Compensating Differentials, Tournaments, and the Market for MBAs

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Abstract

This paper investigates the labor market effects of obtaining an MBA degree. Despite estimated positive returns to the degree on earnings, a *negative* reduced form effect of the MBA on managerial attainment is found, a finding that is especially puzzling since managerial status and earnings are highly positively correlated. This reduced form result is extremely robust. In particular, evidence is provided suggesting that the negative effect of an MBA on managerial attainment is *not* due to: 1. observed or unobserved productivity differences between MBAs and non-MBAs; 2. differential worker sorting across observable dimensions like firm size or industry; or 3. a probationary period following MBA attainment. While basic models of MBA attainment cannot explain the key empirical regularities, a model of worker sorting on the basis of differential preferences over unobserved job or career tracks is presented which does allow for these findings. The model is estimated using a panel data set consisting of registrants for the Graduate Management Admissions Test (GMAT). Estimation produces a positive overall effect (on wages and managerial attainment) of an MBA, and demonstrates the existence of a compensating

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differential between positions with a higher likelihood of managerial attainment versus positions with a lower likelihood of managerial attainment.

1 Introduction

Since its conception in 1908, the Master's of Business Administration (MBA) degree has become the premier educational credential in the field of business. Today, more than 100,000 people exit programs in graduate management with the degree each year, second in advanced degrees only to the Master's in Education (U.S. Department of Education, 2001). The immense popularity of the degree is due in part to the fact that the MBA is often touted as allowing its holders to earn significantly higher salaries, presumably by placing them on the "fast track" to positions of higher responsibility. This idea is supported anecdotally, as MBAs in prominent positions are in abundance. For example, MBAs constituted 40 percent of the Fortune 100 CEOs in 2001 (Mintzberg, 2004). It is also supported by business schools' claims to be imparting managerial skills and enhancing the leadership potential of their graduates.[1] Economic theory may also suggest that MBAs should rise to the top. To the extent that MBAs are more productive than non-MBAs – either initially, such that the degree is used as a signal, or from newly acquired human capital – firms should desire to place them in positions of greater responsibility.

As this paper documents, however, while MBAs do, on average, enjoy higher incomes as a result of the degree, their likelihood of acquiring positions involving significant managerial responsibility is actually *lower* than their non-MBA counterparts. Within the data set used in this study, of those without MBAs by the end of the sample period, 28.5 percent held positions as mid- to upper-level managers. In contrast, only 19.9 percent of those who acquired

[1]Consider the following quotations from business schools' own web sites: "This program is designed to develop high-potential managers" (University of Virginia (Darden), 2003); "The mission of The Fuqua School of Business is to provide the highest quality education for business and academic leaders, and promote the advancement of the understanding and practice of management through research" (Duke University (Fuqua), 2005); "As a graduate of management education, you ultimately will have opportunities to lead these enterprises. As a graduate of the Stanford MBA Program, you will be well prepared for that responsibility. You will understand the general management principles that create an enduring foundation for leadership" (Stanford Graduate School of Business, 2005); "[The full-time MBA Program] offers an unsurpassed education in management fundamentals and leadership skills" (Berkeley (Haas), 2005); "The combination of an integrated program design, a world-class faculty, accomplished peers, a supportive learning environment and access to a thriving business community provide exceptional preparation for effective managerial leadership" (UCLA (Anderson), 2005);

an MBA by the end of the sample period held such positions. Of course, this difference only reflects a correlational relationship between MBA attainment and managerial status. Determining a causal effect of the degree on labor market outcomes is made difficult by the fact that individuals who choose to obtain an MBA are likely to differ from those who do not. Nonetheless, the finding is extremely robust. The negative relationship is present for full-time and part-time programs, higher ranked and lower ranked programs, males and females, controlling for work experience, job tenure and various measures of individual ability.

The finding that an MBA appears to negatively affect promotion prospects is puzzling, both because of the supposed intent and instructional content of an MBA education, and because of the fact that, as one might expect, managers tend to earn higher incomes than non-managers.[2] Thus, even to the extent that an MBA graduate is interested in making money, they should seemingly be interested in obtaining a managerial position. Several simple models of MBA attainment, as shown later in the paper, cannot explain this empirical finding.

As an explanation, I hypothesize a model in which worker preferences over earnings and managerial status itself (beyond the associated higher earnings) drive the sorting between unobserved job "tracks" or tournaments. Specifically, the model assumes there are two types of tournaments. One tournament is associated with a lower average expected earnings and a higher probability of winning the tournament (attaining a managerial position). The other tournament is associated with a lower probability of managerial attainment, but is compensated with higher average earnings. That is, the market offers a certain trade-off between earnings and managerial status. Individuals with different preferences, however, will choose to locate themselves on different ends of this trade-off. An MBA, by increasing an individual's level of human capital, increases their potential for career success (in terms of both earnings and promotion). But, due to self-selection into MBA programs, MBAs are likely to differ from non-MBAs on the basis of both ability and preferences. If MBAs tend to have preferences oriented more towards earnings and less towards managerial status than their non-MBA counterparts[3], a positive effect of an MBA on earnings and a naive negative "effect" of an MBA

[2]Lazear (1999) shows that wage growth is usually accompanied by promotion.

[3]Supporting this possibility is Livingston (1971): "A major reason why highly educated and ambitious men do not learn how to develop successful managerial careers is that they lack the "will to manage"...[They] are not motivated to manage. They are motivated to attain high salaries..." Indeed, in a recent survey of top business school graduates sponsored by the Fuqua School of Business, the job characteristic rated least important was

on managerial status can be predicted by the model due to different unobserved choices over the type of tournament structure to enter.

Empirically, I estimate a model which attempts to control both for individual differences in ability and for differences in preferences. I assume that an individual's accumulated level of human capital can be expressed in a single "skill index", which includes whether or not the individual possesses an MBA. This skill index affects both wages and managerial attainment. The richness of the data allows for some unique controls for ability. In addition, the presence of pre-MBA employment observations allows for the control of average productivity differences between individuals who choose to obtain MBAs versus those who do not. Further, I allow for unobserved heterogeneity in ability by including a finite mixture distribution of population "types" within the skill index.

Differences in individual preferences over tournaments are predicted by observable characteristics. In particular, the empirical specification allows for multiple, discrete, unobserved types of individuals, where the probability of being a particular type is predicted by observable variables. In an unobserved way (through preferences over job tracks), an individual's type then affects their observed earnings and likelihood of being a manager. Since the same variables that predict preference type are also allowed to affect managerial status and earnings directly through the skill index, the effects of skills and preferences are explicitly separated. A particular preference type should affect managerial status and earnings in opposite directions, reflecting the trade-off that individuals make when choosing between different tournaments.

The model is estimated using data from a survey of individuals who registered to take the Graduate Management Admissions Test (GMAT). Commissioned by the Graduate Management Admissions Council (GMAC), the survey was administered in four waves, allowing for us to follow individuals over the course of up to 9 years, regardless of whether or not they entered a program in graduate management and regardless of whether or not they even completed the GMAT. Estimation of the model results in the recovery of a positive and significant effect of a full-time MBA on both earnings and managerial attainment through augmentation of the skill index. Furthermore, unobserved preference type is found to affect wages and the probability of holding a managerial position in opposite directions, reflecting the hypothesized compen-

"Authority (responsibility of managing others)" (The Fuqua Report, 2003). In another survey, money was the key criterion for 77% of graduates (Dearlove, 1997).

sating differential between earnings and probability of promotion to a managerial position, and allowing for the determination of a positive market value or "price" of managerial status.

The rest of the paper proceeds as follows. Section 2 discusses the relation of this study to various strands of the economics literature. Section 3 describes the data. Section 4 presents the apparent anomalous reduced form relationships in the data and the robustness of these findings to various possible explanations. Section 5 supplies various models of MBA attainment, earnings and managerial status and lays out their empirical implications. Section 6 discusses the empirical model to be estimated, while section 7 displays results of this estimation. Section 8 concludes.

2 Related Literature

This paper contributes to a number of strands in the economics literature. A large body of literature attempts to quantify the causal effect of an additional year of schooling on earnings. Estimation of this effect is generally complicated by the fact that unobservable personal traits may be correlated with both schooling and earnings. Thus, the earnings of individuals who complete more schooling may differ, even in the absence of the additional schooling, from those who complete less schooling. In an attempt to overcome this problem, previous research has relied on instrumental variables (such as proximity to colleges or date of birth[4]), data on siblings or twins to control for some degree of innate ability and family environment[5], or exclusion restrictions in structural models[6]. Alternatively, this study exploits the fact that the majority of MBAs obtain work experience prior to enrolling, allowing for the control of unobservable fixed differences in the characteristics of MBAs versus non-MBAs. Identification of the effects of an MBA thus comes from the timing of MBA completion, rather than from relying on non-MBAs as a control group. Furthermore, this study focuses not solely on earnings, but also examines the effect of an MBA on the attainment of managerial positions. To the extent that workers value more than earnings, current estimates of the returns to schooling may understate the true returns.

More specifically, this work also builds on the small body of research pertaining to the

[4]See, for example, Angrist and Krueger (1991) and Kane and Rouse (1995).

[5]See, for example, Ashenfelter and Krueger (1994) and Ashenfelter and Rouse (1998).

[6]See Willis and Rosen (1979), Keane and Wolpin (1997, 2000, 2001).

effects of an MBA. Articles in the popular press and business schools themselves often report average starting salaries of graduates as an indicator of program effectiveness, while little emphasis is placed on the relation of these statistics to differences in the strength of incoming students. A few studies attempt to determine the efficiency or value added of MBA programs using aggregate data on student characteristics as reported by top-rated schools (Tracy and Waldfogel (1997); Colbert, Levary and Shaner (2000); Ray and Jeon (2003)). The authors' rankings of these programs are typically compared to popular published rankings, and significant differences are found. None of these papers, however, use detailed individual-level data of student characteristics and outcomes, and the economic return to the MBA degree is not specifically addressed. A few other studies do look more carefully at individual outcomes, but also not with the goal of estimating the average return to an MBA. Graddy and Pistaferri (2000) analyze the starting salaries of graduates of London Business School in order to determine the extent of the gender wage gap. Similarly, using the same data as in the current study, Montgomery and Powell (2003) look at changes in the gender wage gap due to MBA completion. Also using the same data, Montgomery (2002) estimates a model of the choice between graduate business schools, focusing on the characteristics of the programs and the prospective students themselves. Finally, Arcidiacono, Cooley and Hussey (2005), using a fixed effects procedure to eliminate the effects of unobserved ability differences, is the only study to focus on estimating the economic returns to various types of MBAs. The present paper builds on their work by extending their analysis to include the effect of an MBA on managerial position. As this paper demonstrates, focusing solely on earnings overlooks an important part of the dynamics of the MBA labor market.

To the extent that a tournament model is thought to underlie the attainment of managerial positions, this research also builds on the literature involving tournament theory [Lazear and Rosen (1981)] and its application. In this framework, the advancement of individuals within a firm's hierarchy is viewed as a tournament in which individuals compete with one another for promotion. The more able candidates tend to win promotions (in this case, to managerial positions), receiving a prize in the form of higher pay. One of the implications of the theory of tournaments is that the greater the probability of winning the tournament, the lower the prize (the spread between the pay of winners and losers) and the lower the average wage of the workers. Optimal hierarchical structures may vary between firms for a number of reasons,

and thus the probability of winning a tournament will vary)[7]. Rather than investigating the wage and promotion dynamics within a particular firm (or a particular tournament), this estimation methodology utilized in this paper is motivated by a model that incorporates individuals' unobserved choices *between* tournaments.

