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How does College major affect employee turnover?

A Statistical Analysis

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**Executive Summary**

To the Board of Directors of Massachusetts Mutual Life Insurance Company,

Currently, employee turnover is a reoccurring and pertinent predicament in many offices. Many Human Resources departments are concerned that they will not have enough internal resources needed for their organization’s needs. Many employees feel unsatisfied with their jobs, leading them to find better workplaces.

Massachusetts Mutual Life Insurance Company has been experiencing some of the highest turnover rates in the industry, and thus, it is crucial to understand what makes people leave the company. In the report, the question of how different college majors affect employee turnover is answered. We identified college degree, degree of work relatedness, age, marital status, gender, and parental status as the main factors that affect the probability of a person’s potential change in career. While human behavior is highly unpredictable, the results of this study will be insightful to identify what type of candidates a company may prefer to hire.

The results from the National Survey of College Graduates conducted in 2013 was used in this study. We had 84,045 observations that represented individuals working in the United States. The average probability of job change is reported to be 27.8%. More than 60% of respondents have a degree in either engineering, social sciences, or non-STEM fields.

There were six regression models used in the study. The first one looked at the direct effect of college majors on the probability of job change. The second model explores how relatedness of one’s job affect the dependent variable. The third and fourth regressions examined how age affects employee turnover. The fifth model analyzed the effects of gender, marriage, and children separately. Regression 6 studied the effect on children and marriage and how gender plays a role on the probability of switching jobs.

Regression 1 and 2 showed that college majors and degree of relatednessdo not highly impact theprobability of changing careers. However, the results indicated that people who hold their degree in social sciences are most likely to change their jobs, and those who studied biological, agricultural, and environmental sciences have the lowest probability of switching their employers. The degree of relatedness of their job and college degree is not significant for the probability of job change. Regression 3 and 4 showed that age is an important factor that affects employee turnover. The older candidate is less likely to change his/her career due to job security and high degree of specialization in their field. It was also established that age has a non-linear relationship with the dependent variable job change. Regression 5 highlighted the fact that a combination of gender, marital status, and parental status influences a person’s likelihood to change jobs, more so than each category individually. The sixth model showed that women on average are more likely to change jobs. On the other hand, marriage increases female’s probability of job change but does not have much effect on men, highlighting the difference in behavior patterns for both genders in the workplace. Children decrease the probability of job change for both genders.

Based on this study, it can be concluded that college major has some effect on the job change probability; however, age, a combination of gender, conjugal status, and parental status play a bigger role on people’s willingness to switch their careers. The results bring some insight into the reason behind employee turnover, but is not sufficient enough to predict human behavior at a workplace.

**Introduction**

Currently, almost every company has faced the issue of employee turnover. 75% of Human Resources managers are concerned that they will not have enough the human capital needed for their organization’s needs and that it will hinder the company’s ability to achieve its goals and stick to its strategy.[[1]](#footnote-1) At the same time, 70% of employees are not satisfied with their jobs and feel that they were not prepared for their careers.

