Does it Pay to Work in Your Degree Field?

Evidence from the American Community Survey

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In today's world, students have more choice when it comes to picking which university they would like to attend. However, the more daunting task can be deciding on a major. Students often have to choose between their skills, ease of study, future occupations, and schedule when deciding which field of major to pursue. Nonetheless, tuition at most schools is rising, so graduating quickly is becoming much more of a priority. Students can no longer decide on a major their junior year or switch majors two or three times without racking up an extra $30,000 in expenses. "With rising tuition costs and a rapidly changing job landscape, a student's college major is more important than ever. It can either set you up for lifetime career success and high earnings or sink you into debt with few avenues to get ahead of it," writes Jenna Goudreau from Forbes Magazine. In that article, Katie Bardaro, lead economist at compensation research firm PayScale, explains "Unless you go to a top-20 brand name school, what matters most to employers is your major." Goudreau then finds in a new report by Gen-Y researcher Millennial Branding that "69% of managers agreed that relevant coursework is important when considering job candidates." That means knowing which majors serve as pipelines to particular jobs is of particular importance.

Florida's Bright Futures Scholarship, the state funded scholarship program, has been under consideration for a few reforms proposed by legislators and professors alike. The first reform was a proposal to increase the amount of students pursuing STEM (Science, Technology, Engineering, Mathematics) majors by giving those students more scholarship money than students pursuing other majors.

"When legislation was proposed last year to give students in STEM topics more scholarship money at the expense of those in other majors, students fought back with emails, phone calls, and a Facebook page, Protect Your Bright Futures, that still has 17,000 members statewide," according to Luis Zaragoza, staff writer for the Orlando News Sentinel. Another novel idea came back in December 2012. Contributing writer Emily Townsend to FSUNews.com writes that "after much backlash from fellow lawmakers, Rep. Jimmie Smith announced in December that he would withdraw a proposed bill he filed that would make Florida graduates with Bright Futures pay back their scholarship money if they left Florida for job offers out of the state." Although both of these proposals did not go very far, states are having to take drastic measures to provide adequate aid while receiving limited funding.

With rising costs and major overhauls to scholarship programs in the future, knowing the career options that certain majors give a college student is becoming a vital task. In a study of 2006-2011 graduates, thirty seven percent of students said they wish they had more strongly considered picking a major and another twenty percent of students took jobs they were not interested in. (Stone et. al 2012).

Although there is existing research and literature about the jobs with the highest return on investment or jobs with the best salaries, the focus here will be on which majors pipeline students to specific careers in an effort to create the greatest chance of landing a job in a field of interest. As an extension of that question, this study hopes to ascertain if there is a wage premium for people with jobs holding a major in a related field. Taking the top ten degrees based on number of graduates and pairing those degrees with the largest occupations will be the first goal. Then,

those occupations will be characterized as being related to a respondent's degree field using a crosswalk from the National Center of Education Statistics and the associated wages will be noted. This paper hypothesizes that people with jobs that are closely tied with their major are screened as more competent and knowledgeable given their educational background, which garners them a much higher wage than they otherwise would in an occupation unrelated to their degree. My evidence suggests that there is a $6,077 wage premium for holding an occupation that is related to your degree field if you hold constant age, race, and gender.

The dataset used comes from the Integrated Public Use Microdata Series (IPUMS) from the Minnesota Population Center at the University of Minnesota. Specifically, the data was compiled from the American Community Survey (ACS) from the year 2010 and includes 1,653,093 observations. (King et al. 2010). The variables include age, sex, race, four-year bachelor's degree field, occupation, and income from wages. Although there are over 1.6 million observations, only 516,889 respondents have bachelor's degrees so this sample will be used more often. The data will be presented in percentages, which allows for better comparison of results amongst other data sets and for data replication if that should ever become an issue. That being said, taking into account weights of the respondents will help make sure no subset of the population is oversampled or undersampled. Because there are so many different degrees listed from the ACS, the degrees in their most general form is more suited for this paper and the top ten general degrees based on number of

graduates will be the focus[1]. The top ten degrees sorted by descending number of graduates are: business; education administration and teaching; social sciences; engineering; medical and health sciences and service; psychology; biology and life sciences; fine arts; communications; and English language, literature, and composition. These degrees are given in the following table, Table 1.a:

Table 1.a - Top Ten Degrees by Number of Graduates

Field of Degree	**Percent**
Business	20.48%
Education Administration and Teaching	13.28%
Social Sciences	7.72%
Engineering	7.37%
Medical and Health Sciences and Service	6.88%
Psychology	4.91%
Biology and Life Sciences	4.81%
Fine Arts	4.05%
Communications	3.83%
English Language, Literature, and Composition	3.25%
Total	76.59%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

When comparing degrees, many of the fields are heavily concentrated among either males or females. Men are more heavily located in fields related to mathematical application such as engineering and architecture and fields where a certain degree of physical activity is required such as construction, agriculture, or military related fields. There is also a huge concentration in the field of computer science and its applications. Fields where are at least 66% of respondents are male are listed in the following table, Table 2.a:

[1] See Table 1.b in Appendix B for full list of degrees

Table 2.a - Degree Fields with Male Concentration

Field of Degree	**% Male**
Construction Services	90.30%
Transportation Sciences and Technologies	89.36%
Electrical and Mechanic Repairs and Technologies	89.04%
Military Technologies	88.89%
Engineering Technologies	86.19%
Engineering	84.38%
Theology and Religious Vocations	71.62%
Computer and Information Systems	69.61%
Architecture	69.41%
Philosophy and Religious Studies	67.83%
Environment and Natural Resources	67.27%
Agriculture	66.42%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Women are concentrated in fields such as psychology, family science, social work, and education, particularly English and foreign languages, that are related to serving others. However, one particular field that is rooted in serving others but still dominated by males is religious studies and other theological fields. Degree fields where are at least 66% of respondents are female are listed in the following table, Table 2.b:

