Minnesota firms post-graduation. Using data from the Minnesota Department of Employment and Economic Development, the Carnegie Foundation for the Advancement of Teaching, the National Center for Education Statistics, and Barron's Profiles of American Colleges, this paper finds the interactions between attending a liberal arts college and certain majors are statistically significant for graduates in Minnesota. Liberal arts returns are higher in business, education, health, and social sciences relative to humanities. Except for the interaction between business and liberal arts, this finding is robust when other institutional characteristics—size and an alternate measure of institutional selectivity—are taken into account and when the classification of fields of study is altered. One should note that these findings apply only to jobs

graduates hold during the period 6 months to 18 months after graduation, and the findings may differ significantly after they have spent more time in the labor market.

Following a review of the relevant literature in Section I, Section II outlines my economic theory for the interaction between liberal arts institutions and college major. Section III contains a summary of the data. The theory section ends with a guiding equation and hypotheses which will be evaluated through my empirical analysis in Section IV. Finally, Section V concludes and discusses limitations and future studies.

I. LITERATURE REVIEW

It is well-documented that fields requiring quantitative skills, such as engineering, enjoy the largest returns[4]. While the between-major earnings differences are generally agreed upon, unexplained within-major heterogeneity remains. Within each major category for Canadian graduates, engineering and computer science majors experienced the least variance in earnings, and fine arts and humanities graduates displayed the most variance, not controlling for institutional characteristics (Finnie & Frenette, 2003). Finnie and Frenette (2003) speculate that homogeneity among workers within a given field of study and well-defined job opportunities for graduates in that field may be able to explain a portion of the within-major variance of earnings. In contrast to Finnie and Frenette's (2003) study, Carnevale, Strohl, and Melton (2011) find that engineering majors

[4] Rumberger and Thomas (1993) categorize fields of study for graduates in the United States into the following groups: engineering, business, health, education, social sciences, mathematics and science, and other—comprised mainly of humanities majors. They find engineering and health majors experience the greatest earnings, business and mathematics/science command mid-range earnings, and education, social sciences, and other are in the lowest earnings bracket. Similarly, Finnie and Frenette (2003) analyze data on three cohorts of Canadian college graduates. They categorize majors into ten groups, notably separating natural sciences from engineering and economics from other social sciences. Finnie and Frenette (2003) also find that health and engineering—grouped with computer science—majors are in the top earnings tier; social sciences and humanities majors again command the lowest returns.

experience the greatest earnings variation, and education majors experience the least. The discrepancy between these two results may be due to the fact that Carnevale, Strohl, and Melton (2011) analyze graduates from the United States and do not control for other factors that impact earnings, unlike Finnie and Frenette (2003) [5].

The outcomes of post-secondary education may be affected by the composition and structure of a college or university. Liberal arts institutions impact student outcomes through their small sizes, residential programs, and emphasis on mentoring relationships with faculty (Astin, 1999). Astin (1999) finds that liberal arts colleges excel at teaching writing skills, cultural awareness, and other forms of personal development, but these strengths come at the price of reduced likelihood of performing research. Controlling for major and individual characteristics, liberal arts students earn up to 10 percent less than their counterparts at other types of institutions (Thomas, 2003). Students at liberal arts colleges are especially disadvantaged when compared with those at graduate-degree granting and research institutions, not controlling for college major (Monks, 2000). Monks (2000) argues that curricular design and classroom dynamics, such as the examples outlined above, affect the accumulation of human capital, which may partially explain the difference in returns between students at liberal arts versus non-liberal arts institutions.

The literature does not examine a potential interaction between institution type and college major. College type may affect the quality of education received within a given field of study. An institution's curricular design impacts the types of skills the

[5] Finnie and Frenette (2003) control for factors such as age, post-graduation experience, self-employment status, marriage/children, region, industry, and occupation; Carnvale, Strohl, and Melton (2011) do not.

institution teaches its students. Certain curricular designs excel at producing specific skill types that are relatively more important in certain fields than others. Dean and Dolan (2001) find that the curricular character of economics departments at various institutions varied by whether the economics department was located in the business department or in a liberal arts division, supporting the idea that the interaction may significantly impact human capital accumulation.

In order to isolate the potential effects of field of study and institution type, other factors affecting post-graduation earnings must be considered. Part of the heterogeneity in graduates' earnings may be explained by college quality and selectivity. Higher college quality, measured as the average SAT score for an institution's entering freshmen, has been linked to greater initial earnings (Davies & Guppy, 1997; Thomas, 2000). There are numerous measures of college quality, but in general, students who study lucrative majors at high quality institutions command the highest earnings (James et al., 1989). Beyond selectivity measures, there are slight benefits to attending a private institution instead of public (James et al., 1989), which may be due to higher quality instruction at private schools (Monks, 2000). When one controls for college major, the effect of attending a private institution is less significant (James et al., 1989).

Individual characteristics affect an individual's choice of major and institution, as well as his or her subsequent labor market outcomes. The choice of major depends on the expected job opportunities associated with that field of study, nonpecuniary qualities of these jobs, and the individual's ability (Ehrenberg, 2003). An individual's preferences also determine what he or she decides to study in college. Certain demographic

characteristics can proxy for preferences and impact labor market outcomes. Gender, for example, affects the likelihood that an individual will enter a high-skill, high-return field of study. Men are more likely to enter lucrative fields than women (Davies & Guppy, 1997), and women typically earn less than men, even after controlling for individual, institutional, and labor market characteristics (Daymont & Andrisani, 1984; Monks, 2000; Thomas, 2003; Finnie & Frenette, 2003). In addition to men's greater likelihood to enter high-return fields, Davies and Guppy (1997) find that men are more likely to enter selective colleges. Other characteristics that have been shown to affect returns to post-secondary education include race (Rumberger & Thomas, 1993; Loury & Garman, 1995; Monks, 2000), family background (Davies & Guppy, 1997), and labor market experience (Thomas, 2003). The effects of labor market experience are highly correlated with field of study since different college majors allow entry into different labor markets.

Ability determines college major in part because different fields of study demand different skill sets. Davies and Guppy (1997) link higher ability, as measured by Armed Forces Qualification Test (AFQT) scores, to entry into more lucrative fields. Ability sorting also occurs among colleges; students with greater ability are more likely to attend selective colleges (Davies & Guppy, 1997). Performance, which is usually measured as college GPA and is linked to ability, also affects returns to education. Thomas (2000) finds that earnings may increase up to 6 percent as a result of a one point increase in GPA. Many other studies also find a correlation between GPA and the returns to post-secondary education (e.g., James et al., 1989; Rumberger & Thomas, 1993; Loury & Garman, 1995; Thomas, 2003).

II. THEORY

To assess the interaction between field of study and attending a liberal arts institution, and its effect on earnings, this paper uses the framework of comparative advantage. First, I assume there are two institutions, liberal arts (LA) and non-liberal arts (NLA). I also assume that institutions produce two types of skills, hard skills (h) and soft skills (s), using labor—such as professors—as the only factor of production. The h and s produced are identical across LA and NLA institutions. Labor is homogeneous within an institution type but heterogeneous across institution types. In this adaptation of comparative advantage theory, curricular structure may be thought of as the production technology. The LA structure results in a comparative advantage in s. That is, the opportunity cost of producing s is lower in LA than NLA, since labor in LA is relatively more productive in s than h. Similarly, the opportunity cost of producing h is lower in NLA, and the NLA curricular structure results in a comparative advantage in h. As a result, the LA endows its students with relatively more s than h, and the NLA institution endows its students with relatively more h than s. Therefore, the LA institution has a ratio of h/s that is relatively lower than the NLA institution's.

I also assume there are two fields of study: a and b. As the quality of education in each field increases, the market wage received increases (Figure 1). In field a, demand for s is higher than demand for h, and field b experiences higher demand for h than s. The quality of education in field a depends on the ratio h/s. Since s is valued relatively more than h in field a, the quality of education in field a decreases for increasing h, holding s constant in the h/s ratio (Figure 2). Coupling this relationship with the

relationship between quality and wages, the demand for a is shown in Figure 3. The demand for individuals in field a decreases as h/s increases due to the firms' preference for workers with more s. The workers from the LA institution receive a higher wage than workers from the NLA institution since, as mentioned previously, the NLA college has a higher h/s ratio and thus produces lower quality education in field a. Thus, this graphical analysis predicts that in a field that requires more soft skills, liberal arts college students will receive higher wages than non-liberal arts students. Figures 4 and 5 illustrate that the opposite phenomenon occurs in a field which requires more hard skills than soft.

This theory suggests that field of study is important, as it determines which labor market one may reasonably expect to enter following graduation (i.e. - whether one is on D_a or D_b). Choosing a liberal arts versus non-liberal arts college is also important, since theory predicts that the institution type interacts with major to determine the wage within a given field of study. One should note, however, that individual characteristics also determine the wage, as was shown in Section II. Therefore, my guiding equation for my empirical analysis is:

$$\ln w_i = \beta_0 + \beta_1 Major_i + \beta_2 Liberal\ Arts_i + \beta_3 Major_i * Liberal\ Arts_i + \beta_4 X_i + \varepsilon_i$$

Where X_i is a vector of individual characteristics including: race, gender, age, labor market experience, college performance, and family background.

III. SUMMARY STATISTICS

My guiding equation suggests I need micro-level data on wages, type of institution attended, college major, and a vector of demographic characteristics.

Conventionally, the individual characteristics in this vector are race, gender, age, labor market experience, college performance, and family background characteristics, such as parental level of education. The data I use include measures for all of these variables except for college performance and family background characteristics.

My data come from the Minnesota Department of Employment and Economic Development (DEED). The raw data are micro-level panel data, but I collapse the dataset based on Social Security Number (SSN). Therefore, my regressions are performed on a dataset with one observation per individual and no time component. DEED collected information on employees from all firms in the state of Minnesota that are subject to Unemployment Insurance taxes. These data include information of firm-level characteristics as well as details about individuals in the workforce. The wage data are reported as total quarterly earnings for a given employee within a specific firm for every quarter between the first quarter of 2003 and the fourth quarter of 2012. Additionally, DEED has data from the same time period for the total number of hours worked in a quarter by a specific employee.

Some individuals in the labor market hold two or more jobs during a given quarter. In order to ensure there is one observation for each person employed in Minnesota following college graduation, I use SSNs to identify which individuals appear more than once per quarter. I sum all earnings from the individual's multiple jobs to find his or her total earnings during each quarter and similarly calculate total quarterly hours worked. From the total quarterly earnings and hours worked, I calculate the hourly wage

for each individual in the sample during every quarter he or she is employed[6]. Missing hourly wage observations may be the result of unemployment or the individual finding employment outside of Minnesota following graduation, since the wage data are only for Minnesota firms.