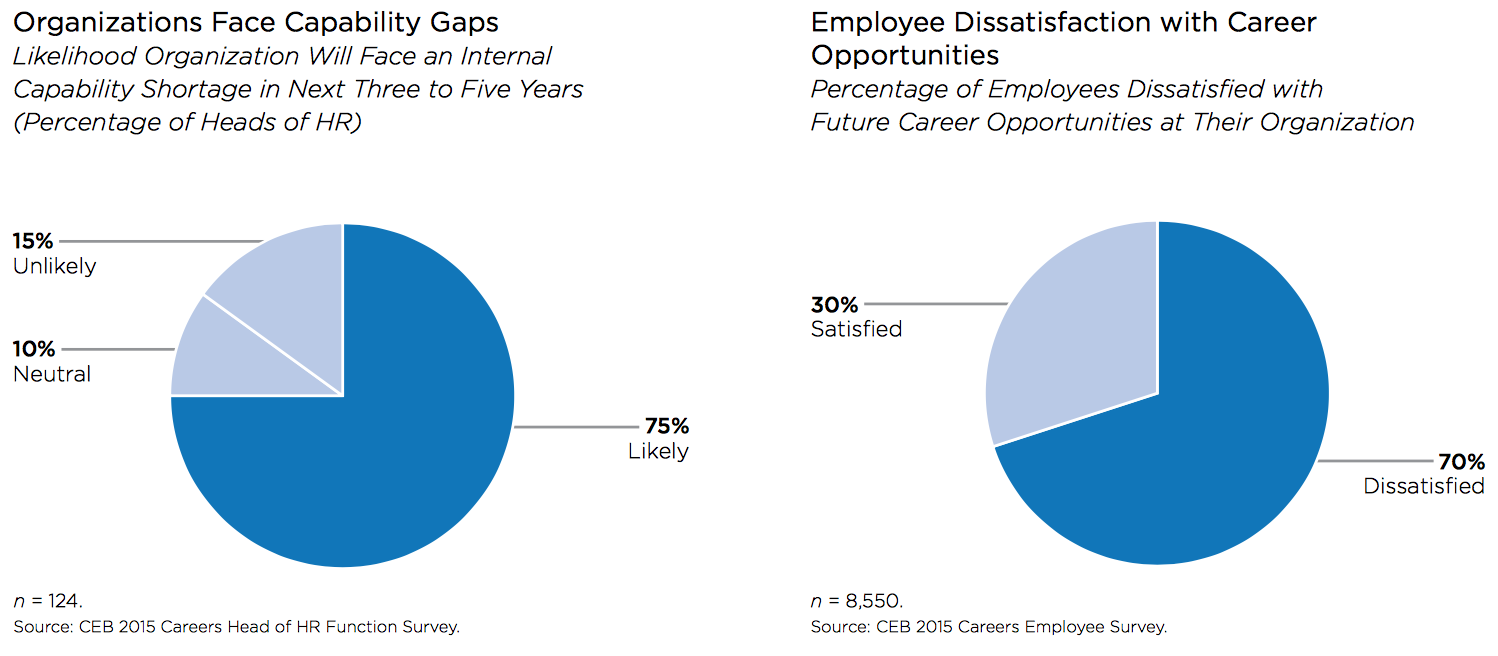


Exhibit 1

It is imperative to understand what drives people away from their jobs. Employee turnover directly affects a business’s bottom line, and high turnover is one of costliest expenses that a company incurs. When asked the question of why individuals left their jobs, more than 40% of employees attributed it to the lack of future career opportunities. Many people choose their field of study at a university based on what they want to do after graduation, especially if it is a STEM field, medical or law track, or business degree. However, there are many instances when people either find work in a somewhat related field or choose a completely new path for their career. With the second option, more often than not people have to acquire a completely new set of skills. Some choose to attend graduate schools before acquiring the job. However, those who do not attain a higher degree, may hinder their ability to succeed in the field due to not having the adequate knowledge to pursue the new profession. Subsequently that results in a decrease in job satisfaction, which can lead to a change of career.

A recent study administered by New York Fed staff revealed that more and more college graduates are underemployed, meaning that they work in a job that is not connected to their field of study, or one that does not require a college degree at all.[[2]](#footnote-2) The study shows that one’s degree does not determine the job one will have. Thus, we want to look at how one’s college major and the relatedness of the job to the acquired degree affect employee turnover as well as other possibly confounding factors. This report answers the question of how a bachelor’s degree affects employee turnover. We identified college degree, degree of work relatedness, age, marital status, gender, and parental status as the main factors that affect the probability of a person’s change in career.

Since Massachusetts Mutual Life Insurance Company has been experiencing some of the highest turnover rates in its industry and the average time spent with the company is less than a year, it is crucial to understand why people leave the company.[[3]](#footnote-3) Additionally, it may be insightful to identify what type of attributes the company should look for when hiring a new employee in order to get people who will bring value to the firm.

**What Drives Job Change?**

1. *Data Description*

The database used for this research is from the National Survey of College Graduates from the National Science Foundation (NSF) conducted in 2013. The survey is designed to assess college graduates in all academic disciplines from the Unites States. The respondents are anyone living in the U.S. during the survey reference week and holding at least a bachelor’s degree in any educational field, being under the age of 76.