Table 2.b - Degree Fields with Female Concentration

Field of Degree	**% Female**
Family and Consumer Sciences	92.73%
Library Science	86.85%
Medical and Health Services	82.82%
Public Affairs, Policy, and Social Work	78.87%
Education Administration & Teaching	76.48%
Linguistics and Foreign Languages	73.57%
Interdisciplinary and Multi-Disciplinary Studies	71.91%
Psychology	69.59%
Area, Ethnic, and Civilization Studies	66.86%
Law	66.47%
English Language, Literature, and Composition	66.19%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

However there are also many fields that do not have a significant concentration of either males or females. Degree fields where neither males nor females are at least 66% of respondents are listed in the following table, Table 2.c:

Table 2.c - Degree Fields with Balanced Gender Concentration

Field of Degree	**% Male**	**% Female**
Communication Technologies	64.91%	35.09%
Physical Sciences	64.14%	35.86%
History	60.97%	39.03%
Cosmetology Services	60.81%	39.19%
Criminal Justice and Fire Protection	59.92%	40.08%
Mathematics and Statistics	56.36%	43.64%
Business	54.16%	45.84%
Social Sciences	53.28%	46.72%
Physical Fitness, Parks, Recreation, and Leisure	51.76%	48.24%
Biology and Life Sciences	50.59%	49.41%
Nuclear, Industrial Radiology, and Biological Technologies	47.50%	52.50%
Communications	40.57%	59.43%
Liberal Arts and Humanities	39.42%	60.58%
Fine Arts	38.00%	62.00%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Within each general degree classified by the CIP, the top ten most common occupations will be listed including the percentage of people unemployed or not in the labor force. Then, those occupations will be paired with the degree field and it will be determined if the degree obtained is related to the occupation.

Arguably, the most popular degree field is business. However, business is a broad field and within that field, according to the ACS, there are more detailed degrees such as: accounting; actuarial science, business management and administration; operations, logistics, and e-commerce, business economics; marketing and marketing research; finance; human resources and personnel

management; international business; hospitality management; and management information systems and statistics. Based on the census, people who have business degrees have jobs in 475 different occupations. Over one-third of degrees in the business field are concentrated in the occupations listed below and there is an unemployed/not in labor force rate just above 5%, the natural rate of unemployment (Weidner 2011). The top jobs coming from business degrees are listed in Table 3.a below:

Table 3.a - Top Occupations with Business Degrees

Occupation Title	**Percent**
Accountants and Auditors	11.90%
N/A: (unemployed/Not in LF)	5.48%
Managers, all others	4.46%
Financial Managers	3.78%
1st Line Supervisors of retail sales workers	2.62%
Sales Representatives, wholesale and manufacturing	2.61%
Chief Executives	2.51%
Marketing and Sales Managers	2.20%
Secretaries and Administrative Assistants	2.00%
Retail Salespersons	1.99%
Elementary and Middle School Teachers	1.81%
Total	41.35%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The second most populous degree is education administration and teaching. This is another broad field and the detailed degrees within that field based on the ACS are: educational administration and supervision; school student counseling; elementary education; mathematics teacher education; physical health and education teaching; early childhood education; science and computer teacher education; secondary teacher education; special needs education; social science or

history teacher education; teacher education: multiple levels; language and drama education; and art and music education. Because education is so popular, there are 455 different occupations that people with this degree hold. Although there is a higher unemployed/not in labor force rate, education is almost twice as concentrated in its most prevalent job fields, which is not surprising as people get degrees specifically in education to teach or be an administrator. The top occupations with education degrees are listed in Table 3.b below:

Table 3.b - Top Occupations with Education Degrees

Occupation Title	**Percent**
Elementary and Middle School Teachers	36.84%
N/A: (unemployed/Not in LF)	9.03%
Secondary School Teachers	6.25%
Education Administrators	4.24%
Preschool and Kindergarten Teachers	2.26%
Postsecondary Teachers	2.22%
Special Education Teachers	1.97%
Other Teachers and Instructors	1.80%
Secretaries and Administrative Assistants	1.50%
Counselors	1.43%
Teacher Assistants	1.12%
Total	68.66%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The third most popular general degree is social sciences and includes detailed fields from the ACS such as: economics; anthropology and archeology; criminology; geography; international relations; political science and government; and sociology. There are 451 different occupations represented by people with degrees in a social science. The field of social sciences encompasses many subjects and there is a lot of overlap between occupations from this degree field and jobs in

education and business such as accountants and elementary school teachers. The top ten occupations are listed in Table 3.c below:

Table 3.c - Top Occupations with Social Science Degrees

Occupation Title	**Percent**
Lawyers	8.87%
N/A: (unemployed/Not in LF)	6.45%
Managers, all others	4.32%
Elementary and Middle School Teachers	3.57%
Postsecondary Teachers	2.67%
Accountants and Auditors	2.42%
Social Workers	2.29%
Chief Executives	2.06%
Financial Managers	1.90%
Management Analysts	1.79%
Secretaries and Administrative Assistants	1.53%
Total	37.88%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The next most popular general degree is engineering. Although very specific, there are many different types of engineering reflected in these general degree fields from the ACS: aerospace; biological; architectural; biomedical; chemical; civil; computer; electrical; engineering mechanics, physics, and science; environmental; geological and geophysical; industrial and manufacturing; materials engineering and materials science; mechanical; metallurgical; mining and mineral; naval architecture and marine; nuclear; and petroleum. There are 455 different occupations represented. Engineering is a field that is always in high demand and has one of the lower unemployment/not in labor force rates among different degrees. As expected, most jobs are directly related to engineering because of the very narrow coursework of mathematics and sciences such as physics involved. The top jobs from engineering degrees are noted in Table 3.d:

Table 3.d - Top Occupations with Engineering Degrees

Occupation Title	**Percent**
Engineers, all others	7.06%
Managers, all others	6.85%
Software Developers, applications and systems software	5.83%
Civil Engineers	5.64%
N/A: (unemployed/Not in LF)	4.06%
Electrical and Electronics Engineers	3.81%
Mechanical Engineers	3.41%
Architectural and Engineering Managers	2.68%
Aerospace Engineers	2.40%
Chief Executives	2.06%
Postsecondary Teachers	2.17%
Total	45.98%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Medical and health sciences and services is the next degree field. It includes more specific fields such as: communication disorders sciences; health and medical administrative services; medical assisting services; medical technologies technicians; health and medical preparatory programs; nursing; pharmacy, pharmaceutical sciences; treatment therapy professions; and community and public health. People in these fields often have a science background that allows them to obtain higher degrees. Registered nurses alone make up over one-third of the population. With 386 different occupations represented, the top jobs for medical and health sciences degree recipients are listed in Table 3.e:

Table 3.e - Top Occupations with Medical and Health Science Degrees

Occupation Title	**Percent**
Registered Nurses	33.70%
N/A: (unemployed/Not in LF)	6.20%
Pharmacists	4.89%
Medical and Health Services Managers	3.33%
Physical Therapists	3.07%

Table 3.e - Top Occupations with Medical and Health Science Degrees

Occupation Title	**Percent**
Speech-language Pathologists	2.73%
Nurse Practitioners	2.17%
Postsecondary Teachers	2.03%
Clinical Laboratory Technologists and Technicians	1.95%
Elementary and Middle School Teachers	1.71%
Total	64.75%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The next general degree field is psychology. The ACS breaks this degree into detailed degrees such as: educational psychology; clinical psychology; counseling psychology; industrial and organization psychology; and social psychology. Psychology has more respondents unemployed or not in the labor force than any respondents in one particular occupation. There are 411 different occupations from psychology degrees with the top ten occupations listed in Table 3.f:

Table 3.f - Top Occupations with Psychology Degrees

Occupation Title	**Percent**
N/A: (unemployed/Not in LF)	7.49%
Counselors	5.87%
Elementary and Middle School Teachers	5.58%
Social Workers	5.34%
Psychologists	4.48%
Postsecondary Teachers	2.93%
Managers, all others	2.54%
Lawyers	2.05%
Secretaries and Administrative Assistants	2.04%
Physicians and Surgeons	1.96%
Registered Nurses	1.82%
Total	42.09%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Biology and life sciences is the next general degree field which encompasses more detailed degrees such as: biochemical sciences; botany; molecular biology; ecology; genetics; microbiology; pharmacology; physiology; zoology; and neuroscience. This degree is filled with people that study a life science to either teach it, research it, or because it is the most prevalent track to get into medical, dental, or nursing school. There are 416 different occupations represented by recipients of biology and life science degrees, and the top ones are listed in Table 3.g:

Table 3.g - Top Occupations with Biology & Life Science Degrees

Occupation Title	**Percent**
Physicians and Surgeons	15.58%
N/A: (unemployed/Not in LF)	5.00%
Postsecondary Teachers	4.64%
Dentists	3.27%
Managers, all others	3.17%
Elementary and Middle School Teachers	3.04%
Clinical Laboratory Technologists and Technicians	2.55%
Medical Scientists	2.43%
Physical Scientists, all others	2.35%
Registered Nurses	2.04%
Biological Scientists	2.01%
Total	46.08%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The next general degree field is fine arts. The more detailed degrees defined by the ACS are: drama and theatre arts; music; visual and performing arts; commercial art and graphic design; film, video, and photographic arts; art history and criticism; and studio arts. Fine arts degree recipients have one of the largest unemployment rates of any of the top ten degree fields. Nonetheless, there are 428 different occupations, and the top ten are listed in Table 3.h below:

Table 3.h - Top Occupations with Fine Arts Degrees

Occupation Title	**Percent**
Designers	10.09%
N/A: (unemployed/Not in LF)	7.53%
Elementary and Middle School Teachers	4.96%
Artists and Related Workers	3.15%
Others Teachers and Instructors	2.86%
Managers, all others	2.63%
Retail Salespersons	2.52%
Secretaries and Administrative Assistants	2.26%
Secondary School Teachers	2.21%
Musicians, Singers, and Related Workers	2.03%
Total	44.49%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Communications is the next general degree field and includes detailed degrees such as: communications; journalism; mass media; and advertising and public relations. Communications is a field that is diluted across 397 different occupations. There is not a single occupation that has more than 5% of communication degree holders. The top occupations for communication degree recipients are listed in Table 3.i below:

Table 3.i - Top Occupations with Communications Degrees

Occupation Title	**Percent**
N/A: (unemployed/Not in LF)	5.48%
Elementary and Middle School Teachers	4.19%
Managers, all others	3.59%
Marketing and Sales Managers	3.36%
Secretaries and Administrative Assistants	2.41%
Sales Representatives, wholesale and manufacturing	2.27%
Retail Salespersons	2.13%
Customer Service Representatives	1.95%
Editors	1.89%
Public Relations Specialists	1.86%
Writers and Authors	1.86%
Total	30.98%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

The final degree to be discussed is English language, literature, and composition, which can be broken down by the ACS into: English language and literature; and composition and speech. These degree holders are concentrated in fields such as teaching, law, and other occupations where writing is a main job requirement. English degree holders are among the most unemployed college graduates according to the census data. However, there are 378 different occupations for English degree recipients and the top ones are listed below in Table 3.j:

Table 3.j - Top Occupations with English Degrees

Occupation Title	**Percent**
N/A: (unemployed/Not in LF)	8.55%
Elementary and Middle School Teachers	8.44%
Postsecondary Teachers	5.80%
Lawyers	4.77%
Secondary School Teachers	3.13%
Managers, all others	2.68%
Secretaries and Administrative Assistants	2.51%
Education Administrators	2.20%
Writers and Authors	2.07%
Editors	1.98%
Retail Salespersons	1.59%
Total	43.72%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

Now that the largest occupations from the top ten degrees have been noted in the above tables, the next step is to take every one of those occupations and determine the degrees that the occupation holders have obtained to determine which degrees are related to those occupations. For that, the National Center for Education Statistics database was used to make sure that there was a reliable mechanism to logically pair up degrees to occupations (NCES 2010). To do so

required the creation of a crosswalk of the ACS and CIP degree fields that were then compared to the NCES occupation codes, which showed which degree fields were related to occupations. The occupations have been divided up into categories and then into further subcategories.

However, there are a few impediments that need to be discussed. The NCES did not have an occupation for software developers, applications and systems software. With reasonable judgment, computer and information sciences as well as engineering can be considered related degrees for that occupation. Two other fields, dentists and physicians and surgeons, has a high degree of connection with degrees obtained during residency, which is not included in the census data because the focus is on undergraduate degrees. However, a determination has been made that biology and life science, physical sciences, and medical and health sciences and services degrees are related to the two aforementioned sets of occupations. The occupation "other teachers and instructors" was not found with the NCES so it was assumed that the only related degree is education administration and teaching. Also, lawyers is a skewed degree because there is no undergraduate law degree and unlike, pre-medical tracks, it is up for debate as to which degrees are actually related. Finally, post secondary teachers have been completely omitted. Only 11% have degrees in education because many higher-level educators teach in the field of their degree. This would mean there are more than forty degrees that are considered related to this occupation, which is beyond the scope of this paper.

The first category to be discussed is management, business, and financial occupations. Within this category is the first sub category, management

occupations. There is not much of a premium for working in a field related to your degree. There is, however, a very large increase in wages between respondents who have obtained a degree and those who may have only an associate's degree or just a high school diploma. Also, at first glance, there is a high rate of chief executives without a bachelors' degree. However, many people start small businesses and can give themselves the title of a chief executive. The results of the management occupations are listed below in Table 4.a:

Table 4.a - Related Degrees and Wages of Management Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Managers, all others	16.4% Business (14.18%) Fine Arts (1.65%) Public Affairs, Policy, and Social Work (0.57%) **$90,147.70**	37.61% Engineering (7.85%) Social Sciences (5.18%) **$91,351.53**	45.99% **$48,897.14**
Financial Managers	35.03% Business **$93,830.36**	24.44% Social Sciences (6.66%) Engineering (1.79%) **$99,678.33**	40.53% **$47,159.76**
Chief Executives	24.96% Business (24.49%) Public Affairs, Policy, and Social Work (0.47%) **$144,592.00**	42.00% Social Sciences (7.60%) Engineering (7.26%) **$148,197.10**	33.04% **$87,067.45**
Marketing and Sales Managers	26.51% Business (26.01%) Family and Consumer Sciences (0.50%) **$90.017.19**	40.2% Communications (7.44%) Social Sciences (5.40%) Engineering (4.54%) **$89,992.12**	33.29% **$56,919.94**
Education Administrators	30.3% Education Administration and Teaching **$67,212.48**	49.77% Business (8.21%) Social Sciences (5.78%) **$67,659.35**	19.93% **$32,740.40**
Architectural and Engineering Managers	62.67% Engineering (61.58%) Architecture (1.09%) **$122,007.40**	22.31% Business (4.22%) Physical Sciences (3.98%) Computer and Information Sciences (3.50%) **$114,174.90**	15.02% **$72,238.19**
Medical and Health Services Managers	19.83% Medical and Health Sciences and Services (19.83%) **$86,481.41**	39.49% Business (9.52%) Biology and Life Sciences (5.59%) Psychology (4.60%) **$81,986.31**	40.68% **$48,983.29**

NOTE: Source is ACS. Sampling weights used

The next subcategory is business and financial operations occupations. These occupations are all business related and the management analysts actually make more money when their degree is not related. These next 2 occupations are noted in the following table, Table 4.b below:

Table 4.b - Related Degrees and Wages of Business & Financial Operations Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Accountants and Auditors	58.02% Business (57.85%) Interdisciplinary Studies (0.17%) **$67,361.21**	19.91% Social Sciences (4.44%) Education Administration and Teaching (1.81%) **$61,107.25**	22.07% **$36,566.18**
Management Analysts	21.78% Business **$68,854.23**	54.74% Social Sciences (9.80%) Engineering (8.27%) **$70,049.42**	23.48% **$47,097.76**

NOTE: Source is ACS. Sampling weights used

The next category of occupations, professional and related occupations, encompasses the most professions. The first subcategory here is computer and mathematical operations. People in this occupation have backgrounds in computer information sciences as well as engineering and the wages and degrees of these jobs is listed in Table 4.c:

Table 4.c - Related Degrees and Wages of Computer & Mathematical Operations Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Software Developers, applications and systems software	52.05% Computer and Information Sciences (27.02%) Engineering (25.03%) **$86,134.64**	30.96% Business (7.62%) Mathematics and Statistics (4.68%) **$80,470.79**	16.99% **$68,290.26**

NOTE: Source is ACS. Sampling weights used

The next subcategory is architecture and engineering occupations. These occupations are overwhelmingly concentrated with engineering degrees but

physical sciences and business are frequent unrelated degrees found in these occupations. These engineering occupations are described in Table 4.d below:

Table 4.d - Related Degrees and Wages of Architecture & Engineering Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Civil Engineers	70.31% Engineers **$79,980.01**	15.65% Physical Sciences (2.55%) Business (2.45%) **$71,471.76**	14.04% **$57,272.14**
Electrical and Electronics Engineers	59.64% Engineering **$86,315.73**	17.75% Physical Sciences (3.53%) Business (2.88%) **$79,871.02**	22.61% **$62,885.00**
Mechanical Engineers	58.36% Engineering **$75,542.37**	14.53% Engineering Technologies (4.36%) Business (3.37%) **$65,770.06**	27.11% **$54,923.78**
Aerospace Engineers	62.44% Engineering **$98,291.68**	21.95% Physical Sciences (4.16%) Business (3.82%) Computer and Information Sciences (3.27%) **$90,190.07**	15.61% **$67,424.01**
Engineers, all others	61.51% Engineering (61.24%) Medical and Health Sciences and Services (0.27%) **$85,769.50**	19.81% Physical Sciences (4.37%) Business (2.82%) **$80,527.07**	18.68% **$61,364.19**

NOTE: Source is ACS. Sampling weights used

The next subcategory of professional occupations is life, physical, and social science occupations. These occupations are characterized with a wider range of degrees (from psychology to agriculture) that are considered related than most other occupations. There is not much of a wage premium for obtaining a degree in your field if you are a psychologist or biological scientist but there is a substantial premium if you are a medical or physical scientist. These occupations are listed in the following table, Table 4.e:

Table 4.e - Related Degrees and Wages of Life, Physical, & Social Science Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Psychologists	61.87% Psychology (59.51%) Medical and Health Sciences and Services (1.73%) Interdisciplinary and Multi-Disciplinary Studies (0.63%) **$47,097.72**	37.24% Education Administration and Teaching (6.29%) Social Sciences (6.18%) Public Affairs, Policy, and Social Work (3.82%) **$45,229.93**	0.89% **$32,855.32**
Medical Scientists	53.87% Biology and Life Sciences (42.81%) Medical and Health Sciences and Services (10.28%) Interdisciplinary and Multi-Disciplinary Studies (0.78%) **$71,386.69**	44.29% Physical Sciences (18.28%) Engineering (5.67%) Psychology (4.39%) Social Sciences (3.19%) **$79,160.82**	1.84% **$56,963.18**
Physical Scientists, all others	26.32% Physical Sciences (25.72%) Interdisciplinary and Multi-Disciplinary Studies (0.60%) **$77,832.92**	72.47% Biology and Life Sciences (29.38%) Engineering (12.20%) Medical and Health Sciences and Services (5.17%) **$63,367.11**	1.21% **$47,255.86**
Biological Scientists	70.39% Biology and Life Sciences (56.61%) Environment and Natural Resources (11.41%) Agriculture (2.37%) **$51,888.15**	25.99% Physical Sciences (7.46%) Medical and Health Sciences and Services (4.63%) Engineering (2.60%) **$52,734.52**	3.62% **$50,594.44**

NOTE: Source is ACS. Sampling weights used

The next subcategory is community and social service occupations. These two occupations are characterized by a low salary and a large percentage of respondents became counselors and social workers without obtaining a bachelor's degree. These occupations are noted in Table 4.f below:

Table 4.f - Related Degrees and Wages of Community & Social Service Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelors' degree** **Average Salary**
Counselors	22.03% Education Administration and Teaching (13.91%) Public Affairs, Policy, and Social Work (4.96%) Medical and Health Sciences and Services (3.16%) **$42,086.65**	57.04% Psychology (21.13%) Social Sciences (7.47%) Business (6.21%) English (3.12%) **$35,991.10**	20.93% **$24,963.38**
Social Workers	26.66% Public Affairs, Policy, and Social Work (19.80%) Criminal Justice and Fire Protection (3.44%) Medical and Health Sciences and Services (3.42%) **$40,216.31**	49.86% Psychology (15.95%) Social Sciences (10.76%) Education Administration and Teaching (5.24%) **$38,415.20**	23..48% **$29,383.94**

NOTE: Source is ACS. Sampling weights used

The next subcategory is legal occupations. Lawyers have many unrelated degrees. Many people get degrees in political science (a social science), history, and business before going to law school since there is no pre-law degree. The wages for lawyers with a related degree is most likely an outlier and should be ignored. Because of the higher education required, there is a large wage premium for getting a degree. These details are described in Table 4.g below:

Table 4.g - Related Degrees and Wages of Legal Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Lawyers	0.94% Law **$93,302.78**	97.46% Social Sciences (32.54%) Business (13.80%) History (9.81%) English Language, Literature, and Composition (7.37%) **$114,178.90**	1.60% **$57,151.36**

NOTE: Source is ACS. Sampling weights used

The next subcategory of professional occupations is education training, and library occupations. These occupations are primarily dominated with an education administration degree besides the post secondary teachers explained earlier. Many of the occupations such as preschool teachers, other teachers and instructors, and teachers' assistants have respondents that did not obtain a bachelor's degree. There is a small wage premium for getting an education degree before becoming a teacher. These occupations are listed in the following table, Table 4.h:

Table 4.h - Related Degrees and Wages of Education Training and Library Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Elementary and Middle School Teachers	58.80% Education Administration and Teaching **$42,660.81**	36.16% Business (4.44%) Social Sciences (3.31%) Psychology (3.29%) **$40,204.11**	5.54% **$18,509.79**
Secondary School Teachers	45.81% Education Administration and Teaching **$46,431.18**	49.4% English (5.61%) Fine Arts (4.93%) **$44,085.32**	4.79% **$24,616.81**
Preschool and Kindergarten Teachers	27.83% Education Administration and Teaching (25.38%) Family and Consumer Sciences (2.45%) **$29,098.33**	18.66% Psychology (3.24%) Business (2.53%) Social Sciences (2.08%) **$20,963.28**	53.51% **$14,769.77**
Special Education Teachers	52.00% Education Administration and Teaching **$44,891.25**	34.32% Psychology (7.11%) Business, Social Sciences (3.77%) **$40,797.09**	13.68% **$19,061.39**
Other Teachers And Instructors	15.20% Education Administration and Teaching **$25,907.59**	44.37% Fine Arts (7.37%) Business (6.04%) **$27,983.10**	40.43% **$24,637.00**
Teachers Assistants	6.53% Education Administration and Teaching **$19,667.19**	16.98% Business (3.23%) Psychology (1.87%) **$17,166.19**	76.49% **$14,701.71**