Since the total number of hours worked in a quarter is highly susceptible to reporting errors, some of the hourly wages returned are too low to be realistic. Therefore, I exclude all observations with an hourly wage less than $4.90 from my analysis[7], as this is considered a 'training' wage in Minnesota. The upper bounds of the hourly wage are distorted due to outliers, so I exclude observations above the 95th percentile[8] as well. Additionally, I isolate and average each individual's quarterly hourly wage observations for the 6 months to 18 months following college graduation. I use this time period since there is high volatility in finding a job for the first 6 months after graduation. The upper bound on the timeframe is 18 months simply because the data are recent, and there are not yet wage observations for a longer time period. Finally, I take the log of all wage observations, similar to the majority of literature analyzing returns to a college education (e.g.-Loury & Garman, 1995; Monks, 2000; Thomas, 2003). My earnings data are therefore the log of the average hourly wage earned 6 to 18 months after graduation.

In addition to the wage data, I also obtain raw data from DEED for post-secondary degree completers in Minnesota. The Office of Higher Education (OHE) provided DEED with information for all individuals who completed a degree from any

[6] 15, 191 individuals in my final sample do not have hourly wage data.
[7] Of the 15, 191 observations without wage data, 181 are missing due to my hourly wage < $4.90 exclusion criteria.
[8] Of the 15, 191 observations without wage data, 161 are missing due to my hourly wage > 95th percentile hourly wage exclusion criteria.

post-secondary institution in the state during the 2009-2010 and 2010-2011 academic years. DEED processed the raw data, so all observations are unique by SSN. This step was necessary to account for individuals who major in two fields or complete two degrees in a given year. Since I am interested in undergraduate education, I focus on the data for completers of bachelor's degrees. For each individual, the degree data include the institution conferring the degree, date the degree was conferred, the student's major, race[9], gender, date of birth, and SSN. I use the date of birth and the date the degree was conferred to calculate the individual's age at completion and quarter the degree was conferred.

In order to merge the wage and degree completer data, I match observations based on their SSNs. This match results in 58,453 total degree completers with distinct SSNs. By identifying unique observations of the institution codes[10], I classify the institutions attended by size, public versus private, liberal arts versus non-liberal arts, Barron's selectivity ranking, highest level of degree awarded, and mean composite ACT scores for the 75th percentile of students.

The data for size, public versus private, liberal arts versus non-liberal arts, and highest level of degree awarded come from The Carnegie Classification of Institutions of Higher Education[11]. The Carnegie Foundation for the Advancement of Teaching collects data on institutional characteristics and activities from the National Center for Education

[9] The race categories include: Black/African American, American Indian or Alaska Native, Asian, Hispanic/Latino, White, Native Hawaiian or other Pacific Islander, two or more races, nonresident alien, and unavailable. I exclude degree completers with unavailable race data, resulting in the loss of 3,225 observations.
[10] 33 institutions are represented in my final sample.
[11] (Carnegie Foundation for the Advancement of Teaching, n.d.-a)

Statistics, the National Science Foundation, and the College Board (Carnegie Foundation for the Advancement of Teaching, n.d.-b). The data are from the 2008 to 2010 time period and include information on the total number of students attending the institution (size), as well as whether it is a public institution[12]. Data for highest level of degree awarded also come from the 2008 to 2010 time period. The Carnegie Classification of this variable is based on whether the institutions grant doctorate degrees or exhibit high research activity, whether they award a large number of master's degrees, or if baccalaureate degrees make up a significant proportion of degrees awarded[13]. Therefore, there are three categories for highest level of degree awarded: Doctorate/Research, Master's, and Bachelor's[14].

The Carnegie Classification contains information on the proportion of bachelor's degree majors in the arts and sciences and in professional fields, referred to as the undergraduate instructional program classification. Table 1 outlines the categories for this variable, and Figure 8 illustrates the proportion of observations that fall into each of the categories. I exclude students who attended institutions classified as Associate's Dominant or specialty institutions, such as a theological seminary, as these institution types are outside the scope of this study[15]. I generate a dummy variable "liberal arts", so all institutions with greater than 60% of students pursuing degrees in arts and sciences are considered liberal arts.

[12] See Figure 6 for the percentage of students in the sample attending public institutions.
[13] (Carnegie Foundation for the Advancement of Teaching, n.d.-b)
[14] See Figure 7 for the percentage of students attending institutions in each of the highest level of degree awarded categories.
[15] 3,616 observations are not included in the final sample due to the exclusion of students at Associate's Dominant or specialty institutions.

Institutional selectivity classifications come from Barron's Profiles of American Colleges[16] 2013 data, which ranks institutions based on the entering class's standardized test scores, class rank, high school GPA, and the acceptance rate of applicants, as Monks (2000) explains. The categories include Special, Non/Less Competitive, Competitive, Very Competitive, and Highly/Most Competitive[17]. The data for composite ACT scores of incoming first-time students at each institution come from the National Center for Education Statistics' (NCES) College Navigator tool[18]. The NCES reports the average composite ACT scores of the 75th percentiles of admitted students for the fall of 2011 or 2012; ACT score information is collected from all institutions that require the standardized test score in the application process. These data are mainly gathered via the Integrated Postsecondary Education Data System (IPEDS), which is the NCES's main data collection program for postsecondary education (National Center for Education Statistics, n.d.). The NCES also reported the average SAT scores of first-year students, but a majority of students submitted ACT scores instead, making it a more precise measure of institutional quality.

In addition to the institutional classifications, I classify the fields of study. I extract all unique 6-digit classification of instructional programs (CIP) codes from my dataset, and classify the majors into 9 categories. I base my categories on Rumberger and Thomas's (1993) work[19], but I add humanities as a separate category and include computer science in the already-defined mathematics and science category. Therefore,

[16] (Barron's Profiles of American Colleges, n.d.)
[17] Figure 10 illustrates the percentage of institutions in each selectivity category.
[18] (National Center for Education Statistics, n.d.)
[19] Rumberger and Thomas (1993) use the following categories: engineering, business, health, education, social sciences, mathematics and science, and other—comprised mainly of humanities majors.

my major categorizations are: Business, Education, Engineering, Health, Math/Science/Computer Science (MSCS), Social Sciences, Humanities, Other, and Unavailable. All observations classified as other or unavailable are excluded from my analysis[20]. More detailed information on these classifications may be found in Table 2, as well as Figure 11.

Of the 47, 340 unique degree completers during the '09-'10 and '10-'11 academic years who meet my inclusion criteria and have valid race data, 85.48% are White, 3.24% are Black/African American, 1.95% are Hispanic/Latino, and the remaining 9.34% fall into the Other Race category[21]. Only slightly more than half of degree completers (55.5%) are female. Though there is a gender balance among all degree completers in general, health and education majors are more likely to be female, while males dominate engineering and MSCS (Table 3). Minnesota is representative of the national trends with respect to these distributions. Nationally, women are concentrated in health and education, and engineering majors are more likely to be men (Carnevale, Strohl, & Melton, 2011).

Only 14.01 % of individuals in the sample attended institutions classified as liberal arts (Figure 9). Major seems to be correlated with attendance of a liberal arts institution; as Table 3 illustrates, a higher percentage of students studying MSCS, social sciences, and humanities attend liberal arts institutions than their peers in other fields of study. Most students (78.42%) are traditional age, meaning that they are 25 years old or younger when they receive their degrees. Health majors are the most likely out of all

[20] 7,188 observations are lost when students with 'other' and 'unavailable' majors are excluded.
[21] I group American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, two or more races, and nonresident aliens into one category—Other Race.

majors to also be non-traditional aged students (Table 3). Table 4 summarizes pertinent information on the age at graduation, size of the institutions, number of quarters of post-graduation employment, post-graduation log-wages, post-graduation quarterly hours worked, and post-graduation quarterly earnings for individuals included in my analysis. Age at graduation and number of quarters of post-graduation employment can be used to proxy for labor market experience.

There are 32, 149 individuals in the final sample, mainly due to the number of missing earnings observations. Approximately 20% of individuals who do not have wage data attended liberal arts institutions, a greater proportion than the 14.01% of liberal arts students in the sample when individuals without wage data are included. This higher proportion suggests the liberal arts students may have faced higher unemployment rates or were more likely to find employment outside Minnesota. Similarly, MSCS and humanities majors are slightly over-represented and business and education majors are slightly under-represented among the individuals without hourly wage data when compared to the overall sample of graduates with and without wage data[22].

Kernel density plots of hourly wage for liberal arts versus non-liberal arts students, found in Figure 12, illustrate that there is a slight difference in the distribution of earnings between graduates from the two institution types. Figure 12 excludes engineering graduates since there are no engineering students at liberal arts institutions in my sample. Beyond this difference in earnings, Figure 13 shows that there is also variation in earnings across the different major categories. The densities seen in Figure

[22] MSCS: 8.36% of students without hourly wage data versus 6.16% overall, Humanities: 29.68% without versus 24.46% overall, Business: 15.83% without versus 21.56% overall, and Education: 9.5% without versus 11.47% overall.

13 crudely match the rankings of earnings by major from the literature. Figures 14 through 20 illustrate the distribution of wages for each of the major categories by liberal arts versus non-liberal arts. Figure 17 is particularly interesting since the hourly wage distributions for liberal arts and non-liberal arts health majors are significantly different. This difference may suggest the type of health majors offered at a *LA* college differs greatly from those at *NLA* institutions, thus leading to different occupations with vastly different hourly wages.

IV. ANALYSIS

Estimation Issues

Given my guiding equation and data, my estimation equation is:

$$\ln(hourly\ w_i) = \beta_0 + \beta_1 Major_i + \beta_2 Liberal\ Arts_i + \beta_3 Major_i * Liberal\ Arts_i + \beta_4 Race_i + \beta_5 Age_i + \beta_6 Age_i^2 + \beta_7 Female_i + \beta_8 Quarter\ Degree\ Received_i + \beta_9 Quarters\ Employed\ Post\ Graduation_i + \beta_{10} Average\ Hours\ Worked\ per\ Quarter_i + \beta_{11} Public\ Institution_i + \beta_{12} Selectivity_i + \beta_{13} Highest\ Level\ of\ Degree\ Awarded_i + e_i$$

where *i* represents each individual in the sample. I test the residuals of my ordinary least squares (OLS) estimation for heteroskedasticity using the Breusch-Pagan / Cook – Weisberg test. This test confirms the presence of non-constant variance[23], which I correct for by using robust standard errors. Then, I use a variance inflation factor (VIF) test to detect whether multicollinearity is present. The resulting mean VIF is 5.66, indicating mild multicollinearity. I choose not to alter my estimation equation, since the

[23] Probability > Chi-square= 0.00.

slightly large VIF is mainly due to the multicollinearity between Age and Age^2. When Age^2 is removed, the VIF is 2.07.

