Career Choice and Skill Development of MIT Graduates: Are the "Best and Brightest" Going into Finance?

Pian Shu*

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Abstract

I analyze the characteristics of entry-level financiers and the impact of the recent financial crisis on their career outcomes. I present three key results using detailed data on MIT bachelor's graduates from 2006 to 2012 . Firstly, graduate school and careers in finance, especially at hedge funds and trading positions, both attract students with high raw academic talent. However, financiers are significantly less likely to develop academic skills and more likely to participate in extracurricular activities that develop soft skills. As a result, the two groups do not appear to be substitutable in their skill sets at the time of college graduation. Secondly, the recent financial crisis caused an exogenous and large decrease in entry-level jobs in finance, which was mostly concentrated in the less quantitative side of finance such as investment banking. The shock had the largest impact on management and economics students who do not have a second major in science and engineering. Although many of them did not enter finance due to the contraction in the sector, there was no evidence that they pursued a career in science and engineering instead. Lastly, I find no evidence that the crisis has affected students' tendency to major in management and economics. These results suggest that finance does not attract the most productive scientists and engineers from MIT. It is not clear whether limiting entry into finance in the case of the recent financial crisis has improved the overall efficiency in talent allocation.

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1 Introduction

Before the onset of the financial crisis in 2008, finance had consistently been the most popular sector among recent bachelor's graduates of Harvard, Yale, Princeton, and MIT entering the labor force (Hastings et al., 2010; Rampell, 2011). This is potentially disconcerting as these talented individuals may have been more productive in sectors with higher social returns (Philippon and Reshef, 2012; Greenwood and Scharfstein, 2013; Kedrosky and Stangler, 2011). Since inefficiently-allocated talent hurts the long-term growth of an economy (Baumol, 1990; Murphy et al., 1991; Philippon, 2010), understanding the extent to which finance may contribute to talent misallocation has important implications for both economists and policymakers.

In this paper, I examine the central question: how productive would the elite college graduates going into finance have been in a world with fewer jobs in finance? The answer depends not only on the skill composition of financiers but also the type of alternative sectors that they might enter. I present empirical evidence on both fronts using detailed individual-level data on recent MIT bachelor's graduates. Understanding the career choices of top science and engineering graduates is particularly relevant for the debate on talent allocation since it is widely acknowledged that the science and engineering workforce fosters a nation's innovation and growth (Murphy et al., 1991; Goolsbee, 1998; Romer, 2001; Ryoo and Rosen, 2004).

I find that graduate school and finance, especially the quantitative jobs in finance such as trading, compete for students with the best raw academic talent, measured by an index score assigned by the admissions office based on college applications. However, the two groups follow very different paths of skill development during their time at MIT. Conditional on raw academic talent, demographic characteristics, and major of study, students going to graduate school take significantly more courses and achieve significantly higher GPAs than future financiers in almost every term in college starting in their freshmen year. By contrast, future financiers are significantly more likely to participate in club leadership, internships, intercollegiate sports, and Greek letter organizations. These results suggest that students with different career interests endogenously develop different sets of skills. Students who aspire to go to graduate school are likely to hone their academic skills and their GPAs reflect their efforts. In contrast, students who are interested in finance participate in more extracurricular activities and spend more time developing soft skills such as leadership, teamwork, and communication. As a result, the two populations' skill sets differ when they graduate from MIT.

Furthermore, I study the impact of the recent financial crisis separately for the class of 2009 and the classes of 2010-2012. After the crisis exogenously and dramatically decreased the availability of entry-level jobs in finance, the 2009 cohort had little time to adjust their skill development and job hunting process, whereas the later classes would have had some more time to adjust. I find that the effect of the shock varies based on a graduate's academic training. There is a significant decrease in the probability of taking a relatively less quantitative job (such as investment banking analyst) among almost all of the graduates in 2009, except for those who have a very low propensity to entering finance (e.g. graduates who major in non-math science and humanities). However, some of the graduates with science and engineering backgrounds are able to stay in finance and switch to a more quantitative job, such as working for a hedge fund or as a trader. As a result, only two groups are significantly less likely enter finance in 2009: graduates who major only in management or economics without a science and engineering major, and engineering-focused graduates. For the former group, the alternative career outcome seems to be mostly something other than employment and graduate school (such as volunteering activities, traveling, and looking for jobs), whereas the latter group also has graduate school as an alternative option. I also find that limiting the number of entry-level jobs in finance in the case of a financial crisis does not make the sector less attractive to graduates but, rather, makes it more selective; financiers who stayed in the sector in 2009 earned significantly higher base salaries and higher raw academic talent, even after controlling for their job type and academic training.

Over the longer term, I find no evidence that the 2010-2012 cohorts changed majors after the financial crisis. Although there are also fewer financiers from these classes, they do not seem to come from science and engineering majors. Only graduates who major in management or economics without a science and engineering major are significantly less likely to enter finance. Their alternative career outcomes seem to be working in other industries that are not in science and engineering as well as something other than employment and graduate school.

Taken together, the empirical results suggest that due to endogenous skill development, those entering finance out of MIT are unlikely to be the best and brightest in science and engineering at the time of graduation, though they may be the best in finance. In another working paper using the 1980-2005 cohorts from MIT (Shu, 2012), I show that science and engineering majors have significantly higher patent production in the long term than their classmates at MIT. Furthermore, cumulative GPAs also positively and significantly predict patent production. In this paper, I find that students with these characteristics are most likely going to graduate school in science and engineering regardless of the financial crisis. Furthermore, the marginal financiers who have left finance due to the recent financial crisis are mainly students without a science and engineering major who are unlikely going into science and engineering sectors. Thus, it is unclear whether the decrease in the entry into finance due to the recent financial crisis has improved the overall efficiency of talent allocation.

In the rest of the paper, I discuss the literature and conceptual framework in Section 2 and describe the data and summary statistics in Section 3. Section 4 examines the pre-crisis selection into finance and graduates' skill development. Section 5 examines the immediate impact of the recent financial crisis on the class of 2009 while Section 6 analyzes the later impact. Section 7 concludes the paper.

2 Rise of Finance and Implications for Talent Allocation

The U.S. financial services sector has experienced tremendous growth over the past several decades in both size and wage. During the last 40 years, its contribution to U.S. GDP has more than doubled from 4% to nearly 8.5% (Philippon, 2008). Philippon and Reshef (2012) find that the wage gap between financiers and engineers in the Current Population Surveys grew from less than 5% to over 30% between 1980 and early 2000s, and that the skill intensity in finance has also risen. The proportion of bachelor's graduates who become financiers has also grown steadily over the past few decades. Goldin and Katz (2008) show that the proportion of male Harvard BA graduates working in finance 15 years after graduation has tripled from 5% to 15% between the 1970 cohort and the 1990 cohort.

Macroeconomic theory suggests that talent allocation responds to the society's reward structure and that allocating talent from productive to rent-seeking activities hurts economic growth (Baumol, 1990; Murphy et al., 1991; Acemoglu, 1995). It is not evident, however, that the rising employment in finance represents misallocation of talent in practice. Two crucial questions remain unaddressed: 1) Does the rapid increase in financial wage come from the productivity boom or increasing opportunities in rent seeking? 2) Is finance drawing new talent from sectors where those individuals would have been productive? Most of the debate in the economics literature has centered around the first issue, although a consensus has not been reached. For instance, Philippon and Reshef (2012) find that financial deregulation in the early 1980s drove the increase in the skill intensity and thus wage in finance. In contrast, Bolton et al. (2011) suggest that the growth of information technology lowered the costs of exchanging financial information and allowed financiers to extract more rents. Greenwood and Scharfstein (2013) show that asset management accounts for a large part of the growth in finance. They argue that while the society may have benefited from the decreasing required rates of returns for investors and the lower cost of capital to corporations, the high fees associated with asset management may also lead to rent-seeking activities as well as distorted talent allocation. Malkiel (2013) argues that most of the increase in the fees associated with asset management is a deadweight loss for investors.

The second question, although equally important, has received little attention in the literature. Goldin and Katz (2008) show that the increase in business occupations for Harvard male graduates parallels the decrease in jobs in law and medicine. However, without further analysis, one cannot conclude that the marginal graduate going into finance is the same as the marginal graduate dropping out of law and medicine. Oyer (2008) provides only suggestive evidence that jobs in finance may crowd out careers in consulting and entrepreneurship more than in information technology and manufacturing. Since the Stanford MBA graduates are a highly specialized sample, his results may not apply to college graduates or other populations. The lack of rigorous empirical evidence has invited much speculation. Arguments based on anecdotal evidence and correlation studies suggest that the rise of the financial employment leads to the decline of innovation and entrepreneurship(Kedrosky and Stangler, 2011; Wadhwa, 2011).