NOTE: Source is ACS. Sampling weights used

The next subcategory is arts, design, entertainment, sports, and media occupations. These occupations have many different degrees that could be considered related from communications to fine arts to family and consumer sciences. There may or not be a wage premium for getting a degree in a related field. These occupations are listed in Table 4.i below:

Table 4.i - Related Degrees and Wages of Arts, Design, Sports, and Media Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Designers	26.97% Fine Arts (25.81%) Computer and Information Sciences (0.61%) Family and Consumer Sciences (0.55%) **$39,102.76**	27.28% Business (4.18%) Engineering (3.78%) Communications (3.25%) **$40,811.63**	45.75% **$27,264.55**
Artists and Related Workers	35.49% Fine Arts (30.13%) Communications (3.53%) Computer and Information Sciences (1.14%) Medical and Health Sciences and Services (0.69%) **$34,349.25**	20.05% Education Administration and Teaching (2.98%) Business (2.75%) English (2.06%) **$25,606.94**	44.46% **$18,953.78**
Musicians, Singers, and Related Workers	25.42% Fine Arts (24.38%) Theology and Religious Vocations (1.04%) **$26,445.02**	27.54% Education Administration and Teaching (8.74%) Business (3.51%) **$17,538.42**	47.04% **$16,287.01**
Editors	49.27% Communications (21.11%) English (18.75%) Fine Arts (6.25%) Business (2.82%) Communication Technologies (0.34%) **$49,601.03**	33.73% Social Sciences (6.25%) History (4.05%) Education Administration and Teaching (3.15%) **$47,233.01**	17% **$27,655.20**
Public Relations Specialists	25.05% Communications (24.78%) Family and Consumer Sciences (0.27%) **$58,934.89**	52.99% Social Sciences (11.48%) Business (9.40%) English (7.86%) **$71,101.62**	21.96% **$36,630.92**
Writers and Authors	39.50% Communications (17.41%) English (16.46%) Fine Arts (5.35%) Family and Consumer Sciences (0.28%) **$39,688.46**	43.61% Social Sciences (7.76%) Business (6.05%) History (4.40%) **$37,605.12**	16.89% **$22,107.00**

NOTE: Source is ACS. Sampling weights used

The final subcategory for professional and related occupations is healthcare practitioners and technical occupations. These occupations are strongly associated with a science background or medical and health classes where applicable as an undergraduate degree. Many of these occupations such as physicians, nurses, and dentists require degrees beyond a bachelor's degree. Because of this, this set of occupations has some of the lowest rates of respondents without a bachelor's

degree because so much education and training is required. As a whole, there is a substantial wage premium for related degrees, perhaps because these degrees make you more prepared for graduate schooling. These occupations and their wages are noted below in Table 4.j:

Table 4.j - Related Degrees and Wages of Healthcare Practitioners & Technical Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Registered Nurses	41.18% Medical and Health Sciences and Services **$59,594.34**	12.09% Business (1.85%) Biology and Life Sciences (1.74%) **$52,725.08**	46.73% **$49,278.70**
Pharmacists	65.33% Medical and Health Sciences and Services **$96,401.18**	32.27% Biology and Life Sciences (15.29%) Physical Sciences (5.00%) **$87,534.61**	2.4% **$38,581.00**
Physical Therapists	52.52% Medical and Health Sciences and Services **$63,931.52**	38.11% Biology and Life Sciences (11.58%) Physical Fitness, Parks, Recreation, and Leisure (7.06%) **$57,601.30**	9.37% **$38,802.80**
Physicians and Surgeons	72.22% Biology and Life Science (46.02%) Physical Sciences (13.70%) Medical and Health Sciences and Services (12.50%) **$172,037.80**	27.12% Psychology (5.90%) Social Sciences (3.18%) Engineering (3.12%) **$153,627.20**	0.66% **$113,245.99**
Speech-language Pathologists	68.12% Medical and Health Sciences and Services **$48,236.77**	31.04% Education Administration and Teaching (7.58%) Communications (5.13%) Psychology (4.35%) **$47,483.98**	0.84% **$29,192.69**
Nurse Practitioners	74.88% Medical and Health Sciences and Services **$77,993.92**	22.31% Biology and Life Sciences (5.82%) Psychology (3.49%) **$74,895.79**	2.81% **$58,158.94**
Clinical Laboratory Technologists and Technicians	20.06% Medical and Health Sciences and Services **$52,250.83**	34.62% Biology and Life Sciences (18.33%) Physical Sciences (3.95%) $44,590.81	45.32% **$34,453.92**
Dentists	75.37% Biology and Life Sciences (50.12%) Medical and Health Sciences and Services (12.75%) Physical Sciences (12.50%) **$115,236.40**	24.38% Psychology (5.48%) Social Sciences (2.89%) Engineering (2.16%) **$104,668.40**	0.25% **$28,287.82**

NOTE: Source is ACS. Sampling weights used

The final category is sales and office occupations. The first subcategory is sales and related occupations. These occupations have the highest rates of respondents without a bachelor's degree. There is not a heavy concentration of degrees that are related in these fields although business is the most common. These occupations are listed in Table 4.k below:

Table 4.k - Related Degrees and Wages of Sales & Related Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
1st Line Supervisors of Retail Sales Workers	9.58% Business (9.30%) Family and Consumer Sciences (0.28%) **$55,731.36**	15.15% Social Sciences (1.87%) Education Administration and Teaching (1.71%) **$48,333.72**	75.27% **$33,028.60**
Sales Representatives, wholesale and manufacturing	19.35% Business **$78,695.46**	28.42% Social Sciences (4.11%) Engineering (3.41%) **$77,915.56**	52.23% **$45,158.67**
Retail Salespersons	7.85% Business (7.41%) Agriculture (0.44%) **$47,371.39**	17.48% Education Administration and Teaching (2.48%) Social Sciences (2.12%) **$33,085.97**	74.67% **$21,273.10**

NOTE: Source is ACS. Sampling weights used

The last subcategory is office and administrative support occupations. People in these occupations rarely obtain a bachelor's degree and there is not much of a wage premium for doing so. These occupations are listed below in Table 4.l:

Table 4.l - Related Degrees and Wages of Office & Administrative Support Occupations

Occupation	**% of occ. in related field** **Average Salary**	**% of occ. in non-related fields** **Average Salary**	**% with no bachelor's degree** **Average Salary**
Secretaries and Administrative Assistants	5.80% Business (5.08%) Medical and Health Sciences and Services (0.72%) **$31,935.24**	13.36% Education Administration and Teaching (2.47%) Social Sciences (1.46%) **$28,791.12**	80.84% **$26,852.51**
Customer Service Representatives	7.23% Business **$38,942.40**	15.50% Social Sciences (1.89%) Communications (1.85%) **$36,670.45**	77.27% **$23,431.21**

NOTE: Source is ACS. Sampling weights used

Although descriptive analytics have been used to describe these degrees, occupations, and wages, a more formal econometric approach will determine exactly how much age, race, and gender affect one's wages and also to determine exactly how important it is to get a job that is related to one's degree. Dummy variables were created for gender and race: male and white were used as the anchor to develop this regression command. It is important to control for these variables in order to try and isolate the effect the relatedness of a degree has on income. This fixed effect equations allows the model to control for all degree fields and occupations:

```
. xi : areg incwage age male white related i.degfield,absorb(occ)
i.degfield        _Idegfield_0-64     (naturally coded; _Idegfield_0 omitted)
```

The output was as follows:

```
Linear regression, absorbing indicators          Number of obs   =     275086
                                                 F(  41, 274997) =     281.10
                                                 Prob > F        =     0.0000
                                                 R-squared       =     0.2500
                                                 Adj R-squared   =     0.2497
                                                 Root MSE        = 61977.2103
```

incwage	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	480.3853	10.66975	45.02	0.000	459.4729	501.2977
male	21133.3	277.1749	76.25	0.000	20590.05	21676.56
white	4640.739	333.8787	13.90	0.000	3986.346	5295.132
related	6077.083	374.939	16.21	0.000	5342.213	6811.953

This model produced an R-squared value of .25 which means that 25% of the variance of income in this model is explained by the independent variables in the regression. For a data set with so many observations, this is a very meaningful R-squared. The coefficient on age means that for every one year someone gets older,

he is expected to make $480.39 more. The coefficient for males means that males are expected to make $21,133.3 more than females. Likewise, whites are expected to make $4,640.73 more than nonwhites. Finally, if someone gets a job where the degree field is related, that person is expected to make $6,077.08 more than if that person took a job in a field that is unrelated to that person's degree when controlling for age, gender, and race. There is 95% confidence that the wage increase for taking a job that is related to one's degree holding all else constant will fall between $5342.21 and $6811.95. For all four of these variables, the p-value is practically 0 meaning that one's age, race, gender and if one's degree is related to your occupation are all significantly significant in explaining income.

It is important to run a few tests to validate the results. Serial correlation is the correlation of a variable with itself, which in time could skew the error term. Because of all the data was compiled from the 2010 census survey, serial correlation will not exist in this model. The next test performed was a variance inflation factors (VIF) test to test for multicollinearity, the correlation between specific variables. The results are as follows:

```
. vif
```

Variable	VIF	1/VIF
male	1.01	0.988983
age	1.01	0.989054
white	1.01	0.993367
related	1.01	0.993848
Mean VIF	1.01	

Because the mean VIF is 1.01, which is well below the accepted level of 10, multicollinearity is not present here. The final test is the White Test, which tests for heteroskedasticity, the correlation of the error term. The results are as follows:

```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(11)     =  12406.53
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	12406.53	11	0.0000
Skewness	10707.28	4	0.0000
Kurtosis	-1.53e+11	1	1.0000
Total	-1.53e+11	16	1.0000

The null hypothesis states that there is homoskedasticity. Because the p-value is 0, the null hypothesis is rejected meaning that heteroskedasticity is indeed present. To correct for this, robust was added onto the original regression command for this output to build in robust standard errors:

```
. xi : areg incwage age male white related i.degfield,absorb(occ) robust
i.degfield        _Idegfield_0-64     (naturally coded; _Idegfield_0 omitted)
note: _Idegfield_64 omitted because of collinearity

Linear regression, absorbing indicators          Number of obs   =     275086
                                                 F(  40, 274998) =     261.92
                                                 Prob > F        =     0.0000
                                                 R-squared       =     0.2500
                                                 Adj R-squared   =     0.2497
                                                 Root MSE        = 61977.0976
```

incwage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
age	480.3853	9.577303	50.16	0.000	461.6141	499.1566
male	21133.3	281.2347	75.14	0.000	20582.09	21684.52
white	4640.739	304.1276	15.26	0.000	4044.657	5236.82
related	6077.083	333.5641	18.22	0.000	5423.306	6730.859

The coefficients for age, sex, race, and relatedness remain unchanged. The standard errors get larger and the t-statistics change but all the coefficients and variables are still considered statistically significant.

However, it is important to note that this increase of $6,000 for taking a job in one's degree field is inclusive of many fields and is not representative of any one particular field. For example, when running the same regression model and selecting for a particular occupation, the coefficient on the related variable can vary by a tremendous amount. Based on the results from below, a mechanical engineer will make $12726.15 more if he gets a degree in engineering rather than a different degree.