For the sake of this project, we decided to use only observations that are relevant to our question. The screening criteria for the project were:

1. Individuals who were in a labor force at the time of survey.
2. Individuals who were employed at the time of survey.
3. Individuals who had at least a bachelor’s Degree at the time of survey.

We excluded people that did not have a bachelor’s degree, were retired, or were not in a labor force when the survey was conducted. At the end, we had 84,045 observations in the data set, with each observation corresponding to a single individual.

1. *Variables Definitions*

There were multiple undergraduate fields of study, but for the purpose of this research we used the 7 major areas of undergraduate study identified by NSF. Additionally, the survey data included a variable that specified the degree of association between the job and field of study, which was defined as being closely or somewhat related, or not related. The main dependent variable is job change, which measures the probability of a person’s likelihood to switch jobs.

The following variables were used in this project:

|  |  |
| --- | --- |
| Variable Name | Variable definition |
| Job Change | Indicator variable of whether people changed jobs between February 1, 2013 and October 1, 2010 |
| Relatedness degree of job to major | An extent of how highest degree is related to job |
| Age | Age of a respondent |
| Bachelor Degree in Computer and Mathematics Sciences | Includes Computer and information sciences, Mathematics, Statistics |
| Bachelor Degree in Biological, Environmental, and Agricultural sciences | Includes Agricultural and food sciences, Biological and Environmental life sciences |
| Bachelor Degree in Physical sciences | Includes Chemistry, Earth, atmospheric and ocean sciences, Physics, Astronomy |
| Bachelor Degree in Social sciences | Includes Economics, Political and related sciences, Psychology, Sociology, Anthropology |
| Bachelor Degree in Engineering | Includes Chemical, civil, architectural, electrical, computer, industrial, mechanical engineering |
| Bachelor Degree in Science- and Engineering-related fields | Includes Health, Science and Mathematics teacher education, Technology and Technical Fields, Architecture |
| Bachelor Degree in Non-STEM fields | Includes Management and administration fields, Education, Social service, Sales and marketing, Art and Humanities, Communications, Journalism, Law |
| Gender | Gender indicator |
| Marital status | Marital status indicator |
| Children | Indicator variable whether there are children in the household |

Table 1

1. *Descriptive Data Analysis*

We used age squared in the regression model in order to counteract the possibility of skewness that could result from the age variable.

The survey involved 84,045 people located in the United Sates at the time of survey and consisted of 54.27% males and 45.73% females. The age ranged from 19 to 75 years old, with an average age of 41.9. Out of all the respondents, only 27.79% people changed jobs between October 1st, 2010 and February 1st, 2013. When asked about their bachelor’s degrees, there was an uneven distribution between the seven academic fields: 21.56% of people majored in engineering, 21.29% in social sciences, 20.19% had a degree in non-STEM fields, 11.29% studied biological, agricultural, and environmental sciences, 10.97% of respondents held a degree in science and engineering-related fields, 8.61% in computer science and mathematics, and only 6.09% of people majored in physical sciences as undergraduates. The degree of relatedness of the individual’s current job and highest degree of education indicated that 85.44% of people work in at least a somewhat related field to what he/she studied in college.

Additionally, there were more married people in the survey – 64.84%, compared to the 35.16% of respondents that indicated their marital status as single or other. Out of all surveyed people, there were 26.57% married females and 38.27% married males. Even though there were more people in a marriage-like relationship, only 43.71% of respondents had children in their household: 19.12% were female and 24.59% were male.

1. *Regression and Results*

We established 6 different statistical models to measure the relationship of college major on job change. The simple regression model looked at the correlation between those two variables; however, in the later models, we included other factors that may have an effect on our dependent variable. After thorough consideration, we identified 4 confounding factors that are controlled in different regressions: relatedness of job to a degree, age, gender, and whether people had children in the household.

This model predicts the probability of job change, given certain parameters. The coefficients of explanatory variables represent the percentage point changes in the probability of job change happening for a certain type of individuals.

Since there are too many variables to create a complete model for predicting job change, and since human behavior is unpredictable, we will look at the influence variables have on the likelihood of someone to change their jobs, which we will denote as the percentage change in the dependent variable.