Main Results

I begin my analysis by replicating the specifications found in Rumberger and Thomas (1993) and Monks (2000) in order to understand to what degree the individuals in my sample resemble those of previous studies and to provide the ability to analyze how the coefficients change in the interaction term's presence. One should note missing data for college performance and for certain labor market experiences make perfect replication of the specifications impossible.

The first regression I perform, a near-replication of Rumberger and Thomas (1993), only analyzes the impact of college major on $ln(hourly\ wage)$ and does not control for attendance of a liberal arts institution (Column (i) of Table 5). All majors earn relatively more per hour than humanities majors; this result is statistically significant at the 1% level. The coefficients for engineering and MSCS are within one standard deviation of those found by Rumberger and Thomas (1993). While the other coefficients are not quantitatively the same as the replicated specification, the ranking of majors is similar. Unlike Rumberger and Thomas's (1993) findings, health majors barely edge out engineering and education overtakes both social sciences and humanities. These discrepancies may be the result of either changes that have taken place over the last twenty years or differences in Minnesota's labor market relative to the national labor market, since their study analyzes nation-wide data. Overall, this model explains 28.1%

of the variation in earnings, compared to the 43.8% that Rumberger and Thomas's (1993) model explains.

The results from replication of Monks' (2000) specification can be found in column (ii) of Table 5. Direct comparison of results is more challenging in this case, since the Carnegie Classifications methodology which Monks (2000) used to classify liberal arts institutions changed since the time of his analysis. My model, however, finds that students at liberal arts institutions are disadvantaged, which qualitatively matches Monks' (2000) finding. Graduates from liberal arts schools earn 5.92% less per hour on average than their non-liberal arts counterparts when controlling for demographic characteristics and labor market experiences.

Column (iii) of Table 5 illustrates that when controlling for both major and liberal arts attendance, the coefficient values are similar to those in (i) and (ii), which only control for either major or liberal arts. Column (iv) of Table 5 shows the main regression results for this study. The omitted major category is humanities, and the omitted interaction term is humanities*liberal arts. The interaction between liberal arts and engineering is also omitted since there are not engineering majors at liberal arts institutions in this sample. All of the interaction terms are statistically significant except for MSCS*liberal arts. While significance of these terms supports my hypothesis that the interaction between institution type and college major has an important effect on earnings[24], I also must consider whether the coefficients exhibit the direction of association I would expect to see based on my theory.

[24] An F-test performed on the interaction term categories confirms the term impacts wages overall (Prob > F = 0.0000).

The theory suggests fields requiring more soft skills should see a greater benefit of attending a liberal arts institution. The results of this analysis are mixed. Health, social sciences, education, and business majors experience greater benefits by attending liberal arts colleges, while such institutions confer negative impacts on MSCS majors, all relative to humanities majors. The positive impact on health majors is not surprising, depending on what portion of the health field those individuals occupy. If the health majors end up in careers as nurses or other positions that require communicating with patients, then the soft skills accrued at liberal arts institutions would be beneficial. If these majors, however, work in highly technical and specialized fields, then the result is contrary to economic theory. The second potentially unexpected result is the coefficient on business*liberal arts. If one expects soft skills to be relatively more important in humanities than business, then the coefficient for business*liberal arts should be negative. Business majors, however, see a larger benefit of a liberal arts education than students in the humanities. This result suggests soft skills may in fact be more important in the occupations held by business majors than humanities majors.

This analysis finds that students at liberal arts colleges earn 7.78% less per hour than their counterparts at non-liberal arts institutions, and the ranking of major by earnings remains the same when the interaction term is included. In order to interpret the within-major impact of a liberal arts education, I combine the liberal arts and liberal arts*major coefficients for each of the major categories (Column (i) of Table 8). Business majors from liberal arts institutions receive 4.59% less per hour, health majors earn 14.80% more per hour, and MSCS majors make 8.97% less per hour, all relative to

non-liberal arts students with the same major; these findings are statistically significant at the 1% level. The hourly wages received by liberal arts and non-liberal arts students are not statistically different for graduates within either education or social sciences majors.

With the exception of master's degree granting institutions (relative to baccalaureate) and non/less competitive institutions (relative to competitive), the remaining explanatory variables exhibit the same directions of association found in the literature. Overall, this model explains 28.6 % of the variation in the log-hourly wage.

Robustness Tests

This section examines the robustness of my main results when subjected to changes in assumptions. For each robustness test, I check for and address additional potential estimation issues.

Institutional Characteristics

Rumberger and Thomas (1993) suggest that the number of students attending an institution (size) may impact earnings, but they do not study its effect extensively. Larger schools may be systematically different from smaller schools because the number of students affects the learning atmosphere and resources available. Therefore, I regress the log-hourly wages using the same estimation equation as my main analysis but with size added. This estimation's results are found in column (i) of Table 6. The coefficients on the interaction terms remain roughly the same in terms of magnitude and direction of association, but business*liberal arts is no longer statistically significant. The within-major impacts of attending a liberal arts institution are also similar, but the difference between liberal arts and non-liberal arts business majors is no longer statistically

significant, as seen in column (ii) of Table 8. It is possible that the liberal arts institutions in the sample are more likely to be smaller than non-liberal arts, resulting in benefits for business majors derived from the size and not the curricular structure of the institution. When size is controlled for, health majors at liberal arts schools earn 17.70% more per hour than those at non-liberal arts institutions, and this finding is statistically significant at the 1% level (Column (ii) of Table 8). The third statistically significant finding is that MSCS majors receive 5.73% less per hour by attending a liberal arts institution (Column (ii) of Table 8). The impacts of selectivity and highest level of degree awarded are also diminished when size is included.

Additionally, I test the robustness of my main results with an alternative measure of institutional selectivity. Rather than include Barron's selectivity rankings, I control for the 75th percentile ACT score of the institution's entering class. The results for this specification are found in column (ii) of Table 6. The coefficient values are robust to this alternate specification, with the exception of highest level of degree awarded. Within-major analysis for this specification can be found in column (iii) of Table 8. This shows the within-major hourly wage difference is again no longer significant for business majors, but social science majors at liberal arts institutions earn a statistically significant 2.63% more per hour.

Major Categorizations

Similar to Finnie and Frenette (2003), I test the effect of separating economics majors from the social sciences. First, I regress the model without the interaction term (Column (i) of Table 7), to better understand how an additional major category impacts

the coefficient values. The coefficient values are robust to the addition of economics as a separate field of study, except for social sciences. Returns to social sciences degrees were initially inflated by the inclusion of economics. The drop in coefficient value for social sciences can be attributed to the fact that economics majors earn more than other social sciences, as seen in the significantly higher coefficient value for economics majors.

I model my main regression with the interaction term and the economics major added. The results of this estimate are displayed in column (ii) of Table 7 and are nearly identical to my main results. This specification indicates that economics majors receive a benefit from attending a liberal arts institution, relative to humanities majors. Without economics included, the within-major hourly wage difference for social science students is statistically significant, as is the same metric for economics majors (Column (iv) of Table 8). Hourly wages are 7.36% higher for economics graduates from liberal arts institutions, compared to economics students from non-liberal arts schools.

My final robustness check regresses the main specification with economics and number of students attending the institution added (Column (iii) of Table 7). The impact of institution size is the same in this specification as in the specification without economics. The statistical significance of the within-major wage differential for social sciences disappears when size is accounted for (Column (iv) of Table 8). All alternate specifications indicate that the results for the variables of interest—field of study, attendance of a liberal arts institution, and the interaction between the two—are robust. When within-major wage variation is considered, however, the alternate specifications

impact the results. The within-major results for business and social science majors are the least robust.

V. CONCLUSION

The goal of this paper is to analyze the impact of the interaction between college major and attending a liberal arts institution on post-graduation earnings. The guiding equation is derived from a comparative advantage theory which suggests soft skill intensive college majors receive higher wages if they attend a liberal arts college. Using data from exclusively Minnesota bachelor's degree completers from the '09-'10 and '10-'11 academic years who were employed at Minnesota firms 6 months to 18 months after graduation, my primary regression shows that the interaction is statistically significant. Overall, liberal arts students earn 5.92% less per hour when other institutional characteristics are controlled for, but they may earn more than their non-liberal arts counterparts depending on their fields of study.

Education, health, and social science majors are less disadvantaged by attending a liberal arts college than humanities majors. A less robust finding is that the negative impact of attending a liberal arts institution is not as severe for business majors relative to humanities. Within each major category, health and economics majors receive a statistically significant hourly wage benefit, and MSCS are disadvantaged, by attending liberal arts institutions. The within-major wage difference for education majors is not significant, regardless of the specification, and the significance for business and social science majors is not robust.

My results are varied in terms of matching the economic theory. Depending on the relative importance of soft skills one ascribes to health and business majors, the impact of attending a liberal arts institution could be negative or positive relative to the *LA* impact on humanities graduates. If soft skills are more important for humanities students than business or health, then the results are contrary to what is predicted by the comparative advantage framework.

One main limitation of this study is lack of information on each individual's college performance or other measures of ability. The data do not include family background characteristics either. These variables are important since students may have unobservable characteristics—like motivation—that cause the students to self-select into certain majors or institutions and also affect earnings, thereby overstating the college effects (James et al., 1989). Ability and family background may serve as proxies for these unobservable characteristics, thus resulting in more accurate estimates of college effects.

The data do not include more detailed information on labor market experiences, such as tenure, which also greatly influence an individual's earnings. To minimize the impact of omitted variables like tenure, I control for the individual's age, number of quarters employed during the time period in question, and the quarter of graduation to account for labor market characteristics at the time of graduation. I do not control for occupation or the degree to which the graduates' first jobs are related to their fields of study due to lack of data. While field of study may proxy for occupation to a certain degree, I am unable to comment whether *LA* leads to higher wages in soft-skill-intensive occupations and a wage disadvantage in hard-skill-intensive occupations. Additionally,

the individual's location post-graduation is not accounted for. If students remain close to their alma mater and certain types of institutions are more likely to be located in rural areas where wages tend to be lower, then the results may be biased.

Future Studies

While ranking the initial earning potentials of different majors provides pertinent information, it is also important to understand how earnings grow over time based on field of study. During the first four years of a graduate's career, business, engineering, and math majors experience higher earnings growth relative to education majors (Thomas & Zhang, 2005). Thus, according to the literature, not only do quantitative fields of study earn more initially, they also experience more rapid earnings growth. These results suggest that labor markets operate differently for certain fields of study. Engineering graduates, for example, may face a more stable and well-defined labor market than other fields of study (Finnie & Frenette, 2003). Additionally, the effect of college quality is not constant over time. During the first four years following entrance into the job market, the effect of college quality on earnings increases (Thomas & Zhang, 2005). Given these findings, future studies should explore the impacts of college major, attendance of a liberal arts institution, and their interaction on earnings over an extended time-period following college graduation, rather than only the time immediately following graduation.