An individual's choice over tournaments is characterized by a tradeoff between expected earnings and likelihood of promotion to a managerial position. The existence of this tradeoff suggests a compensating differential between job tracks with a higher likelihood of obtaining an upper managerial position and job tracks with a lower likelihood of obtaining such a position.[8] As such, this paper contributes to a large literature that attempts to obtain estimates of compensating wage differentials, or the market "price" of several characteristics of jobs, such as worker safety [Gunderson and Hyatt (1996), Viscusi (1993)], unemployment risk [Murphy and Topel (1987)], and health benefits [Olson (2002)]. Typically, this involves estimating regressions of wage on the characteristic of interest and other individual and job-specific control variables. Using this method, the coefficients of interest frequently turn out to be small, or even opposite their expected sign. This is because unobserved worker ability, heterogeneous preferences, and omitted workplace variables complicate the usual hedonic regression approach. Alternatively, other studies rely on the job switching behavior of some individuals in an attempt to diminish these concerns (cite). This study, besides estimating the compensating differential of managerial status itself, also suggests an innovative estimation approach. Instead of modeling wage as a function of the job characteristic of interest (in this case, managerial status itself) and other variables, the wage and non-wage characteristic is modeled separately. By allowing observed individual traits to affect both wage and the likelihood of holding a job with the characteristic of interest, and by allowing the same traits to also affect the probability of being a particular unobserved preference type, the inclusion of preference type within the wage and non-wage equations should uncover the existing trade-off that individuals are willing to make between the wage and non-wage characteristics.

[7] See Lazear (1998) for a discussion.

[8] In some ways this work is similar in spirit to that of Sauer (1998), who examines the career choices over time of law school graduates. The graduates choose between several observable employment sectors, which differ by earnings and nonpecuniary returns. Here, I allow for sorting between *unobservable* sectors, characterized by different average wage rates and implicit probabilities of managerial attainment, and use this sorting to estimate the market compensating differential of the probability of managerial attainment.

3 Data

I utilize a longitudinal survey of registrants for the Graduate Management Admissions Test (GMAT). The survey, sponsored by the Graduate Management Admissions Council (GMAC), was administered in four waves, beginning in 1990 and ending in 1998. 5,885 individuals responded to wave 1, a sample that diminished to 3,771 by wave 4. The survey asks detailed questions about education experience, work experience and earnings. It also provides information on characteristics of jobs held by respondents. This includes information on promotions, managerial responsibility, size of firm, etc. Information on the way individuals paid for their education is also available. In addition, the survey data was linked to GMAT registration and test records, providing reliable information on prospective student test scores.

The problem of unobserved heterogeneity is well recognized in the literature involving education attainment. If there exists an ability or trait which is known to the individual and unobserved by the econometrician, then estimates of the monetary return to education, or the effect on chances of promotion, will be biased. For example, suppose an individual is particularly adept at "thinking outside the box", a trait which is rewarded with both higher wages and a higher likelihood of holding an upper-management position. It is likely that this trait also has a positive influence on the individual's decision to obtain an MBA, in which case estimates of the return to an MBA (in wage or position) would be biased upward. This data set, however, offers a number of good ability controls not commonly available. First, by focusing only on individuals having taken the GMAT, the sample is relatively homogeneous in terms of career goals and initial human capital. Second, since most registrants actually took the GMAT, a standardized test designed to evaluate students' cognitive skills and likelihood of performing well in business school, the scores provide a relatively good measure of individual ability and scholastic aptitude.[9] Scores from the verbal and quantitative sections of the exam are used in this study, as well as undergraduate GPA. In addition, the surveys ask respondents to evaluate their own skills and abilities in a number of areas, allowing for the more complete control of ability factors than has been possible in prior studies.

[9]Validity studies have shown that GMAT scores do a reasonable job of predicting performance in graduate management programs. Recent studies indicate that the average correlation between GMAT scores and mid-program grades is 0.48, compared to the correlation between the same grades and undergraduate grade point average of only 0.28 (www.gmac.com).

Even more significant is the fact that almost all those who enroll in MBA programs have acquired at least a couple years of work experience prior to enrolling. The lack of observing the counterfactual of wages without additional education has been the fundamental problem of studying the returns to education. Here, the decision to get an MBA can effectively be controlled for, as the nature of the data allows for the effects of an MBA on wages and managerial attainment to be identified not by differences in wages and managerial status *across* MBAs and non-MBAs, but by differences in individuals' pre- and post-MBA observations.

Table 1 displays descriptive statistics of individuals in the sample at the time of the first survey, grouped by whether or not the individual obtained an MBA degree by the their last survey response, and by whether the degree was obtained in a full-time or part-time program. Immediately, some differences between the MBA and non-MBA samples stand out. In particular, the full-time MBAs tend to be younger. This is reflected in their lower years of work experience, tenure, lower hourly wage, and lower likelihood of marriage. The sample of individuals that got part-time MBAs were slightly more experienced in the beginning of the sample period, however, than those that received no MBA. Differences between the samples in frequency of mid- to upper-level managers (a self-reported measure) may also reflect differences in age and experience, as eventual full-time MBAs are significantly less likely to start out (in the sample) as managers. They are, however, just as likely to be managers by wave 4 as those that get part-time MBAs, suggesting that full-time programs may be more successful in affecting managerial potential. In addition, those that possess another graduate-level or professional degree at the time of the first survey are less likely to go on to obtain an MBA.

The MBA and non-MBA samples differ in terms of observed ability measures. MBAs, especially full-time MBAs, have much higher average quantitative and verbal GMAT scores, as well as undergraduate grades. These differences probably reflect, at least in part, admissions standards of MBA programs, but also may reflect some self-selection into MBA programs on the part of more able individuals.

The "Self-reported skills" in Table 1 is an aggregation of survey responses to various skill self-assessment questions, identical to that designed by Montgomery and Powell (2003).[10] Specifically, respondents are asked to evaluate on a scale the extent to which they possess several skills that are presumed to be useful in being a successful manager: oral communication,

[10]Montgomery and Powell term this, perhaps more accurately, a "confidence index".

Table 1: Wave 1 Descriptive Statistics by MBA Status

	No MBA	Full-time MBA†	Part-time MBA†
Experience (yrs.)	6.19	3.79	6.77
	(5.64)	(3.87)	(6.07)
Tenure (yrs.)	3.12	2.13	3.34
	(3.82)	(2.25)	(3.86)
Hourly Wage ($)	15.06	13.60	15.62
	(7.03)	(5.03)	(5.69)
Quantitative GMAT	27.66	33.33	29.95
	(8.73)	(8.23)	(7.96)
Verbal GMAT	27.27	32.02	29.64
	(7.98)	(7.50)	(7.38)
Undergrad. GPA	2.97	3.11	3.06
	(0.43)	(0.40)	(0.43)
Self-reported skills	-28.33	-27.95	-28.75
	(5.35)	(5.20)	(5.21)
Manager (Wave 1)	0.170	0.113	0.175
Manager (Wave 4)	0.291	0.200	0.199
Other grad. degree	0.059	0.028	0.039
Married	0.372	0.218	0.425
Asian	0.158	0.180	0.124
Black	0.153	0.155	0.098
Hispanic	0.172	0.169	0.142
Female	0.414	0.363	0.402
Firm size	17503	21878	18725
Observations	1754	284	508

†Defined by whether an individual completed an MBA program sometime during the 4 waves. Standard deviations in parentheses.

written communication, ability to delegate tasks, ability to work as a team, etc. Registrants responded to 16 such questions on a scale from 1 (most skillful) to 4 (least skillful). The negative of the sum is used in this study, making the range from -64 (least skillful) to -16 (most skillful). This skill measure is included in the analysis in order to control for ability and confidence factors not captured by test scores or grades. As can be seen in the table, the mean reported skill level does not differ substantially between the groups, although future full-time MBAs report themselves to be slightly more skilled.

While some degree of selection into MBA programs is evident from differences in mean ability measures in Table 1, any sorting on the basis of observables into management versus non-management positions by the end of the sample period is less apparent.[11] Table 2 presents the means of some key variables by managerial status in wave 4. As expected, those that report having mid- to upper-level management positions tend to be slightly older and have more work experience than those that report holding non-managerial or entry-level managerial positions. Surprising, however, is the fact that the mean tenure is smaller for the mid- to upper-level managers. Mid- to upper-level managers also enjoy an average of a 23% higher hourly wage than the lower positions. These higher earnings may reflect a greater degree of human capital accumulation for this group (they have, after all, more on-the-job experience). Observed ability measures, however, do not go far in supporting this idea. Both GMAT scores and undergraduate grades are virtually indistinguishable between the two groups, and while higher managers have a slight tendency to report having more skills, this difference is small.[12] Perhaps the most significant difference between the two groups is that, as suggested from prior discussion, upper managers are significantly *less* likely to have obtained an MBA than those in non-managerial or entry-level managerial positions, and are no more likely to have attended a top ranked MBA program or a full-time program, or to have obtained an alternative advanced degree.

Perhaps the fact that few differences are observed between those who become upper-level managers and those who do not is due to the vague and potentially non-meaningful managerial

[11] Minorities and females, however, are less likely to be mid- to upper-level managers by wave 4. This could reflect some degree of worker sorting, though a discrimination story is also likely.

[12] Note, however that the mean verbal GMAT score is slightly *higher* for upper managers and the mean quantitative GMAT is slightly *lower*. This will be discussed in more detail in Section 3.

Table 2: Wave 4 Descriptive Statistics by Managerial Status†

	Non- and entry-level manager	Mid- to upper-level manager
Experience (yrs.)	8.63	9.83
	(6.04)	(6.65)
Tenure (yrs.)	4.46	3.82
	(4.44)	(4.01)
Hourly Wage ($)	24.47	30.13
	(13.32)	(21.14)
Quantitative GMAT	29.37	29.16
	(8.66)	(8.45)
Verbal GMAT	28.89	29.12
	(7.74)	(7.82)
Undergrad. GPA	3.04	3.00
	(0.41)	(0.41)
Self-reported skills	-28.64	-27.69
	(5.21)	(5.12)
MBA	0.460	0.346
Top 10 MBA	0.034	0.026
Top 11-25 MBA	0.043	0.034
Other grad. degree	0.111	0.118
Married	0.626	0.652
Asian	0.148	0.102
Black	0.131	0.090
Hispanic	0.175	0.175
Female	0.427	0.353
Career important	0.650	0.624
Family important	0.883	0.869
Wealth important	0.226	0.201
# People managed[1,2]	3.43	30.8
Budget (millions $)[1,2]	1.08	10.6
Pay and promotion decisions?	0.43	0.82
# Pay and promotion decisions	12.6	23.8
Firm size[2]	21386	13364
Observations	1716	587

Standard deviations in parentheses.

[1]Due to differences in survey design, these variables include waves 1 through 3.

[2]Imputed from a categorical variable.

categories. What exactly does it mean to be a mid- to upper-level manager? While survey respondents were asked to classify themselves with little objective criteria for the distinctions, the surveys do provide us with some more job-related information that can be used to identify and confirm differences between the classifications.[13] The bottom of Table 2 reports this information. Indeed, there appears to be significant differences between managers reporting to be non- and entry-level managers verses those reporting to be mid- to upper-level managers. The average upper-level manager reports managing 30.8 people, while entry-level managers average only 3.43 people in the units they manage. Similarly, the annual budget over which non- or entry-level managers had primary responsibility is only one tenth as large as that of upper-level managers. The percentage of respondents indicating that they make decisions about the pay and promotion of others also increases with managerial status. On the other hand, upper-level managers are less likely to be found at large firms.