*Effect of college majors on job change probability*

We ran a simple regression using the 7 fields of study to predict the probability of job change based on major. Appendix 1 contains the results for each individual regression. Our regression model indicated that individuals majoring in the social sciences were the most likely to change jobs (30.9%) while those that studied physical sciences had the lowest probability of career change (25.6 %). We also found that people have a similar probability of changing jobs if they studied biological, agricultural, environmental and physical sciences. Another eye-catching result is that people with degrees in computer and mathematics related fields were 2.73% more likely to change their occupation than people with non-STEM bachelor’s degrees.

A possible explanation for these results could be that people with more quantitative diplomas have more flexibility in their careers, as they do not require careers that are directly related to their field, or there is a high degree of free flow, leading people to work freelance or on a project basis. As for social sciences field, it consists of 35.9% psychology majors and that could explain why it is the most likely major field to change careers. It is widely known that psychology major has a reputation for the highest unemployment rates – 5.8% in 2012.[[4]](#footnote-4) In order to get into a more prestigious role in psychology, and in the other majors that constitute the social science field, it is necessary to get a doctorate degree and that could be one of the many reasons as to why people do switch their career path to something else.

This statistical model explains only 0.19% change in the dependent variable and, even though all the variables do have a direct effect on the job change probability, they do not fully explain the employee turnover and may be picking up the omitted variable bias, meaning that a variable not included in the regression affects both independent and dependent variables and leads to an incorrect relationship model.

*Effect of degree of job and major relatedness on job change probability*

After analyzing the results of the simple regression model, we looked at the effects of possible confounding factors on the dependent variable. The degree of relatedness between their current job and their field of study did not prove to have a significant effect on the probability of employee’s job change. On average, people were 2.5% more likely to change jobs if their current employment didn’t match their field of study. The new relationship model explained only 0.23% of change in the dependent variable.

Possible limitation to this model is that people assess their current job, not their previous one, when determining a change in career. There are three other limitations in the explanation of what is happening in this model. Firstly, individuals could have already switched their previous job that was not related to what they studied to something that is similar to their skill set. Secondly, they could have gone to school to obtain a degree from a field that they would like to work in and then found a job in that industry. Thirdly, people changed jobs but still could be working in an unrelated field. Additionally, the only case for which this variable would be significant is when people did not change their jobs, did not go to a graduate school, and work in an unrelated field, since it that case we assess the direct effect of the college major and its relatedness on the turnover. One key finding was that on average there were less people who changed their job to something that was related to their highest degree (23.4%) than people who did not change their jobs and were working in related fields (62%). That leads to a conclusion that people on average tend to work in at least a somewhat related field. Overall, the regression is still picking up some omitted variable bias and should not be considered as a correct relationship model.

*Effect of age on job change probability*

It is important to evaluate age as a possible confounding factor on employee turnover, because the older one is, the less likely one is to change jobs or careers. Appendix 1 includes the third regression, where apart from college majors, age was used to test its effect on the job change probability. Age proved to have a significant effect on the job change probability, since the coefficients of 3 major fields significantly changed compared to the first and second regressions. The coefficient of physical sciences changed from -0.051 to -0.035, that of science-related and engineering-related fields changed from -0.040 to -0.022, and coefficient of non-STEM fields changed from -0.051 to -0.022 compared to the second regression. After running a correlation on age and college majors, it was found that age and the three major fields mentioned above have a positive correlation with age, implying that typically there are more older people who majored in those fields at college. The biggest age correlation coefficient was on non-STEM field – 0.1022 (Appendix 2). Since that major category consists mostly of business and humanities majors, 29.3% and 27.3% respectively, it was insightful to find that those fields become less popular amongst the younger population. It could be explained by the fact that recently STEM fields became more popular due to the technology spread and an increased importance of science breakthroughs. Another possible explanation is the generation difference. Younger people in business tend to change their jobs more frequently in order to get experience, whereas older individuals already have enough exposure in their field and acquired some specialization in what they do.