A classic Roy (1951) model of self-selection would indicate that if finance does not value science and engineering skills, then the skill composition of financiers could be quite different from that of scientists and engineers. The rise of algorithm trading and quantitative finance, as described in Kirilenko and Lo (2013), suggests that this may not be the case and that the return for quantitative skills as well as backgrounds in science and engineering could be quite high. On the other hand, the best scientists and engineers may have strong tastes for working in science and engineering and might not necessarily respond to the monetary incentives (Stern, 2004). While some previous studies find that students' choices of majors and careers are sensitive to potential future payoffs (Berger, 1988; Keane and Wolpin, 1997; Ryoo and Rosen, 2004; Majumdar and Shimotsu, 2006; Boudarbat, 2008), others find that large differences in ability sorting across majors that cannot be explained by earnings premiums, pointing to the importance of unobserved preferences (Arcidiacono, 2004). While Philippon and Reshef (2012) show that the aggregate skill intensity and college premium in finance have both increased dramatically over the past several decades, little empirical evidence exists at the micro-level on the self-selection of entry-level financiers.

3 Data

3.1 Variables and samples

I have collected data on all graduates that received a bachelor's degree from MIT between 2006 and 2012. I collected the data from various offices at MIT, including the Registrar's Office, the Admissions Office, Career Services, Student Financial Services, and Institutional Research. About 1.5% of the population received multiple bachelor's degrees from MIT in different years; I drop that portion from the sample since it is unclear which cohort they belong to.[1] For each of the individuals in my data, I observe his or her gender, ethnicity, year of birth, high school state, and the amount of financial aid he or she received during their senior year. The data also allows me to observe a variety of skill measures, and I construct the following variables from the raw data.

Raw academic talent: The admission numeric index provides a proxy of a student's raw academic talent before entering MIT. Based on college applications, the index score is a weighted average of objective measures such as standardized test scores, high school grades, and the difficulty of high school courses. It does not measure subjective qualities or soft skills. I normalize the admission index within each cohort, so the reported statistics are measured in standard deviations away from the cohort means. The admission index score is available for around 95.2% of the sample and does not apply to transfer students. I exclude from my analysis anyone who is missing an admission index score.

Skill development during college: To receive a bachelor's degree from MIT, a student must satisfy the requirements for the core curriculum (the General Institute Requirements) as well as for the departmental program(s) of her choice. The core curriculum requires students to

[1] I keep students who have received multiple bachelor's degrees in the same year.

take courses in a wide range of subjects from science and engineering to humanities. In the first and second years, students usually take general courses in the core curriculum and introductory courses in the fields of their interest. In their junior and senior years they focus on field-specific courses. I use the primary major declared two years before graduation to measure a student's preliminary academic interest, since all students are required to declare at least one major by the end of the second year. Around 1.2% of the students in my sample had not decided on a major two years before graduation, and around 3.2% of the sample had declared two majors by then. The preliminary academic interest is an excellent indicator of a student's eventual choice of major(s). For instance, over 94% of the students who declared their primary major in Electrical Engineering and Computer Science (EECS), the most popular major at MIT, ended up receiving a bachelor's degree in EECS. Nearly 95% of the students who declared a science primary major received a bachelor's degree in science. For all of the students, I also observe the number of units passed as well as GPA earned during each term, which I use to measure their course load and academic performance during their time at MIT.[2]

Academic skills at graduation: I use the major(s) that a student graduated with and her cumulative GPA to measure the field-specific academic skills that she has at graduation. For the purpose of my analysis, there are four fields of particular interest: management and economics; engineering[3]; mathematics; science other than mathematics[4]. A student could develop skills in two of these fields; around 17% of the graduates double majored. To account for these variations, I assign each of the graduates to one of the seven distinct groups:

1. "Mgmt/Econ & SE" includes students who majored in management or economics as

[2] I do not observe the GPA in the first term since it is not calculated. Freshmen receive either Pass or No Record in their first semester at MIT.

[3] These include Aeronautics and Astronautics (Course 16); Biological Engineering (Course 20); Chemical Engineering (Course 10); Civil and Environmental Engineering (Course 1); EECS (Course 6); Materials Science and Engineering (Course 3); Mechanical Engineering (Course 2); Nuclear Science and Engineering (Course 22); and Ocean Engineering (Course 13).

[4] These include Biology (Course 7); Brain and Cognitive Sciences (Course 9); Chemistry (Course 5); Earth, Atmospheric, and Planetary Sciences (Course 12); and Physics (Course 8). Mathematics is Course 18.

well as science or engineering.

2. "Mgmt/Econ; Non-SE" includes students who majored in management and/or economics but not science or engineering ("Mgmt/Econ; Non-SE"). Some of these students may have double majored in both management and economics, and some may have also majored in a second non-SE field.

3. "Engineering" includes students who majored in engineering and did not major in science or management/economics. Like in Group 2, some of these students may have double majored in two engineering fields or may have also majored in a second non-SE field other than management and economics.

4. "Mathematics" includes students who majored in math but not in engineering, management, or economics. Some of these students may have double majored in two science fields or may have also majored in a second non-SE field.

5. "Other Science" includes students who majored in a science field other than mathematics but did not major in the other three fields of interest.

6. "SE Double" includes students who double majored in science and engineering.

7. "Other Majors" includes the rest of the students; they majored in non-SE fields other than management or economics such as humanities or political science.

Activities participated at MIT: I observe self-reported indicators of participation in internships, the undergraduate research opportunities program ("UROP"), leadership positions, intercollegiate sports, and fraternities or sororities during college. The first three variables are provided by the Graduating Student Surveys, taken every spring by the undergraduate students expecting to graduate by the end of that semester. I obtain the last two variables from the Senior Surveys, taken every even year by the undergraduate seniors. The two surveys serve different purposes but cover mostly the same population. Not all students report their participation in these activities, so I exclude missing values in any analysis involving these variables.

Career outcomes and initial sectors: The Graduating Student Surveys also provide the initial career outcomes. There are three main outcomes: 1) employment, 2) graduate school, and 3) other ("Nonstandard Outcomes" including volunteering, distinguished fellowship, traveling, postponing the job search, undecided, etc.). I assign students who are going into employment into one of the three sectors: 1) finance; 2) science and engineering industries ("SE Industries") such as software, defense, hardware, and bio-tech; 3) Non-science and non-engineering industries other than finance ("Other Non-SE Industries") such as consulting, law, architecture, and marketing. The assignment is done manually by looking up each employer online. In cases when the employer is missing, I use self-reported industries. Thus, there are a total of five outcomes that a graduate could have.[5] For most of the students going into graduate school, I observe their intended degree and field. For most of the employed students, I also observe their starting base annual salary, which I adjust for inflation using the Consumer Price Index. For the graduates entering finance, I construct an indicator variable of whether their job is likely to be quantitative. The indicator is yes if the employer is a hedge fund or the job position is related to trading or quantitative analysis. The most common non-quantitative position in finance in my sample is investment banking analysts.

The full sample for my analysis includes all graduates who received a bachelor's degree from MIT between 2006 and 2012, excluding those with a missing admission index score or who received multiple bachelor's degrees in different years. There are a total of 6521 graduates in the full sample. For my analysis in Section 4 and 5, I focus on the sub-sample of graduates with valid career outcomes, which is around 61% of the full sample.[6]

[5]For graduates going into non-financial industries, I also mark whether they are going into software or consulting, though this information is not used in the main analysis.

[6]MIT grants degrees in June, September, and February. The Graduating Student Surveys are only for June graduates, which are the vast majority of the students. Nearly 92% of the bachelor's degrees granted between 2006 and 2012 were granted in June.

3.2 Descriptive statistics

Table 1 reports the mean statistics for the full sample and three sub-samples: graduates with valid career outcomes (column 2); graduates going into finance (column 3); and graduates taking a quantitative job in finance (column 4). Table A.1 in the Appendix presents the mean statistics for the graduates with the other types of career outcomes. The proportion of female students in the full sample is 45.7%. The sample's average age at graduation is 22.38. Around 37.3% of the students are Caucasian Americans, 27.2% are Asian Americans, and 8.8% are international students. Around 75.2% receive financial aid during their senior year.[7] By construction, the means of the normalized admission index and GPA are both zero in the full sample. Nearly 89% of the students have at least one major in science and/or engineering.[8] Around 11.2% of students majored in management or economics, with 36.7% of them (or 4.1% of the full sample) also majoring in science and engineering. Compared to the full sample, the graduates with valid career outcomes are more likely to be female, have higher admission index scores, and have higher GPAs. The composition of their majors is fairly similar to the full sample, though there are less of the other non-SE majors.

