Searching for Jobs: Evidence from MBA Graduates

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Abstract

This paper proposes and tests empirically a model of optimal job search using novel data on job seeking strategies of participants in the labor market for MBA graduates. Theoretically and empirically I find that the breadth of search that workers conduct depends on their ability, outside option, and fit with available jobs, as well as on the exogenous job application cost and the ex-ante probability of applications resulting in offers. These results illustrate the formation of the supply of human capital available to hiring companies, which drives the efficiency of matching between workers and firms and ultimately determines productivity.

Keywords: job search, matching, human capital, MBA education, career choice

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1 Introduction

An important driver of firm productivity is hiring talented workers whose skills match the needs of the firm. While there exist significant theoretical work regarding matching in the labor market, spearheaded by the seminal contributions of Spence (1973) and Jovanovic (1979), this work assumes that workers either get matched with firms at random and the quality of the match is revealed over time (as in Jovanovic (1979)), or they use a directed search approach by targeting firms that offer higher wages (Rogerson, Shimer, & Wright (2005)). These models are meant to capture macroeconomic phenomena such as the dynamics of unemployment and wages, but do not seek to explain the formation of the pool of human capital available to each firm.

The actual search strategies used by workers, however, determine the supply of human capital that individual firms face when making hiring decisions. Therefore, job candidates' search choices drive the efficiency of the actual matches between firms and workers and ultimately influence firm productivity, but this search process is yet to be understood. This paper addresses this gap in the literature by proposing and testing empirically a simple model of allocation of effort during workers' search for jobs, with the goal of understanding the determinants of the supply of talent available to firms. I use a novel data set that contains detailed information about the search strategies and labor market outcomes of more than 2,000 MBA graduates from a top U.S. business school recruited by globally-known companies.

Theoretically I show that candidates competing for employment increase their job search effort if the marginal cost of effort is lower, the likelihood that firms will hire increases, their outside option is worse, the job sought is more valuable, or if their ability is lower. Candidates apply to positions for which they are better qualified, while higher ability types are more likely to choose to participate in contests for higher paying jobs.

These predictions are confirmed empirically. I find that candidates apply to more positions when they do not have to spend valuable points to bid to be considered for these jobs, and, conditional on having an offer from a previous summer or full-time employer, they apply to fewer positions if the probability of firms' hiring is lower, which occurs during the 2008-2009 economic recession. Candidates with a more valuable outside option, namely, those that have an offer from a prior employer, are more focused in their search and apply to fewer positions, concentrated in fewer industries. Higher ability candidates, as measured by their GPA, GMAT score, the prestige of the undergraduate school they attended, or the expertise in the industry they apply to, are also more focused in their search compared to lower ability individuals. Job seekers that have taken more classes or have been involved in more extracurricular activities related to a particular industry (e.g., Finance or Technology) are more likely than other individuals in the sample to apply to jobs in that industry. Moreover, I observe that contests for higher-paying jobs attract more candidates than lower-paying jobs, and the average ability (measured by the GPA or GMAT score) of these candidates is higher. There also exist a gender effect, with men being more likely to compete in contests for the better paid positions.

While the goal of this paper is to study the individual-level search behavior of job applicants, in a companion paper (Kuhnen (2009)) I focus on a related question, namely, how firms screen and compete for workers, once the pool of human capital they can hire from is formed.

The model of job search that I propose here uses the tournament theory framework (Lazear & Rosen (1981)). Although very simple, it makes several predictions that are difficult to obtain in other settings. For instance, the model predicts that effort levels are different across candidates. In models of asymmetric contests where outside options of the players are not heterogeneous (e.g.,, Baik (1994)), the result is that all contestants

put in the same level of effort, even if they may have different abilities, and this effect seems to run contrary to what I document job candidates actually do in the data. Also, in the labor economics literature on job market search and unemployment (e.g., Pissarides (2000)) it is difficult to obtain the theoretical prediction that workers search with higher intensity in bad economic times. However, as Shimer (2004) shows, the empirical evidence indicates that workers search for jobs harder (specifically, through more channels) during recessions. Shimer (2004) proposes a general equilibrium model of unemployment where workers can send simultaneously many job applications and finds that when the cost of applying is low, a worker who has at least an 80% chance of getting a job responds to an adverse macroeconomic shock by increasing his search intensity. The intuition behind this result is that, since a worker will only accept one job offer even if many are received, the marginal benefit of sending an additional application is higher in bad times, when the worker may have zero offers, than in good times, when he may have several offers already. The model I present here has a similar intuition, which is that because job candidates' outside options are less valuable in bad economic times, they will search more to seek employment. While this result is not obtained in a general equilibrium context, my simple framework also allows us to study the influence of other parameters on the search behavior of workers, namely the cost of search and the heterogeneity in abilities or in the values that candidates assign to specific jobs.

The model makes the simplifying assumption that candidates apply to just one job and decide how much effort to exert during the application process. The intuition of the results obtained here would carry in a more complicated framework where a job applicant must determine which n jobs to apply to out of N openings, and can only take one offer from a set of possibly multiple offers (e.g. the one with the highest wage, or best fit or highest overall utility for that person). Solving for the optimal set of jobs one should apply to is not trivial when applications are costly, as this problem requires maximizing

a sub-modular function of finite sets. For simple specifications of the job payoff and application cost function, Chade & Smith (2006) propose a greedy algorithm that finds the optimal set of opportunities a candidate should pursue.[1] The resulting comparative statics their model would yield in the context of job search are two-fold: if the application costs are higher, candidates will apply to fewer jobs, and if the probability of getting an offer for each job opening increases (perhaps because the employers become keener to fill vacancies because the economic conditions are better and production is more valuable), then applicants are more "aggressive", in the sense that they are more likely to apply to long-shot jobs (i.e. those positions that are highly desirable but difficult to get). Similar predictions, though, are also obtained in my simplified framework where the decision is about how much effort candidates choose to put in the recruiting process, for instance either by improving their resume or by networking with representatives of the firm they are interested in.

Related to this paper, there exists a small but growing literature focused on labor market outcomes of MBA students. Oyer (2008) finds that more MBA students get jobs in investment banking upon graduation if the stock market performs better during those individuals' graduate school years, and the lifetime wages of students that go into investment banking directly after business school are significantly greater than those of students who do not. Sapienza, Maestripieri, & Zingales (2009) find that MBA students high in testosterone and low in risk aversion are more likely to work in higher risk finance jobs after graduation. Kaniel, Massey, & Robinson (2009) find that optimistic MBA students tend to place less weight on the importance of landing a job after graduation, but despite this, they are more likely to hold summer internships by the spring of their first year, and receive full-time job offers faster than their peers. These papers, however,

[1]The behavior studied in Chade & Smith (2006) is the decision regarding to which colleges a high school student should apply.

focus on career outcomes and do not address individual-level job search strategies.

2 A simple model of job search

I will assume that two individuals seek employment and compete for the same job in a one-shot game. Let λ be the probability that a job offer will be made to either of the candidates, with higher values of this parameter indicating better economic conditions (e.g., a lower unemployment rate) at the time when the candidates apply for the job. If individual $i \in \{1, 2\}$ does not get employed he will have an outside option with utility $\underline{v_i}$. This outside option captures, for instance, the value of any potential job offers that the candidate may get at a later time, or the value of an existing employment offer that the candidate already has obtained.

The two candidates differ in their ability, which can be broadly interpreted as their human capital, either general or specific to the job they apply to. Let $\theta > 1$ capture this ability difference, and without loss of generality, let agent 1 be the more able candidate. Then θ indicates how much more able agent 1 is relative to agent 2. Agents are also heterogeneous with regard to the amount of utility they would get if they got the job offer. Let the utility agent i of being employed in this particular position be given by v_i. I assume that $v_i - \underline{v_i} > 0$, that is, agents prefer to be employed rather than take their outside option.

