Worker mobility, employer-provided general training, and the choice of graduate education.

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Abstract:

This paper links inherent mobility to observed schooling choices. A job search model with graduate education predicts that more mobile workers are more likely to enroll in full-time MBA programs. Adding to the literature on employer-sponsored general training, the model predicts that employers are likely to provide tuition assistance to workers who find quits costly. I use a panel survey of GMAT registrants to test some of the empirical implications of the model. I show that observable measures of job attachment are correlated with the probability of attending part-time and, conditional on part-time attendance, with the likelihood of receiving tuition reimbursement.

Keywords: job mobility | employer-provided general training | MBA education | business education

Article:

1. Introduction

There exists an extensive body of literature that studies the wage returns to education and training, but most of this research ignores the endogeneity of worker mobility. Inherent differences in the cost of changing employers may simultaneously affect observed wages, schooling choices, and turnover behavior. This paper addresses the issue theoretically, by building on existing job search models with costly quits, and empirically, by taking advantage of several unique features of Master of Business Administration (MBA) education.

I study graduate management education using a job search model with heterogeneity in workers' inherent costs of switching employers (Hey and McKenna, 1979 and Burgess, 1992). In this

partial equilibrium model, both part-time and full-time degrees increase productivity and move the distribution of wage offers to the right. Full-time degrees also increase the job arrival rate. This assumption is consistent with the specific nature of graduate business education. It is widely acknowledged that network building is an important component of MBA education and is more strongly emphasized in full-time programs (e.g. Alsop, 2005). A central implication of the model is that workers who have high mobility costs are likely to self-select into part-time programs. Employers sponsor workers with very low propensity to change jobs. These workers would otherwise not obtain the degree because their returns are lower than the costs. Firms extract rents from the employment relationship because of the low probability of turnover.1

To test the empirical predictions of the model, I use a four-wave panel survey of Graduate Management Admission Test (GMAT) registrants. Since most graduate management programs in the U.S. require the GMAT for admission, the data are well-suited for studying the choice between full-time and part-time programs, conditional on the decision to apply to business school. The survey also asks respondents to report their employers' financial contributions towards the MBA education. I use survey questions about geographic mobility and the importance attributed to professional networking to infer a worker's inherent propensity to change jobs. I find that high mobility costs are positively correlated with the probability of attending a part-time program and, conditional on part-time attendance, with the likelihood of receiving employer-provided tuition reimbursement. It is also consistent with the theoretical model that only about one half of part-time MBA graduates who are sponsored report a new employer in their first post-graduation survey, while about 91% of full-time business school graduates change firms after graduation.2

Because an MBA degree provides more general than firm-specific human capital, my study also adds to the literature on employer-provided general training. Becker (1964) is the first to point out that in a competitive labor market firms do not have an incentive to pay for general human capital. Workers have to be paid the full value of their general skills, hence employers cannot recoup the cost of training. However, MBA education is one of many examples of a labor market setting in which firms pay for general human capital, and numerous studies have attempted to provide a justification. A key assumption in Becker's (1964) theory is that the labor market is competitive; Acemoglu et al. (1999a) relaxes this assumption and argues that distortions in the wage profile of skilled workers make general skills equivalent to specific skills. When employers earn higher rents at higher levels of human capital, they have an incentive to cover part of the cost of general training. Acemoglu and Pischke (1999a) proposes several causes of wage distortion, including quitting costs that are increasing with skill and complementarity between specific and general skills.

Several other recent studies examine firm-sponsored tuition reimbursement programs in the context of labor turnover. Cappelli (2004) investigates tuition reimbursement programs for undergraduate education and suggests that such programs serve to attract and retain better workers. He argues that workers who receive tuition assistance are committed to staying with their employer until obtaining a degree. Manchester's (2008) study presents evidence that workers who do not intend to change jobs self-select into firms that offer tuition assistance. Benson et al. (2004) show evidence that tuition reimbursement programs are more effective in worker retention when employees are promoted after earning a degree. Their result is relevant for MBA education, where promotions upon degree completion are common.