On average, one additional year in age decreases one’s probability of changing jobs by 0.81%, controlling for other variables. This model explained 5.62% change in the dependent variable, proving that age has more influence than college majors on the dependent variable, as seen in Appendix 1. Considering the big change in coefficients of the main variables after we added age to the regression, we can conclude that there was definitely an omitted variable bias in previous models. Age is crucial factor to hold constant when we look at the effect of college majors.

After trying different relationship models for age, it was found that square of age was a better fit. Age then was enforced into the regression as a quadratic. The results of the fourth regression that included age squared indicated that the relationship between age and the probability of job change is not linear. Exhibit 2 graphs this relationship, and indicates a decrease in the probability of a person to change jobs as age increases. Starting at the age of 65, people are more than 75% less likely to change jobs and career. Once people find jobs that they like, they tend to stay committed to those positions, have higher job security, and thus are less likely to change it. It is also true that it is harder to find new career options as one gets older, as there is a smaller pool of opportunities for a very specific set of skills. As one gets older, they are more likely to have a partner and children, and it becomes harder to move geographically for a new job.

Exhibit 2

*Effect of gender, children, and marital status on job change probability*

Other variables examined in this survey were gender, marital status, and whether there are children in the household. Appendix 1shows the fifth regression where we introduced those variables. Children are an important factor since they affect the mobility of an individual and their willingness to change jobs. Children on average will reduce one’s probability of switching jobs by 2.33%, holding other things constant. Gender also matters since females and males have different behavior patterns. Gender and marital status had an insignificant effect on the dependent variable. Females and married people are more likely to change jobs (0.37% and 0.25% respectively); however, these factors cannot be viewed as isolated variables. Although the factors that were added to the new relationship model definitely affect people’s choice of job change in the real life, they do not have much effect in this regression. Gender and marital status turned out to have a statistically insignificant effect on the probability of job change. It is incorrect to assume a single effect of marriage and children on work choices, therefore we introduced interaction terms in the sixth regression. Through these terms one can see the difference between male and female experience with children and marriage.

*Changes in variables in the best-fit regression*

Since we introduced the simple regression, we created the sixth regression that is a more fitting relationship model between the probability of job change, college majors, and other confounding factors. This regression accounts for 6.02% change in the dependent variable, which is a significant improvement from the 0.19% in the simple regression.

* College majors

The coefficients of different college major categories underwent big changes since the first model. Holding other things constant, below is a list of bachelor’s degrees’ probability of changing jobs in descending order:

1. Social sciences – base line
2. Science- and engineering-related fields – 1.66% less likely than people in social sciences
3. Non-STEM fields – 1.72% less likely than people in social sciences
4. Engineering – 1.85% less likely than people in social sciences
5. Computer science and Mathematics – 2.10% less likely than people in social sciences
6. Physical sciences – 3.40% less likely than people in social sciences
7. Biological, agricultural, and environmental sciences – 4.33% less likely than people in social sciences

Physical, biological, agricultural, and environmental sciences tend to be very specific and require a lot of specialization. It is difficult to find jobs that utilize the specific set of skills in those fields, therefore people tend to stick around for longer period of time due to lack of other job opportunities. We expected them to have lower rates of employee turnover for these fields and the results proved our hypothesis.

Computer science, mathematics, and engineering majors tend to find jobs that are very related to what they studied at college due to the ever-expanding job market. At the same time, these majors are considered as prestigious, so people have plenty of opportunities to find work in other fields as well, due to the flexibility of their skill sets. The regression shows that these individuals are somewhere in the middle on the turnover spectrum due to the two sides of their employability.

Non-STEM degrees have a relatively high probability of job change. Our initial hypothesis was that those people are the ones who switch around their jobs due to the business industry volatility. However, science-related and engineering-related majors and non-STEM majors had very similar coefficients. There were more people who had science degrees participating in the survey and that could have led to somewhat skewed results.

As we talked about it earlier, social sciences are most likely to change their employers due to the necessity of attending graduate schools for better job opportunities in those fields and the high percentage of Psychology majors that are known for their volatile job market.

* Age

After establishing the fact that there is a non-linear relationship between age and job change probability, we created a graph to show the total effect of age on the dependent variable. After running the final regression, the coefficient of age and age squared slightly changes, and the new graph is shown in the Exhibit 3.