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Table 1: Liberal Arts and Undergraduate Instructional Program Classifications

Liberal Arts	Degree Composition	Carnegie Classification
1	80+% A&S	A&S Focus
1	60-79% A&S	A&S plus Prof
0	41-59% Each	Balanced A&S and Prof
0	60-79% Prof	Prof plus A&S
0	80+% Prof	Prof Focus

Note: A&S denotes "Arts and Sciences", Prof denotes "Professional".
I drop all observations for which the Carnegie Classification does not fit into the above categories. Such institutions were either Associate's Dominant or specialty institutions (e.g.-theological seminary or music school); 3,616 observations are lost as a result.

Table 2: CIP Category and Major Classifications

CIP Category	Major Classification
Business, management, marketing, and related support services.	Business
Education.	Education
Architecture and related services.	Engineering
Engineering.	Engineering
Engineering technologies and engineering-related fields.	Engineering
Science technologies/technicians.	Health
Health professions and related programs.	Health
Residency programs.	Health
Computer and information sciences and support services.	Math, Science, and Computer Science
Mathematics and statistics.	Math, Science, and Computer Science
Physical sciences.	Math, Science, and Computer Science
Area, ethnic, cultural, gender, and group studies.	Social Sciences
Communication, journalism, and related programs.	Social Sciences
Communications technologies/technicians and support services.	Social Sciences
Psychology.	Social Sciences
Social sciences.	Social Sciences
Foreign languages, literatures, and linguistics.	Humanities
English language and literature/letters.	Humanities
Liberal arts and sciences, general studies and humanities.	Humanities
Philosophy and religious studies.	Humanities
Theology and religious vocations.	Humanities
Visual and performing arts.	Humanities
History.	Humanities
Agriculture, agriculture operations, and related sciences.	Other
Natural resources and conservation.	Other

CIP Category	Major Classification
Personal and culinary services.	Other
Family and consumer sciences/human sciences.	Other
Multi/interdisciplinary studies.	Other
Parks, recreation, leisure, and fitness studies.	Other
Homeland security, law enforcement, firefighting and related protective services.	Other
Public administration and social service professions.	Other
Construction trades.	Other
Mechanic and repair technologies/technicians.	Other
Precision production.	Other
Transportation and materials moving.	Other
Unclassified	Unclassified

Note: All majors within in the “Other” and “Unclassified” categories are excluded from my analyses.

Table 3: Student Characteristics within Majors

Major	Females within Major	Liberal Arts within Major	Traditional Age Students within Major
Business	45.9%	6.2%	73.7%
Education	75.1%	4.9%	70.7%
Engineering	15.9%	0.0%	81.2%
Health	86.0%	4.7%	61.9%
MSCS	29.3%	29.9%	83.0%
Social Sciences	61.1%	20.3%	84.1%
Humanities	56.4%	21.0%	83.7%

Note: MSCS represents Math/Science/Computer Science.

Table 4: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Age at Graduation	25.099	5.882	19	70
Size (Number of Students at Institution)	19803.81	18972.89	1243	51659
Quarters of Post-Grad Employment	3.584	0.858	1	4
Post-Grad Ln(Hourly Wage)	2.742	0.381	1.590	3.606
Post-Grad Quarterly Hours	408.052	182.261	0.5	2083
Post-Grad Quarterly Earnings	7375.482	4718.669	6.25	82942

Note: N=31,376

Table 5: Primary Regression Results

	Average Log-Hourly Wage			
Variables	(i)	(ii)	(iii)	(iv)
Business	0.226***		0.220***	0.214***
	(0.006)		(0.006)	(0.006)
Education	0.198***		0.198***	0.190***
	(0.007)		(0.007)	(0.007)
Engineering	0.387***		0.376***	0.369***
	(0.010)		(0.010)	(0.010)
Health	0.459***		0.459***	0.442***
	(0.010)		(0.010)	(0.010)
MSCS	0.244***		0.247***	0.252***
	(0.010)		(0.010)	(0.011)
Social Sciences	0.040***		0.041***	0.029***
	(0.005)		(0.005)	(0.006)
Liberal Arts		-0.061***	-0.043***	-0.081***
		(0.012)	(0.011)	(0.014)
Business*Liberal Arts				0.035*
				(0.018)
Education*Liberal Arts				0.062**
				(0.025)
Health*Liberal Arts				0.219***
				(0.031)
MSCS*Liberal Arts				-0.013
				(0.025)
Social Sciences*Liberal Arts				0.072***
				(0.015)
Public	-0.077***	-0.059***	-0.074***	-0.073***
	(0.005)	(0.006)	(0.006)	(0.006)
Specialized Institution	0.080***	0.094***	0.093***	0.092***
	(0.008)	(0.009)	(0.008)	(0.008)
Non/Less Competitive	2.78e-04	0.053***	0.011	0.011
	(0.007)	(0.008)	(0.007)	(0.007)
Very Competitive	0.028***	0.064***	0.060***	0.058***
	(0.007)	(0.010)	(0.009)	(0.009)
Highly/Most Competitive	0.107***	0.030***	0.069***	0.070***
	(0.005)	(0.008)	(0.008)	(0.008)
Doctorate/Research		0.084***	0.042***	0.041***
		(0.010)	(0.009)	(0.009)
Masters		0.010	-0.019**	-0.019**
		(0.009)	(0.009)	(0.009)

Variables	Average Log-Hourly Wage			
	(i)	(ii)	(iii)	(iv)
Quarters of Post-Grad Employment	0.060***	0.094***	0.059***	0.060***
	(0.003)	(0.002)	(0.003)	(0.003)
Constant	0.249	-0.528***	0.145	0.152
	(0.166)	(0.180)	(0.166)	(0.166)
Observations	31,376	31,376	31,376	31,376
R-squared	0.281	0.143	0.284	0.286

Note: (i) Results from specification by Rumberger and Thomas (1993), with missing information on family background, GPA, and labor market experiences. (ii) Results from specification by Monks (2000), with missing information on tenure and the Armed Forces Qualification Test. (iii) Results controlling for field of study and attendance of a liberal arts institution. (iv) Main results controlling for interaction between field of study and attendance of a liberal arts institution. The omitted category for selectivity is "Competitive". "Humanities" is the reference category for major, and "Humanities*Liberal Arts" is the reference for the interaction term. "Baccalaureate" is the omitted category for highest level of degree awarded. Gender, Race, Age, Age^2, and Quarter Degree was Received were controlled for in (i-iv), and Average Hours Worked per Week was controlled for in (i),(iii),and (iv).

Robust standard errors in parentheses. *** Significant at 1% level, **significant at 5% level, *significant at 10% level.

Table 6: Institutional Characteristics Robustness Regression Results

	Average Log-Hourly Wage	
Variables	(i)	(ii)
Business	0.215***	0.218***
	(0.006)	(0.006)
Education	0.192***	0.188***
	(0.007)	(0.007)
Engineering	0.369***	0.370***
	(0.010)	(0.010)
Health	0.445***	0.448***
	(0.010)	(0.011)
MSCS	0.252***	0.254***
	(0.011)	(0.012)
Social Sciences	0.029***	0.031***
	(0.006)	(0.006)
Liberal Arts	-0.049***	-0.041***
	(0.016)	(0.013)
Business*Liberal Arts	0.023	0.032*
	(0.018)	(0.017)
Education*Liberal Arts	0.055**	0.062**
	(0.025)	(0.025)
Health*Liberal Arts	0.212***	0.227***
	(0.031)	(0.031)
MSCS*Liberal Arts	-0.011	-0.013
	(0.025)	(0.025)
Social Sciences*Liberal Arts	0.069***	0.067***
	(0.015)	(0.014)
Public	-0.099***	-0.050***
	(0.008)	(0.005)
Specialized Institution	0.102***	
	(0.009)	
Non/Less Competitive	0.007	
	(0.007)	
Very Competitive	0.032***	
	(0.010)	
Highly/Most Competitive	0.022	
	(0.014)	
Doctorate/Research	0.014	0.068***
	(0.011)	(0.009)
Masters	-0.021**	0.011
	(0.009)	(0.009)

Variables	Average Log-Hourly Wage (i)	(ii)
Quarters of Post-Grad Employment	0.059***	0.059***
	(0.003)	(0.003)
Size	1.92e-06***	
	(4.54e-07)	
75th Percentile ACT Score		0.012***
		(0.002)
Constant	0.139	-0.158
	(0.166)	(0.177)
Observations	31,376	29,528
R-squared	0.286	0.273

Note: (i) Main results, controlling for number of students attending the institution. (ii) Main results, exchanging Barron's selectivity measure with 75th percentile ACT score. The omitted category for selectivity is "Competitive". "Humanities" is the reference category for major, and "Humanities*Liberal Arts" is the reference for the interaction term. "Baccalaureate" is the omitted category for highest level of degree awarded. Gender, Race, Age, Age^2, Average Hours Worked per Week, and Quarter Degree was Received were controlled for in both specifications.
Robust standard errors in parentheses. *** Significant at 1% level, **significant at 5% level, *significant at 10% level.