Financiers are less likely to be female, more likely to be Asian American, and less likely to receive financial aid. The average base salary in 2012 dollars is around $78,000, which is around $10,000 more than the average of all the employed graduates. Interestingly, financiers have higher admission index scores but lower GPAs on average, which I explore further in Section 4. Since the overwhelming majority of graduates from MIT are science and engineering majors, it is not surprising that around 73% of the financiers have at least one major in science and/or engineering. It is also not surprising that students who major in management or economics are much more likely to enter finance. Students who major in mathematics are also much more likely to enter finance, while students who have non-math

[7] The average amount of financial aid among those receiving aid is around $23,200 in real 2012 dollars.

[8] This is calculated by excluding "Mgmt/Econ; Non-SE" and "Other Majors."

science majors are much less likely to enter finance.

Compared to all financiers, graduates who take a quantitative job in finance are less likely to be female, more likely to be Caucasian American, and less likely to be international students. Their average base salary in 2012 dollars is around $90,000, which is around $12,000 more than the average of all financiers. They have higher admission index scores, but not much higher GPAs. As expected, their training is more likely to have been quantitatively oriented. Around 80% of them have at least one major in science and/or engineering. In particular, there are more math majors and those who double majored in science and engineering. There is also a slightly higher proportion of graduates who have one major in management or economics and another major in science or engineering.

4 Pre-Crisis Skill Development and Selection into Finance

Since the recent financial crisis may have changed selection into finance after 2008, I focus on the classes of 2006 to 2008 to show how financiers differ from the rest in terms of observed talent and skills before the crisis. Figure 1 plots the distributions of admission index scores and GPAs for the quantitative and non-quantitative jobs in finance as well as the rest of the career outcomes. The mean normalized admission index scores for both quantitative and non-quantitative jobs in finance are positive, suggesting that these graduates are likely to have admission index scores above the mean of their cohorts. Graduates taking quantitative jobs in finance have the highest average admission index scores among the plotted groups, followed by those entering graduate school. Students with career outcomes other than finance and graduate school have negative mean normalized admission index scores.

However, the distributions of normalized GPAs look very different. Students going into graduate school have on average significantly higher GPAs than the rest. The mean normalized GPAs of both quantitative and non-quantitative financiers are slightly negative and comparable to students going into other non-SE industries as well as those who are not going into employment or graduate school.

Figure 1 suggests that both finance and graduate school seem to attract students with the best raw academic talent, but the two groups appear to follow different paths of skill development. For instance, someone who has set their mind on getting into a top doctoral program may work hard to achieve the best grades, whereas students interested in finance may spend more time attending networking events, developing soft skills such as communication, or even practicing trading stocks and derivatives. Below I investigate these differences further.

4.1 Course load and academic performance

To see the differences in students' development of academic skills, I run the descriptive regressions:

$$Units_{it} = \alpha + \beta^t D_i^{Outcome} + \delta(Controls)_{it} + \epsilon_{it}, \quad (1)$$

$$GPA_{it} = \alpha + \beta^t D_i^{Outcome} + \delta(Controls)_{it} + \epsilon_{it}, \quad (2)$$

where the dependent variable is the number of units passed by person i in term t or the term GPA, $D^{Outcome}$ is a set of dummies indicating person i's career outcome, and controls include gender, age, ethnicity, high school region, financial aid, normalized admission index score, indicator variables for major at graduation, interactions between admission index and majors, and indicator variables for semester and year of graduation. Since I include an extensive list of controls, I do not normalize GPA by term. I estimate Equation (1) and (2) in OLS with the omitted career outcome being a quantitative job in finance. Thus, the coefficients of interest β^t measure the differences in course load or academic performance between the graduates of each career outcome and the omitted group. The coefficient estimates do not have any causal interpretation because students' skill development could also influence their career interests.

Figure 2 plots the coefficient estimates and 95% confidence intervals by semester for the other financiers and those entering graduate school, while Figure A.1 plots the coefficient estimates and 95% confidence intervals for the rest of the career outcomes. Although the financiers working for a hedge fund or having a trading position have higher admission index scores on average than the other financiers, both groups take a similar number of courses in each term and earn similar GPAs conditional on their observed characteristics. By contrast, students entering graduate school have a significantly heavier course load before their senior year than the financiers taking a quantitative job. The differences in the course loads between the freshman and junior years average about 2.6 units per term, which is about 22% of a regular full-semester course (12 units). Furthermore, students entering graduate school also have significantly higher GPAs in every term, with the differences averaging about 0.26 points per term, which is about half of the standard deviation of the term GPA in the regression sample. Figure A.1 shows that students going into non-financial industries as well as those with nonstandard outcomes have largely similar course load and academic performance as those taking a quantitative job in finance, except that they have higher GPAs in the senior year.

4.2 Extracurricular Activities

The following descriptive regressions illustrate the differences in students' participation in activities:

$$Activity_i = \alpha + \beta D_i^{Outcome} + \delta(Controls)_i + \epsilon_i, \tag{3}$$

where controls include gender, age, ethnicity, high school region, financial aid, normalized admission index, indicator variables for major at graduation, normalized cumulative GPA, and indicator variables for year of graduation. Thus, the set of coefficients β measures the difference in the participation of each activity conditional on the observed characteristics and academic skill development. The omitted group is the graduates taking a quantitative job in finance.

Table 2 reports the coefficient estimates from Logistic regressions along with the participation rate.[9] The majority of the students in my sample have had undergraduate research experiences, internships, and leadership positions during their time at MIT. About 31% and 39% have taken part in intercollegiate sports or joined a Greek letter society, respectively. Compared to non-financiers, financiers are more likely to have participated in internship, leadership activities, competitive sports, or a fraternity or sorority. Students going to graduate school are significantly more likely to have undergraduate research experiences. Within finance, those taking a quantitative job are significantly more likely to have participated in intercollegiate sports but less likely to have taken leadership positions or joined a fraternity or sorority.

Overall, the results in this section suggest that students with different career interests spend their time differently, and they do not follow the same pattern of skill development. Students interested in going to graduate school take more courses and receive better grades than the potential financiers, and the differences are apparent starting in the freshmen year. In Shu (2012), I find that cumulative GPA positively predicts MIT bachelor's graduates' long-term production of patents, suggesting that academic skill development is an important source of productivity in science and engineering. Financiers, on the other hand, are more likely to engage in activities that develop soft skills, such as taking leadership positions, competing in sports, and socializing in a fraternity or sorority.

5 Immediate Impact of the Crisis on Class of 2009

Figure 3 plots, by cohort, the proportion of students with each of the following career outcomes: going into finance; taking a quantitative job (i.e. in trading or hedge fund); taking other types of jobs in finance (the left graph); going to graduate school; working in a science and/or engineering industry; going into a non-financial non-SE industry; and having an outcome other than employment and graduate school (the right graph). It shows the clear impact of the recent financial crisis on the initial career outcomes of MIT bachelor's

[9] The estimates from Linear Probability Models and Probit are very similar.

graduates. The proportion of financiers drops dramatically in 2009 and does not fully recover afterward. The decrease mainly derives from less people taking the other types of jobs in finance, although there is also a negative trend in the proportion of students taking a quantitative job in finance. Figure 3 provides suggestive evidence on the possible alternative career outcomes of potential financiers. Immediately after the onset of the crisis, graduate school and nonstandard career outcomes both see a surge in 2009, while other industries of employment also experience a downturn to a lesser degree than finance. Over the longer term, however, the downward trend in finance parallels the upward trend in the other sectors of employment especially in the science and engineering industries.

For the class of 2009, the crisis is mainly a sudden shock to the supply of jobs in finance, which also happens after the graduates have finished most of their skill development at MIT. The classes of 2010 to 2012, on the other hand, have more time to adjust to the shock, and could potentially adapt their skill development accordingly, so I estimate the impact of the crisis for them separately.

5.1 Differential Impact on Entry into Finance

Since the financial crisis affects different types of jobs in finance differently, the impact of the financial crisis on entry into finance is likely to vary based on the graduates' academic skills. To examine this differential impact, I run the following regressions:

$$Pr(Outcome_i = Fin) = \alpha + \beta \left(D_i^{2009} \times \Gamma_i \right) + \delta (Controls)_i + \epsilon_i \quad (4)$$

where the dependent variable is an indicator variable for whether graduate i enters finance after graduation, D_i^{2009} is the indicator variable for the 2009 cohort, Γ_i is a set of indicator variables for the seven groups that graduate i is classified to based on her major(s) at graduation, and controls include gender, age, ethnicity, high school region, financial aid status, normalized admission index, normalized cumulative GPA, and indicator variables for academic groups. The regression sample includes only the 2006-2009 cohorts to show the immediate impact of the crisis. The set of parameters of interests, β, measures the change in the probability of entering finance between the 2009 and 2006-2008 cohorts within each academic group.