Table 2 may be seen as providing some initial evidence that obtaining an MBA is not necessarily good for one's prospects of obtaining a managerial position. While an MBA education is presumably intended to provide students with management skills, better enabling them to become managers, those who become managers by wave 4 in this data set are less likely to have obtained an MBA than those who remain as non-managers or entry-level managers. Of course, these statistics merely reflect correlations in the data, and serve no basis for causal inference. As an initial look at the effect of receiving an MBA on promotion opportunities, we can look at mean responses to some of the particularly relevant survey questions. Table 3 shows the percentage of wave 4 respondents agreeing with the given statements dealing with their current opportunities for promotion. The table is separated by MBA status. Individuals in school at the time of the survey were excluded. All of the differences in means suggest that

[13]The surveys asked respondents to classify themselves as one of the following: non-manager, entry-level manager, or mid- to upper-level manager. Throughout the analysis I group the first two classifications together. This paper looks at the effect of an MBA on the likelihood of promotion. I view both non-manager and entry-level manager positions to be lower positions within a firm's hierarchy, so that labeling movements between them as promotions or demotions is not appropriate. These two groups have similar observable characteristics and earn similar wages, and the proportions of individuals who go on to obtain MBAs do not differ substantially. An MBA is found to have no effect on the ability of a non-manager to obtain an entry-level managerial position, or vice-versa. Furthermore, the results presented in later sections are robust to eliminating either of the first two groups from the analysis.

Table 3: Attitudes toward promotion, by MBA (Wave 4)

	MBA	No MBA
Good opportunities for promotion	0.61	0.49
Opportunities somewhat limited	0.52	0.63
Promotion on ability	0.75	0.67
Dead-end job	0.13	0.18
Good chance for promotion	0.67	0.57
Unfair promotion policy	0.14	0.18
Infrequent promotions	0.49	0.53
Regular promotions	0.40	0.32
Fairly good chance for promotion	0.70	0.60
Observations	1311	992

those with MBAs are in positions of greater opportunity for promotion. With the exception of "unfair promotion policy" and "infrequent promotions", all differences are statistically significant at the 5% level. Thus, it seems that while MBAs are less likely to hold managerial positions, they actually feel better about their opportunities for promotion.

Table 2 exhibited few differences in mean characteristics between managers and non-managers (other than rates of MBA attainment). It may be, however, that differential promotion rates are being masked by worker sorting on another dimension. Most notably, workers may be sorting on the basis of firm size. There is, after all, a large literature which documents and attempts to explain the wage premium found at larger firms.[14] In contrast, as seen at the bottom of Table 2, individuals reporting to be mid- to upper-level managers are more likely to be employed at smaller firms. In order to determine whether MBAs are really less likely to be managers, or whether they are just more likely to be at larger firms, Table 4 displays frequencies of individuals holding managerial positions by eventual MBA status and firm size categories. The left side of each column reports the percentage of individuals in the given wave with a given MBA status who are employed in firms in the indicated size category. Comparing those who get MBAs sometime between wave 1 and wave 4 to those who do not, we see that

[14]For a review of this literature, see Oi and Idson (1999)

Table 4: Managerial Frequencies by Firm Size and MBA

	MBA				No MBA			
	Wave 1		Wave 4		Wave 1		Wave 4	
Firm size	%	Mgr.	%	Mgr.	%	Mgr.	%	Mgr.
less than 25	6.9	0.364	7.5	0.488	8.4	0.275	11.5	0.544
25-999	24.6	0.234	22.8	0.313	28.1	0.255	28.6	0.337
1,000-25,000	37.1	0.148	33.9	0.169	36.1	0.128	33.8	0.241
25,000+	31.4	0.124	35.8	0.115	27.5	0.130	26.1	0.192

The first columns indicate the percentage of individuals within that column that were employed within the given firm size category. The second columns indicate the frequency of individuals within each cell that were observed holding a managerial position. MBA indicates that an MBA was obtained sometime between Wave 1 and Wave 4. Firm size corresponds to number of employees world-wide.

MBAs are more likely to work for larger firms, both before and after obtaining the degree. However, as the right side of each column shows, within each firm size category, MBAs in wave 4 are still less likely to hold managerial positions than non-MBAs. Furthermore, in wave 1, prior to enrolling in business school, MBAs are equally (if not more) likely to be managers than those who do not get MBAs. Thus, according to simple difference-in-differences calculations, an MBA appears to make individuals *worse* off in terms of promotion to managerial positions.

4 Relationship between MBA Attainment, Earnings, and Managerial Status: Reduced Form Estimates

In the previous section, sample statistics suggested some intriguing correlations between MBA attainment, earnings and managerial status. In this section various reduced form estimation results are presented which serve to further substantiate the relationships between these variables. By controlling for time trends, work experience, various demographic variables and measures of worker ability, these estimates go considerably further in isolating a causal effect

of an MBA on earnings and managerial status than did the mere correlations implied by the statistics in the previous section. In particular, three notable relationships are found within the following regression results:

1. Obtaining an MBA has a positive effect on an individual's earnings.
2. Being a mid- to upper-level manager has a positive effect on an individual's earnings.
3. Getting an MBA appears to have a *negative* effect on an individual's likelihood of being a mid- to upper-level manager.

A number of simple explanations might serve to reconcile these empirical regularities. In particular, it may be that there are heterogeneous abilities between MBAs and non-MBAs. It might also be the case that MBAs and non-MBAs differ in their initial managerial positions. Those that do not obtain an MBA might not do so because they are already more likely to be managers. As suggested in the last section, it could also be that the observed relationships are being driven by differential worker sorting across observable dimensions like firm size or industry. Finally, a probationary employment period following MBA attainment might explain the results. Each of these hypotheses are investigated, and rejected, in turn.

Table 5 presents the results of regressions of earnings on a dummy variable for MBA completion and work experience variables and other controls. The sample consists of individuals with current jobs reporting earnings such that hourly wage rates could be constructed. The dependent variable is the logarithm of the hourly wage. The estimated coefficients are very similar to those reported in Arcidiacono, Cooley and Hussey (2005), who use the same data to estimate the economic returns to an MBA, despite a slightly different sample than that which is used here. The baseline regression results with no ability controls, displayed in column (i), report a return to an MBA on earnings of 8.48%. In order to determine whether or not the return to an MBA is primarily to individuals with MBAs being able to obtain management positions (which are higher paying), managerial status is controlled for in column (ii). Indeed, the coefficient on managerial status is large and very significant, with mid- to upper-level managers earning an average of 11.65% more than lower level or non-managers, controlling for total work experience and tenure at the current job. The coefficient on MBA, however, actually increases, suggesting that the return to an MBA on earnings is present not due to

Table 5: Log Wage Regressions

	(i)		(ii)		(iii)		(iv)		(v)	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
MBA	0.0848*	0.0140	0.0912*	0.0139	0.0532*	0.0135	0.0657*	0.0174	0.1421*	0.0187
Part-time*MBA	-	-	-	-	-	-	-0.0267	0.0212	-0.1270*	0.0217
Experience	0.0469*	0.0027	0.0434*	0.0027	0.0456*	0.0027	0.0459*	0.0027	0.0373*	0.0042
Experience^2	-0.0013*	0.0001	-0.0012*	0.0001	-0.0012*	0.0001	-0.0012*	0.0001	-0.0018*	0.0001
Tenure	0.0134*	0.0017	0.0134*	0.0016	0.0134*	0.0016	0.0135*	0.0016	0.0037*	0.0013
Oth. adv. degree	0.1287*	0.0199	0.1273*	0.0198	0.0850*	0.0187	0.0842*	0.0187	-0.0200	0.0198
Married	0.0463*	0.0110	0.0437*	0.0108	0.0443*	0.0104	0.0441*	0.0104	0.0324*	0.0102
Female	-0.0872*	0.0110	-0.0815*	0.0109	-0.0466*	0.0110	-0.0460*	0.0110	-	-
Asian	0.0877*	0.0153	0.0942*	0.0153*	0.0722	0.0149	0.0720*	0.0149	-	-
Black	-0.0794*	0.0168	-0.0716*	0.0165	0.0170	0.0165	0.0162	0.0165	-	-
Hispanic	-0.0485*	0.0152	-0.0461*	0.0150	0.0042	0.0148	0.0036	0.0148	-	-
Manager	-	-	0.1165*	0.0132	0.1172*	0.0129	0.1161*	0.0129	0.0686*	0.0103
Undergrad GPA	-	-	-	-	0.0500*	0.0133	0.0495*	0.0133	-	-
Verbal GMAT	-	-	-	-	0.0004	0.0009	0.0004	0.0009	-	-
Quant. GMAT	-	-	-	-	0.0110*	0.0008	0.0110*	0.0008	-	-
Reported skill	-	-	-	-	0.0026*	0.0010	0.0026*	0.0010	-	-
R^2	0.3563		0.3659		0.4063		0.4064		0.5813	

Estimated on 9419 observations from 3803 individuals. Regressions also included year dummies. Standard errors are clustered at the individual level. *Statistically significant from zero at the 5% level.

an increased likelihood of obtaining a managerial position, but *despite* a lower likelihood of obtaining a managerial position.

Of course, we know from the statistics reported in Table 1 that those individuals who get MBAs are more able according to certain measurable characteristics, and thus would probably earn more even without getting an MBA. Column (iii) thus controls for undergraduate grades, verbal and quantitative GMAT score, and the self-reported skill index discussed earlier. With the exception of verbal GMAT score, which has no effect on wages, the coefficients on these

variables are positive and significant.[15] Furthermore, the estimated return to an MBA falls to 5.32%, disclosing a positive ability bias found in the results of the first two regressions. Column (iv) separates the effect of an MBA on wage by schedule of MBA program: part-time or full-time. Heterogeneity in the returns to program type is found to exist. While both types are positive, full-time MBAs enjoy a substantially higher return. Despite the included controls for ability, there may be individual characteristics or skills which MBAs tend to possess that positively affect wages, but which are unobservable to the econometrician. The last regression in Table 5 thus includes individual fixed effects to account for all time-invariant unobserved heterogeneity that may still be biasing the coefficients.[16] Controlling for unobserved heterogeneity has a significant effect on the estimates. The coefficient on managerial status falls, which is not surprising since managers have proven themselves to be productive in the workplace. The difference between full-time and part-time programs increases substantially. A full-time MBA is estimated to provide an average return of 14.2%, while the return to a part-time program decreases further to about 1.5%. As discussed by Arcidiacono, Cooley and Hussey (2007), these findings suggest that individuals who attend full-time MBA programs are *less* able in unobservable dimensions than their non-MBA counterparts.

I now investigate the effect of an MBA on managerial attainment. In order to do this, I present the results of several regressions of logit models of managerial attainment. The dependent variable is thus equal to one if the individual reported being a mid- to upper-level manager, and equal to zero otherwise. As in the case of the wage regressions, only full-time, current jobs are included.

The results are displayed in Table 6. Column (i) shows the baseline results with no ability controls, and column (ii) includes measurable controls for ability. In both cases, the observed effect of an MBA on managerial status is *negative* and significant. This result is puzzling, since an MBA was seen to have a *positive* effect on earnings, and earnings and managerial status seem to be strongly correlated. The result, however, is extremely robust. To begin, note that despite the fact that some MBAs may lose some on-the-job training by going to

[15]The finding that there is a positive and significant return to math ability but no return to verbal ability is also found in Arcidiacono (2004).

[16]See Arcidiacono, Cooley and Hussey (2007) for a discussion of the benefits and issues associated with the use of fixed effects in this setting.