Table 7: Field of Study Robustness Regression Results

	Average Log-Hourly Wage		
Variables	(i)	(ii)	(iii)
Business	0.220***	0.214***	0.215***
	(0.006)	(0.006)	(0.006)
Education	0.194***	0.187***	0.189***
	(0.007)	(0.007)	(0.007)
Engineering	0.380***	0.374***	0.374***
	(0.010)	(0.010)	(0.010)
Health	0.455***	0.439***	0.442***
	(0.010)	(0.010)	(0.010)
MSCS	0.251***	0.255***	0.255***
	(0.010)	(0.011)	(0.011)
Social Sciences	0.022***	0.016***	0.015***
	(0.005)	(0.006)	(0.006)
Economics	0.212***	0.173***	0.172***
	(0.012)	(0.014)	(0.014)
Liberal Arts	-0.049***	-0.081***	-0.044***
	(0.011)	(0.014)	(0.016)
Business*Liberal Arts		0.032*	0.019
		(0.018)	(0.018)
Education*Liberal Arts		0.059**	0.051**
		(0.025)	(0.025)
Health*Liberal Arts		0.219***	0.211***
		(0.031)	(0.031)
MSCS*Liberal Arts		-0.013	-0.010
		(0.025)	(0.025)
Social Sciences*Liberal Arts		0.037**	0.032**
		(0.015)	(0.015)
Economics*Liberal Arts		0.152***	0.154***
		(0.026)	(0.027)
Public	-0.070***	-0.069***	-0.098***
	(0.006)	(0.006)	(0.008)
Specialized Institution	0.091***	0.090***	0.101***
	(0.008)	(0.008)	(0.009)
Non/Less Competitive	0.009	0.010	0.005
	(0.007)	(0.007)	(0.007)
Very Competitive	0.065***	0.064***	0.035***
	(0.009)	(0.009)	(0.010)
Highly/Most Competitive	0.063***	0.062***	0.008
	(0.008)	(0.008)	(0.014)

	Average Log-Hourly Wage		
Variables	(i)	(ii)	(iii)
Doctorate/Research	0.042***	0.043***	0.012
	(0.009)	(0.009)	(0.011)
Masters	-0.021**	-0.020**	-0.022**
	(0.009)	(0.009)	(0.009)
Quarters of Post-Graduation Employment	0.059***	0.059***	0.059***
	(0.003)	(0.003)	(0.003)
Size			2.16e-06***
			(4.52e-07)
Constant	0.146	0.150	0.136
	(0.166)	(0.166)	(0.165)
Observations	31,376	31,376	31,376
R-squared	0.290	0.291	0.292

Note: (i) Results without interaction term and including Economics as a field of study. (ii) Main results, including Economics as a field of study. (iii) Main results, including Economics as a field of study and controlling for number of students attending the institution. The omitted category for selectivity is "Competitive". "Humanities" is the reference category for major, and "Humanities*Liberal Arts" is the reference for the interaction term. "Baccalaureate" is the omitted category for highest level of degree awarded. Gender, Race, Age, Age^2, Average Hours Worked per Week, and Quarter Degree was Received were controlled for in (i-iii). Robust standard errors in parentheses. *** Significant at 1% level, **significant at 5% level, *significant at 10% level.

Table 8: Within-Major Liberal Arts Impact

	Average Log-Hourly Wage				
Major	(i)	(ii)	(iii)	(iv)	(v)
Business	-0.047***	-0.025	-0.009	-0.049***	-0.025
Education	-0.020	0.006	0.021	-0.021	0.008
Health	0.138***	0.163***	0.186***	0.139***	0.167***
MSCS	-0.094***	-0.059**	-0.054**	-0.093***	-0.054**
Social Sciences	-0.009	0.020	0.026**	-0.044***	-0.012
Economics				0.071***	0.110***

Note: (i) Primary regression results, (ii) Regression results controlling for number of students at institution, (iii) Regression results using 75th percentile ACT score as selectivity measure, (iv) Regression results separating Economics major from Social Sciences, (v) Regression results using Economics major and controlling for number of students at institution. Robust standard errors in parentheses. *** Significant at 1% level, **significant at 5% level, *significant at 10% level.