Table 3 reports the coefficient estimates from linear probability regressions using three sets of controls for any unobserved time trend. The first includes no controls and assumes that there is no unobserved trend in entry into finance between 2006 and 2009 other than the break in 2009. The second includes a linear trend, which may also absorb part of the effect of the crisis. The third includes dummies for the 2006 and 2007 cohorts and uses 2008 as the base cohort. All three specifications give very similar results. I also estimate the regressions with taking a quantitative job in finance (Columns (4)-(6)) or taking other jobs in finance (Column (7)-(9)) as the dependent variable. Overall, engineering students as well as the management/economics students without an SE major are significantly less likely to enter finance in 2009 compared to the previous years. In 2006-2008, the proportions of financiers among the engineering graduates and the "Mgmt/Econ; Non-SE" group are 8% and 44.7%, respectively. Thus, the magnitude of the effect in 2009 is quite large, equivalent to almost half of the base probabilities. Consistent with Figure 3, the main source of the effect comes from the decrease in the likelihood of taking a non-quantitative job in finance. Similarly, Columns (7) to (9) show that almost all the other academic groups are also significantly less likely to take a non-quantitative job in finance in 2009. The two exceptions are non-math science majors and other non-SE majors, who have very low probabilities of entering finance.

Interestingly, for the management/economics students who also major in science and engineering as well as those double majoring in both science and engineering, the decrease in the probability of taking a non-quantitative job in finance is compensated by a significant increase in the probability of taking a quantitative job in finance. As a result, these two groups only experience a small and insignificant decrease in the overall likelihood of entering finance in 2009. The math majors are somewhat more likely to take a quantitative job in finance but the magnitude is not large or statistically significant. There is a sizable decrease in their overall probability of entering finance, although the effect is not statistically significant.

5.2 Alternative Career Outcomes in 2009

To examine the alternative careers of potential financiers in 2009, I run the following regressions on the 2006-2009 cohorts:

$$Pr(Outcome_i) = \alpha + \beta D_i^{2009} + \delta(Controls)_i + \epsilon_i \tag{5}$$

where the dependent variable is an indicator variable for whether graduate i has a certain career outcome. I estimate the equation within each of the two groups whose entry into finance is significantly affected in 2009: engineering graduates (who do not major in science or management/economics) and management/economics graduates without an SE major.

Table 4 suggests for the management/economics graduates without an SE major, non-standard career outcomes is the main alternative to finance. For those who concentrate on engineering, graduate school is also an option. In particular, the engineering graduates are 10% more likely to enter graduate school in 2009, which is more than the decrease in the likelihood of their entry into finance.

5.3 Comparing Marginal and Average Financiers

The significant impact of the recent financial crisis on entry into finance implies that some students did not become financiers *because* of the shock. I call those individuals whose career choices are sensitive to this shock the "marginal financiers." In contrast, the "infra-marginal financiers" work in finance regardless of the graduating economic conditions. Figure 3 and Table 3 suggest that the marginal financiers are unlikely to work for a hedge fund or in a trading/quantitative position. They are likely to be engineering graduates as well as management/economics graduates without an SE major. Following Gruber et al.

(1999); Chandra and Staiger (2007), I develop an empirical test to further determine how the marginal financiers differ from the average financiers in terms of raw academic talent:

$$Y_i = \alpha + \delta ln\left(S_j\right) + \epsilon_i \tag{6}$$

where Y is an outcome variable of interest (e.g., admission index score) and S_j is the share of financiers in cohort j. The regression is run on *the sample of financiers only.*

Intuitively, δ measures how much the average characteristic of financiers changes when there are more financiers. As the proportion of financiers increases, their average outcome changes based on how much each additional financier differs from the average. A negative δ implies that each additional financier decreases the mean outcome of the entire group of financiers. Mathematically, the relationship is

$$\delta = \frac{\partial Y/S}{\partial ln\left(S\right)} = \frac{\partial Y}{\frac{\partial S}{S}}\frac{1}{S} + \frac{\partial \frac{1}{S}}{-\partial ln\left(\frac{1}{S}\right)}Y = \frac{\partial Y}{\partial S} - \frac{Y}{S}.$$

This shows that δ measures the difference between a marginal financier's outcome ($\frac{\partial Y}{\partial S}$) and the average outcome ($\frac{Y}{S}$).

Table 5 reports the coefficient estimates from OLS with two dependent variables: the log real base salary (measured in 2012 dollars) and the normalized admission index scores. The regression sample includes only the 2006-2009 cohorts. The marginal financiers earn almost 18% less in their observed base salary than the average financiers and have around 0.67 standard deviation lower admission index scores conditional on their academic groups. Since the decrease of financiers in 2009 comes mainly from the non-quantitative jobs, part of this difference could be driven by the observation that the quantitative jobs in finance have higher base salaries and take graduates with higher admission index scores than the rest of finance. However, column (2) shows that even within the quantitative jobs in finance, the average real base salary rises for nearly 10% in 2009. The average salary within the non-quantitative jobs has a modest but insignificant increase. Columns (5) and (6) further show that the average admission index scores within each type of jobs in finance both increase significantly in 2009 even conditional on the academic groups.

Overall, the results from this section show that the immediate impact of the financial crisis on the career outcomes of the class of 2009 depends on their academic training and raw talent. Although there is a dramatic decrease in the availability of entry-level jobs in the non-quantitative part of finance, graduates with double majors and SE background are able to switch to a quantitative job in finance. The management/economics students who do not major in science and engineering are hit the hardest; a large proportion of them are not able to enter finance and instead have outcomes other than employment and graduate school. Although graduates who focus on engineering are also significantly less likely to enter finance, graduate school is a viable option for some of them.

The decrease in the supply of jobs in finance made the financial sector significantly more competitive in 2009. The fewer financiers who enter the sector right after the crisis had higher base salaries adjusted for inflation, and they also had higher admission index scores than the previous financiers. These differences hold even after controlling for their academic background and the type of job in finance.

6 Later Impact of the Crisis on Classes of 2010-2012

For the classes of 2010-2012, the financial crisis may have changed the demand for a job in finance as well as the supply, as a job in finance may be considered more rent-seeking and riskier than before. If so, the students may have changed their skill development accordingly by changing their field of study or changing the time they allocate to different activities. To see whether there is a change in students' probability of majoring in management and economics, I run the following regressions:

$$Pr(MgmtOriented_i) = \alpha + \beta D_i^{2010-2012} + \delta(Controls)_i + \epsilon_i \quad (7)$$

$$Pr(Mgmt_i) = \alpha + \beta D_i^{2010-2012} + \eta MgmtOriented_i + \delta(Controls)_i + \epsilon_i \quad (8)$$

where controls include gender, age, ethnicity, high school region, financial aid status, and normalized admission index. "*MgmtOriented*" is 1 if graduate i declares the primary major in management or economics two years before graduation (i.e. at the end of the sophomore year), and "*Mgmt*" is 1 if graduate i receives a degree in management and/or economics.

Table 6 suggests that there is no significant change in the graduates' tendency to major in management and economics regardless of how I control for the time trend. The results are the same in the full sample as well as in the sub-sample with valid career outcomes. Furthermore, there is also no significant change in the graduates' tendency to double major in management/economics and science/engineering.

Since there is no evidence on the effect of the crisis on major choices, I can estimate the differential impact of the crisis on the career outcomes of the 2010-2012 cohorts using specifications similar to Equation (4) and Equation (5). The results are reported in Table 7. Compared to the 2006-2008 cohorts, only the management/economics graduates without a SE major among the 2010-2012 cohorts are significantly less likely to enter finance, and they are mostly dropping out of the non-quantitative side of finance. It is unclear what their alternative career paths to finance might be, but Columns (4) to (7) suggest that they are unlikely to be working in the science and engineering industries or going to graduate school.

7 Conclusion

How productive would the elite college graduates going into finance have been in a world with fewer jobs in finance? My analysis based on the recent MIT bachelor's graduates suggests that financiers are unlikely to have become highly productive scientists and engineers due to three observations. Firstly, although financiers have ex ante good raw academic talent, they are significantly less likely to develop academic skills, which are highly valued in the science and engineering sectors, than students who are going to graduate school. Instead, they spend more time developing non-academic skills by participating in different extracurricular activities. Second, the recent financial crisis, though a great exogenous shock to the entry-level jobs in finance, has not affected most of the science and engineering students. The largest impact has been on the management and economics students who did not major in science and engineering, who as a result of the crisis are pushed into career outcomes other than employment and graduate school in 2009. Third, I find no evidence that the crisis has affected the later graduates' choice of majors.