Each agent i chooses how much effort e_i to exert during the job application process in order to increase his chance of being hired. For instance, a candidate can spend more time polishing his resume, networking with employees from the recruiting firm, or studying topics that may be covered in the job interview. Effort is costly and causes the agent disutility equal to ce_i, where $c > 0$. As in other models of contests with asymmetric players (e.g., Baik (1994) and Brown (2008)), the ability difference θ as well as the effort

exerted will influence the probability of "winning"(in this case, of obtaining the job offer). Conditional on the exogenous hiring probability λ, the probability that agent 1 gets the job offer is

$$p_1 = \frac{\theta e_1}{\theta e_1 + e_2}, \tag{1}$$

and the probability that agent 2 gets the offer is

$$p_2 = 1 - p_1 = \frac{e_2}{\theta e_1 + e_2}. \tag{2}$$

The two agents will simultaneously set the effort spent in the recruiting process. Agent i therefore solves the following problem:

$$\max_{e_i} \Pi_i = \lambda p_1 v_1 + (1 - \lambda p_1)\underline{v_1} - ce_1 \tag{3}$$

It is easy to show that the resulting Nash equilibrium is characterized by the following effort levels:

$$e_1^* = \frac{\lambda\theta(v_2 - \underline{v_2})}{c\left(\theta + \frac{v_2 - \underline{v_2}}{v_1 - \underline{v_1}}\right)^2} \tag{4}$$

and

$$e_2^* = \left(\frac{v_2 - \underline{v_2}}{v_1 - \underline{v_1}}\right) \frac{\lambda\theta(v_2 - \underline{v_2})}{c\left(\theta + \frac{v_2 - \underline{v_2}}{v_1 - \underline{v_1}}\right)^2} \tag{5}$$

From equilibrium conditions (4) and (5) we obtain the following comparative statics results:

$$\frac{de_i^*}{dc} < 0, \qquad \forall i \in \{1, 2\} \tag{6}$$

$$\frac{de_i^*}{d\lambda} > 0, \qquad \forall i \in \{1,2\} \tag{7}$$

$$\frac{de_i^*}{d(v_i - \underline{v_i})} > 0, \qquad \forall i \in \{1,2\} \tag{8}$$

$$\frac{de_i^*}{d\theta} < 0 \iff v_2 - \underline{v_2} < \theta(v_1 - \underline{v_1}), \qquad \forall i \in \{1,2\} \tag{9}$$

and we also have that

$$e_2 - e_1 = e_1 \left(\frac{v_2 - \underline{v_2}}{v_1 - \underline{v_1}} - 1 \right), \qquad \forall i \in \{1,2\} \tag{10}$$

The implications of the comparative statics in (6)—(8) are straightforward and intuitive: all else equal, a candidate will put more effort in his job application process if the cost of applying is lower, if the exogenous probability that hiring will in fact occur is higher, or if the utility from getting the job, relative to being left with the outside option, is higher.

The result given by (9) is a generalization of that obtained in prior models of contests with asymmetric players such as Baik (1994), where both agents assign a value of 0 to their outside option, and they have the same value for being employed (i.e., $\underline{v_1} = \underline{v_2} = 0$ and $v_1 = v_2 = V > 0$). Under these simplifying assumptions, both agents put less effort in the contest when the difference in ability between the two players is larger. The result is intuitive: if the better agent is much more able that the other player, he does not need to put in much effort to win the contest. The lower ability player understands that he stands a low chance of winning because he is far less able that the other person, and therefore will also exert a low effort level.

When there is heterogeneity in outside options and the values that players assign to

the job, as it is the case in my setup, equilibrium effort levels are decreasing in the ability difference θ if and only if the low ability candidate is not too "desperate" for the job relative to the other agent (i.e., when $v_2 - \underline{v_2} < \theta(v_1 - \underline{v_1})$).[2]

Further, equation (10) indicates that if the lower ability agent 2 needs the job more than the higher ability agent 1 (i.e., if $v_2 - \underline{v_2} > v_1 - \underline{v_1}$), then he will in fact work harder during the recruiting process than agent 1. This will happen, for instance, when the outside option $\underline{v_2}$ of the low ability candidate is particularly bad. The empirical evidence in Hines, Hoynes, & Krueger (2002) and Oreopoulos, von Wachter, & Heisz (2006) suggests this is the case, at least during economic recessions, as lower ability workers are less able to secure employment. Kuhnen (2009) shows that, unconditionally, lower ability individuals end up being employed in lower paying jobs. Hence, it is reasonable to assume that lower types benefit from getting the job (instead of taking the outside option) more than higher types.

This simple framework therefore yields the following testable predictions:

Proposition 1 *All else equal, a job candidate will put more effort into the recruiting process when the marginal cost c of applying is lower, his value for the job v_i is higher, his outside option $\underline{v_i}$ is lower, or the unconditional probability λ that hiring will occur is higher. The highest effort will be exerted by the candidate who needs the job more, i.e., who has the highest value of $v_i - \underline{v_i}$.*

Once it is known what the equilibrium effort levels are given the players' valuations $v_i, i \in \{1, 2\}$, of a particular job and the talent difference θ, it is natural to inquire which jobs individuals will choose to compete for.[3] Let $\Pi_1^*(\theta, v_1, v_2)$ be the equilibrium value of

[2]Simple algebra shows that $\frac{de_1^*}{d\theta} = \frac{\lambda}{c}(v_2 - \underline{v_2})\frac{\frac{v_2-\underline{v_2}}{v_1-\underline{v_1}} - \theta}{\left(\theta + \frac{v_2-\underline{v_2}}{v_1-\underline{v_1}}\right)^3}$ and $\frac{de_2^*}{d\theta} = \frac{v_2-\underline{v_2}}{v_1-\underline{v_1}}\frac{de_2^*}{d\theta}$.

[3]Here I am making the simplifying assumption that a player outside option $\underline{v_i}$ is the same no matter which job he will choose to apply for.

profits realized by agent 1 if he chooses to apply for a job for which he is θ times more able than the competition, and from which he and the competition would get utility v_1 and v_2, respectively. It can be shown that for all positive values of θ and of $v_1 - \underline{v_1}$:

$$\frac{d\Pi_1^*}{dv_1} > 0 \quad and \quad \frac{d\Pi_1^*}{d\theta} > 0 \tag{11}$$

Therefore, we have the following additional prediction:

Proposition 2 *Candidates will choose to compete for jobs for which they are relatively more qualified (i.e., for which they have higher θ) and from which they derive higher utility (i.e., jobs that offer them a higher v_i), keeping all other parameters and the competitors the same across jobs.*

3 Data

The data were obtained from the career management office at a top business school in the U.S. and provide detailed information about the demographics (age, gender, country of residence, undergraduate degree), work experience, grades, on-campus club memberships, job applications and job offers of students enrolled in the two-year full-time MBA program at this institution. For each student in the class of 2007, 2008 and 2009 (about 500 per class) the data set contains the internship and full-time jobs they applied to during the on-campus recruiting season, when employers set up interviews on the premises of the business school according to a pre-announced schedule. As the data were obtained in June 2009, for class of 2010 candidates I only know information about their internship recruiting. Moreover, for each student in the class of 2007, 2008 and 2009 the data set contains all the internship and full-time offers they obtained, from all firms and not just those that conducted their recruiting on campus. Finally, for the class of 2006 I only

know the job offers received by students, but do not know the complete set of firms they applied to. Since the paper is focused on job search strategies I will limit the analysis to data from the cohorts graduating in 2007 through 2010, since for those individuals I know their job application history.

Students can apply to obtain an interview slot during on-campus recruiting in two stages. In the first stage, referred to as "closed", they can submit resumes to companies that will offer on-campus recruiting. Employers then select whom to invite for interviews based on students' resumes only. This process is costless to students. In a second stage, called the "open" or "bidding" system, students can bid a limited number of points (out of an annual endowment of 800 points) to obtain an interview slot. Therefore, in this second stage obtaining an interview with a desired employer is costly to the student. The data set contains all the bids that each student placed for interview slots for either internships or full-time jobs, as well as information whether or not the bids were successful (i.e., higher or equal to the clearing bid for that contest). On-campus recruiting for full-time positions occurs at the beginning of the students' second year in the MBA program, between September and December. On-campus recruiting for summer internships occurs during the January-March period of the students' first year in the MBA program. For both types of positions recruiting occurs in multiple rounds, each of them lasting one week, with each company recruiting in one round only. Bidding takes place sequentially, first for interviews with companies in the first round (i.e., those present on campus during the first week of interviews), and then for companies in each of the subsequent rounds. Before students send in any applications or bid any points, they know the full on-campus recruiting schedule, that is, which companies will be interviewing in each round, and how many closed and open slots they have available.

I complement these data with a measure of employer prestige, using the Fortune MBA 100 annual rankings, which are typically published in May. If a firm is ranked in the

top 100 according to these surveys, then I will refer to it a prestigious employer.[4] I also collect data on the prestige of the undergraduate institution that each student attended, using the word-wide college ranking compiled by QS Top Universities in 2008.[5] For each college that the individuals in my sample went to I determine whether it is a top 100 school using these rankings.

4 Results

4.1 Choosing effort during job search: Tests of Proposition 1

When the cost of effort is lower, all else equal, more effort is expended ($\frac{de_i^*}{dc} < 0$).