Table 6: Managerial Status Logit Regressions

	(i)		(ii)		(iii)		(iv)		(v)	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
MBA	-0.3485*	0.0927	-0.3701*	0.0948	-0.4284*	0.0948	-0.2590*	0.1205	-0.8545*	0.2754
Part-time*MBA	-	-	-	-	-	-	-0.3308*	0.1531	0.7149*	0.3242
Experience	0.2300*	0.0199	0.2327*	0.0204	0.1417*	0.0199	0.1457*	0.0202	0.0732	0.0682
Experience^2	-0.0055*	0.0008	-0.0056*	0.0008	-0.0037*	0.0007	-0.0038*	0.0008	-0.0168*	0.0021
Tenure	-0.0002	0.0092	0.0035	0.0091	-0.0199*	0.0098	-0.0186*	0.0098	0.0182	0.0179
Oth. adv. degree	0.0705	0.1198	0.0669	0.1218	0.1097	0.1171	0.1096	0.1173	-0.1775	0.3262
Married	0.1562*	0.0734	0.1345	0.0742	0.1158	0.0752	0.1182	0.0752	0.0955	0.1632
Female	-0.3513*	0.0768	-0.4198*	0.0799	-0.2598*	0.0756	-0.2588*	0.0757	-	-
Asian	-0.4314*	0.1147	-0.2918*	0.1194	-0.3335*	0.1169	-0.3369*	0.1170	-	-
Black	-0.5010*	0.1218	-0.5187*	0.1273	-0.4800*	0.1168	-0.4985*	0.1178	-	-
Hispanic	-0.1430	0.1012	-0.1683	0.1039	-0.1418	0.0971	-0.1509	0.0976	-	-
Undergrad GPA	-	-	0.0166	0.0905	-0.0872	0.0860	-0.0896	0.0861	-	-
Verbal GMAT	-	-	0.0220*	0.0065	0.0086	0.0062	0.0082	0.0062	-	-
Quant. GMAT	-	-	-0.0149*	0.0062	-0.0070	0.0055	-0.0076	0.0055	-	-
Reported skill	-	-	0.0469*	0.0071	0.0343*	0.0067	0.0341*	0.0067	-	-
Manager$_{(t-1)}$	-	-	-	-	2.239*	0.0859	2.240*	0.0861	-	-

Columns (i) and (ii) estimated on 9419 observations from 3801 individuals. Columns (iii) and (iv) estimated on 6960 observations from 3419 individuals. Column (v) estimated on 2412 observations from 769 individuals. Regressions also included year dummies. Standard errors are clustered at the individual level. *Statistically significant from zero at the 5% level.

business school (at least those in full-time programs), total work experience and tenure is fully accounted for in these regressions.

It could be argued that the negative coefficient on MBA found in these regressions is due to the fact that individuals who are initially managers have less incentive to go back to school than those that are initially non-managers in the sample. Not only have they already attained a mid- to upper-level position in management, the type of position that an MBA education is purported to help one obtain, but they also have a higher opportunity cost, as managers

typically enjoy higher earnings.[17,18] Column (iii) therefore includes lagged managerial status (a dummy variable for whether or not the individual was a mid- to upper-level manager in their prior observation in the data) in the analysis (thus removing the first wave of data from the sample). This serves to isolate the effect of an MBA on *changes* in managerial status. As seen in the table, past managerial status is a strong predictor of current managerial status. The coefficient on MBA remains negative and significant, however (and actually decreases further), showing that the observed negative effect of an MBA on managerial attainment was not due to differences in the initial managerial positions of MBAs versus non-MBAs.

Table 5 showed the importance of separating the effects of part-time versus full-time MBA programs on wages. Column (iv) of Table 6 does the same thing for managerial position. Both full-time and part-time programs have negative and significant coefficients. Part-time MBAs, however, are particularly less likely to obtain positions in middle or upper management.

Note that these findings should not be due to unobserved productivity differences not accounted for in the logit regressions, as the coefficient on MBA should still mimic (at least in sign) those found in the wage regressions. Nonetheless, a fixed effects logit regression was performed in order to rule out the potential influence of unobserved heterogeneity. The results are displayed in column (v). The negative coefficients remain for both full-time and part-time programs. Interestingly, however, the coefficient on MBA (full-time MBAs) significantly increases in magnitude, while the interaction with part-time decreases substantially. This could be due to the drastically reduced sample size which result from the use of individual fixed effects with a binary dependent variable. This technique requires that we observe the individual in both a managerial position and a non-managerial position at different points in time.[19]

[17] Opportunity cost is less of an issue for those considering part-time MBA programs, however.

[18] Conversely, it could perhaps also be argued that MBAs, due to admissions standards regarding amount or quality of work experience, are *more* likely to initially hold managerial positions, though the descriptive statistics in Table 1 suggest this is not the case.

[19] As an alternative method of controlling for unobserved heterogeneity, I included in the managerial logit regression the individual fixed effects estimated from a log wage regression (Table 5, column (v)). The fixed effects were strongly positive and statistically significant, but their inclusion did little to remedy the observed negative relationship between MBA and managerial status.

Another surprising result found in Table 6 is the fact that while quantitative skills positively influence wage, they actually affect managerial attainment negatively. Furthermore, while verbal skills (as reflected in the verbal GMAT score) had no effect on earnings, they have a positive and significant effect on managerial status.[20] Thus, both the MBA degree and GMAT scores have opposite effects on wages versus managerial status.

Another possible explanation for the results is one of differential sorting of MBAs versus non-MBAs into different types of jobs. Given the summary statistics in Table 4, an obvious form of possible sorting is on the basis of firm size. A worker employed in the smallest firm size category was almost four times more likely to report being a mid- to upper-level manager than a worker employed in the largest firm size category. The MBA credential in wave 4, however, is significantly more common among those working in the larger firms. No matter the cause of MBAs going to (and coming from) larger firms, the fact that managerial positions appear to be harder to obtain in larger firms suggests that controlling for firm size in the regression may perhaps reverse the negative coefficient. Column (i) in Table 7 does just that, including dummy variables indicating the firm size categories from Table 4. Controlling for observable individual characteristics, being employed by a larger firm does indeed negatively affect the likelihood of holding a managerial position. The MBA coefficient, however, remains negative and significant, though slightly lower in magnitude.

Yet another possible argument for the observed negative effect of an MBA on managerial status is that an MBA may actually be good for long-term career prospects and promotability, but due to the relatively short time horizon of data this effect is not being picked up. That is, it may be that an MBA may put an individual on the "fast track" for advancement, but at the expense of an initial period of little or no advancement (or even demotion). This could be consistent with some sort of a probationary period found in certain types of jobs. In response to this possibility, first note that it might seem unlikely that such a trend is not also found in an individual's earnings. Second, the analysis only includes full-time current jobs, so the analysis is not being biased by any temporary unemployment or part-time employment that may occur in a transitional period immediately following business school. Third, note that as the survey period spans about 9 years following GMAT registration, we do observe some

[20]These effects are most pronounced in column (ii). In the other specifications, the effects of GMAT scores on managerial position are weakened by the presence of prior managerial position.

Table 7: Alternative Explanations: Managerial Status Logit Regressions

	(i)		(ii)		(iii)		(iv)	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
MBA	-0.1772	0.1215	-0.1142	0.1774	-0.1741	0.1218	-0.1209	0.1376
Part-time*MBA	-0.3431*	0.1554	-0.3596*	0.1596	-0.3561*	0.1567	-0.2383	0.1815
Experience	0.1408*	0.0212	0.1412*	0.0213	0.1416*	0.0213	0.1405*	0.0224
Experience^2	-0.0038*	0.0008	-0.0038*	0.0008	-0.0038*	0.0008	-0.0037*	0.0008
Tenure	0.2205	0.1516	0.0015	0.0102	0.0033	0.0102	0.0022	0.0022
Oth. adv. degree	0.0954	0.1269	0.0948	0.1269	0.0640	0.1292	0.0007	0.1364
Married	0.1982*	0.0774	0.1983*	0.0774	0.2126	0.0773	0.2128	0.0792
Female	-0.2500*	0.0797	-0.2499*	0.0798	-0.2632*	0.0802	-0.2518*	0.0825
Asian	-0.4059*	0.1236	-0.4059*	0.1236	-0.3921*	0.1231	-0.3531*	0.1261
Black	-0.3651*	0.1261	-0.3654*	0.1262	-0.3575*	0.1270	-0.3456*	0.1324
Hispanic	-0.1818	0.1021	-0.1820	0.1022	-0.1860	0.1022	-0.16870	0.1056
Undergrad GPA	-0.1120	0.0897	-0.1117	0.0898	-0.1267	0.0898	-0.1345	0.0923
Verbal GMAT	0.0125*	0.0064	0.0125*	0.0064	0.0121	0.0064	0.0154*	0.0066
Quantitative GMAT	-0.0015	0.0059	-0.0015	0.0059	-0.0012	0.0056	-0.0046	0.0060
Reported skills	0.0390*	0.0071	0.0389*	0.0071	0.0386*	0.0071	0.0356*	0.0072
Manager$_{(t-1)}$	2.256*	0.0902	2.255*	0.0903	2.261*	0.0907	2.242*	0.0935
Size2	-0.5298*	0.1128	-0.5297*	0.1128	-0.5053*	0.1125	-0.5061*	0.1159
Size3	-1.229*	0.1130	-1.230*	0.1131	-1.191*	0.1128	-1.218*	0.1172
Size4	-1.452*	0.1251	-1.452*	0.1252	-1.403*	0.1265	-1.418*	0.1319
Time since MBA	-	-	-0.0217	0.0443	-	-	-	-
Industry1	-	-	-	-	0.0760	0.1710	0.0141	0.1708
Industry2	-	-	-	-	-0.1980	0.1318	-0.1779	0.1363
Industry3	-	-	-	-	0.0462	0.1261	0.0662	0.1301
Industry4	-	-	-	-	-0.3341*	0.1443	-0.2635	0.1476
Industry5	-	-	-	-	0.2169	0.1554	-0.2372	0.1607
Employer pay*MBA	-	-	-	-	-	-	-0.1959	0.1984
Employer pay	-	-	-	-	-	-	-0.0200	0.0914
Observations	6364		6364		6332		5979	

Dependent variable is whether or not the individual reported being a mid- to upper-level manager in their current job. Regressions also included year dummies. Standard errors are clustered at the individual level.

*Statistically significant from zero at the 5% level.

individuals for several years following completion of an MBA, longer than should be necessary to observe post-probationary job outcomes. The presence of this data allows for the specific examination of this possible explanation, which was done in two ways. First, as shown in column (ii) of Table 7, the MBA variable was interacted with the time elapsed since MBA completion. Inclusion of this variable was found to be insignificant, and actually negative in sign. Second, observations less than a year following MBA completion were omitted. The results (not shown) were almost identical, and were also insensitive to the amount of time following MBA completion omitted from the analysis.[21]

Related to the possibility of a post-MBA probationary period or temporary "dip" in managerial status is the possibility of a *pre*-MBA shock to one's employment situation. Relevant here is the discussion of the "Ashenfelter dip" found in the job training literature. Ashenfelter (1978) noticed that employees' earnings tended to drop to some degree before entering a job training program, a feature of the data attributable to the endogeneity of the timing of entrance into the training program. Of course, MBA enrollment is also endogenous. It is possible that individuals elect to return to school following a loss of job, a decrease in pay or demotion from a manager to a non-manager. Detachment from the work force (or moving to another employer) would result in lower chances of obtaining a managerial position, perhaps even after getting an MBA. Individuals in the estimated sample have current jobs at the time of responding to the first wave of the survey (which is also immediately following GMAT registration), however, so the unemployed entering MBA programs is not driving the results. (Note also that the regressions control for work experience and tenure.) Any temporary demotion that may have occurred prior to MBA enrollment should actually bias the estimated effect of an MBA on managerial status *upward* when controlling for initial managerial status. Also, any negative change in a worker's employment situation should also show up in the worker's earnings. Arcidiacono, Cooley and Hussey (2007) examine in detail the same data for the presence of an Ashenfelter dip in earnings. No evidence for such a dip is found.[22]

[21] Probationary employment is also inconsistent with the finding that effect of a part-time MBA is more negative than that of a full-time MBA. Individuals obtaining part-time MBAs are more likely to work for the same employer following graduation, and should then be less likely to have to prove their productivity by undergoing a probationary period.