Figure 1: Wages and Quality of Education

Figure 2: Quality of Soft-Skill-Intensive Major

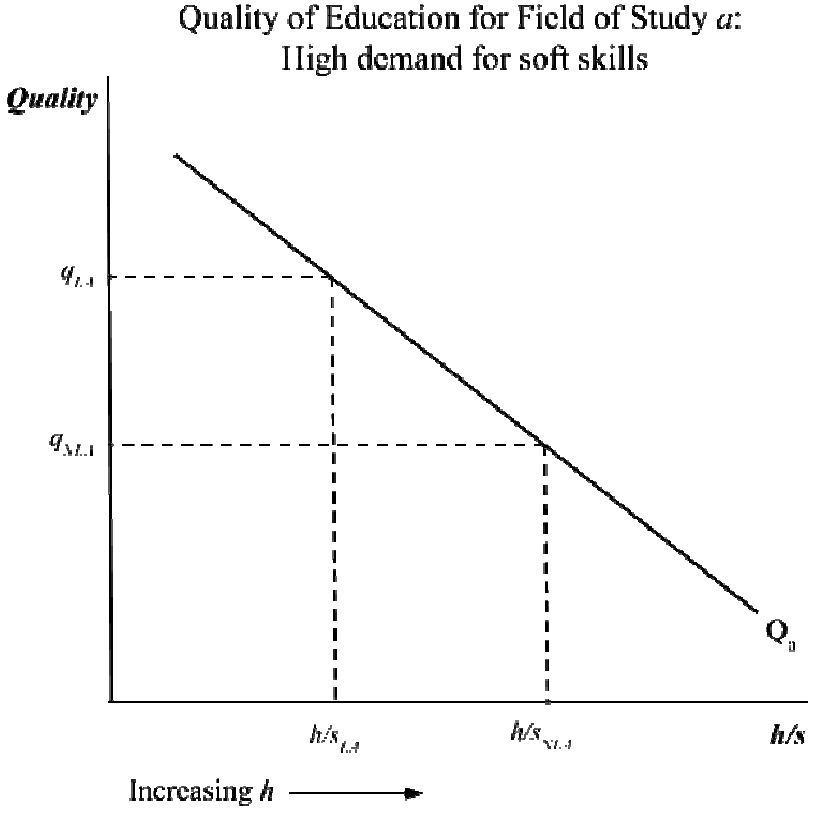


Figure 3: Demand for Soft-Skill-Intensive Major

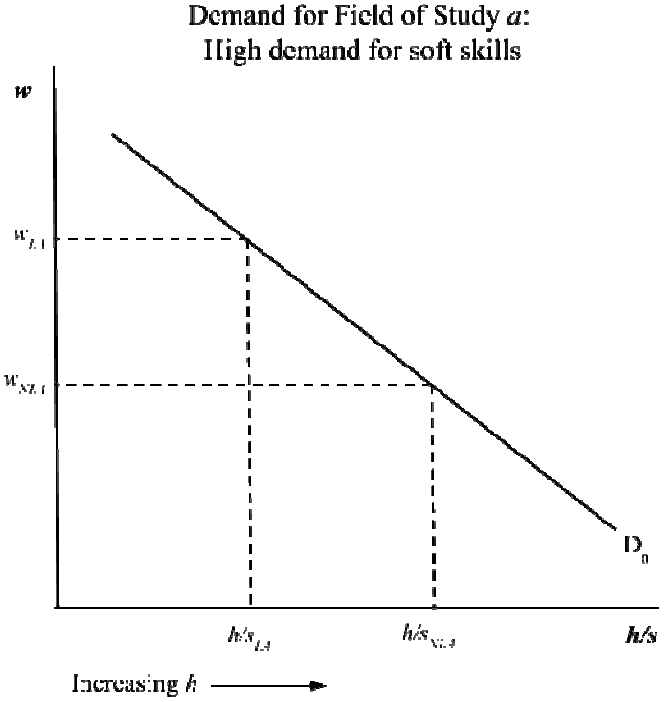


Figure 4: Quality of Hard-Skill-Intensive Major

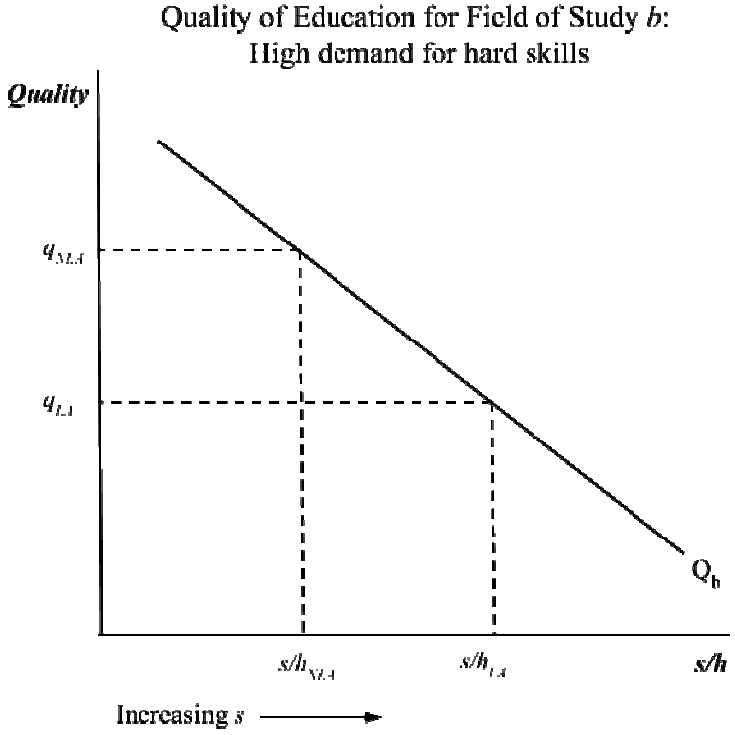


Figure 5: Demand for Hard-Skill-Intensive Major

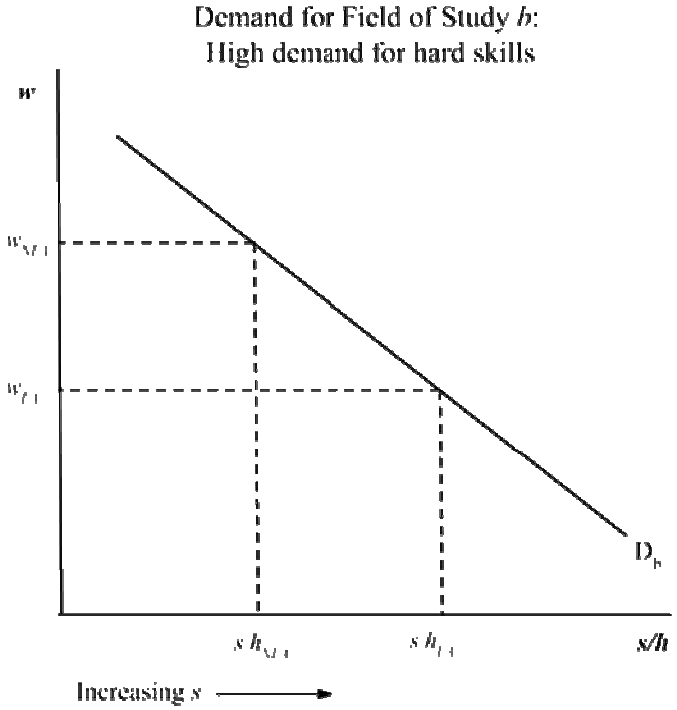
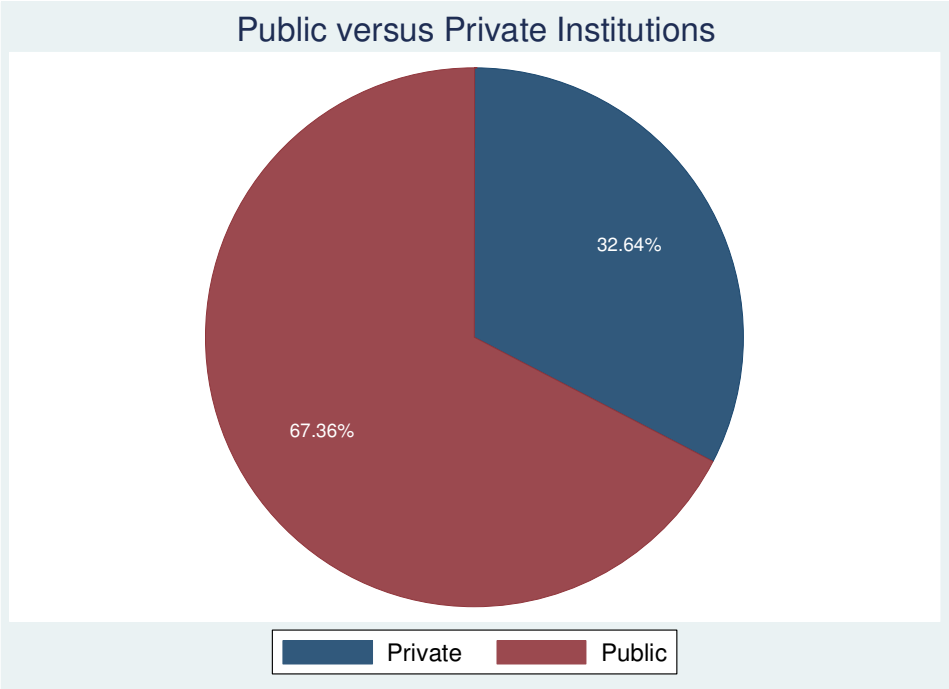
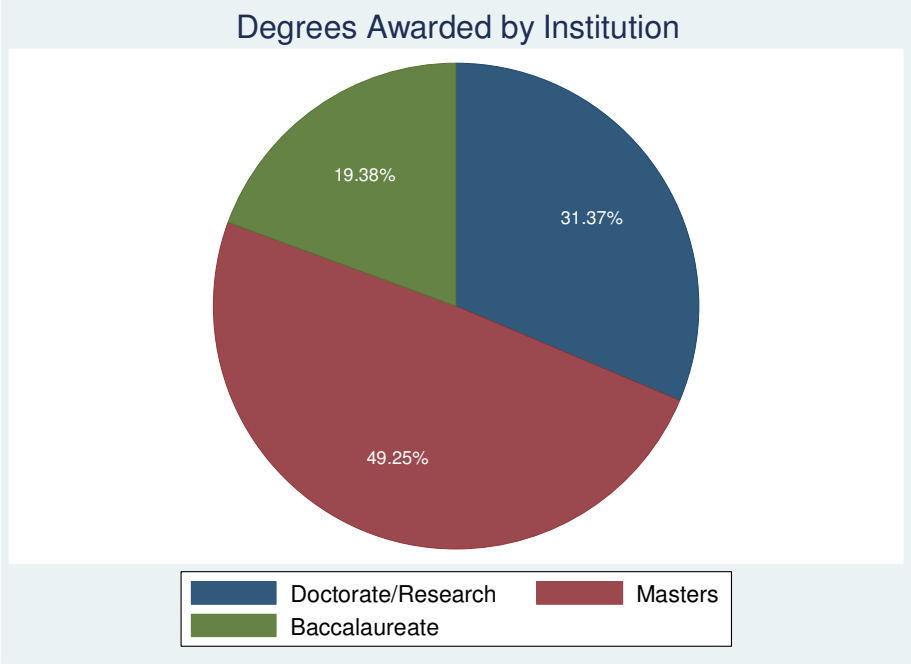


Figure 6: Public versus Private Institutions



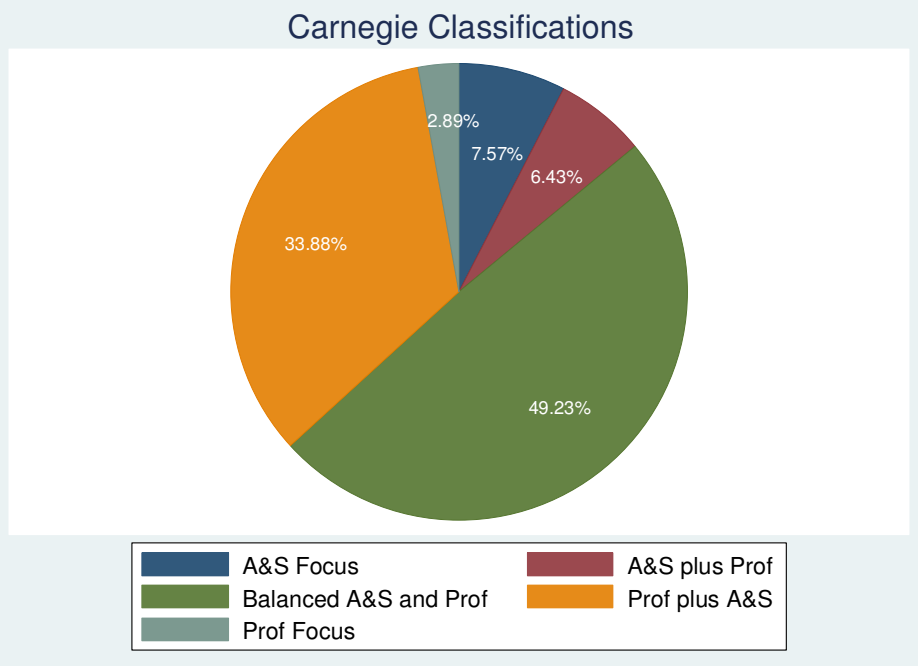
Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation.

Figure 7: Highest Level of Degree Awarded by Institution



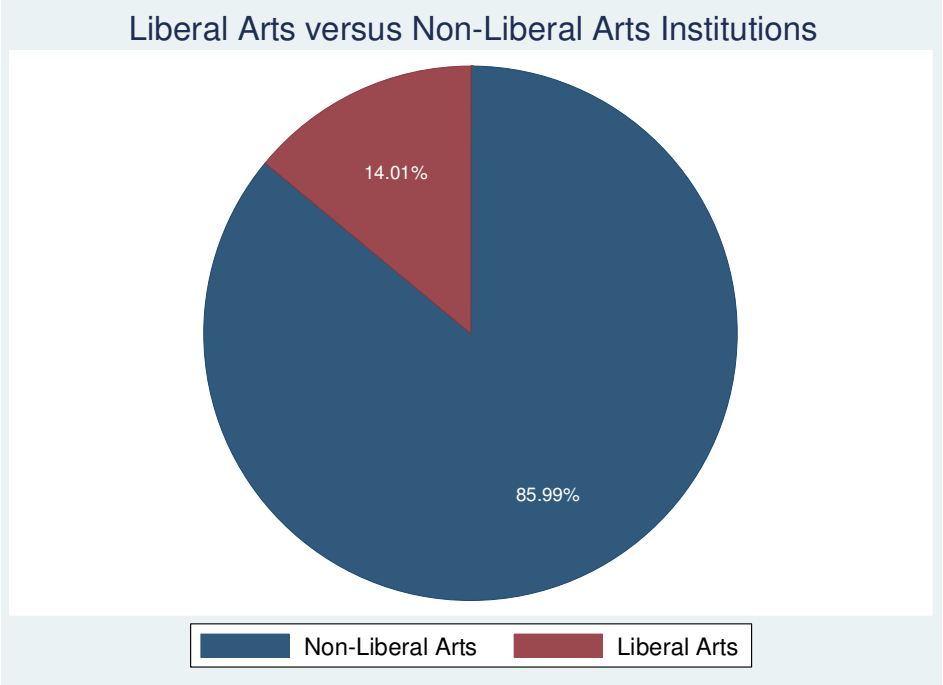
Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation.

Figure 8: Carnegie's Undergraduate Instructional Program Classification



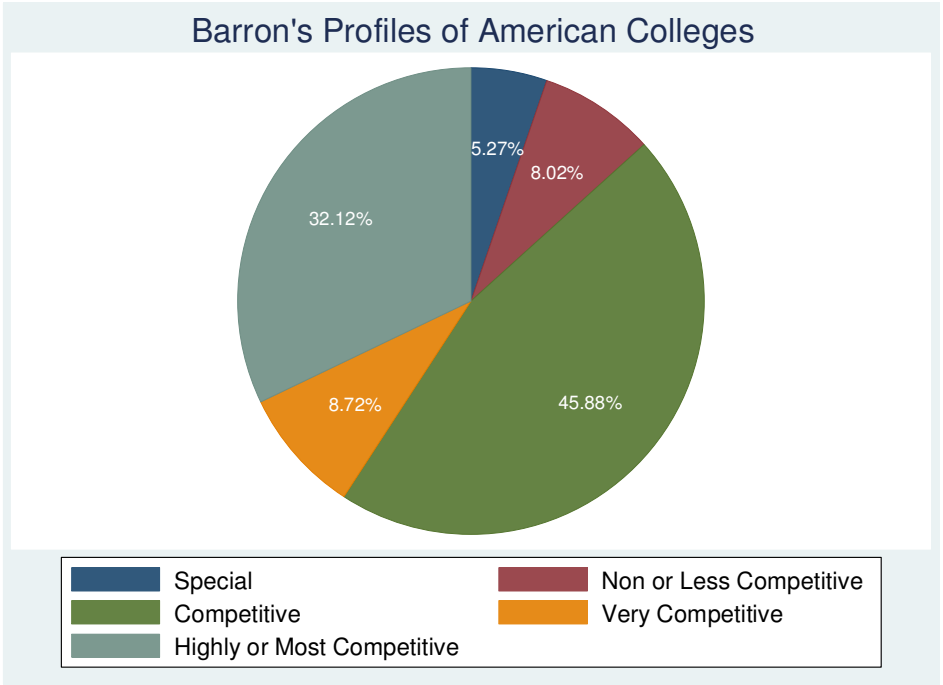
Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation. A&S denotes Arts and Sciences, and Prof denotes Professional.