The effect of age on the job change decreased due to the fact that we added more confounding factors. Gender, marital and parental status decreased the effect of age on the job change probability. At since the age of 65 one is more than 70% less likely to change jobs, compared to more than 75% in the previous graph.

Exhibit 3

* Gender, children, and marriage

As mentioned before, gender plays a huge role on the behavior. Children and marital status have to be considered in relation to gender as well since there are variations in the individual behavioral patterns when it comes to child care. Single childless females are 4.09% more likely to change jobs than single childless males, holding other variables constant. Married females with children are on average 2.11% less likely to switch jobs and married males with children are 0.61% more likely to change their job. Such small coefficient on the latter category implies that marriage and children do not have a huge effect on male’s job tenure.

Married men and women have almost the same chances of switching jobs, 1.94% more for females than for males. This result suggests that childless people are more prone to job switching, which is attributed to more mobility and flexibility of their time. However, 70.5% of males in the survey were married, so the effect of marriage could be different on males if the data would not be skewed towards married men. Women with children tend to stay with their current jobs and this could be partially explained by increased benefits from their employers: maternity leave, more work-life balance, and family-friendly workplaces. These results go hand in hand with the results from the American Sociological Review in 2014.[[5]](#footnote-5)

If we look at how children affect the probability of job change, we find that if married females do not have children in their household, they are 4.06% more likely to switch jobs than those with children. For married men, children in the household decrease their likeliness to find a new job by 1.16%. That means that children do have a different effect on both genders, and they mostly affect women than men. It is due to the fact that women typically take care of children at the early stages and that reduces their ability to change their jobs and careers.

Marriage also has varied effects depending on gender. Childless single females are 2.15% more likely to change their career when compared to childless married females. Single childless males are 1.77% less likely to switch their jobs compared to married childless men. The difference of effects of marriage could be attributed to the female motivation to achieve more before starting a family and thus trying different career paths before finding the perfect fit, something that is common among younger people. Additionally, one research proposed that apart from a desire to start a family and take of their children, women do not have support at their workplace and their decreases their ambition to find better work.[[6]](#footnote-6) For men, marriage does not play a huge role in their life since usually women are more involved in the family development process.

* Degree of relatedness of job and college major

With the addition of age and gender variables, the coefficient for the degree of relatedness increased, which implies that age and gender are an influential factor on this variable.

* Missing Variables

Apart from the confounding factors that we included in our regressions, there are other variables that could have an effect on employee turnover are geographical location and general unemployment rate. Big cities usually have more job opportunities and it could be easier to find one that is related to a person’s college degree. Another factor that must be considered is general unemployment rate: if the unemployment rate is high, people are more interested in staying in their current position, rather than looking for something else.

**Conclusion**

The goal of this report was to investigate the effect of college majors on employee turnover. Holding all other variables constant, people with social sciences have a higher probability of changing their job than other majors. People who study physical, biological, agricultural, and environmental sciences have the lowest probability of job change. The degree of relatedness of the current job and highest degree of education does not have a significant effect on employee turnover. It was found that age is a more significant factor when we examined employee turnover. The older one is, the less likely one is to change their job and career. Gender plays a significant role when it comes to switching jobs. Women on average are more likely to change jobs. However, if they have children, they are less likely to switch their workplace than males with children. Marriage, on the other hand, increases female’s probability of job change. Marriage does not have much effect on men, highlighting the difference in behavior patterns for both genders in the workplace. The results from this study will be useful to Massachusetts Mutual Life Insurance Company when they are recruiting new people, however, they have to only serve as guidelines since these relationship models are not sufficient enough to predict human behaviors.