This paper builds toward an understanding of the welfare implications of the growing financial sector in the U.S., focusing on the top of the talent distribution. My results are likely informative for other top engineering and science undergraduate programs. However, it is important to note the differences between MIT bachelor's graduates and the average science and engineering population. First, as the number one ranked engineering school (U.S. News Ranking, 2012), MIT is likely to attract students who are best suited for engineering and science in terms of both their talents and tastes. Thus, even though a marginal financier from MIT may not have been the most productive scientist or engineer from MIT, she may still have above average talent compared to the broader population. An important direction for future research would be to generalize the methodology developed in this paper to study a more representative sample of engineering and science students in the U.S.

References

Acemoglu, Daron, "Reward Structures and the Allocation of Talent," *European Economic Review*, 1995, *39* (1).

Arcidiacono, Peter, "Ability Sorting and the Returns to College Major," *Journal of Econometrics*, 2004, *121* (1-2).

Baumol, William, "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of Political Economy*, 1990, *98* (5-1).

Berger, Mark C., "Predicted Future Earnings and Choice of College Major.," *Industrial and Labor Relations Review*, 1988, *41* (3).

Bolton, Patrick, Tano Santos, and Jose A. Scheinkman, "Cream Skimming in Financial Markets," *National Bureau of Economic Research Working Paper No. 16804*, 2011.

Boudarbat, Brahim, "Field of study choice by community college students in Canada," *Economics of Education Review*, 2008, *27* (1), 79–93.

Chandra, Amitabh and Douglas Staiger, "Productivity Spillovers in Health Care: Evidence from the Treatment of Heart Attacks," *Journal of Political Economy*, 2007, *115*, 103–140.

Goldin, Claudia and Lawrence Katz, "Transitions: Career and Family Life Cycles of the Educational Elite," *American Economic Review*, 2008, *98* (2), 363–369.

Goolsbee, Austan, "Does Government R&D Policy Mainly Benefit Scientists and Engineers?," *American Economic Review*, 1998, *88* (2), 298–302.

Greenwood, Robin and David Scharfstein, "The Growth of Finance," *Journal of Economic Perspectives*, February 2013, *27* (2), 3–28.

Gruber, Jonathan, Phillip Levine, and Douglas Staiger, "Abortion Legalization and Child Living Circumstances: Who is The "Marginal Child"?," *Quarterly Journal of Economics*, 1999, *114* (1), 263–291.

Hastings, Daniel, Steven Lerman, and Melanie Parker, "The Demand for MIT Graduates," *MIT Faculty Newsletter*, February 2010, *XXII* (3).

Keane, Michael P. and Kenneth I. Wolpin, "The Career Decisions of Young Men," *Journal of Political Economy*, 1997, *105* (3).

Kedrosky, Paul and Daniel Stangler, "Financialization and Its Entrepreneurial Consequences," Technical Report, Kauffman Foundation Research Series 2011.

Kirilenko, Andrei A and Andrew W Lo, "Moore's Law versus Murphy's Law: Algorithmic Trading and Its Discontents," *Journal of Economic Perspectives*, February 2013, *27* (2), 51–72.

Majumdar, Sumon and Katsumi Shimotsu, "Enrollment Responses to Labour Market Conditions: A Study of the Canadian Market for Scientists and Engineers," *Queen's Economics Department Working Paper No. 1105*, 2006.

Malkiel, Burton G, "Asset Management Fees and the Growth of Finance," *Journal of Economic Perspectives*, February 2013, *27* (2), 97–108.

Murphy, Kevin M., Andrei Shleifer, and Robert W. Vishny, "The Allocation of Talent: Implications for Growth," *Quarterly Journal of Economics*, 1991, *106* (2), 503–530.

Oyer, Paul, "The Making of an Investment Banker: Stock Market Shocks, Career Choice, and Lifetime Income," *Journal of Finance*, 2008, *63* (6), 2601–2628.

Philippon, Thomas, "The Evolution of the US Financial Industry from 1860 to 2007: Theory and Evidence," *New York University Working Paper*, 2008.

_ , "Financiers versus Engineers: Should the Financial Sector Be Taxed or Subsidized?," *American Economic Journal: Macroeconomics*, 2010, *2* (3), 158–182.

_ **and Ariell Reshef**, "Wages and Human Capital in the U.S. Finance Industry: 1909–2006," *The Quarterly Journal of Economics*, November 2012, *127* (4), 1551–1609.

Rampell, Catherine, "Out of Harvard, and Into Finance," http://economix.blogs.nytimes.com/2011/12/21/out-of-harvard-and-into-finance/ 2011.

Romer, Paul M., "Should the Government Subsidize Supply or Demand in the Market for Scientists and Engineers?," in "Innovation Policy and the Economy," MIT Press, January 2001, pp. 221–252.

Roy, A. D., "Some Thoughts on the Distribution of Earnings," *Oxford Economic Papers*, 1951, *3* (2), 135–146.

Ryoo, Jaewoo and Sherwin Rosen, "The Engineering Labor Market," *Journal of Political Economy*, 2004, *112* (1-2), 110–140.

Shu, Pian, "The Long-term Impact of Business Cylces on Innovation: Evidence from MIT," *Working Paper*, 2012.

Stern, Scott, "Do Scientists Pay to Be Scientists?," *Management Science*, 2004, *50* (6), 835.

U.S. News, "Best Undergraduate Engineering Schools," http://colleges.usnews.rankingsandreviews.com/best-colleges/rankings/engineering 2012.

Wadhwa, Vivek, "Friends Don't Let Friends Get Into Finance," *TechCrunch.Com*, March 2011.

Tables and Figures

Table 1. Summary Statistics

Variable	All	Valid Career	Finance	Finance (Quantitative)
N	6,521	3,952	336	122
Base Salary	-	\$67,857	\$77,821	\$90,600
Demographics				
Female	45.7%	49.5%	36.0%	20.5%
Age at Graduation	22.38	22.26	22.28	22.26
Caucasian American	37.3%	39.5%	34.5%	45.1%
Asian American	27.2%	28.5%	38.1%	33.6%
International Student	8.8%	8.1%	10.1%	4.9%
Receiving Financial Aid	75.2%	77.6%	71.4%	69.7%
Academic Talent and Skills				
Normalized Adm Index	0.00	0.05	0.21	0.44
Normalized GPA	0.00	0.17	0.01	0.03
Mgmt./Econ & SE	4.1%	4.3%	17.9%	19.7%
Mgmt/Econ; Non-SE	7.1%	6.5%	26.2%	18.0%
Engineering	53.7%	55.4%	35.4%	30.3%
Math	6.2%	5.9%	13.1%	20.5%
Other Science	18.9%	18.7%	2.1%	1.6%
SE Double	5.9%	6.3%	4.8%	8.2%
Other Majors	4.1%	3.0%	0.6%	1.6%

Notes: This table reports the mean statistics for: (1) the full sample, (2) the sub-sample with valid career outcomes, (3) the sub-sample of graduates going into finance, and (4) the sub-sample of graduates working in quantitative jobs in finance. “Base Salary” and “Financial Aid” are both in 2012 dollars.

Table 2. Participation in Activities

	(1) UROP	(2) Internship	(4) Leadership	(5) IC Sports	(6) Fraternity
Participation Rate	85.7%	76.3%	71.5%	31.3%	39.1%
Finance - Other	-0.009	-0.090***	0.129***	-0.104***	0.074***
	(0.007)	(0.019)	(0.016)	(0.019)	(0.022)
Graduate School	0.040**	-0.339***	-0.036	-0.157***	-0.168***
	(0.020)	(0.005)	(0.029)	(0.023)	(0.043)
Other Non-SE Industries	-0.016	-0.366***	0.045**	-0.185***	-0.013
	(0.015)	(0.015)	(0.022)	(0.019)	(0.024)
SE Industries	0.004	-0.342***	-0.020	-0.242***	-0.102***
	(0.014)	(0.022)	(0.027)	(0.016)	(0.017)
Nonstandard Outcomes	0.009	-0.438***	-0.043	-0.128***	-0.135***
	(0.013)	(0.019)	(0.027)	(0.022)	(0.025)
N	1598	1556	954	766	766

Notes: Person-level observations. Coefficients reported are marginal effects from Logistic models. Dependent variable is 0/1 indicator variable for participating in undergraduate research opportunities program (Column (1)), internship (Column (2)), leadership positions (Column (3)), intercollegiate sports (Column (4)), and fraternity or sorority (Column (5)) during the time at MIT. Robust standard errors clustered by career outcome are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Sample includes the 2006-2008 cohorts with valid responses to the survey questions on the Graduating Student Surveys and Senior Surveys. All the regressions control for gender, age, ethnicity, high school region, financial aid, normalized admission index, indicator variables for major at graduation, normalized cumulative GPA, and indicator variables for year of graduation.