Given the structure of the on-campus recruiting process that the individuals in the sample face, this prediction is easily testable. Students can initially send applications at no cost to companies that have interview slots on campus, and the companies will pick those candidates they like best to populate the "closed" slots (i.e., closed to bidding). After the closed slots are filled up, students are informed whether or not they were successful at getting interviews and can then bid costly points to get "open" interview slots (i.e., open to bidding). Therefore, the model predicts that students should apply to more positions during the closed and costless stage than during the open and costly stage. Figure 1 presents evidence that this is indeed the case, for every cohort in my sample (i.e., class of 2007 through class of 2010) and for both internship and full-time job searches. Across all cohorts, the average number of internship applications submitted by students is 13.78 in the closed (costless) stage, and 4.18 in the open (costly) stage. The

[4]The rankings for 2006-2009 are available at: http://money.cnn.com/magazines/fortune/mba100/2009/full_list/.

[5]The ranking is available at: http://www.topuniversities.com/worlduniversityrankings/results/2008/overall_rankings/top_100_universities/.

average number of full-time job applications is 6.27 in the closed (costless) stage, and 2.12 in the open (costly) stage. The differences in applications between the costless and costly stages for both types of search are significantly different than zero ($p < 0.01$). The averages are computed across the entire sample of students, including those who did not submit any application using the on-campus recruiting system.

When the exogenous probability of hiring increases, all else equal, more effort is put into the search ($\frac{de_i^*}{d\lambda} > 0$).

To test this, I compare the search effort by candidates looking for jobs in good economic times versus those recruiting in bad economic times, while keeping constant their outside option ($\underline{v_i}$). Hence, I will analyze only those candidates that have a full-time offer already that resulted from an internship or a prior full-time employer, and therefore face a high, and relatively similar across people, outside option value $\underline{v_i}$. The only difference then between the two groups of searchers is the value of λ they face: high for those recruiting in good times, low for the others.

I find that in bad economic times (low λ), a higher fraction of those with an existing full-time offer will accept it and will search little or not at all during the fall recruiting season, compared to those searching in good times (high λ). As can be seen in Figure 2, 7% fewer students who have an offer already from an internship or a prior employer go through the on-campus recruiting season for full-time jobs during bad economic conditions (i.e., class of 2009) than during good economic conditions (i.e., class of 2007). This difference is significantly different from zero ($p < 0.05$). Of the students with an existing offer, members of class of 2007 apply on-campus to 5.98 jobs on average, whereas members of class of 2009 apply to 5.03 jobs on average (the difference of the means is significant from zero at $p < 0.1$). Hence, those with good outside options are less likely to search any further in bad times, and more likely to simply take the outside option.

As additional support for this prediction, Figure 3 shows that of the students with an existing offer, 83.33% decide to accept it if they are part of the class of 2009 but only 63.18% accept it if they are part of the class of 2007. For the class of 2008, the outside option acceptance rate is in between these values, at 76.25%. As implied by Proposition 1, these results therefore indicate that conditional on having a valuable outside option, candidates put significantly less effort in their search in times when hiring is less likely, i.e., when λ is smaller.

To complete this argument, it is necessary to show that it is indeed the case that in bad economic times (fall 2008-spring 2009) λ is smaller, that is, the probability that somebody is hired conditional on companies conducting recruiting is lower in bad times. One way to verify whether λ is smaller in bad times is to look at the number of offer per student. I find that the average number of offers per candidate is 1.51 for the class of 2007, 1.37 for the class of 2008 and 0.99 for the class of 2009. The distribution of the number of offers that students receive is presented in Figure 4. Consistent with the result that the average number of full-time job offers per candidate is much lower for the cohort recruiting in bad times (class of 2009) relative to that recruiting in good times (class of 2007), Figure 4 shows that in bad times the fraction of candidates with two or more offers is less than half than in good times, whereas the fraction of people with zero or just one offer is significantly higher.

Note that bad economic times can mean both a lower λ, as well as a lower value of the outside option $\underline{v_i}$. The overall effect of economic conditions on search effort is therefore determined by the opposing influence of these two parameters.[6] If λ is lower, effort is not that productive and therefore search should be less intense. However, if $\underline{v_i}$ is also low, not searching leads for sure to a bad outside option, and this in turn can overcome

[6]This is why in testing whether effort increases with lambda, all else equal, I only used the sample of people who have a valuable outside option, that is, those who have an outstanding full-time job offer from a company they have worked for as interns or regular employees.

the effect that a low λ has on search intensity. Hence, those candidates with bad outside options, who are those without an existing offer from a prior workplace, may in fact search with higher intensity if they are part of a cohort recruiting in bad times, relative to those recruiting in good times. Confirming this prediction, I find that on average class of 2007 students with no existing offers apply to 9.73 jobs, class of 2008 students apply to 10.55 jobs, and class of 2009 students apply to 13.95 jobs during on-campus full-time recruiting. These means are significantly different at $p < 0.01$.

When the value of the outside option is lower, all else equal, more effort is put into the job search ($\frac{de_i^*}{dv_i} < 0$).

As before, I identify full-time job candidates with better outside options as those who have a full-time offer from a summer internship or a former employer. In Table 1 I estimate a probit model of the probability that a student will choose to participate in the on-campus full-time recruiting process that occurs during the September-December period each year. I include class fixed effects to account for the influence of economic conditions at the time of recruiting on the search process. The results in Table 1 show that individuals who have a full-time offer from a summer internship or from a former full-time employer are 14%, and respectively 23%, less likely to participate in the on-campus recruiting in the fall of their second year of MBA studies. Moreover, conditional on going through on-campus recruiting for full-time jobs, candidates will apply to fewer positions if they have an offer from an internship already, as indicated by the summary statistics in Table 2. Those without an existing offer apply on average to 11 jobs, while those with an offer from a prior work place apply to about 6 jobs.

In Table 3 I estimate OLS models for the number of applications sent by each student separately for internships and full-time jobs, as well as for the industry concentration index of these applications. I include as independent variables measures of outside option

value, as well as of the human capital of the candidate. I control for the industry that the searcher seems most interested in, and include class fixed effects. In line with the univariate results documented before, I find that candidates that have already a full-time offer from an internship or a prior employer search less during the fall on-campus recruiting process, in both the costless and the costly stage. Individuals with valuable outside options apply to about four fewer jobs in the costless stage and two fewer jobs in the costly stage compared to other candidates that have similar industry interests and human capital, and are recruiting during the same economic conditions. Moreover, their search is significantly more focused, as the industry concentration index of their portfolio of applications is 10% higher than that of candidates without an outstanding full-time offer.

As discussed earlier, it is likely that outside options of candidates going through full-time job recruiting in bad economic times are worse than those of candidates recruiting in good times. As a result, candidates have the incentive to put more effort in the search process in bad times, even though the exogenous hiring probability λ may be smaller then, to avoid being left with a low $\underline{v_i}$. I find that indeed, across all candidates who chose to participate in on-campus recruiting for either internships or full-time jobs (and therefore likely not to have valuable outside options), the search is broader in bad economic times than in good times, as shown be the evidence in Table 4. The average number of internship applications per student is 20 for class of 2007, and 23 for class of 2010, while the industry concentration index drops from 0.72 to 0.65. Hence, even looking at searches for internships, the overall effect of tough economic conditions is an increase in the number of applications and in the diversity of industries a candidate is willing to consider. Table 4 also documents similar effects for the case of searching for full-time jobs.

As a further test of the prediction that those with worse outside options will put more

effort in recruiting, I analyze the bids submitted by candidates interested in winning interviews during the open stage of recruiting. Arguably, those who are still bidding for interviews in later rounds have not yet received acceptable offers, and therefore face worse outside options than those bidding in earlier rounds. This effect is indeed seen in the data. Figure 5 shows that those still bidding in late stages of the recruiting process spend significantly more points per bid than those bidding in earlier stages. Note, however, that this can simply be the result of approaching the end game, that is, the end of bidding, when points become useless. I will return to this point later in the subsection.

Lower types will put more effort into the search that higher types if they need the job more ($e_2 > e_1 \iff v_2 - \underline{v_2} > v_1 - \underline{v_1}$).

As argued earlier, empirical evidence in extant papers supports the idea that lower ability people have much more to gain from getting the job, since their outside option is worse than that of higher types. For instance, Oreopoulos et al. (2006) shows that low ability workers are those who are hurt most in recessions, and Kuhnen (2009) shows that, unconditionally, lower ability applicants get employed in worse jobs in terms of seniority and pay, than high ability applicants. Hence, the prediction of the model is that lower ability individuals will search harder. The results in the OLS regression models in Table 3 are consistent with this prediction. Higher ability candidates, as measured by their graduate school GPA or the prestige of the undergraduate degree institution they attended, apply to fewer positions in both the closed and open recruiting stages and have a higher industry concentration index than lower ability candidates.[7] For instance, increasing a candidate's GPA by 1 point (out of 4 possible) leads to a decrease of about

[7]Controlling for GPA and the prestige of the undergraduate institution attended, the candidate's GMAT score is positively correlated with the number of internship applications. However, if I estimate a similar model as that in Table 3 and only include the GMAT score as the proxy of the candidate's ability (so without the GPA variable on the right-hand side) I find that a higher GMAT score leads to a more focused search.