```
. reg incwage white male age related if occ==1460
```

Source	SS	df	MS		
Model	1.1133e+11	4	2.7832e+10	Number of obs =	1621
Residual	2.4482e+12	1616	1.5150e+09	F(4, 1616) =	18.37
				Prob > F =	0.0000
Total	2.5596e+12	1620	1.5800e+09	R-squared =	0.0435
				Adj R-squared =	0.0411
				Root MSE =	38923

incwage	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
white	2262.297	2646.485	0.85	0.393	-2928.606	7453.2
male	6118.828	3320.504	1.84	0.066	-394.1185	12631.77
age	602.715	87.5464	6.88	0.000	430.9986	774.4314
related	12726.15	2440.429	5.21	0.000	7939.415	17512.89
_cons	30684.06	5596.566	5.48	0.000	19706.77	41661.35

Running the same regression instead with accountants and auditors, the coefficient on the related variable is only $5,867.51, the premium if one majored in business.

```
. reg incwage white male age related if occ==800
```

Source	SS	df	MS	Number of obs =	16965
Model	4.0002e+12	4	1.0000e+12	F(4, 16960) =	242.03
Residual	7.0079e+13	16960	4.1320e+09	Prob > F =	0.0000
				R-squared =	0.0540
				Adj R-squared =	0.0538
Total	7.4079e+13	16964	4.3668e+09	Root MSE =	64281

incwage	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
white	7880.809	1254.567	6.28	0.000	5421.726	10339.89
male	27331.09	1005.394	27.18	0.000	25360.41	29301.77
age	338.1333	44.24456	7.64	0.000	251.4094	424.8572
related	5867.505	1135.831	5.17	0.000	3641.159	8093.852
_cons	29180.26	2339.124	12.47	0.000	24595.33	33765.19

Lastly, secretaries and administrative assistants are set to make as low as only $2,817 for having a related degree as indicated by the regression model.

```
. reg incwage white male age related if occ==5700
```

Source	SS	df	MS	Number of obs =	7981
Model	1.1794e+11	4	2.9484e+10	F(4, 7976) =	41.41
Residual	5.6791e+12	7976	712023376	Prob > F =	0.0000
				R-squared =	0.0203
				Adj R-squared =	0.0199
Total	5.7970e+12	7980	726445347	Root MSE =	26684

incwage	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
white	-2041.2	810.8125	-2.52	0.012	-3630.604	-451.7955
male	10978.73	1134.002	9.68	0.000	8755.787	13201.67
age	180.1554	24.95287	7.22	0.000	131.2413	229.0695
related	2817.892	651.2273	4.33	0.000	1541.316	4094.467
_cons	21200.13	1316.193	16.11	0.000	18620.05	23780.22

The conclusion of this study is that having an occupation-relevant degree increases annual earnings by $6,077.08 when, controlling for age, gender, race,

occupation, and degree field. With the inclusion of the fixed effects, the constant a_0 will shift up or down depending on the degree field and occupation combination. The model developed looks like this:

Y= a_0 + $480.39*age + $21,133.33*male + $4,640.79*white + $6,077.03*related +X*deg. + Y*occ. + e.

It is important to note that there are many factors, which go into determining wages, and only a few have been tested for. Some of these variables cannot be controlled. There are limitations to the model explored in this paper. There is omitted variable bias because there is no variable coding for a person's decision in choosing a degree. It could be a short sighted decision or it could be that someone will make lots of money no matter what their degree because of the human capital they have developed while getting educated and this exploration would require more data and more time. However, one can make a smart decision regarding the choice of major in order to be set up for success in the future. Nevertheless, with so many skilled applicants looking for work, standing out with a strong record in a degree that employers are looking for could land anyone that extra $6,077 a year.

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Appendix B: Table 1.b

Table 1.b - All Degrees by Number of Graduates

Field of Degree	**Percent**
Business	20.48%
Education Administration and Teaching	13.28%
Social Sciences	7.72%
Engineering	7.37%
Medical and Health Sciences and Service	6.88%
Psychology	4.91%
Biology and Life Sciences	4.81%
Fine Arts	4.05%
Communications	3.83%
English Language, Literature, and Composition	3.25%
Physical Sciences	3.10%
Computer and Information Sciences	2.86%
History	2.24%
Criminal Justice and Fire Protection	1.55%
Mathematics and Statistics	1.48%
Liberal Arts and Humanities	1.38%
Public Affairs, Policy, and Social Work	1.38%
Agriculture	1.23%
Linguistics and Foreign Languages	1.10%
Family and Consumer Sciences	0.89%
Physical Fitness, Parks, Recreation, and Leisure	0.81%
Engineering Technologies	0.79%
Architecture	0.74%
Philosophy and Religious Studies	0.72%
Environment and Natural Resources	0.67%
Interdisciplinary and Multi-Disciplinary Studies	0.64%
Theology and Religious Vocations	0.60%
Area, Ethnic, and Civilization Studies	0.33%
Transportation Sciences and Technologies	0.26%
Law	0.16%
Construction Services	0.16%
Communication Technologies	0.13%
Cosmetology Services and Culinary Arts	0.07%
Library Science	0.06%
Nuclear, Industrial Radiology, and Biological Technologies	0.03%
Electrical and Mechanic Repairs and Technologies	0.03%
Military Technologies	0.01%
Total	100.00%

NOTE: Source is ACS. Sampling weights used and limited to bachelor's degree holders

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