**Appendix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Regression of a probability of job change | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| comp\_math\_science | -0.0244089\*\*\*  (-3.91) | -0.021362\*\*\*  (-3.41) | -0.0265063\*\*\*  (-4.35) | -0.0235608\*\*\*  (-3.87) | -0.0220155\*\*\*  (-3.59) | -0.0210172\*\*\*  (-3.43) |
| bio\_agr\_env\_science | -0.050689\*\*\*  (-8.92) | -0.048575\*\*\*  (-8.53) | -0.045907\*\*\*  (-8.29) | -0.0438177\*\*\*  (-7.92) | -0.0432813\*\*\*  (-7.82) | -0.0433552\*\*\*  (-7.83) |
| phys\_science | -0.0535112\*\*\*  (-7.54) | -0.0506274\*\*\*  (-7.12) | -0.0350606\*\*\*  (-5.07) | -0.0346899\*\*\*  (-5.02) | -0.0336289\*\*\*  (-4.84) | -0.0339988\*\*\*  (-4.90) |
| engineering | -0.0232796\*\*\*  (-4.94) | -0.0194839\*\*\*  (-4.09) | -0.0223047\*\*\*  (-4.81) | -0.0204035\*\*\*  (-4.41) | -0.0177502\*\*\*  (-3.70) | -0.0185297\*\*\*  (-3.87) |
| science\_engin | -0.0431232\*\*\*  (-7.52) | -0.0400238\*\*\*  (-6.95) | -0.0216261\*\*\*  (-3.85) | -0.019363\*\*\*  (-3.45) | -0.0181938\*\*\*  (-3.24) | -0.0166096\*\*\*  (-2.96) |
| non\_science\_engin | -0.0517343\*\*\*  (-10.79) | -0.0511454\*\*\*  (-10.66) | -0.0219428\*\*\*  (-4.69) | -0.0183384\*\*\*  (-3.92) | -0.0181017\*\*\*  (-3.87) | -0.0171982\*\*\*  (-3.67) |
| age |  |  | -0.0080966\*\*\*  (-69.31) | -0.0209521\*\*\*  (-23.89) | -0.0177932\*\*\*  (-18.16) | -0.0177794\*\*\*  (-18.14) |
| age2 |  |  |  | 0.0001437\*\*\*  (14.79) | 0.0001097\*\*\*  (10.16) | 0.0001087\*\*\*  (10.06) |
| female |  |  |  |  | 0.0037113\*  (1.15) | 0.0409927\*\*\*  (7.80) |
| children |  |  |  |  | -0.0232913\*\*\*  (-6.40) | - |
| married |  |  |  |  | -0.0024981\*  (-0.69) | - |
| female\_married |  |  |  |  |  | -0.0215471\*\*\*  (-4.37) |
| male\_married |  |  |  |  |  | 0.0177473\*\*\*  (3.39) |
| female\_children |  |  |  |  |  | -0.0405683\*\*\*  (-8.06) |
| male\_children |  |  |  |  |  | -0.0116457\*\*  (-2.38) |
| job\_rel\_degree |  | -0.0250267\*\*\*  (-5.64) | -0.0287806\*\*\*  (-6.66) | -0.0267765\*\*\*  (-6.20) | -0.0264072\*\*\*  (-6.11) | -0.0267554\*\*\*  (-6.20) |
| Constant | 0.3091752\*\*\*  (92.42) | 0.3286053\*\*\*  (68.41) | 0.6636555\*\*\*  (98.72) | 0.9224634\*\*\*  (49.22) | 0.8642321\*\*\*  (42.44) | 0.8462111\*\*\*  (41.28) |
| # observations | 84,045 | 84,045 | 84,045 | 84,045 | 84,045 | 84,045 |
| SEE | 0.44754 | 0.44745 | 0.43519 | 0.43463 | 0.4345 | 0.43428 |
| Adjusted R-Squared | 0.0019 | 0.0023 | 0.0562 | 0.0587 | 0.0592 | 0.0602 |

t-statistics in parentheses; \*p<0.5 \*\*p<0.1 \*\*\*p<0.01; Omitted field: soc\_science.