4 applications for either internships or full-time jobs, for both the costless and costly recruiting stages, and to an increase in the industry concentration index of the portfolio of applications of 4% for internships and 7% for full-time jobs. I do not find a significant effect of the candidates' seniority in the job held prior to starting graduate school and the breadth of their search.

While data items such as the GPA, GMAT score or the prestige of the undergraduate institution attended are proxies for the general human capital of the individual, industry- or firm-specific human capital is also important for getting the job. In the context of the model, the parameter θ encompasses the overall fit of the candidate for the job, which depends on his general as well as his industry- or firm-specific human capital. To test whether the latter component is also a driver of search breadth, as the model would predict, in the regressions in Table 3 I include a dummy variable for whether the candidate is an industry switcher. This indicator takes the value of one if the person searches mainly in a broad industry that is not the same as the broad industry they worked in right before enrolling in the MBA program. The six broad industry categories that I assign companies to are Consulting, Finance, General Corporations, Government/Non-profit, Other Services (which mainly include law firms) and Technology. For example, an individual with a background in Consulting who dedicates the highest number of his applications to Finance jobs is categorized as an industry switcher. A person can be an industry switcher during the internship search, but may be a non-switcher during the full-time job search if during that process they apply mainly to jobs in the broad industry they came from when they started the MBA degree. The opposite can also happen. If the person is not engaged in on-campus job search, I characterize them as a switcher or non-switcher by comparing the broad industry of the job they accepted to that of the job they had right before starting graduate school.[8]

[8]This can happen, for instance, if the student has a full-time offer from a summer internship and

Using the notation of the model, an industry switcher has a lower value of ability or fit with the job θ, compared to a non-switcher. Therefore, the model predicts that industry switching candidates will conduct a broader search than non-switchers.[9] The results of the regression models in Table 3 are consistent with this prediction. Switchers apply to two more internship positions, and to one more full-time position than non-switchers, and have an industry concentration index that is between 3% and 5% lower. These differences are statistically significant at conventional levels.

When the value of the job is higher, more effort is put into the job search ($\frac{de_i^*}{dv_i} > 0$).

Some jobs are more coveted than others, that is, they have a higher value of v_i. For instance, it is arguably better to start one's post-MBA career by joining a more prestigious firm, as this offers better opportunities in terms of career mobility. At the same time, a job that offers more responsibility and higher pay is likely to be seen as more valuable. Hence, the model would predict that candidates will expend more effort when a more prestigious or better paid job is at stake. This prediction is in fact confirmed by the bidding behavior of students in the open stage of recruiting for both internships and full-time jobs, as seen in the regression models in Table 5. Bids placed for interviews with prestigious companies are 71 points higher than those for non-prestigious companies in the case of internships, and 95 points higher in the case of full-time jobs. If the average starting salary in the company providing the interview is $10,000 higher, bids will be 16 points higher for internships, and 10 points higher in the case of full-time jobs.

In these regressions I include broad industry fixed effects, as well as fixed effects for

chooses not to do the on-campus recruiting in the fall of their second year of study.

[9]Note that in the context of the model industry switchers will search more than non-switchers if switchers have a lower value of job fit or ability θ, or a lower value $\underline{v_i}$ of the outside option. It is possible that switchers do not like their outside option that much (this is why they wish to change industries rather than going back to the industry they had prior to graduate school), and value highly getting a job in a new industry.

the round when the bid is placed to account for time trends in the value assigned to jobs, since those bidding in late rounds likely have a low outside option and nothing to lose by spending all their points. I find that the highest bids are those placed for interviews in the Consulting industry. Moreover, confirming the univariate findings in Figure 5, bids increase significantly from round to round. Bids placed in round five are on average almost 150 points higher than bids placed in round one. As discussed earlier, this result can be interpreted as either indicating that those participating in later rounds are more "desperate" since the end of recruiting season is nearer, or as simply saying that saving points for later is less valuable towards the end of recruiting. The bid regression model for full-time job interviews in Table 5 also shows that those that have an offer already from a prior workplace place on average higher bids that the other candidates. This effect is consistent with the results documented earlier that students who have an offer already but choose to participate in on-campus recruiting for full-time jobs will apply to fewer positions. Since they will bid for fewer interview slots, then the average bid of these candidate with a valuable outside option is bound to be higher.

As additional evidence that more effort is put into job search if the value of getting the job is higher, I find that when applying for internships, candidates are significantly broader in their search than when applying to full-time positions. This effect can be seen for instance in Table 4. Arguably, applying to more internships allows the candidate to explore and learn about more companies or industries. This exploratory behavior embeds an option-like payoff, more so than what one would get by applying to a full-time job a year later. Note that this empirical pattern can also be driven by $\frac{de_i^*}{dc} < 0$, that is, recruiting for internships may be less costly, but this is a doubtful assertion. Candidates have to network and prepare for interviews in both situations, and thus the marginal cost of effort could easily be the same for both internships and full-time recruiting.

An alternative explanation for why candidates apply to more internships than full-

time positions is that there may be more numerous relevant internship positions available to a student than full-time jobs. The data allow me to distinguish between this explanation of search based on changes in the available set of interesting jobs, and the one based on the existence of an embedded option-like payoff in internship search. If candidates apply to fewer full-time jobs than internships because there are fewer interesting full-time jobs to compete for, this does not predict that full-time applications will be more or less concentrated in a particular industry compared to internship applications. However, if the change in search is due to a difference in the value of internships versus full-time jobs, with internships having the additional option payoff of exploring new areas, then we expect to see workers be more likely to apply to industries different from their background during the internship search than during the full-time job search. To test this prediction, I compare the industry switching behavior of all students during both internship and full-time recruiting. The fraction of candidates in class of 2007, 2008 and 2009 who are classified as industry switchers during internship recruiting is 63.43%, whereas for full-time job recruiting the fraction of switchers is only 52.80%. This decrease in industry switching behavior of about 10% between the two stages of recruiting is also present within each of the three classes, thus alleviating concerns that it may be just be driven by changes in the economic environment faced by the cohorts studied here. The evidence therefore indicates that candidates are indeed more likely to search outside the industry they came from when joining the MBA program during internship recruiting than during recruiting for full-time jobs, as the model would predict.

4.2 Choosing where to apply: Tests of Proposition 2

Candidates will tend to apply to jobs for which they are better qualified (i.e., for which they have a higher value of θ) and that they find more valuable

(i.e., that have a higher value of v_i).

Proposition 2 implies that there should be a correlation between the type of courses taken (e.g., Finance versus Technology) or extracurricular activities pursued (e.g., membership in the IBanking club or the BioTech club) and what type of job the student will apply to. If a student takes more Finance courses and belongs to more Finance-related clubs on campus, for instance, this suggests that he is more prepared for Finance jobs than others and therefore has a higher θ in the contest for Finance jobs, but also, that he values working in this industry more than his competitors.

As expected, I find that the type of job a candidate will apply to is predicted by the type of classes he takes, and his on-campus club memberships, as indicated by him being on these club's email lists. These effects are illustrated in Figures 6 and 7. For instance, individuals who apply to jobs in Finance take more Finance classes and are members of more Finance clubs on campus, than individuals who apply to jobs in other industries. Similar patterns hold for job applicants to consulting positions, government/non-profit positions, technology or general corporation positions (e.g., consumer goods/marketing).

While Proposition 2 states that people will prefer to compete for jobs they value more, it is important to keep in mind that this result refers to the choice made by a candidate between two job contests keeping the same across contests the relative ability of the candidate (his θ in each contest) and his competitors' valuation of the job ($v_j - \underline{v_j}, j \neq i$). A question that arises naturally, then, is how candidates choose contests in situations when a higher v_i also implies a higher v_j, $j \neq i$, for instance, when all applicants prefer a job with higher salary over one with lower salary. For instance, one may inquire whether it is the case that those students with high ability apply to jobs in high paying industries, and those with low ability apply to jobs in industries characterized by lower wages. In these cases, equilibria may arise where for both the low paying job as well as for the high paying job the set of competitors will be a mix of high and low ability types. The

intuition of this result is that competing head-to-head for a well-paid job with another applicant with high ability has a low chance of success, whereas competing with a low ability candidate for a low paying job has a much higher chance of leading to an offer. It is possible, therefore, that in expectation one is better off choosing to compete against weaker adversaries for a low value outcome, than choosing to apply for a more coveted job. Hence, the model does not have an unconditional prediction whether there should be a positive correlation between ability and the salary or prestige of the jobs people apply to, or, in other words, that only high types apply to the best jobs. For certain regions of the parameter space (if, for instance, the high paid jobs are much more valuable to high types than the low paid jobs), it is possible to have positive assortative selection of types into contests, whereas for other regions the types will be uniformly distributed across contests.