Table 3. Immediate Impact of the Financial Crisis on Entry into Finance (2006-2009)

Outcome	Finance - All			Finance - Quantitative			Finance - Other		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$D_i^{2009}\times$ "Mgmt & SE"	-0.020	-0.005	-0.017	0.172*	0.177*	0.175*	-0.192**	-0.182**	-0.192**
	(0.098)	(0.095)	(0.093)	(0.060)	(0.061)	(0.060)	(0.041)	(0.035)	(0.037)
$D_i^{2009}\times$ "Mgmt; Non-SE"	-0.210***	-0.195***	-0.208***	-0.000	0.005	0.003	-0.209***	-0.200***	-0.210***
	(0.018)	(0.010)	(0.019)	(0.014)	(0.013)	(0.013)	(0.016)	(0.010)	(0.015)
$D_i^{2009}\times$ "Engineering"	-0.041***	-0.027*	-0.039***	-0.006***	-0.000	-0.002*	-0.036***	-0.026*	-0.036***
	(0.006)	(0.011)	(0.002)	(0.001)	(0.001)	(0.001)	(0.006)	(0.011)	(0.002)
$D_i^{2009}\times$ "Math"	-0.110	-0.096	-0.109	0.017	0.022	0.020	-0.127***	-0.117***	-0.129***
	(0.058)	(0.056)	(0.063)	(0.062)	(0.061)	(0.062)	(0.021)	(0.013)	(0.019)
$D_i^{2009}\times$ "Other Science"	-0.014*	0.001	-0.011*	-0.005	-0.000	-0.002	-0.009	0.001	-0.009
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.005)	(0.010)
$D_i^{2009}\times$ "SE Double"	-0.014	0.000	-0.012	0.034**	0.039**	0.037**	-0.048**	-0.039	-0.049**
	(0.022)	(0.030)	(0.022)	(0.007)	(0.008)	(0.008)	(0.015)	(0.023)	(0.014)
$D_i^{2009}\times$ "Other Majors"	-0.031	-0.016	-0.028	-0.029	-0.024	-0.026	-0.001	0.008	-0.002
	(0.038)	(0.032)	(0.034)	(0.037)	(0.037)	(0.036)	(0.005)	(0.011)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort	No	Linear	Dummies	No	Linear	Dummies	No	Linear	Dummies
N	2154	2154	2154	2154	2154	2154	2154	2154	2154

Notes: Person-level observations. Coefficients reported are from linear probability regressions. Robust standard errors clustered at the cohort level are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Sample includes the 2006-2009 cohorts with valid career outcomes. *"D_i^{2009}:"* indicator for the 2009 cohort. All the regressions control for gender, age, ethnicity, high school region, financial aid, normalized admission index, normalized cumulative GPA, and indicator variables for academic group.

Table 4. Immediate Impact of the Financial Crisis on Alternative Career Outcomes (2006-2009)

	Other Non-SE Industries	SE Industries	Graduate School	Nonstandard Outcomes
	Panel A: "Mgmt; Non-SE" (N = 153)			
D_i^{2009}	-0.077	0.037	-0.049*	0.249**
	(0.071)	(0.027)	(0.019)	(0.043)
Cohort	Linear	Linear	Linear	Linear
	Panel B: "Engineering" (N = 1,173)			
D_i^{2009}	-0.035**	-0.084*	0.117***	0.043**
	(0.007)	(0.029)	(0.015)	(0.011)
Cohort	Linear	Linear	Linear	Linear

Notes: Person-level observation. All estimates are from linear probability regressions. Dependent variable is initial career outcome. Robust standard errors clustered at the cohort level are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Samples include the management/economics graduates in the 2006-2009 cohorts who do not have a major in science and engineering (Panel A), the engineering graduates in the 2006-2009 cohorts who do not have a major in science or management/economics. *"D_i^{2009}:"* indicator for the 2009 cohort. All the regressions control for gender, age, ethnicity, high school region, financial aid, normalized admission index, and normalized cumulative GPA.

Table 5. Immediate Impact of the Financial Crisis on Composition of Financiers (2006-2009)

Dep. Var.	Log(Salary)		Normalized Admission Index			
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Financiers Share)	-0.179***		-0.742**	-0.661**		
	(0.020)		(0.128)	(0.157)		
D_i^{2009}×Quantitative Jobs		0.098***			0.561***	0.446**
		(0.007)			(0.086)	(0.089)
D_i^{2009}×Other Jobs		0.017			0.245	0.280*
		(0.012)			(0.110)	(0.106)
Quantitative Jobs		0.239***			0.194***	0.176*
		(0.019)			(0.028)	(0.070)
Dummies for Academic Groups	No	No	No	Yes	No	Yes
N	211	211	216	216	216	216

Notes: Person-level observation. All estimates are from ordinary-least-squares (OLS). Robust standard errors are corrected clustered at the cohort level are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Samples include all financiers from the 2006-2010 cohorts. *"Log (Financiers Share):"* logarithm of the proportion of financiers in the cohort. *"Quantitative Jobs:"* an indicator of whether the employer is a hedge fund or the position is in trading and quantitative analysis. *"D_i^{2009}:"* indicator for the 2009 cohort.

Table 6. Impact of the Financial Crisis on Choice of Major (2006-2012)

	Mgmt/Econ by Sophomore		Mgmt/Econ at Graduation		Mgmt/Econ & SE	
	Panel A: Full Sample (N = 6,521)					
$D_i^{2010-2012}$	-0.014	0.014	0.000	-0.005	0.000	-0.009
	(0.009)	(0.009)	(0.003)	(0.007)	(0.004)	(0.005)
Cohort	None	Linear	None	Linear	None	Linear
	Panel B: Valid Career (N = 3,952)					
$D_i^{2010-2012}$	-0.014	0.018	0.006	0.002	0.006	0.002
	(0.011)	(0.011)	(0.004)	(0.010)	(0.004)	(0.010)
Cohort	None	Linear	None	Linear	None	Linear

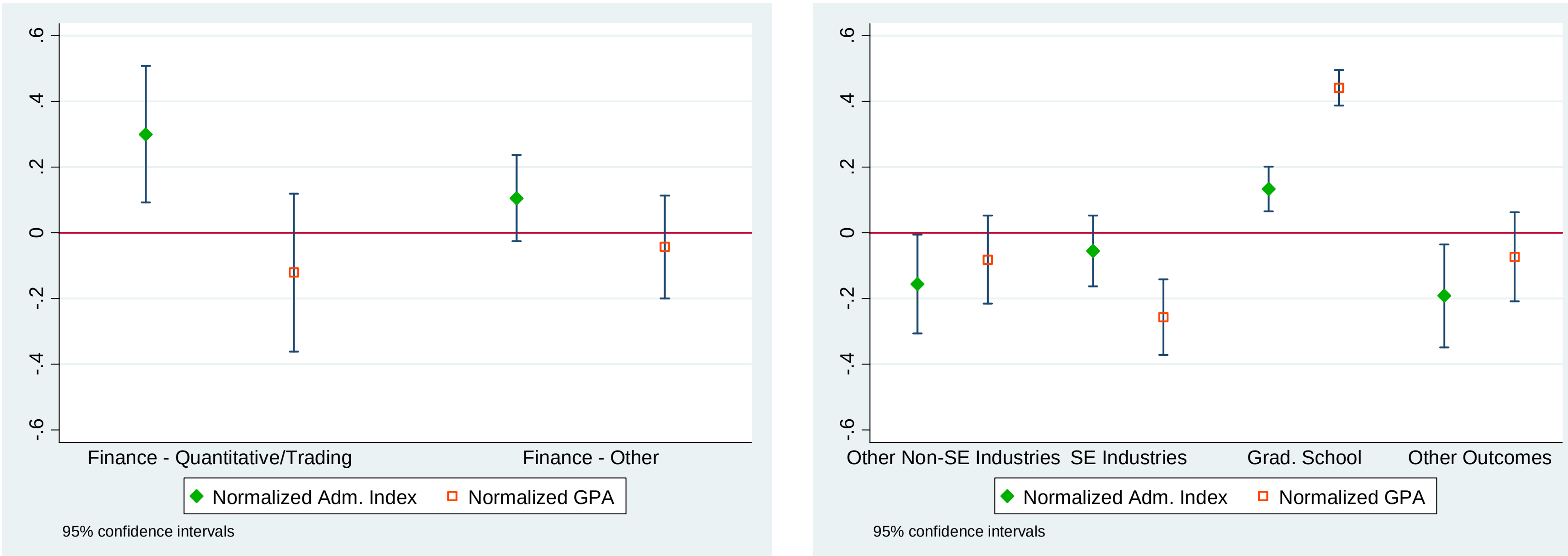
Notes: Person-level observation. All estimates are from linear probability regressions. Robust standard errors clustered at the cohort level are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Samples include all graduates in the 2006-2012 cohorts except for students with missing admission index and students receiving multiple bachelor's degrees in different years (Panel A) and the 2006-2012 graduates with valid career outcomes (Panel B). *"$D_i^{2010=2012}$:"* indicator for the 2010-2012 cohorts. All the regressions control for gender, age, ethnicity, high school region, financial aid, and normalized admission index.