Figure 9: Liberal Arts Institutions



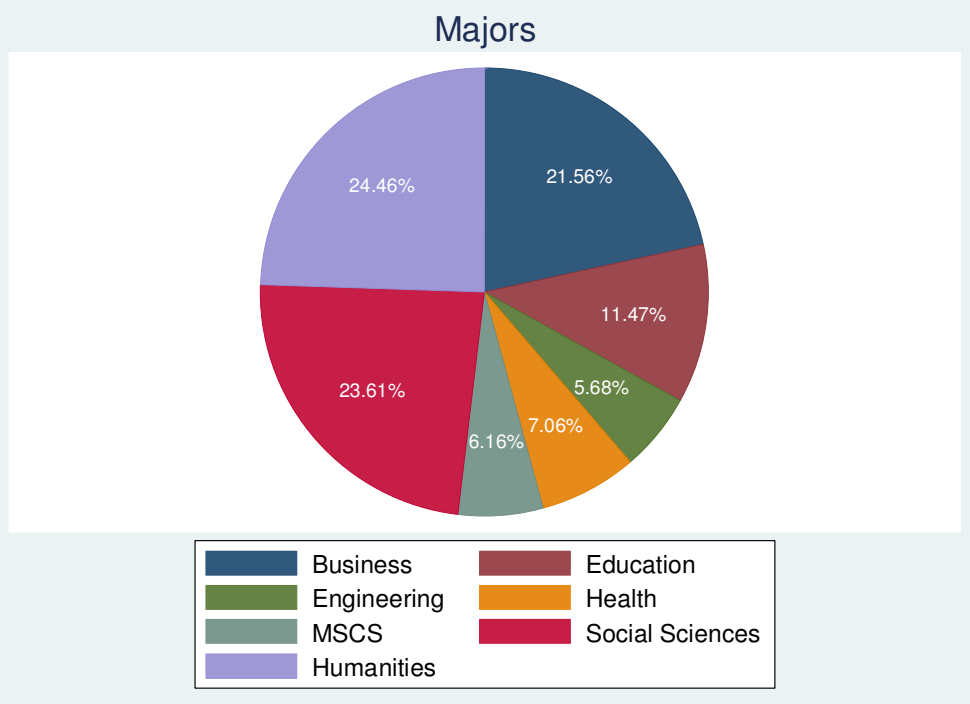
Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation.

Figure 10: Barron's Profiles of American Colleges



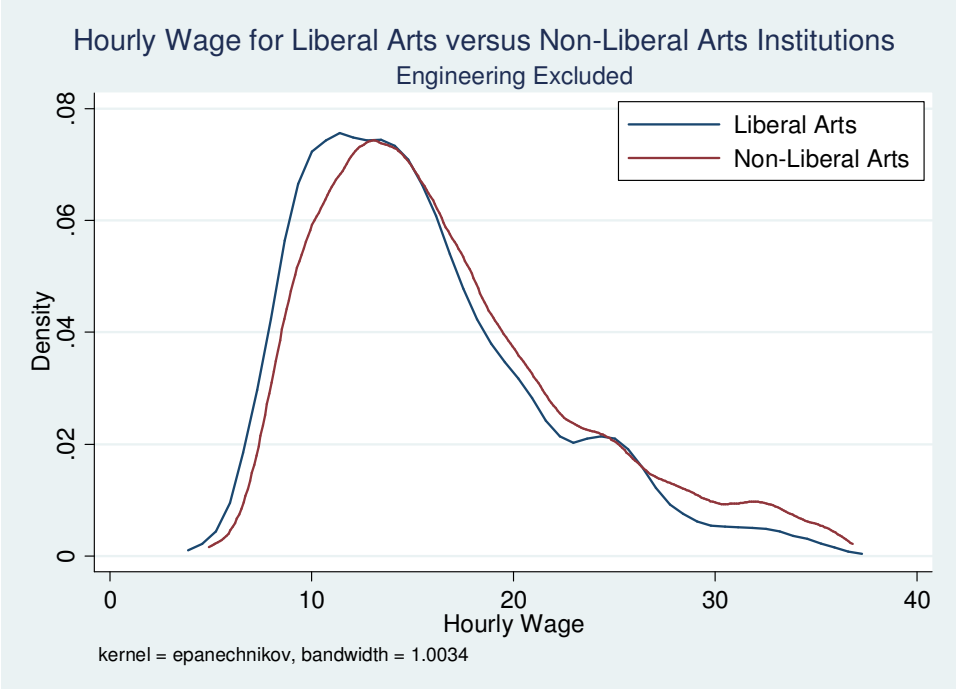
Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation.

Figure 11: Percentage of Students by Major



Note: Sample only includes bachelor's degree recipients from Minnesota institutions who worked in the state following graduation.

Figure 12: Density of Hourly Wage by Institution Type



Note: There are no Engineering majors at Liberal Arts institutions.