The evidence presented in Table 6 shows that in fact there is some self-selection into contests based on ability. I focus on contest choices made during the costly, open bid stage of recruiting, when candidates must bid points to try to win an interview time slot for a particular job, but similar effects are seen in contests involving costless applications. I find that a significantly higher number of candidates participate in contests for jobs in higher paying companies (defined as those paying average starting salaries over $100,000 to individuals in the data set) or more prestigious ones, and candidates bid on average more points in these contests. Contests for jobs in high paying companies attract pools of candidates that not only are more numerous than those participating in contests for low paying jobs, as measured by the number of applicants per job offer, but also are of higher average quality as measured by GPA or the GMAT score. However, I do not find any significant differences between the average ability of those bidding for jobs in prestigious versus non-prestigious companies. These results complement the findings in Gibbons, Katz, Lemieux, & Parent (2005), who develop and estimate empirically a

model of wage and sector choice when comparative advantage and learning coexist in the labor market. In their model a worker's skills determine the worker's current wage and employment sector. Using data from the National Longitudinal Survey of Youth Gibbons et al. (2005) find that high-wage sectors (e.g. finance, business services) employ high-skill workers and offer high returns to workers' skills. My results show that one channel through which this effect occurs is the self-selection of higher types into higher-paying jobs, from the beginning of these individuals' post-MBA career.

As indicated by the statistics presented in Table 6, I find that there are gender effects in contest selection. The fraction of bids for interviews submitted from men is 72% in the case of high paying companies, and only 65% for low paying ones. Therefore, men are more likely to compete in contests for better paid jobs, whereas women are more likely to apply to lower paid positions. This result complements earlier findings regarding the existence of a gender wage gap later in the careers of MBA graduates (Bertrand, Goldin, & Katz (2008)). While self-selection into jobs could drive this gender wage gap, as my results would suggest, another cause could be that during their career women are less likely to renegotiate salaries (Babcock & Laschever (2003)).

5 Conclusion

This paper proposes and tests empirically a simple model of allocation of effort during workers' search for jobs, with the goal of understanding the determinants of the supply of human capital that firms face when making hiring decisions. I use a novel data set that contains detailed information about the search strategies and labor market outcomes of more than 2,000 MBA graduates from a top U.S. business school. I find that candidates competing for employment increase their job search effort if the cost of effort is lower, the likelihood that firms will hire increases, their outside option is worse, the job sought

is more valuable, or if their ability is lower. Candidates apply to positions for which they are better qualified, while higher ability types are more likely to choose to participate in contests for higher paying jobs. There also exist a gender effect, with men being more likely to compete in contests for better paid positions. The main contribution of the paper is to bring forward detailed evidence regarding the job search strategies of participants in an important segment of the labor market, therefore improving our understanding of the formation of the pool of human capital that firms can recruit from. These results, together with those in the companion paper (Kuhnen (2009)), shed light on the process of matching firms and human capital, which is a critical driver of productivity and economic growth.

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Table 1: Who applies for full-time jobs on campus?

Probit model of the choice to participate in the on-campus recruiting process for full time jobs, occurring at the beginning of the second year of the MBA program (September-December). Marginal effects are reported.

	$OnCampus$ $FTJobSearcher_i$
$GotOfferFromInternship_i$	–0.14
	(–6.32)***
$GotOfferFromPrevFTEmployer_i$	–0.23
	(–5.71)***
$Constant$	
Pseudo R^2	0.05
Observations	1407
Class year FEs included	

$^{*}p < .10,^{**}p < .05,^{***}p < .01$

Table 2: Search intensity and types of offers

This table shows the number of full-time jobs candidates apply to during on-campus recruiting as a function of their available options for full-time placement.

Available options	GPA	Number of full-time job applications (on-campus recruiting)
Candidate has full-time offer from prior full-time employer (unconstrained)	3.57	5.86
Candidate has full-time offer from internship obtained on campus	3.53	5.33
Candidate has full-time offer from internship obtained off campus	3.47	6.43
Candidate does not have offers from internships or prior employers	3.39	11.35

Table 3: Determinants of search effort

The table presents OLS regression models predicting the number of applications sent by candidates in the closed and open stages, for both internships and full-time jobs, as well as the industry concentration of these applications. For instance, an industry concentration index of 1 means that the candidate sent all applications to jobs in one industry. An index of 0.6 indicates that the candidate sent 60% of applications to jobs in a particular industry, while the remaining 40% were sent to positions in other industries.

	$\#Applications\ Internships_i^{Closed}$	$\#Applications\ Internships_i^{Open}$	$Industry\ Concentration\ InternApplications_i$	$\#Applications\ FTJobs_i^{Closed}$	$\#Applications\ FTJobs_i^{Open}$	$Industry\ Concentration\ FTApplications_i$
GPA_i	–2.80	–1.18	0.04	–3.09	–1.61	0.07
	(–2.90)***	(–3.64)***	(2.05)**	(–3.29)***	(–4.53)***	(2.96)***
$GMAT_i/100$	3.09	1.23	–0.02	–0.03	0.24	0.02
	(4.51)***	(5.40)***	(–1.48)	(–0.05)	(1.06)	(1.21)
$Top100Undergrad_i$	–0.26	0.05	0.02	–1.19	–0.51	0.02
	(–0.48)	(0.26)	(2.03)**	(–2.59)***	(–2.91)***	(1.61)
$Seniority_i$	–0.98	–0.97	–0.02	0.57	0.24	–0.02
	(–0.82)	(–2.43)**	(–0.86)	(0.55)	(0.61)	(–0.91)
$IndustrySwitcher$	1.35	0.59	–0.05			
$InternshipSearch_i$	(2.43)**	(3.19)***	(–4.97)***			
$GotOffer$				–4.36	–1.74	0.09
$FromInternship_i$				(–9.26)***	(–9.74)***	(7.16)***
$GotOffer$				–4.14	–1.32	0.11
$FromPrevFTEmployer_i$				(–5.76)***	(–4.87)***	(6.07)***
$IndustrySwitcher$				0.72	0.37	–0.03
$FullTimeSearch_i$				(1.55)	(2.11)**	(–2.50)**
$Searchingfor$	–2.60	0.24	0.15	–1.30	–0.29	0.05
$FINC$	(–3.52)***	(0.98)	(11.03)***	(–2.20)**	(–1.31)	(3.27)***
$Searchingfor$	4.34	1.04	0.05	0.18	0.11	–0.04
$GENCORP$	(6.30)***	(4.51)***	(4.18)***	(0.30)	(0.47)	(–2.26)**
$Searchingfor$	–13.99	–3.85	0.30	–6.59	–1.72	0.21
$GOVNONP$	(–4.77)***	(–3.94)***	(5.58)***	(–1.78)*	(–1.23)	(2.12)**
$Searchingfor$	–14.96	–4.05	0.20	–7.84	–1.85	–0.05
$OTHERSERVICES$	(–2.32)**	(–1.89)*	(1.74)*	(–1.64)	(–1.02)	(–0.37)
$Searchingfor$	–0.60	0.52	0.05	0.04	0.64	–0.02
$TECH$	(–0.71)	(1.84)*	(3.12)***	(0.05)	(2.27)**	(–1.25)
$Constant$	–0.47	–0.21	0.69	20.30	7.25	0.35
	(–0.10)	(–0.14)	(8.27)***	(4.80)***	(4.53)***	(3.15)***
R^2	0.09	0.07	0.11	0.13	0.13	0.12
Observations	1841	1843	1856	1315	1316	1319

Class year FEs included

*$p < .10$,** $p < .05$,*** $p < .01$

Table 4: Search breadth by job type and class year.
All students who participated in on-campus interviews are included.

	Internships	Full-Time Jobs
All students applying for both internships and full-time jobs via on-campus interviews	Average number of applications per student	
	22.14	12.83
	Average industry concentration index	
	0.70	0.72
	Internships	Full-Time Jobs
	Average number of applications per student	
Class of 2007	20.45	13.30
Class of 2008	21.76	13.89
Class of 2009	20.14	**17.27**
Class of 2010	**23.01**	N/A
	Average industry concentration index	
Class of 2007	0.72	0.72
Class of 2008	0.70	0.75
Class of 2009	0.72	**0.68**
Class of 2010	**0.65**	N/A

Table 5: Bidding behavior

The table presents OLS regression models for the bids placed by candidates interested in obtaining interview slots during the open stage of on-campus recruiting for internships and full-time jobs. Each year students get 800 points to bid for interviews they are interested in obtaining. Points do not carry to the following year. The omitted industry category is Consulting. Standard errors are corrected for heteroskedasticity and clustered at the job id level.