[22] The endogeneity of the MBA decision cannot fully be taken into account, however. Suppose that individuals have private knowledge about their future job prospects at the firm in which they are currently employed. For

5 Models

The last section documented some empirical relationships found in the data. Most notably, an MBA has a positive reduced form effect on earnings and a negative effect on the likelihood of being a manager, and being a manager has a positive effect on earnings. These reduced form effects were found to be extremely robust, and several hypotheses that might have explained the findings were rejected. Conversely, this section presents several possible theoretical models of earnings, managerial attainment, and the decision to get an MBA. Each model is kept deliberately as simple as possible, the goal being to derive and compare the most relevant empirical implications under various assumptions. In each model, only the individual's decision is considered. The firm side of the model is ignored. In each case, individuals make the one-time decision to obtain an MBA if the expected benefits (in earnings or utility) outweigh the individual-specific costs. It is assumed that workers can earn a full return on their human capital in the labor market. It is also assumed that firms prefer to have more able workers in managerial positions. After the models are presented, Table 9 summarizes the empirical implications of each in relation to the observed empirical relationships.

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example, they may know the types of individuals which have been promoted in the past, the specific skills their firm is looking for in management, whether or not a certain manager is about to retire, etc. Knowledge of these future job prospects, without showing up in pre-MBA data, may affect their choice to get an MBA, which may bias the estimated effect of an MBA on managerial status downward. Obtaining an MBA may be good for them (both in terms of wages and the possibility of obtaining a managerial position), but any positive affect on the probability of being a manager may be small in comparison to the individuals who elected to not obtain an MBA due to specific knowledge regarding an impending future promotion. The data used here is not specific enough to get at this sort of issue directly. However, the first survey does ask individuals about their feelings regarding promotions and other aspects of their current job, as well as expectations regarding future jobs. In general, there are no significant differences between future MBAs and non-MBAs in attitudes toward their current jobs. This includes their feelings regarding job security, pay, and chances for promotion. Furthermore, no differences are found regarding future employment expectations (including industry, staying with the same employer, and managerial status). Based on this, it appears that individuals who choose to go back to school to obtain an MBA do not have substantially different information regarding their chances for success in their current job track than those who elect to not return to school.

5.1 Managerial Status as an Indicator of Productivity

Consider a simple model in which individuals make a one-time decision of whether or not to obtain an MBA degree. The outcome affected by this decision is the level of job the individual acquires. A job is characterized by two parameters, w (earnings) and m (managerial status), where $w > 0$ and $m \in \{0, 1\}$ (non-manager or manager). The worker's objective is to maximize (log) earnings net of schooling costs. That is, they do not derive utility through managerial position itself. Individual i's ability to earn income in the labor market is determined by the product of the market (equilibrium) rental price of human capital (r_h) times the number of skill units possessed by the individual, h_i. I adopt a standard human capital formulation for h:

$$h_i = exp\{h_0 + X_i\beta_1 + MBA_i * \beta_2 + \epsilon_i\}, \tag{1}$$

where h_0 represents the individual's initial skill endowment, X contains work experience, prior schooling and other observed measures reflecting human capital, $MBA\epsilon\{0, 1\}$ is a variable indicating whether or not an MBA was obtained, and ϵ is a skill technology shock. This specification leads to a standard (ln) wage equation:

$$ln(w_i) = \alpha + X_i\beta_1 + MBA_i * \beta_2 + \epsilon_i, \tag{2}$$

where α represents the constant term, $ln(r_h) + h_0$.

Firms offer managerial positions to the most skilled workers, with some error. Let π_i represent the probability of being a manager. The higher a worker's value of h, the more likely they are to hold a managerial position ($\frac{\delta\pi_i}{\delta h_i} > 0$). In this model managerial status serves merely as a label, however, as wages are determined entirely by human capital and not by managerial status itself.[23]

Individuals face the decision of whether or not to obtain an MBA. The MBA positively affects productivity ($\beta_2 > 0$). The cost of MBA attainment for individual i is given by C_i, a random variable with distribution function F. [24] An individual chooses to obtain an MBA if

[23] Note also that there is no asymmetric information in this model. The title of manager thus has no value of signaling ability to other firms, since productivity itself is assumed to be observed by firms.

[24] C_i is intended to fully encapsulate differences in direct and psychic costs of an MBA education, as well as differences in the value of leisure.

the benefits outweigh the costs:

$$\ln(w_i|MBA=1) - \ln(w_i|MBA=0) > C_i \tag{3}$$

or

$$\beta_2 > C_i. \tag{4}$$

Thus, the probability of MBA attainment is given by:

$$P_i = Prob(MBA_i = 1) = F(\beta_2). \tag{5}$$

The empirical implications of this simple model of MBA attainment are the following:

- MBA positively affects earnings. ($\frac{\partial \ln(w_i)}{\partial MBA_i} = \beta_2 > 0$)

- MBA positively affects managerial status. ($\frac{\partial \pi_i}{\partial MBA_i} = \frac{\partial \pi_i}{\partial h_i}\frac{\partial h_i}{\partial MBA_i} = \frac{\partial \pi_i}{\partial h_i}\beta_2 h_i > 0$)

- After controlling for a worker's productivity, managerial position should not affect earnings. Any positive relationship that may exist is due to the inability to perfectly observe productivity.

- MBA attainment is independent of ability (given assumption that costs are independent of ability and experience). If the model is extended to allow h_i and C_i to be negatively correlated, then the most able should get degree.[25] To the extent that h_i is not perfectly controlled for, the estimated effect of an MBA on both earnings and managerial status would be biased *upward*.

Thus, if being a manager is just an indicator or label of individual ability or productivity, the desired empirical implications are not generated. In particular, the effect of an MBA on managerial status should act in the same direction as its effect on earnings.

5.2 Managerial Status as a Reward for Productivity

It may be the case that individuals are not compensated merely on the basis of their productivity, but also for the job that they perform. Such is the case in tournament models of promotion, for example, where individuals are not promoted explicitly based on their accumulated human capital, but rather based on observed relative productivity. Individuals in

[25]This seems reasonable, as the most able and experienced in the workplace probably find schooling less difficult. Also, direct costs may be lower due to employer reimbursement practices, relaxed credit constraints, increased likelihood of school admission, etc. (none of which are considered explicitly here).

managerial positions may be paid more than their marginal product in order to compensate them for past effort or to motivate others to work hard to attain the position. Consider a model very similar to the one presented above. An MBA augments productivity (at cost C_i), and an individual's probability of holding a managerial position (that is, of winning a tournament) increases with their human capital. In this case, however, we alter equation (2) to allow managers to receive higher earnings, independent of productivity:[26]

$$\ln(w_i) = \alpha + X_i\beta_1 + MBA_i * \beta_2 + m_i * \beta_3 + \epsilon_i. \tag{6}$$

Unlike in the previous model, workers wish to become a manager because it is accompanied by a discrete jump in earnings ($\beta_3 > 0$). Thus, in this case there is an additional incentive to increase productivity by obtaining an MBA. As before, an individual chooses to obtain an MBA if the benefits in log earnings exceed the costs:

$$\ln(w_i|MBA = 1) - \ln(w_i|MBA = 0) > C_i. \tag{7}$$

Let π_i^1 represent the probability of being awarded a managerial position after obtaining an MBA. Similarly, let π_i^0 be the probability of being a manager without an MBA. Since π is increasing in h, it is assumed that for any given individual characteristics, $\pi_i^1 > \pi_i^0$.

Then, the decision rule is equivalent to

$$\beta_2 + \beta_3(\pi_i^1 - \pi_i^0) > C_i, \tag{8}$$

where the left hand side is the expected (log) earnings increase from obtaining an MBA. If this inequality holds, individual i obtains an MBA. If not, they do not obtain an MBA. Thus, the probability that individual i is observed to obtain an MBA is given by

$$P_i = Prob(MBA_i = 1) = F(\beta_2 + \beta_3(\pi_i^1 - \pi_i^0)). \tag{9}$$

Under these assumptions of MBA attainment, we would expect to observe the following empirical relationships:

- MBA positively affects managerial status. ($\frac{\partial \pi_i^1}{\partial MBA_i} = \frac{\partial \pi_i^1}{\partial h_i}\frac{\partial h_i}{\partial MBA_i} = \frac{\partial \pi_i^1}{\partial h_i}\beta_2 h_i > 0$)
- MBA positively affects earnings. ($\frac{\partial \ln(w_i)}{\partial MBA_i} = \beta_2 + \frac{\partial \pi_i^1}{\partial MBA_i}\beta_3 = \beta_2 + \frac{\partial \pi_i^1}{\partial h_i}\beta_2\beta_3 h_i > 0$)

[26] Equation (6) can be thought of as a reduced form expression of an explicit tournament model of earnings and promotion.

- After controlling for a worker's productivity, managerial position should still affect wage. ($\frac{\partial \ln(w_i)}{\partial m_i} = \beta_3$)

- MBA attainment is independent of ability (given assumption that costs are independent of ability and experience). If the model is extended to allow h_i and C_i to be negatively correlated, then the most able should get degree.

Thus, allowing managerial status to serve not merely as a label of productivity, but to indicate the outcome of an implicit tournament scenario of promotion, does not generate the desired empirical implications.

5.3 Managerial Status in Utility Function (Compensating Differential)

It may be argued that allowing individuals to get utility only through (log) earnings is overly simplistic. I now extend the model to allow workers to receive utility (or disutility) directly through holding a managerial position. Assuming an additively separable function, workers' utility in each period is represented by:

$$U_i = \gamma_i^w \ln w_i + \gamma_i^m m_i, \tag{10}$$

where γ_i^w and γ_i^m are individual specific parameters reflecting the relative degree to which wages are preferred versus managerial position and $\ln w$ is expressed as in (2). For now, γ_i^w and γ_i^m are both assumed to be positive.

In this case a worker chooses to obtain an MBA *iff*:

$$\gamma_i^w[\ln(w_i|MBA=1) - \ln(w_i|MBA=0)] + \gamma_i^m[Pr(m_i=1|MBA=1) - Pr(m_i=1|MBA=0)] > C_i \tag{11}$$

or, simplifying,

$$\gamma_i^w\beta_2 + (\gamma_i^m + \gamma_i^w\beta_3)(\pi_i^1 - \pi_i^0) > C_i. \tag{12}$$

where C_i is the cost (in utility terms) of obtaining an MBA.

Inequality (12) is very similar to (8). The second term now reflects both the direct effect of an MBA on utility through increased likelihood of obtaining a managerial position, and the indirect effect through the associated increased expected value of earnings. Thus, assuming $\gamma^m > 0$, the benefits of MBA attainment have increased with the addition of utility through managerial position. Assuming $\gamma^m > 0$, individuals will always be better off accepting a

managerial position if it is offered to them. Since an MBA positively affects the chances of being offered a managerial position, MBA attainment and managerial status should be observed to be positively correlated. However, it is worth noting that if $\gamma^m < 0$, it is possible to generate a negative correlation between MBA and managerial status. For this to be the case, there must also be diminishing marginal utility in (log) earnings, which is not exhibited by the above utility function. Suppose that utility is instead specified as:

$$U_i = \gamma_i^w (\ln w_i)^z + \gamma_i^m m_i, \tag{13}$$

where $z < 0$.