Figure 13: Density of Hourly Wage by Major

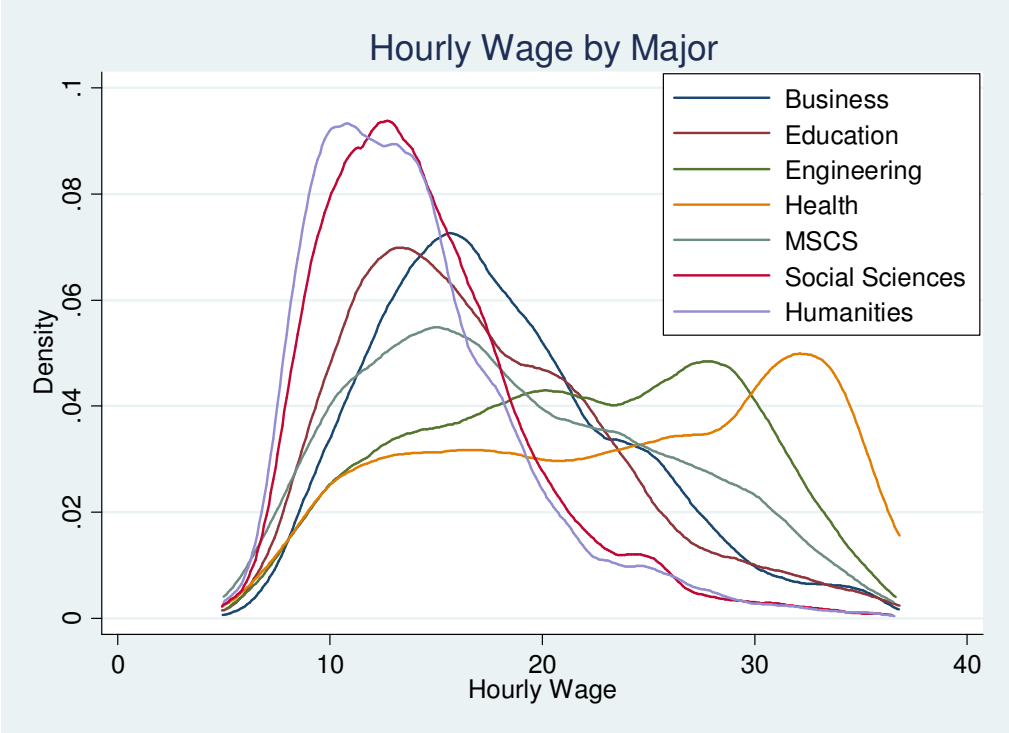


Figure 14: Density of Hourly Wage for Business Majors

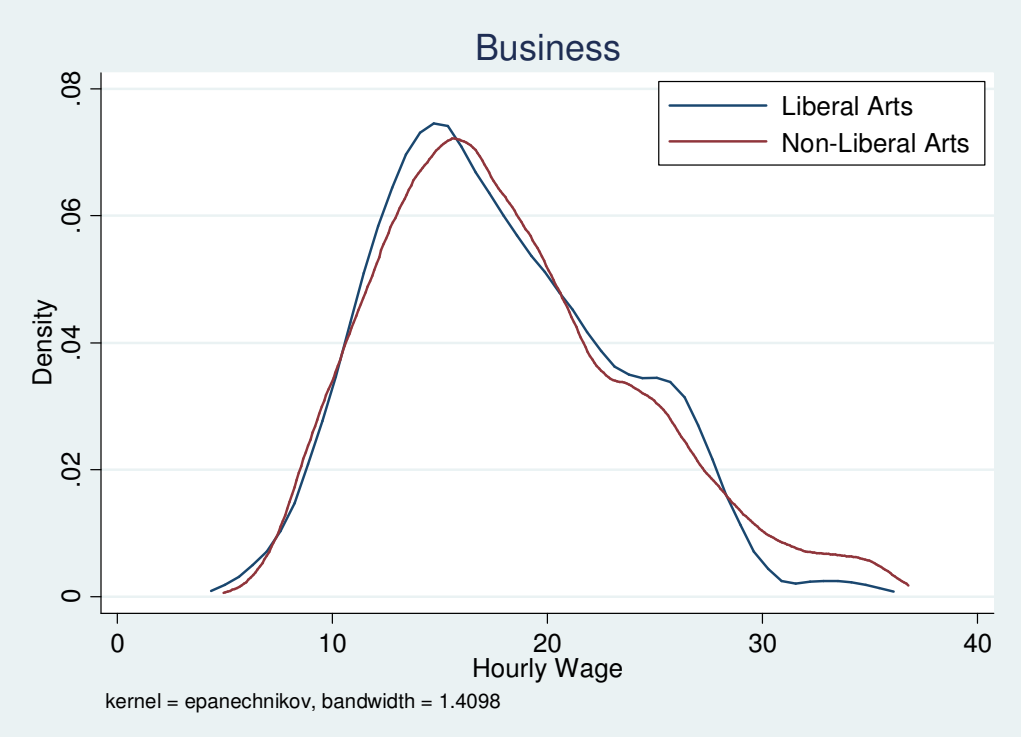


Figure 15: Density of Hourly Wage for Education Majors

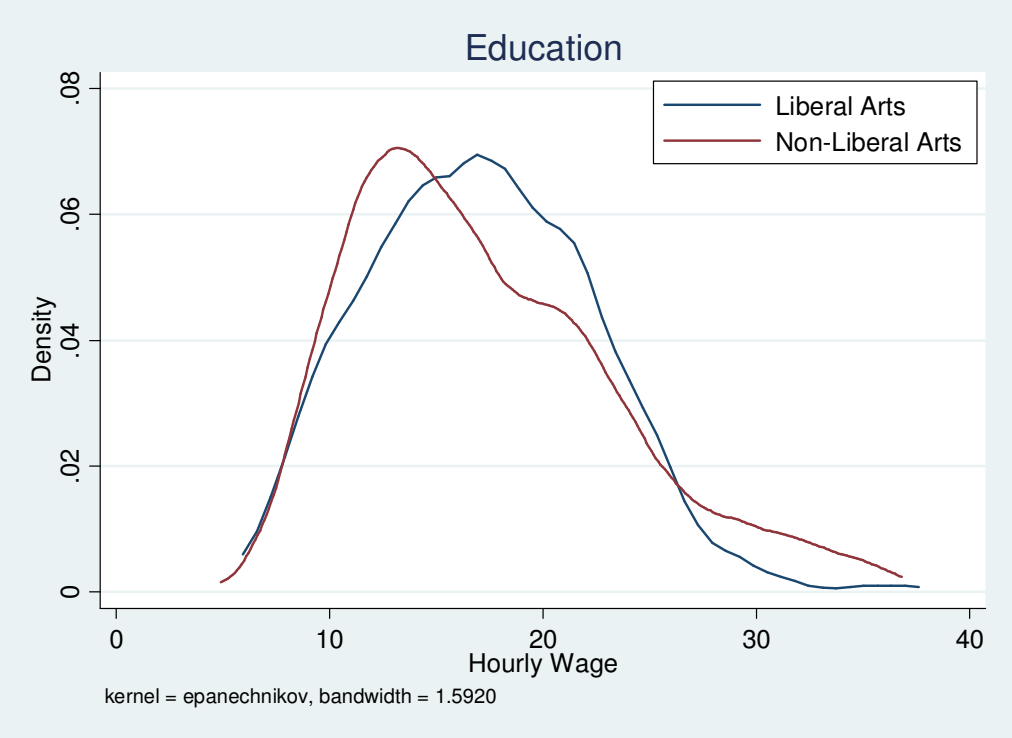
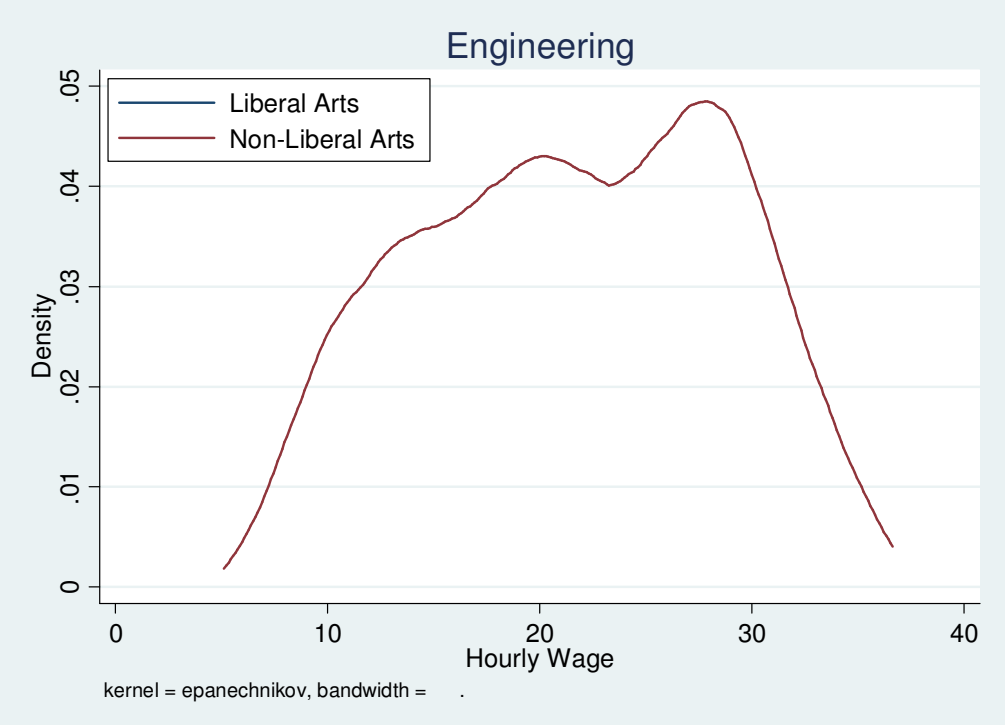


Figure 16: Density of Hourly Wage for Engineering Majors



Note: There are no Engineering majors at Liberal Arts institutions.

Figure 17: Density of Hourly Wage for Health Majors

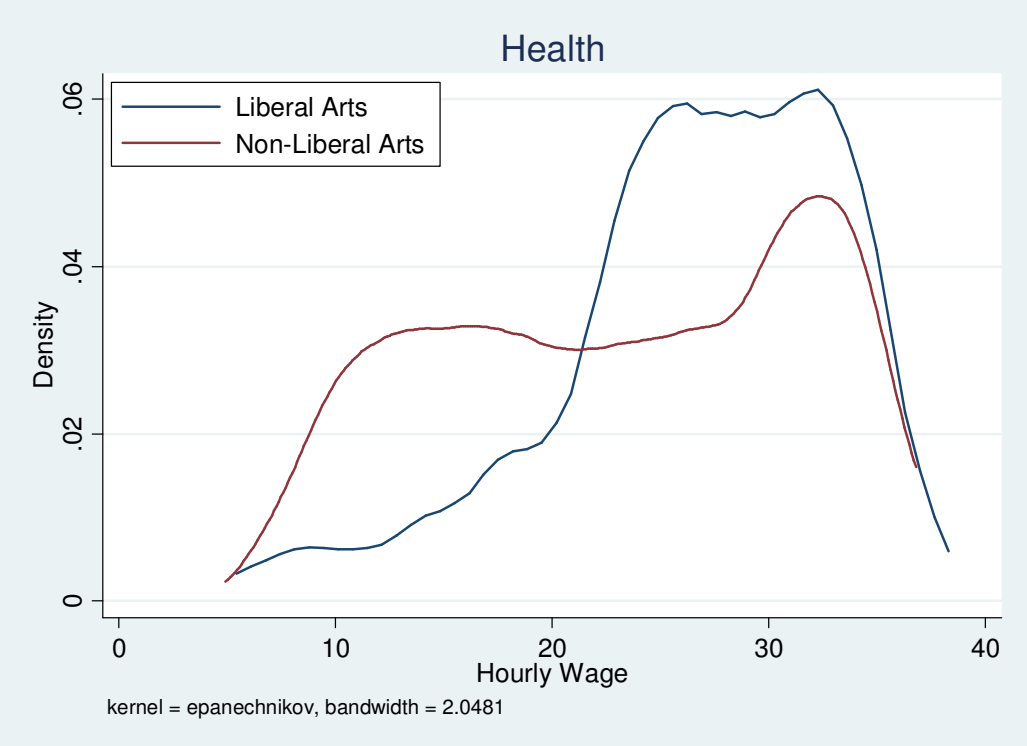
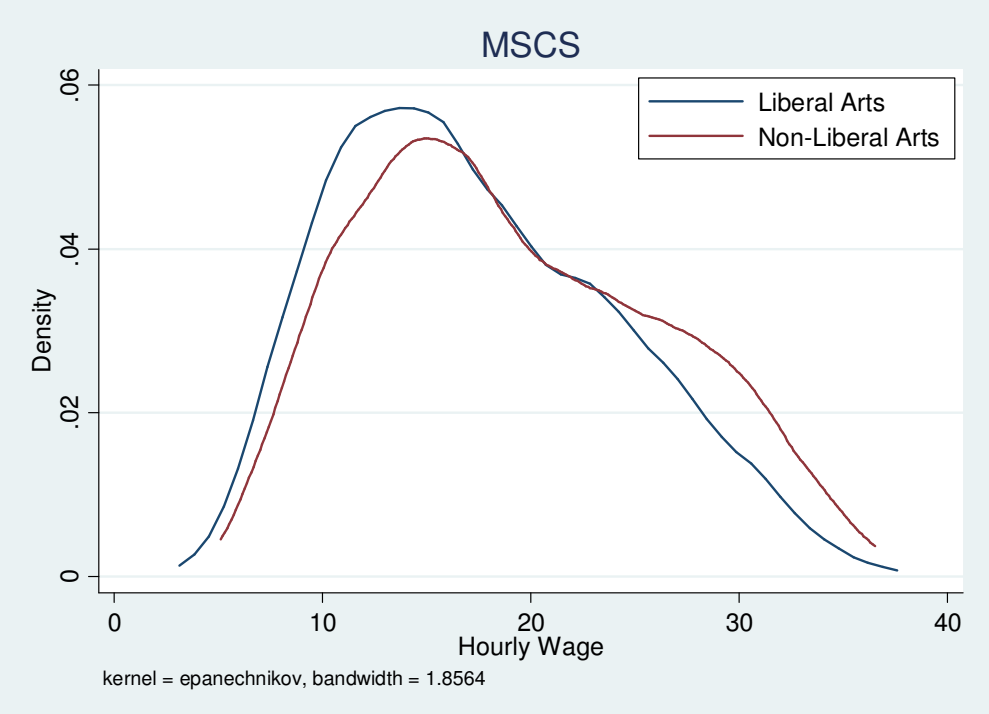


Figure 18: Density of Hourly Wage for MSCS Majors



Note: MSCS represents Math/Science/Computer Science.

Figure 19: Density of Hourly Wage for Social Science Majors

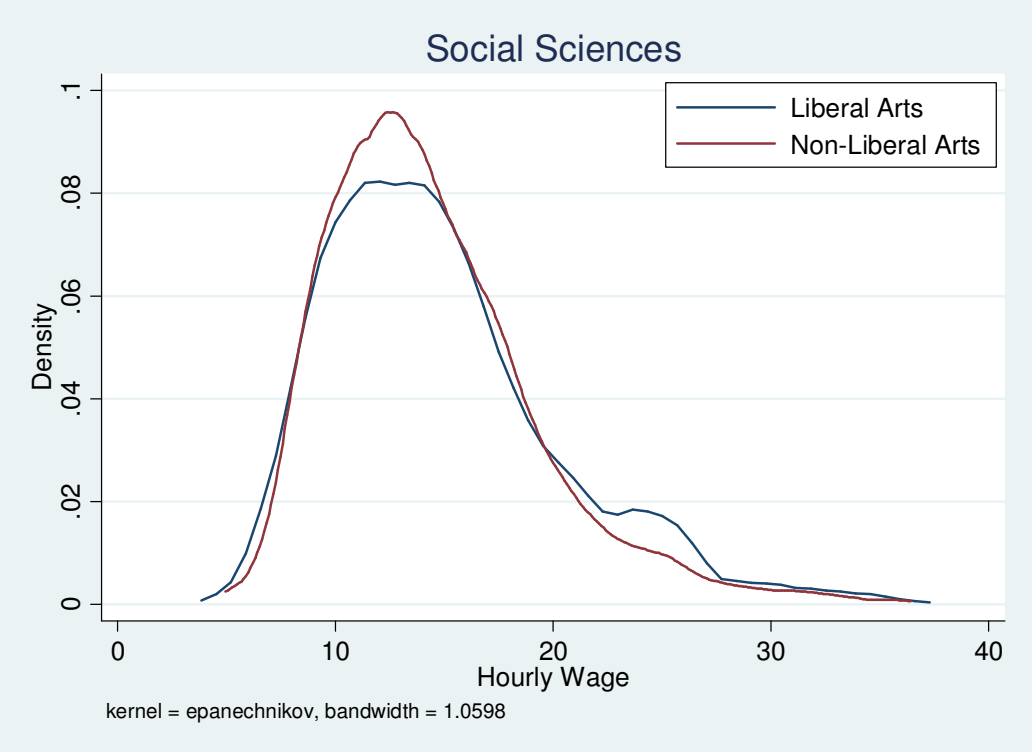


Figure 20: Density of Hourly Wage for Humanities Majors