	Bids for Internships	Bids for Full-time Jobs
$PrestigiousCompany$	71.17	95.05
	$(10.18)^{***}$	$(6.05)^{***}$
$AverageCompanySalary$ $(thousand\$'s)$	1.56	0.97
	$(3.59)^{***}$	$(2.07)^{**}$
$Second\ Round\ of\ Bidding$	24.45	20.42
	$(2.78)^{***}$	(0.97)
$Third\ Round\ of\ Bidding$	88.69	70.38
	$(6.41)^{***}$	$(3.81)^{***}$
$Fourth\ Round\ of\ Bidding$	110.31	144.04
	$(5.60)^{***}$	$(6.05)^{***}$
$Fifth\ Round\ of\ Bidding$	147.30	149.02
	$(3.66)^{***}$	$(4.00)^{***}$
$FINC\ Industry$	–36.06	–65.08
	$(-2.51)^{**}$	$(-2.51)^{**}$
$GENCORP\ Industry$	–42.42	–95.54
	$(-2.84)^{***}$	$(-3.70)^{***}$
$GOVNONP\ Industry$	–45.49	–149.14
	(–1.29)	$(-3.21)^{***}$
$OTHERSERVICES\ Industry$	–40.71	–101.60
	$(-1.68)^{*}$	$(-3.38)^{***}$
$TECH\ Industry$	–80.87	–131.67
	$(-5.83)^{***}$	$(-4.49)^{***}$
$GotOfferFromInternship_i$		64.66
		$(6.36)^{***}$
$GotOfferFromPrevFTEmployer_i$		37.24
		$(2.23)^{**}$
R^2	0.12	0.15
Observations	8883	5720
Class year FEs included		

$^{*}p < .10,^{**}p < .05,^{***}p < .01$

Table 6: Selection into contests

This table shows the average characteristics of applicants as a function of the desirability of the job pursued in the contest. The data refers to open-bid contests. A contest is given by the triplet (company, recruiting year, job type), where job type is either internship or full-time. Whether a company is categorized as high paying or low paying is determined by whether the average full-time job salary offered to candidates during the sample period is above $100,000. Using this threshold 46% of companies are categorized as high paying. Prestigious companies are those named in the Fortune MBA 100 annual listings during 2006-2009. 11% of companies that make offers to candidates in the sample (including those recruiting off-campus) are classified as prestigious.

	High Paying Companies	Low Paying Companies	Diff	Prestigious Companies	Non-Prestigious Companies	Diff
#Applicants	17.55	13.67	3.88***	22.22	10.34	11.88***
#Interviews/Applicant	0.77	0.74	0.03***	0.75	0.75	0.00
#Offers/Applicant	0.05	0.06	-0.01***	0.05	0.05	0.00
#Offers/Interview	0.07	0.10	-0.03**	0.08	0.09	-0.01*
Points bid	131.28	110.47	20.81***	151.50	95.86	55.64***
GPA	3.46	3.42	0.03***	3.43	3.44	-0.01
GMAT	701.99	696.29	5.70***	699.00	698.03	0.97
Top100Undergrad	0.42	0.47	-0.05***	0.45	0.45	0.00
Male	0.72	0.65	0.07***	0.67	0.68	0.01
# Contests	361	606		389	578	