If γ_i^m is less than zero, individuals only choose to hold managerial positions if the additional earnings compensates them for their disutility of being a manager. It may be that in the absence of an MBA, the additional income they receive for being a manager is worth it, but with an MBA, due to their higher earnings, the additional income they receive for being a manager is not worth it. That is, if *non-managerial* status is operating as a normal good, then managerial status may be negatively correlated with MBA status. For this to be the case, we need:

$$U(w(m=1), m=1|MBA=0) > U(w(m=0, m=0|MBA=0),$$
$$U(w(m=1), m=1|MBA=1) < U(w(m=0, m=0|MBA=1)$$

or,

$$\gamma_i^w(\alpha + X_i\beta_1 + \beta_3)^z + \gamma_i^m > \gamma_i^w(\alpha + X_i\beta_1)^z,$$
$$\gamma_i^w(\alpha + X_i\beta_1 + \beta_2 + \beta_3)^z + \gamma_i^m < \gamma_i^w(\alpha + X_i\beta_1 + \beta_2)^z.$$

For certain parameter values, both of these inequalities will hold. However, while this model exists as a theoretically possible way to explain the empirical findings, it is unlikely to be an accurate description of individuals' behavior. First, it seems unrealistic to assume that the majority of individuals, especially MBAs, dislike being in higher positions in the firm's hierarchy. In addition to satisfying the possible intrinsic desire to exercise control over others or situations, with a managerial position may come increased respect and other non-monetary perks associated with the job. Second, the estimated monetary return to an MBA is quite

modest (between 5 and 6 percent for the average MBA). A switch in choice over managerial status would require a relatively large income effect for such a small change in earnings potential. Third, if non-managerial positions were desirable, and individuals were willing to switch to them following MBA completion, the same should be observed for individuals not completing MBAs. That is, with increased human capital (and therefore increased earnings potential) obtained from work experience (on-the-job training), individuals should also desire to be employed in non-managerial positions. In actuality, with increased experience an individual worker is *more* likely to be a manager and stay as a manager.

Therefore, assuming $\gamma_{2i} > 0$ (at least for the vast majority of individuals), the empirical implications of this model are the following:

- MBA positively affects managerial status ($\frac{\partial \pi_i}{\partial MBA_i} = \frac{\partial \pi_i}{\partial h_i}\frac{\partial h_i}{\partial MBA_i} = \frac{\partial \pi_i}{\partial h_i}\beta_2 h_i > 0$).

- MBA positively affects earnings. ($\frac{\partial \ln(w_i)}{\partial MBA_i} = \beta_2 + \frac{\partial \pi_i}{\partial MBA_i}\beta_3 = \beta_2 + \frac{\partial \pi_i}{\partial h_i}\beta_2\beta_3 h_i > 0$)

- After controlling for a worker's productivity, managerial position should still affect wage. ($\frac{\partial \ln(w_i)}{\partial m_i} = \beta_3$)

- MBA attainment is independent of ability (given assumption that costs are independent of ability and experience). If the model is extended to allow h_i and C_i to be negatively correlated, then the most able should get degree.

5.4 A Model With Heterogeneous Job Tracks

While a model of heterogeneous preferences on its own cannot easily explain all of the empirical relationships presented above, a model which incorporates both heterogeneous preferences and heterogeneous job tracks can. If job tracks are distinguished by different tournament structures, and a continuum of structures exists such that there is a trade-off between the likelihood of winning a given tournament and the expected earnings of that tournament, then individuals will select into various tournaments based on their preferences over managerial status versus earnings. This idea is illustrated in Figure 1. The downward sloping line represents the trade-off available in the labor market between expected earnings and the probability of advancement to an upper management position. Each point on the line is associated with a different tournament an individual worker may enter. This locus of points is individual specific, as it is determined by the skill set of the individual. The greater the human capital possessed by the individual, the greater the choice set of the individual and the further

this line is from the origin. The dotted lines in the figure represent indifference curves for two types of individuals with the same choice set (same ability level). One individual has a greater preference for managerial status than the other, and therefore chooses to enter a tournament associated with a higher likelihood of promotion. The other individual relatively prefers earnings over managerial status, and thus decides to locate herself on the lower right portion of the figure. If MBAs are more likely to represent the latter type of individual, and non-MBAs the former type, then an observed negative relationship between MBA attainment and managerial status may be found.

I now formalize this idea within a model. Consider two sectors in the economy, $j\epsilon\{1,2\}$. That is, an individual may enter either of two tournaments. The first tournament ($j = 1$) is associated with greater likelihood of being offered a managerial position and lower average wages, while the second track is associated with a lower likelihood of being offered a managerial position and higher average wages.

Prior to entering either tournament, individuals have the option of obtaining an MBA, which improves wages and increases the probability of obtaining a managerial position in the second period. The first period of employment in either sector involves non-managerial work. A given individual i is promoted to a managerial position in the second period with probability π_{ij}^{mba} if an MBA was obtained and π_{ij}^{nomba} if not. Earnings are given by:

$$\ln(w_{ij}) = \alpha_j + X_i\beta_1 + MBA_i * \beta_2 + m_i * \beta_3 + \epsilon_{ij}. \tag{14}$$

I assume that the base level of pay is greater in sector 2 than in sector 1 ($\alpha_2 > \alpha_1$), and the rate of promotion (given MBA status) is greater in sector 1 than in sector 2 ($\pi_{i1} > \pi_{i2}$). For simplicity, I also assume that $\pi_{i1}^{mba} - \pi_{i1}^{nomba} = \pi_{i2}^{mba} - \pi_{i2}^{nomba}$. That is, the increased probability of promotion due to MBA attainment is the same in both sectors.[27] [28] Allowing for heterogeneous preferences over earnings versus managerial status, utility is specified by (10).

[27] Allowing the MBA to affect promotion probabilities differently according to sector does not change the basic result. In fact, it could easily be argued that the chances for promotion should increase more, upon MBA completion, in sector 2 than in sector 1. In that case, MBAs should be even more likely to enter sector 2.

[28] Note also that I have assumed the returns to an MBA (β_2) and the returns to promotion (β_3) to be the same across sectors. To the extent that β_2 may be larger in sector 2, MBAs will be more likely to enter sector 2, while non-MBAs will be unaffected. The effect of allowing β_3 to vary is more complicated, since it depends on the probabilities of promotion with and without an MBA in each sector.

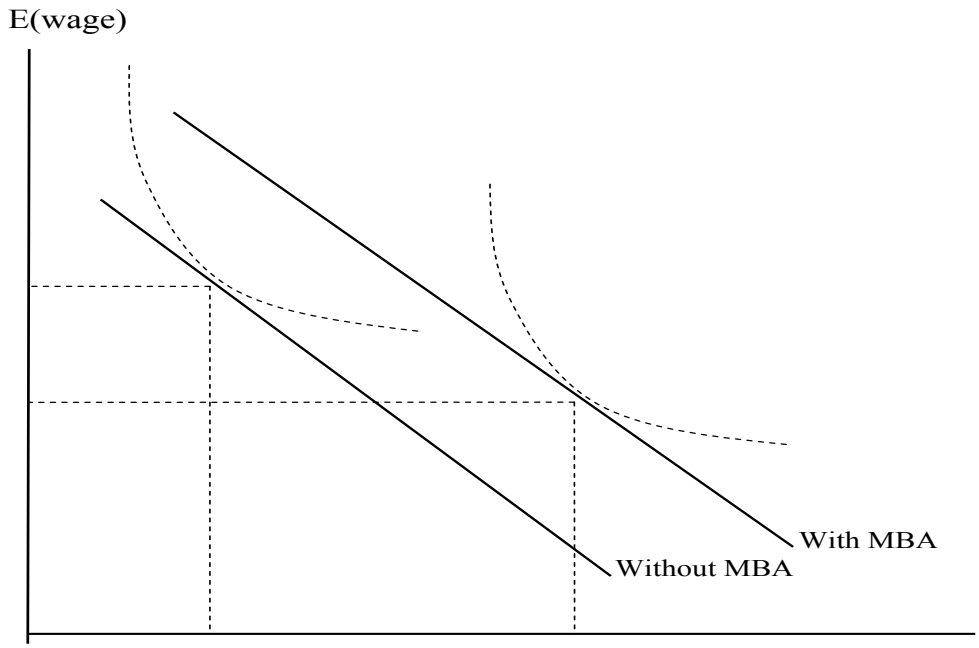

Figure 1: Conceptualization of Model with Heterogeneous Tournaments

Individuals have the choice of MBA attainment and a choice over employment sector, which are assumed to be one-time decisions. Thus, individuals have 4 alternatives: (1) Get an MBA and enter sector 1; (2) Get an MBA and enter sector 2; (3) Don't get an MBA and enter sector 1; (4) Don't get an MBA and enter sector 2. The net benefit of each of these alternatives is given by:

(1) $\gamma_i^w[\alpha_1 + \beta_2 + \delta(\alpha_1 + \beta_2 + \pi_{i1}^{mba}\beta_3)] + \gamma_i^m\delta\pi_{i1}^{mba} - C_i$

(2) $\gamma_i^w[\alpha_2 + \beta_2 + \delta(\alpha_2 + \beta_2 + \pi_{i2}^{mba}\beta_3)] + \gamma_i^m\delta\pi_{i2}^{mba} - C_i$

(3) $\gamma_i^w[\alpha_1 + \delta(\alpha_1 + \pi_{i1}^{nomba}\beta_3)] + \gamma_i^m\delta\pi_{i1}^{nomba}$

(4) $\gamma_i^w[\alpha_2 + \delta(\alpha_2 + \pi_{i2}^{nomba}\beta_3)] + \gamma_i^m\delta\pi_{i2}^{nomba}$

where C_i is the one-time cost (in utility terms) of MBA attainment and δ is a discount factor for period 2 utility. An individual chooses the maximum of these four alternatives. It can be shown that an MBA chooses to be employed in sector 2 over sector 1 *iff*:

$$\frac{\gamma_i^w}{\gamma_i^m} > \frac{\delta(\pi_{i1}^{mba} - \pi_{i2}^{mba})}{(1+\delta)(\alpha_2 - \alpha_1) + \delta\beta_3(\pi_{i2}^{mba} - \pi_{i1}^{mba})} \tag{15}$$

assuming the denominator is positive and γ_i^m is positive. It is assumed that $\pi_{i1}^{mba} > \pi_{i2}^{mba}$, so it must be that the denominator is positive in order to get any MBAs entering sector 2.[29] Thus the following condition must hold:

$$(1+\delta)(\alpha_2 - \alpha_1 + \beta_2 - \beta_2) > \delta\beta_3(\pi_{i1}^{mba} - \pi_{i2}^{mba}). \tag{16}$$

This inequality states that the direct monetary return to choosing sector 2 must be greater than the expected monetary return due to increased likelihood of promotion in sector 1.