Appendix 1

**. corr age comp\_math\_science bio\_agr\_env\_science phys\_science engineering science\_engin non\_science\_engin soc\_science**

(obs=84,045)

| age comp\_m~e bio\_ag~e phys\_s~e engine~g scienc~n non\_sc~n soc\_sc~e

-------------+------------------------------------------------------------------------

age | 1.0000

comp\_math\_~e | -0.0393 1.0000

bio\_agr\_en~e | -0.0186 -0.1095 1.0000

phys\_science | 0.0178 -0.0782 -0.0908 1.0000

engineering | -0.0561 -0.1609 -0.1870 -0.1335 1.0000

science\_en~n | 0.0339 -0.1077 -0.1252 -0.0894 -0.1840 1.0000

non\_scienc~n | 0.1022 -0.1543 -0.1794 -0.1281 -0.2637 -0.1765 1.0000

soc\_science | -0.0388 -0.1596 -0.1855 -0.1325 -0.2727 -0.1826 -0.2616 1.0000

Appendix 2

**. regress job\_change comp\_math\_science bio\_agr\_env\_science phys\_science engineering science\_engin non\_science\_engin age age2 female female\_married male\_married female\_children male\_children rel\_comp\_math not\_rel\_comp\_math rel\_bio\_agr\_env not\_rel\_bio\_agr\_env rel\_phys not\_rel\_phys rel\_engin not\_rel\_engin rel\_science\_engin not\_rel\_science\_engin rel\_non\_science\_engin not\_rel\_non\_science\_engin**

note: rel\_bio\_agr\_env omitted because of collinearity

note: rel\_phys omitted because of collinearity

note: rel\_engin omitted because of collinearity

note: rel\_science\_engin omitted because of collinearity

note: rel\_non\_science\_engin omitted because of collinearity

Source | SS df MS Number of obs = 84,045

-------------+---------------------------------- F(20, 84024) = 271.10

Model | 1022.34555 20 51.1172774 Prob > F = 0.0000

Residual | 15843.0514 84,024 .188553882 R-squared = 0.0606

-------------+---------------------------------- Adj R-squared = 0.0604

Total | 16865.3969 84,044 .20067342 Root MSE = .43423

--------------------------------------------------------------------------------

job\_change | Coef. Std. Err. t P>|t| [95% Conf. Interval]

---------------+----------------------------------------------------------------

comp\_math\_sc~e | -.0165068 .0174159 -0.95 0.343 -.0506419 .0176283

bio\_agr\_env\_~e | -.0039138 .0137851 -0.28 0.776 -.0309324 .0231049

phys\_science | .0457585 .0196804 2.33 0.020 .007185 .084332

engineering | .0040647 .0138834 0.29 0.770 -.0231467 .0312761

science\_engin | .0043785 .0158887 0.28 0.783 -.0267632 .0355202

non\_science\_~n | .0032294 .0101505 0.32 0.750 -.0166656 .0231243

age | -.0177748 .0009803 -18.13 0.000 -.0196962 -.0158534

age2 | .0001086 .0000108 10.04 0.000 .0000874 .0001298

female | .0407975 .0052533 7.77 0.000 .0305011 .0510939

female\_married | -.0215484 .0049251 -4.38 0.000 -.0312015 -.0118952

male\_married | .0177711 .0052421 3.39 0.001 .0074966 .0280457

female\_child~n | -.0404904 .0050342 -8.04 0.000 -.0503575 -.0306233

male\_children | -.0116867 .0049026 -2.38 0.017 -.0212959 -.0020776

rel\_comp\_math | -.2333346 .0529635 -4.41 0.000 -.3371428 -.1295265

not\_rel\_comp~h | -.2251523 .0444096 -5.07 0.000 -.3121948 -.1381099

rel\_bio\_agr\_~v | 0 (omitted)

not\_rel\_bio\_~v | .0480785 .0150562 3.19 0.001 .0185684 .0775887

rel\_phys | 0 (omitted)

not\_rel\_phys | .0924461 .0210193 4.40 0.000 .0512485 .1336437

rel\_engin | 0 (omitted)

not\_rel\_engin | .0281656 .0147241 1.91 0.056 -.0006935 .0570246

rel\_science\_~n | 0 (omitted)

not\_rel\_scie~n | .0264446 .016985 1.56 0.119 -.006846 .0597351

rel\_non\_scie~n | 0 (omitted)

not\_rel\_non\_~n | .0261944 .0114081 2.30 0.022 .0038347 .0485542

\_cons | .8285557 .0210399 39.38 0.000 .7873176 .8697938

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Appendix 3

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