*** Significant at $p < 0.01$

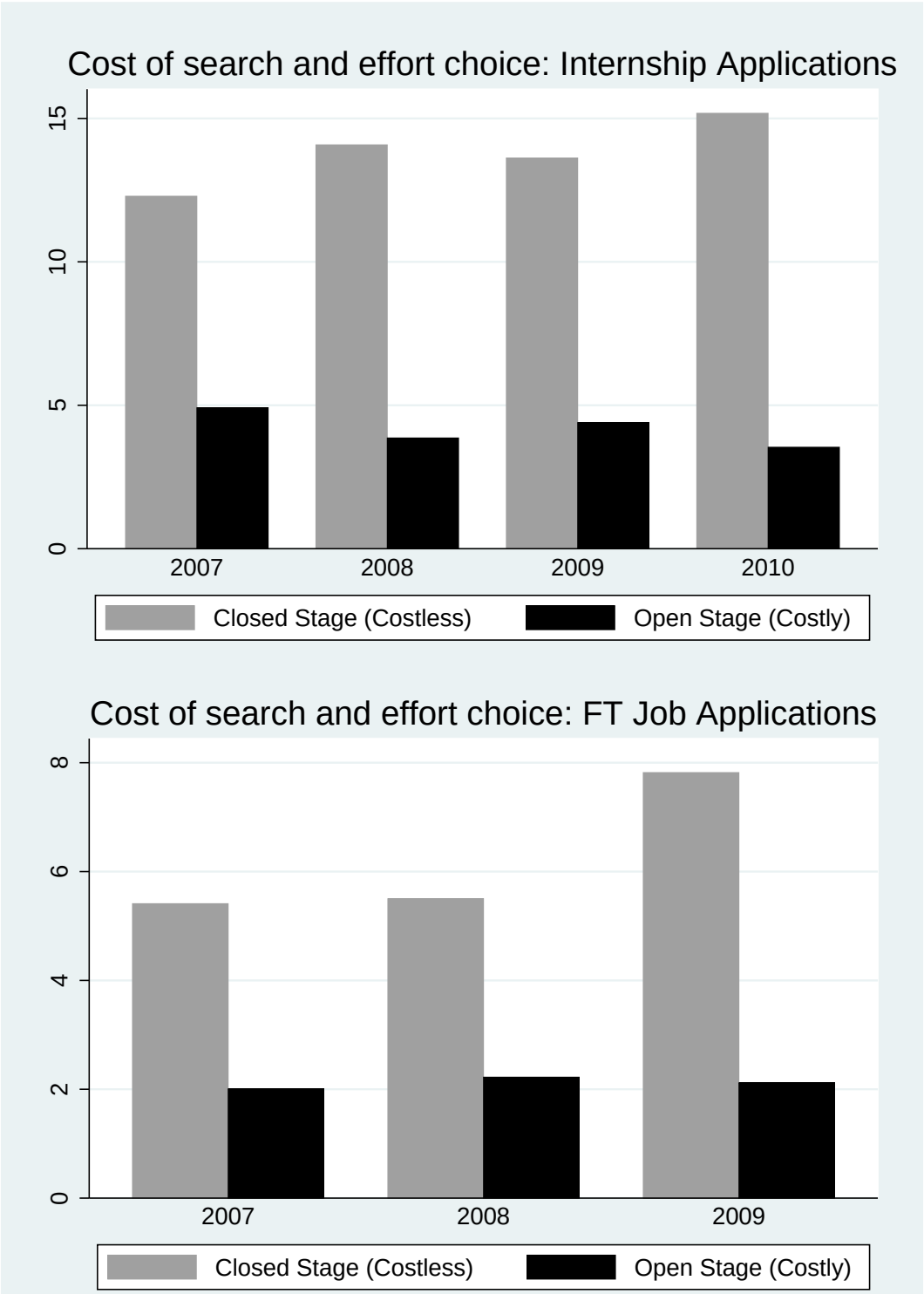

Figure 1: Breadth and cost of search

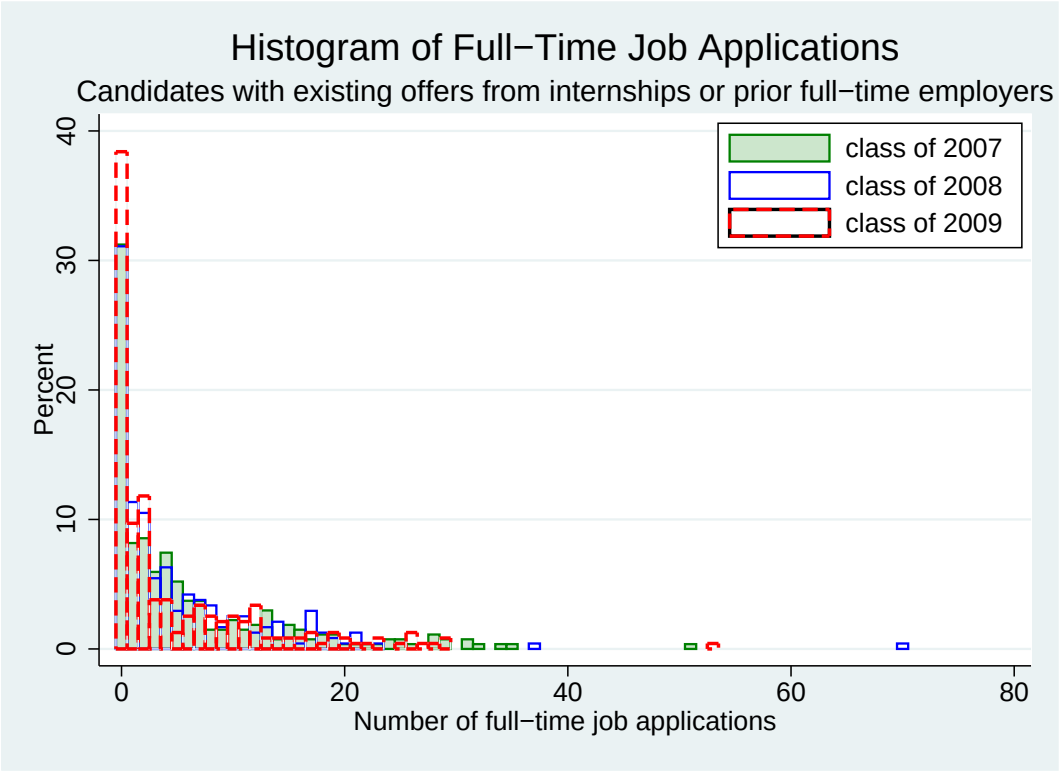

Figure 2: Histogram of the number of full-time job applications made by candidates, by year of graduation

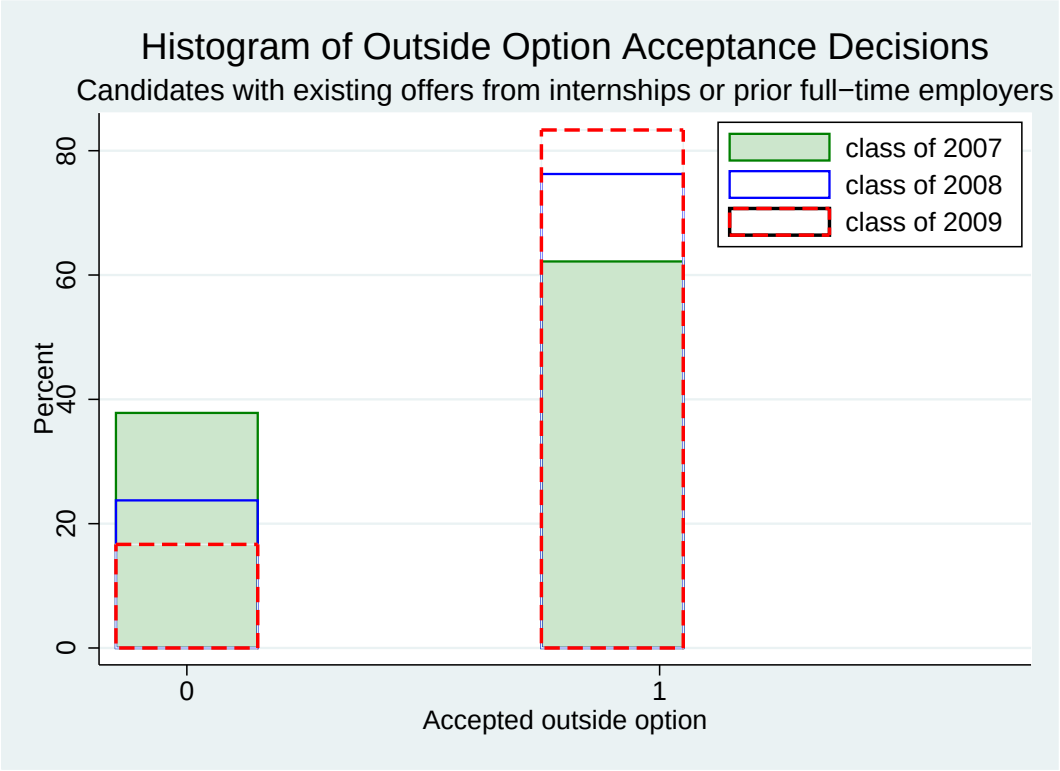

Figure 3: Histogram of decisions to accept or reject the outside option (i.e., an existing offer from a summer internship or a prior full time employer), by year of graduation

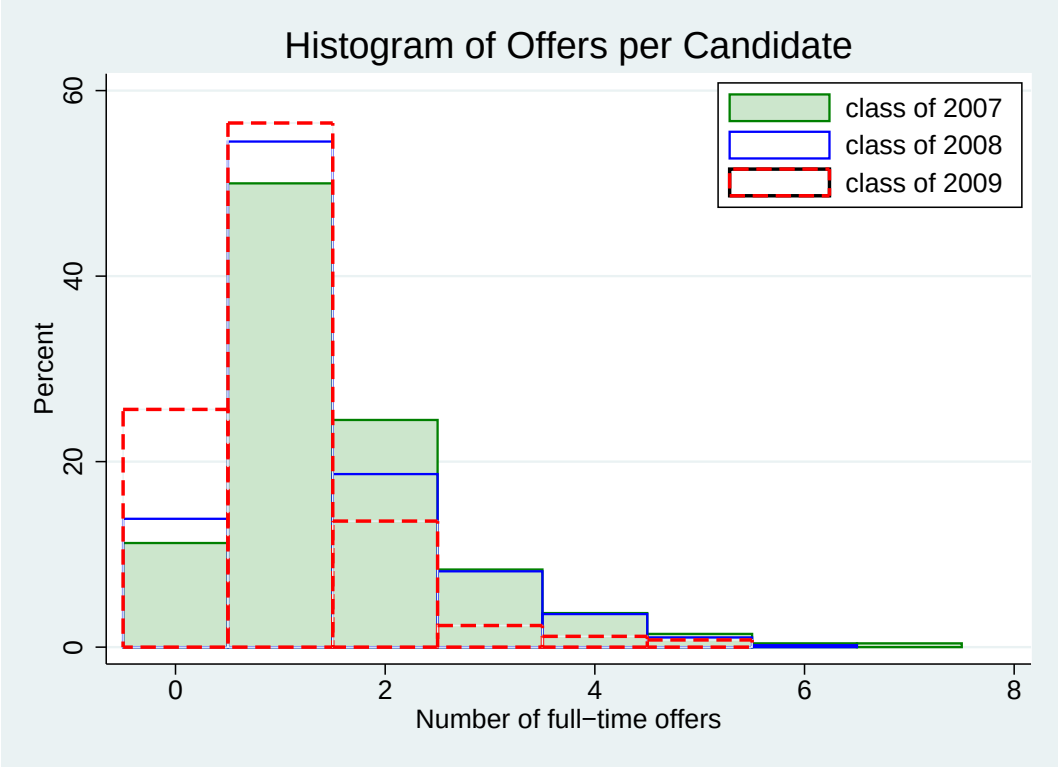

Figure 4: Histogram of the number of offers received by candidates, by year of graduation