Table 7. Later Impact of the Financial Crisis on Career Outcomes (Excluding 2009)

Sample	All Groups			"Mgmt; Non-SE"			
Outcome	Fin.	Fin. - Quant.	Fin. - Other	Other SE	SE Industries	Grad.School	Nonstandard
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$D_i^{2010-2012} \times$ "Mgmt & SE"	-0.063	0.017	-0.080				
	(0.101)	(0.071)	(0.050)				
$D_i^{2010-2012} \times$ "Mgmt; Non-SE"	-0.164***	-0.040	-0.124***				
	(0.024)	(0.029)	(0.012)				
$D_i^{2010-2012} \times$ "Engineering"	0.000	0.006*	-0.006				
	(0.017)	(0.003)	(0.015)				
$D_i^{2010-2012} \times$ "Math"	0.013	0.039	-0.026				
	(0.061)	(0.062)	(0.027)				
$D_i^{2010-2012} \times$ "Other Science"	-0.012	0.007	-0.019				
	(0.029)	(0.014)	(0.021)				
$D_i^{2010-2012} \times$ "SE Double"	0.033	0.007	0.026*				
	(0.017)	(0.007)	(0.011)				
$D_i^{2010-2012} \times$ "Other Majors"	0.010	-0.023	0.033				
	(0.031)	(0.034)	(0.017)				
$D_i^{2010-2012}$				0.129	0.005	-0.042	0.062
				(0.135)	(0.154)	(0.040)	(0.065)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort	Linear	Linear	Linear	Linear	Linear	Linear	Linear
N	3,415	3,415	3,415	226	226	226	226

Notes: Person-level observations. Coefficients reported are from linear probability regressions. Robust standard errors clustered at the cohort level are shown in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Sample includes the 2006-2008 and 2010-2012 cohorts with valid career outcomes. *"$D_i^{2010-2012}$:"* indicator for the 2010-2012 cohorts. All the regressions control for gender, age, ethnicity, high school region, financial aid, normalized admission index, normalized cumulative GPA, and indicator variables for academic group.

Figure 1. By Career Outcome (2006-2008): Mean and 95% CIs of Adm. Index and GPA.

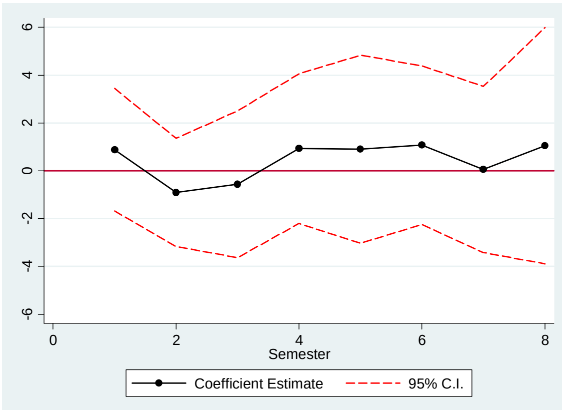


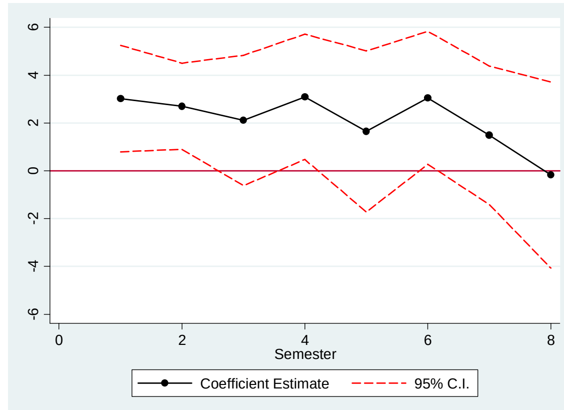
Finance | Non-Finance

Notes: Person-level observation. This figure plots, by initial career outcome, the mean and 95% confidence intervals of normalized admission index and GPA. Sample includes the individuals in the 2006-2008 cohorts with valid career outcomes.

Figure 2. Differences in Skill Development (2006-2008): Course Load and Academic Performance

Panel A: Units by Semester

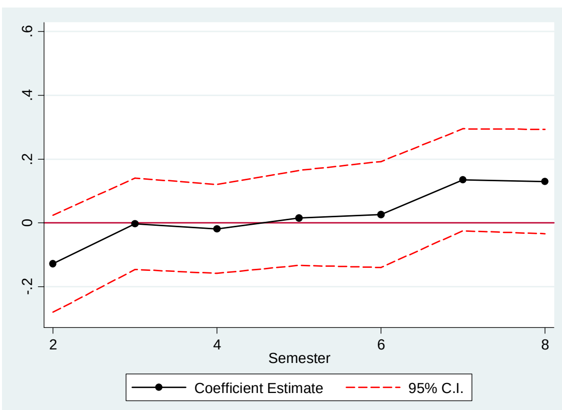


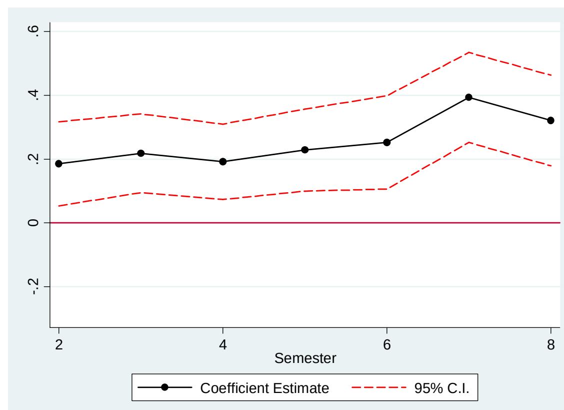


Finance - Other

Graduate School

Panel B: GPA by Semester



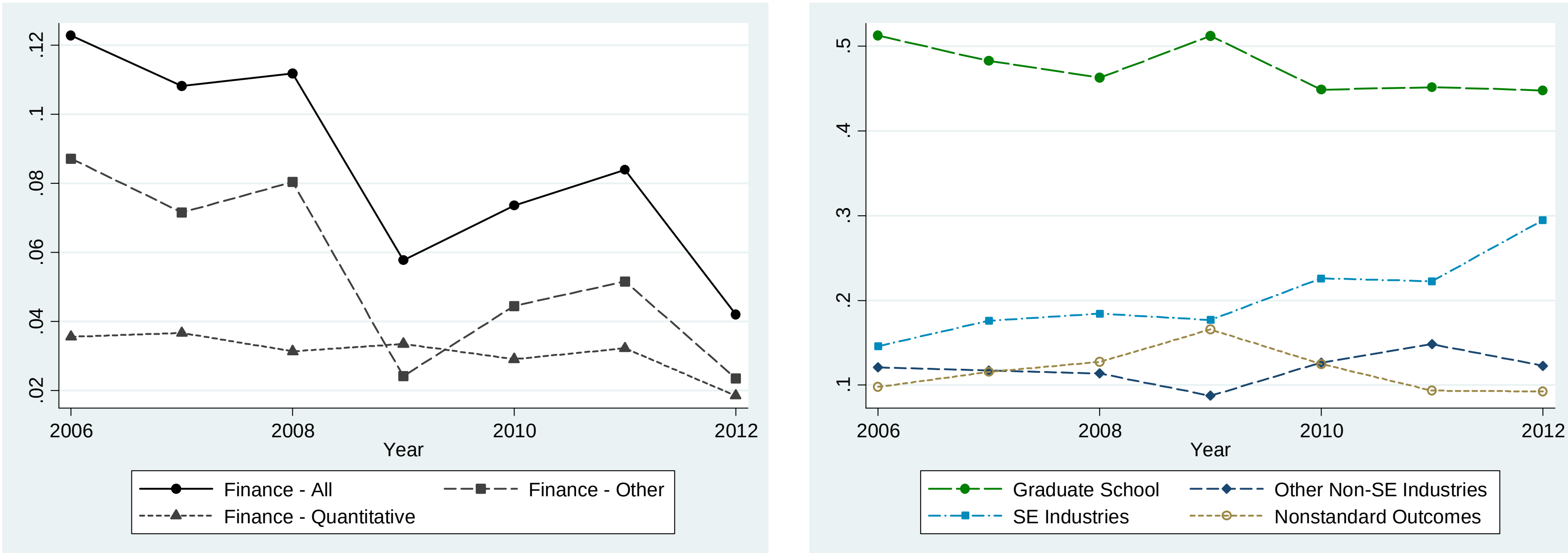


Finance - Other

Graduate School

Notes: Person*semester-level observation. This figure plots, by semester, the OLS coefficient estimates for Equation (1) and (2). Sample includes the individuals in the 2006-2008 cohorts with valid career outcomes. Students taking a quantitative job in finance are the omitted group. Standard errors are clustered by person.