Similarly, it can be shown that a *non*-MBA chooses to be employed in sector 1 over sector 2 *iff*:

$$\frac{\gamma_i^w}{\gamma_i^m} < \frac{\delta(\pi_{i1}^{nomba} - \pi_{i2}^{nomba})}{(1+\delta)(\alpha_2 - \alpha_1) + \delta\beta_3(\pi_{i2}^{nomba} - \pi_{i1}^{nomba})} \tag{17}$$

assuming, once again, that the denominator is positive. That is, the direct monetary return to choosing sector 2 must exceed the expected indirect monetary return in sector 2. Given the assumption that $\pi_{i1}^{mba} - \pi_{i1}^{nomba} = \pi_{i2}^{mba} - \pi_{i2}^{nomba}$, the right hand side of (17) is identical

[29] If γ_i^m is allowed to be negative, however, then more individuals would choose to enter sector 2 (holding other parameters constant). That is, the inequality would be relaxed so that, given a positive denominator, anyone with $\gamma_i^m < 0$ choosing to get an MBA would enter sector 2.

to that of (15). Thus, regardless of the MBA decision, an individual chooses to enter sector 2 *iff*:

$$\frac{\gamma_i^w}{\gamma_i^m} > \frac{\delta(\pi_{i1} - \pi_{i2})}{(1+\delta)(\alpha_2 - \alpha_1) + \delta\beta_3(\pi_{i2} - \pi_{i1})}. \tag{18}$$

This inequality says that the ratio of preferences over earnings to managerial status must exceed the ratio of managerial returns from sector 1 to the monetary returns from sector 2. This is more likely to hold the greater is one's preference for earnings over managerial status. The outcome of the MBA decision is, once again, determined by weighing the costs and the benefits. If the cost of MBA attainment, C_i, is negatively correlated with γ_i^w/γ_i^m, then those that choose to get MBAs will be more likely to have (18) hold than those that do not get MBAs.[30] With this assumption, then, the model generates the desired empirical implications:

- MBA positively affects earnings. ($\frac{\partial \ln(w_i)}{\partial MBA_i} = \beta_{2j} > 0$.)

- MBA attainment may be positively or negatively related to observed managerial status.

- After controlling for a worker's productivity and sector of employment, managerial position should affect earnings positively.

Table 9 summarizes the empirical predictions of each of the models presented. Each of the models accurately predict positive monetary returns to an MBA, since in every case an MBA is assumed to increase human capital, which is valued in the labor market.[31] Three out of the four models also predict the observed positive relationship between wage and managerial status, controlling for worker ability. This result follows from the assumption that underlying observations of managerial position is a tournament model of promotion, where firms pay workers not only directly on the basis of their ability, but also on the basis of hierarchical position within the firm, an outcome based on noisy measures of relative productivity. The exception was in the first model presented, which assumed that being labeled a manager is a

[30] It seems reasonable to think that preferences for earnings might be correlated with costs of (or preferences for) MBA attainment. The MBA degree is widely advertised as an instrument for increasing salary. Also, it may be the case that individuals with greater relative preferences toward earnings may have accumulated more assets, and thus are better suited financially to enroll in an MBA program.

[31] The assumption that an MBA directly augments human capital is not necessary, as a signaling model with asymmetric information between employers and employees can also generate a positive return to obtaining an MBA. The distinction is not important for the purposes of this paper, however, as the key empirical implications of each type of model are the same. Nonetheless, determining the source of the return is important for public policy, and is the focus of another paper.

Table 8: Can these models explain the following reduced form empirical observations?

Model Description	Positive relationship between Earnings & MBA	Positive relationship between Earnings & Manager	Negative relationship between manager & MBA
Manager as indicator of productivity	yes	no	no
Manager as reward for productivity	yes	yes	no
Managerial status as compensating differential	yes	yes	no
Managerial status as compensating differential (with heterogeneous job tracks)	yes	yes	yes

matter of achieving a certain level of individual productivity.

The observed negative relationship between managerial status and MBA attainment, however, is not easily obtained under the assumptions of the first three models. If managerial status is merely an indicator of productivity, then the observed relationship should mimic that of earnings and MBA attainment. If being a manager also entails an increased income beyond one's ability, then MBAs should be more likely to be in managerial positions. Even if MBAs tend to have lower relative preferences for managerial status (which the third model allows for), there should still be an observed positive effect of MBA on the likelihood of being a manager, as managers tend to earn more money, which is desirable. If it is the case that individuals (perhaps especially MBAs) actually *dislike* being managers (aside from the accompanying higher earnings), then the third model may generate the appropriate empirical predictions. For the many reasons discussed above, however, I do not believe this possibility to be a reasonable one. A more intuitively appealing possibility is to allow for the possibility of different job tracks, each associated with different underlying tournament structures. Across tournaments, average earnings is inversely related to the probability of advancement to a managerial position. If individuals that tend to get MBAs also tend to have relative preferences for earnings over managerial status, the desired negative empirical relationship between MBA attainment and the likelihood of being a manager is obtained.

6 Empirical Specification

In this section I lay out an empirical framework for the estimation of the return to an MBA on earnings and the probability of obtaining a managerial position. The empirical strategy is motivated by the final theoretical model presented in section 5. I allow for worker sorting across unobserved job tracks on the basis of heterogeneous preferences over earnings and managerial status. I assume that an individual's accumulated level of human capital at time t can be expressed in a single "skill index":

$$SKILL_{it} = X^s_{it}\beta^s_1 + \sum_{k=1}^{K} \alpha^s_k \tag{19}$$

where X^s contains work experience and tenure, verbal and quantitative GMAT scores, undergraduate GPA, whether or not the individual possesses an MBA, and the self-reported skill

measure discussed in section 3. I allow a full-time MBA and a part-time MBA to augment the skill index differently. In addition, included in X^s are dummy variables for whether or not the individual *ever* obtained an MBA or part-time MBA in the survey period. Including these allows for the fact that the skills of individuals who choose to obtain a full-time MBA, part-time MBA or not to obtain an MBA may differ in unobserved ways. Thus, their inclusion acts much like a fixed effect. Furthermore, I allow for unobserved skills across the population by assuming K "types" of individuals. Each type is associated with a different intercept in the skill index, α_k^s. Let π_k represent the population frequency of type k. Since skill types are unobserved, both of these parameters are estimated directly within the model. An individual's hourly wage is a direct function of the skill index, managerial position (M_t) and X, which includes time dummies and demographic variables like race and gender:

$$\ln(w_t) = \alpha_w + X_t\beta_w + SKILL_t + \beta_M M_t + \delta_w\theta + \epsilon_t^w, \tag{20}$$

where $\epsilon_t \sim N(0, \sigma_w)$. I incorporate heterogeneity in preferences over earnings and managerial status by assuming a finite mixture distribution of individual preferences. In particular, I assume that there are two unobserved types of individuals in the population, $\theta\epsilon\{0, 1\}$. I assume that the probability that $\theta_i = 1$ is a function of the individual's characteristics, X_i^θ:

$$P_i \equiv Pr(\theta_i = 1) = \frac{\exp\{X_i^\theta\beta_\theta\}}{1 + \exp\{X_i^\theta\beta_\theta\}}, \tag{21}$$

where X^θ contains verbal and quantitative GMAT scores, GPA, the sum of the individual's self-reported skills, dummy variables for race and gender, and whether or not the individual ever obtains a full-time or part-time MBA within the sample period. A person's type enters linearly into log wages, as seen in (20). δ_w represents the degree to which being a particular type influences the observed wage through the effect of preferences on choosing a job track with a particular combination of earnings and managerial likelihood.

Similarly, an individual's probability of holding a position as a mid- to upper-level manager is a function of the latent variable, $\hat{M}$, which is given by:

$$\hat{M}_t = \alpha_m + X_t\beta_m + \gamma_s * SKILL_t + \delta_m\theta + \epsilon_t^m, \tag{22}$$

where γ_s, an estimated parameter, allows the skill index to affect wages and managerial propensity in different ways. There exists a threshold level of $\hat{M}$, μ_m, representing the minimum level

necessary to obtain an management position (as opposed to a non-management position).[32] If this threshold level of productivity is exceeded, the worker obtains a managerial position. Assuming ϵ_t^m is drawn from a type I extreme value distribution results in a logit formulation of the probability of being a manager.

I estimate the model using maximum likelihood. Let L^w represent the wage component of the likelihood and let L^m represent the managerial component. The full likelihood function for individual i is then given by:

$$L_i = \sum_{j=1}^{2} \sum_{k=1}^{K} \prod_{t=1}^{T_i} P_{ij} \pi_k L_{ijkt}^w L_{ijkt}^m, \tag{23}$$

where i indicates individual, j indicates an individuals unobserved preference type, k indicates the unobserved population skill type, t indicates the survey wave of the observation and T_i is the individual's last observed wave. For the results presented below, three unobserved skill types are included ($K = 3$).[33] Thus, the individual likelihood function is comprised of six summed terms, representing the six possible skill-preference type combinations. $P_{ij}\pi_k$ represents an individual's probability of being a particular combination of skill and preference types. All parameters are estimated by maximizing the population log likelihood function.

7 Results

The estimated parameters of the empirical model are displayed in Table 10. The first column reports the estimates of the coefficients in the log(wage) equation. The second column reports the estimates of the coefficients in the managerial attainment equation, which, for the variables that enter through the skill index (the upper portion of the table), corresponds to the estimates in the first column multiplied by γ_s. The last column displays the estimates of the influence that each of the various observed variables has on an individual's unobserved preference type (θ).

As seen in the table, estimation of the model which incorporates individual preferences over earnings and likelihood of managerial attainment results in a positive and significant

[32] μ_m can be viewed within a tournament context as the observed productivity level of the next best worker competing in the tournament.

[33] Adding four or more skill types did not substantially change the results.

Table 9: Model Estimates

	Log(Wage)		Manager		$\Pr(\theta = 1)$	
	coef.	s.e.	coef.	s.e.	coef.	s.e.
MBA	0.1424*	0.0209	0.6435*	0.0944		
Part-time * MBA	-0.1651*	0.0244	-0.7461*	0.1103		
MBAever	-0.1218*	0.2310	-0.5505*	0.1046	0.6242*	0.1955
Part-time * MBAever	0.0950*	0.0260	0.4295*	.1174	-0.1219	0.2475
Plan Part-time	0.0304*	0.0129	0.1372*	0.0584	0.4504*	0.1503
Verbal GMAT	0.0028*	0.0008	0.0133*	0.0038	-0.0248*	0.0111
Quantitative GMAT	0.0065*	0.0008	0.0293*	0.0038	0.0738*	0.0107
Undergrad. GPA	0.0610*	0.0130	0.2756*	0.0586	0.1974	0.1460
Reported skills	0.0056*	0.0010	0.0253*	0.0044	-0.0425*	0.0125
Asian	0.0415*	0.0158	0.0068	0.1635	0.9195*	0.2609
Black	0.0357	0.0253	-0.6460*	0.2463	-0.0180	0.3722
Hispanic	0.0041	0.0168	-0.0911	0.1577	0.1648	0.2196
Female	-0.0935*	0.0129	-0.1764	0.1304	0.5536*	0.1890
Age	0.0072*	0.0017	0.0326*	0.0079		
Experience	0.0178*	0.0018	0.0806*	0.0083		
Tenure	0.0070*	0.0011	0.0318*	0.0050		
Manager	0.0928*	0.0103				
$\theta = 1$	0.2958*	0.0122	-2.543*	0.1311		
Type 1 (skill)	0.7860*	0.0396	3.511*	0.1790		
Type 2 (skill)	0.4352*	0.0258	1.967*	0.1164		
γ_s			4.733	0.2464		
π_1 (Type 1)	0.2444					
π_2 (Type 2)	0.6340					

Log(Wage) and Manager components also included year dummies. Estimated on 9035 observations from 3789 individuals. The reported coefficients within the skill index in the Manager column correspond to $\gamma_s * \beta$, where β is the corresponding estimate for Log(Wage). *Statistically significant from zero at the 5% level.

effect of an MBA on both wage and managerial attainment. Specifically, this is true for a full-time MBA, where the monetary return is estimated to be 14.2%. This is virtually identical to the fixed effects estimate presented in Table 5. For part-time MBAs, however, the return is found to be insignificant or even slightly negative (the sum of the coefficients on MBA and $Part-time*MBA$). The coefficients on the dummy variables for whether or not an individual ever received an MBA are also interesting. Individuals that choose to get a full-time MBA tend to be worse in terms of unobserved career success-related factors than those that do not get an MBA, while those that get a part-time MBA tend to be better. Also, individuals that reported (in the first wave of the survey) planning to attend a part-time program (whether or not they actually went to business school) tend to be better off in unobserved dimensions than those that reported an interest in a full-time program. This could be due to the fact that the more able people tend to have higher opportunity costs of attending an MBA program on a full-time basis.