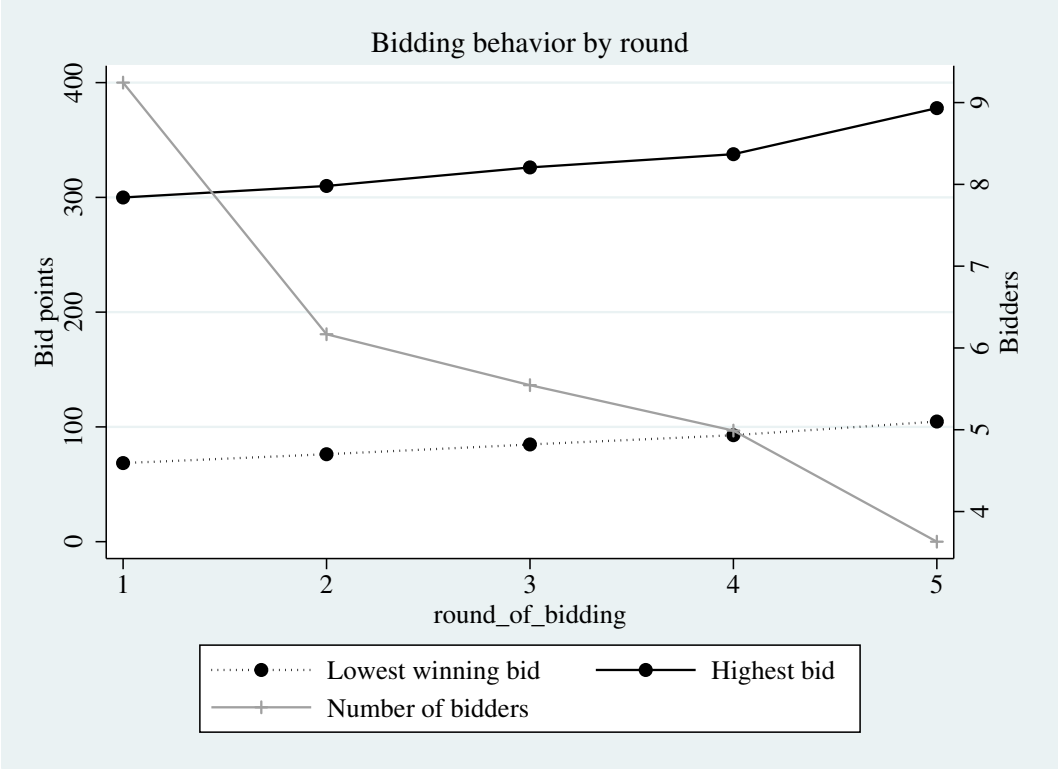

Figure 5: Bidding behavior by round

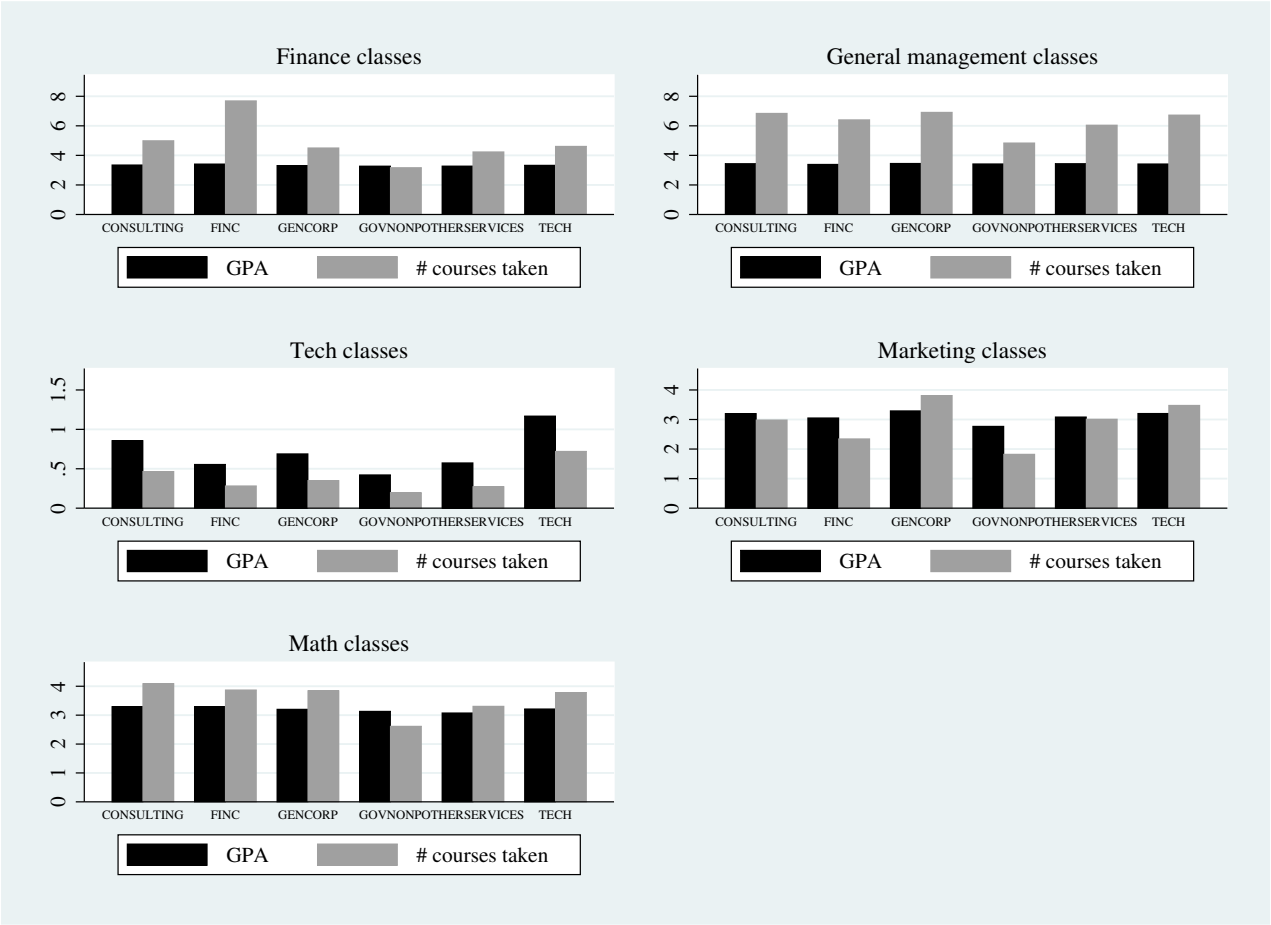

Figure 6: GPA and number of classes taken, by academic area and type of job applied for.

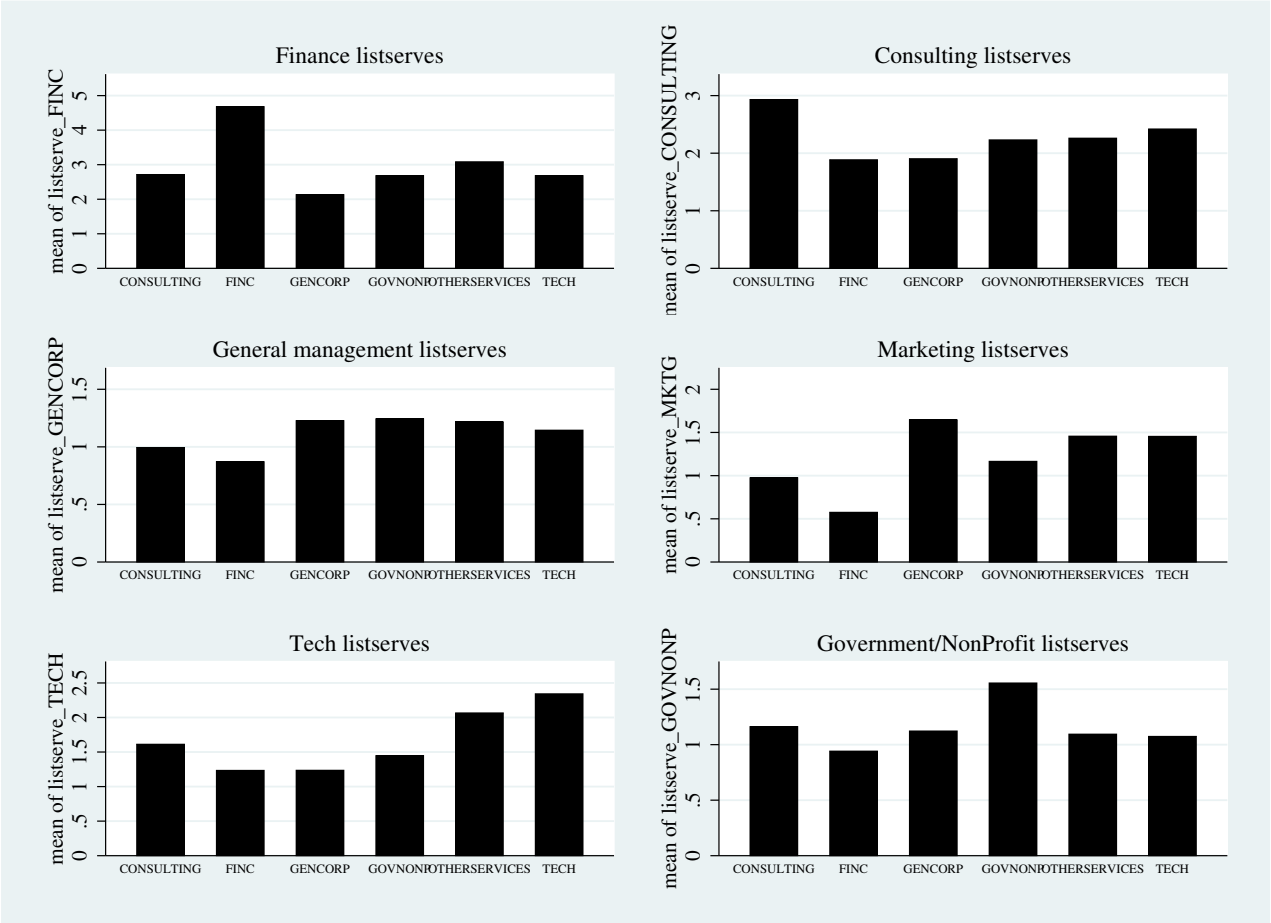

Figure 7: Listserve memberships by industry area and type of job applied for.