Figure 3. By Year: Distribution of Career Outcomes



Finance

Non-Finance

Notes: Person-level observation. This figure plots, by year, the proportion of students with different career outcomes. Sample includes the individuals in the 2006-2012 cohorts with valid career outcomes.

8 Appendix: Additional Tables and Figures

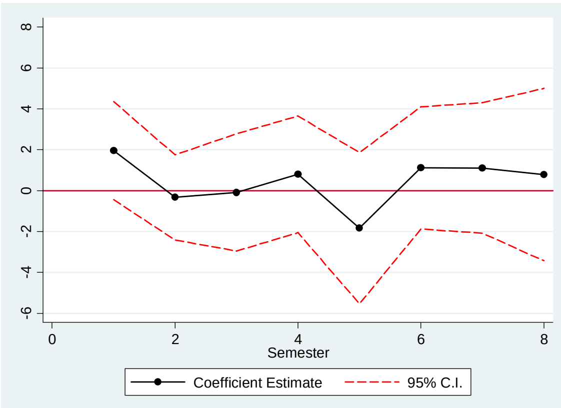
Table A.1. Summary Statistics for Other Career Outcomes

Variable	Grad. School	SE Industries	Other Non-SE Industries	Nonstandard Outcomes	Consulting	Software
N	1,870	476	812	458	255	272
Real Base Salary		$61,289	$67,370		$68,288	$81,628
Demographics						
Female	51.5%	48.5%	45.9%	58.3%	46.7%	33.5%
Age at Graduation	22.22	22.28	22.33	22.26	22.27	22.37
Caucasian American	39.5%	40.8%	42.2%	37.1%	37.3%	37.9%
Asian American	29.6%	28.8%	23.9%	24.9%	34.5%	25.4%
International Student	8.7%	6.7%	6.9%	7.6%	8.6%	11.8%
Receiving Financial Aid	77.5%	76.1%	79.9%	80.1%	70.6%	76.1%
Academic Talent and Skills						
Normalized Adm Index	0.19	-0.13	-0.15	-0.13	0.08	0.02
Normalized GPA	0.47	-0.07	-0.21	-0.05	0.13	-0.25
Mgmt/Econ & SE	2.2%	7.6%	3.1%	1.8%	12.2%	4.8%
Mgmt/Econ; Non-SE	1.8%	16.4%	3.6%	5.9%	18.8%	5.5%
Engineering	53.6%	52.1%	72.3%	50.9%	52.6%	73.5%
Math	5.5%	3.2%	4.8%	7.0%	3.5%	8.8%
Other Science	24.9%	13.5%	11.6%	23.1%	8.6%	2.6%
SE Double	9.5%	2.5%	3.0%	4.4%	3.1%	3.3%
Other Majors	2.6%	4.8%	1.7%	7.0%	1.2%	1.5%
Other Majors	2.6%	4.8%	1.7%	7.0%	1.2%	1.5%

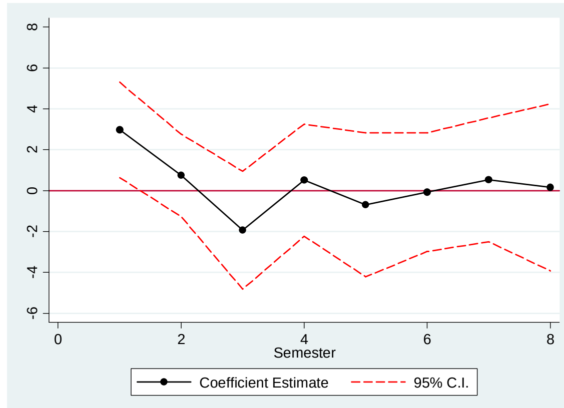
Notes: This table reports the mean statistics for: (1) the sub-sample entering graduate school, (2) the sub-sample going into science and engineering related industries, (3) the sub-sample going into non-SE related industries other than finance, (4) the sub-sample with outcomes other than employment and graduate school, (5) the sub-sample going to work for consulting firms, (6) the sub-sample going to work for software firms. "Base Salary" and "Financial Aid" are both in 2012 dollars.

Figure A.1. Differences in Skill Development (2006-2008): Course Load and Academic Performance; Other Career Outcomes

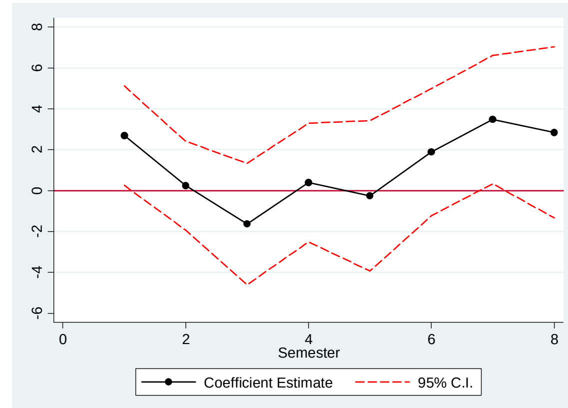
Panel A: Units by Semester



Employed in Other Non-SE Industries

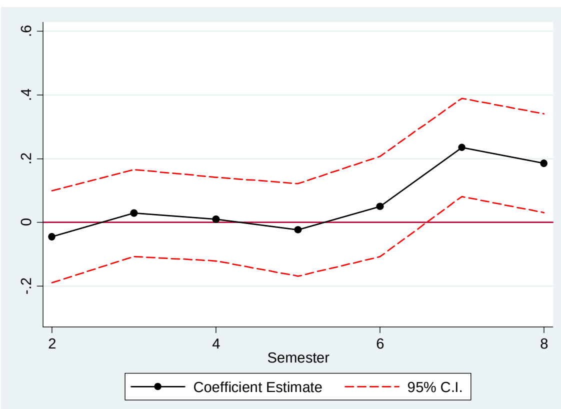


Employed in SE Industries

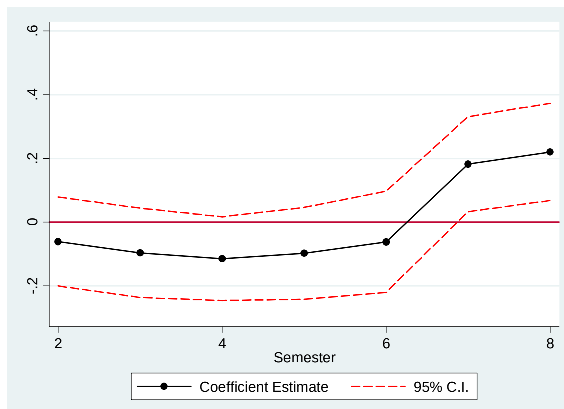


Nonstandard Outcomes

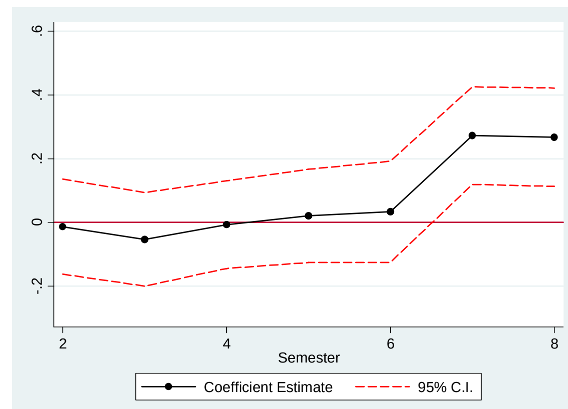
Panel B: GPA by Semester



Employed in Other Non-SE Industries



Employed in SE Industries



Nonstandard Outcomes

Notes: Person*semester-level observation. This figure plots, by semester, the OLS coefficient estimates for Equation (1) and (2). Sample includes the individuals in the 2006-2008 cohorts with valid career outcomes. Students taking a quantitative job in finance are the omitted group. Standard errors are clustered by person.