The estimates also indicate that both verbal and quantitative GMAT scores have a positive effect on labor market outcomes. Recall that this was not the case for the reduced form models presented in section 3, where quantitative GMAT had an apparent negative effect on managerial status. We now see that this was due to the different preferences of individuals with high quantitative scores versus verbal scores. Evidence for this comes from the third column of Table 10, where the effects of verbal and quantitative GMAT on the probability of being a particular preference type are opposite in sign.

The effect of individual preferences appears to be quite substantial, and supports the idea that workers are sorting between unobserved job tracks. The coefficients on $\theta = 1$ are large in magnitude, statistically very significant and opposite in sign, reflecting the existence of a compensating differential between earnings and the probability of holding a managerial position. In particular, we see that MBAs, individuals with higher quantitative GMAT scores, asians, and females are more likely to be of the type that prefers earnings to managerial status. In contrast, individuals with high verbal scores and high self-reported skills (skills which were included in the survey due to their supposed relevance to managerial proficiency) are more likely to be of the type that prefers managerial status over earnings.

To the extent that an individual's preference type is a choice, it is possible to derive an estimate of the compensating differential of managerial status, or the monetary value that

Table 10: Model Predictions (Wave4)

	Predicted Managers	Actual Managers	Predicted Wage	Actual Wage
Full-time MBAs	20.34%	19.16%	24.60	26.76
Part-time MBAs	23.33%	18.45%	26.24	26.32
No MBA	24.95%	27.50%	23.81	24.87

individual indifferent between the two estimated preference types places on being a manager. I do this by using the model estimates to to predict the decreased probability of holding a managerial position in going from $\theta = 0$ to $\theta = 1$ for each individual. These probability differences are weighted by the individual probabilities of being $\theta = 1$, and are then compared to the increase in wages resulting from being $\theta = 1$ versus $\theta = 0$ (29.58%, net the negative effect through the decreased likelihood of holding a more lucrative manager position). On average, I estimate an average compensating differential of about 6 dollars an hour for a 32 percentage point decrease in the probability of being a manager.

To test how well the model fits the key features of the actual data, I predict wave 4 wage rates and managerial frequencies for full-time, part-time and non-MBAs. These predictions are compared to the actual values in Table 11. As can be seen, the model over-predicts wages, under-predicts the managerial frequency of non-MBAs and over-predicts the managerial frequency of MBAs. In particular, the model does a poor job dealing with part-time MBAs. The model replicates the key features of the data for full-time MBAs and non-MBAs, however. Full-time MBAs, despite the estimated positive effect of the degree on managerial status, are significantly less likely to hold managerial positions and yet earn higher wages than their non-MBA counterparts.

8 Conclusion

This paper attempts to explain a set of puzzling empirical observations: while MBAs and managers make more money, MBAs are less likely to be managers. In addition, verbal and quantitative GMAT scores seem to be working in opposite directions: verbal GMAT is positively related to managerial status and unrelated to wage, while quantitative GMAT is positively

related to wage and negatively related to managerial status. As shown, these relationships are more than correlational, and are robust to controlling for work experience, job tenure and ability measures. Furthermore, the observed negative relationship between MBA attainment and managerial status is not explained by sorting across industries or size of firms, pre-MBA enrollment employment shocks, or a post-MBA probationary periods. As an explanation for the observed findings, a model was presented involving worker sorting over unobserved job tracks, where job tracks are differentiated by the types of tournaments individuals enter. With the existence of a compensating differential between average earnings and the likelihood of managerial promotion and heterogeneous preferences over managerial status and earnings, MBAs may be more likely to choose to enter tournaments associated with lower probabilities of managerial attainment, driving the observed negative relationship between managerial status and MBA attainment. The estimation strategy employed in the paper separates out the roles of ability and preferences in affecting the observed earnings and managerial position of individuals. Ability measures enter the model directly through their inclusion in a general skill index, and observed measures also enter indirectly through their influence over the probability of being a certain unobserved preference type.

Estimation results in the recovery of a positive and significant effect of a full-time MBA on both wage and the likelihood of holding a position in mid- to upper-level management. The average return, 14.2% for a full-time MBA (which typically takes 2 years to complete), is within the range of twice the common estimates of the returns to a year of schooling found in the literature. Estimation of the model also demonstrates the existence of a compensating differential between earnings and likelihood of managerial attainment: through preferences over tracks, some individuals are willing to take a lower wage for a higher probability of becoming a manager.

In addition to documenting and explaining an empirical puzzle, this study has suggested an alternative to the traditional method of estimating compensating differentials of job characteristics using hedonic wage regressions. Instead of modeling wage as a function of the job characteristic of interest (for example, job safety) and other variables, the wage and non-wage characteristic may be modeled separately. By allowing observed individual traits to affect both wage and the likelihood of holding a job with the characteristic of interest, and by allowing the same traits to also affect the probability of being a particular unobserved preference

type, the inclusion of preference type within the wage and non-wage equations should uncover the existing trade-off that individuals are willing to make between the wage and non-wage characteristics.

While the results of this research are interesting and promising, further research would be helpful in gaining a more complete picture of the effects of obtaining an advanced degree such as an MBA and the factors relevant in the decision to do so. While the model generates reasonably accurate predictions for full-time MBAs, it does less well in explaining the observed labor market outcomes of part-time MBAs. The motivation for obtaining a part-time MBA is likely to be significantly different than the motivation for choosing to enter a full-time MBA program. Part-timers are likely to know more about their earnings and promotion prospects following MBA completion, and are also more likely to have employers pay for or reimburse them for their educational expenses. An immediate goal is to estimate a model that adequately incorporates part-time MBAs, a substantial fraction of the total MBA recipients. Further research goals include estimating a model that explicitly incorporates the decision to obtain various types of MBAs and, ultimately, the admissions decisions of MBA programs. Doing so would allow for the determination of the extent to which prospective MBAs are sensitive to factors such as tuition, distance, admissions standards and program quality. Furthermore, it would allow for the estimation of the effect of policies that may influence these factors on the MBA decision and subsequent labor market outcomes. In particular, the role that heterogeneous preferences play in determining the effect of such policies could be assessed.

References

[1] **Arcidiacono, P.** (2004), "Ability Sorting and the Returns to College Major", *Journal of Econometrics* 121(1-2): 343-375.

[2] **Arcidiacono, P., Cooley, J. and A. Hussey** (2007), "The Economic Returns to an MBA", *International Economic Review*, forthcoming.

[3] **Angrist, J.D. and A.B. Krueger** (1991), "Does Compulsory School Attendance Affect Schooling and Earnings?", *Quarterly Journal of Economics* 106: 979-1014.

[4] **Ashenfelter, O.** (1978), "Estimating the Effect of Training Programs on Earnings", *Review of Economics and Statistics* 6(1): 47-57.

[5] **Ashenfelter, O. and A.B. Krueger** (1994), "Estimates of the Economic Returns to Schooling for a New Sample of Twins", *American Economic Review* 84: 1157-1173.

[6] **Ashenfelter, O. and C.E. Rouse** (1998), "Income, Schooling and Ability: Evidence From a New Sample of Identical Twins", *Quarterly Journal of Economics* 113: 253-84.

[7] **Colbert, A. Levary, R. and M. Shaner** (2000), "Determining the Relative Efficiency of MBA Programs using DEA", *European Journal of Operational Research* 125: 656-69.

[8] **Dearlove, J.** (1997), "The Academic Labour Process: From Collegiality and Professionalism to Managerialism and Proletarianisation?", *Higher Education Review* 30: 56-75.

[9] **Graddy, K. and L. Pistaferri** (2000), "Wage Differences by Gender: Evidence from Recently Graduated MBAs", *Oxford Bulletin of Economics and Statistics* 62: 837-53.

[10] **Gunderson, M. and D. Hyatt** (1996), "Do Injured Workers Pay for Reasonable Accomodation?", *Industrial and Labor Relations Review*

[11] **Kane, T.J. and C.E. Rouse** (1995) "Labor-Market Returns to Two- and Four-year Colleges", *American Economic Review* 85: 600-14.

[12] **Keane, M.P. and K.I. Wolpin.** (1997) "The Career Decisions of Young Men." *Journal of Political Economy*, 105(3).

[13] **Keane, M.P. and K.I. Wolpin.** (2000) "Eliminating Race Differences in School Attainment and Labor Market Success." *Journal of Labor Economics*, 18(4).

[14] **Keane, M.P. and K.I. Wolpin.** (2001) "The Effect of Parental Transfers and Borrowing Constraints on Educational Attainment." *International Economic Review*, 42(4).

[15] **Lazear, E.** (1998) *Personnel Economics for Managers*, Wiley, 1998.

[16] **Lazear, E.** (1999)"Personnel Economics: Past Lessons and Future Directions. Presidential Address to the Society of Labor Economists, San Francisco, May 1, 1998", *Journal of Labor Economics* 17(2): 199-236.

[17] **Lazear, E. and S. Rosen** (1981)"Rank-Order Tournaments as Optimum Labor Contracts", *Journal of Political Economy* 89: 841-64.

[18] **Livingston, J.S.** (1971) "Myth of the Well-Educated Manager", *Harvard Business Review* Jan.-Feb.:79-89.

[19] **Mintzberg, H.** (2004) *Managers, Not MBAs: A Hard Look at the Soft Practice of Managing and Management Development*. Berrett-Koehler, 2004.

[20] **Montgomery, M.** (2002), "A Nested Logit Model of Choice of a Graduate Business School". *Economics of Education Review* 21(5): 471-80.

[21] **Montgomery, M. and I. Powell.** (2003), "Does a Woman with an Advanced Degree Face Less Discrimination? Evidence from MBA Recipients". *Industrial Relations*

[22] **Murphy, K. and R. Topel.** (1987), "Unemployment Risk and Earnings: Testing for Equalizing Differences in the Labor Market". in K. Lang and J. Leonard, eds., *Unemployment and the Structure of Labor Markets*, Basil Blackwell: 1987, 103-40.

[23] **Oi, W. and T. Idson.** (1999), "Firm Size and Wages". in Ashenfelter, O. and Card, D., eds., *Handbook of Labor Economics*, Vol. 3B, Elsevier Science: 1999, chapter 33, 2165-214.

[24] **Olson, C.** (2002), "Do Workers Accept Lower Wages in Exchange for Health Benefits?". *Journal of Labor Economics* 20(2): S91-S114.

[25] **Ray, S. and Y. Jeon** (2003), "Reputation and Efficiency: A Nonparametric Assessment of America's Top-Rated MBA Programs", *University of Connecticut, Department of Economics Working Paper Series* Working Paper 2003-13.

[26] **Sauer, R.** (1998), "Job Mobility and the Market for Lawyers". *The Journal of Political Economy* 106(1): 147-71.

[27] **Tracy, J. and J. Waldfogel** (1997), "The Best Business Schools: A Market-Based Approach", *Journal of Business* 70(1): 1-31.

[28] **Viscusi, K.** (1993), "The Value of Risks to Life and Health". *The Journal of Economic Literature* 31: 1912-46.

[29] **Willis, R. and S. Rosen.** (1979) "Education and Self-Selection." *Journal of Political Economy* 87(5).