My study is the first to analyze schooling decisions by looking at the choice between part-time and full-time graduate management education. Unlike other studies of employer-provided general training that treat mobility as an outcome of the training program, I model the cost of changing employers as a source of worker heterogeneity. The theory can explain several stylized facts from the literature, as well as some previously undocumented empirical relationships. The theoretical model is presented in the next section. Section 3.1 describes the data used in the empirical portion of the study. I show evidence in Section 3.2 that employers do not try to recoup the cost of tuition reimbursement by paying lower wages. Using a subsample of GMAT registrants who did not enroll in an MBA program, I test the validity of the GMAT Survey mobility measures in Section 3.3. The main implications of the model are tested in Sections 3.4 and 3.5, and Section 4 concludes.

2. Job search model of the returns to an MBA

2.1. Setup

The theory in this section is based on models of on-the-job search with positive cost of job switching (Hey and McKenna, 1979 and Burgess, 1992) and employer-provided general training (Acemoglu and Pischke, 1999a). A worker's marginal product at firm *j* is a combination of general human capital τ and a match-specific component *sj*: $\eta j = (1 + sj)\ \tau$. General human capital is acquired by obtaining an MBA degree; τ is equal to 0 without a graduate business degree and to $\tau^* > 0$ with a part-time or full-time degree. In each period employed workers meet a potential new employer with probability λ. It is often pointed out that full-time MBA programs offer better networking opportunities than part-time programs (e.g. Alsop, 2005), so I make the important assumption that a full-time MBA degree increases the job arrival

rate: $\lambda = \lambda_1$ with a full-time MBA and $\lambda = \lambda_0$ for workers with a part-time MBA or without a degree, where $0 < \lambda_0 < \lambda_1 < 1$.[3]

The following sequence of events is assumed:

1. The worker starts in job *j* with $\tau = 0$ and firm-specific human capital *sj* and decides whether to obtain an MBA degree. The job held prior to enrollment is taken as an exogenous initial condition.[4] A degree is obtained instantaneously at cost *T* that is lower for part-time students than for full-time students: $0 < TPT < TFT$. This assumption is based on the difference in the opportunity cost of part-time and full-time programs. While tuition and other monetary expenditures are comparable for the two types of degrees, full-time students spend time out of the labor force and forego almost two years of potential earnings and labor market experience. As Table 3 shows, part-time students generally do not experience a drop in hours or hourly wages, so this opportunity cost is zero for those who remain employed while enrolled in business school. There is no unemployment in the model because MBA graduates are allowed to return to their pre-MBA employer.

2. In each period, a new job offer arrives with probability λ. Upon meeting a potential new employer *k*, the worker draws a match-specific component *sk* from a known distribution $dFs(x)$. Productivity has a corresponding distribution $dF\,\eta(x|\,\tau)$.

3. Given ηk, the firm and worker bargain over the wage,[5] and the worker decides whether to accept the new job or to stay with her current employer. If she decides to move, she has to pay a one-time cost *c*, which is constant over time but differs across workers. With firm-specific productivity ηj and a new draw ηk, a worker will accept the job if $\eta k > vc(\eta j)$ and will not change jobs if $\eta k \leq vc(\eta j)$ for some reservation function $vc(\eta)$ that depends on *c*.

4. If the two players – the worker and the new employer – do not reach an agreement, the payoffs are postponed by one period, during which time the employee receives her disagreement value denoted byz and the firm receives 0.

5. A new period begins, and a new job offer arrives with probability λ.

The normalization that without an MBA degree $\tau = 0$ means that the marginal product, wage, and employer value of the match all equal zero. Productivity with a graduate management degree is $\eta j > 0$. The bilateral bargaining process determines a wage $w(\eta j) > 0$ associated with this match-specific component and level of general human capital. All agents discount future earnings at the rate of β, $0 < \beta < 1$, so the discounted present value of a job with match-specific value *sj* to a business school graduate is

$$W(\eta_j,\lambda,c)=w(\eta_j)\quad+\beta\Big(W(\eta_j,\lambda,c)\big[1-\lambda\big(1-F^{\eta}\{v_c(\eta_j)|\tau\}\big)\big]+ +\lambda\int_{v_c(\eta_j)}^{\infty}\{W(t,\lambda,c)-c\}dF^{\eta}(t|\tau)\Big).$$

The worker's present discounted value in the case of disagreement in the current period is

$$U(\eta_j,\lambda,c)=z+\beta\Big(W(\eta_j,\lambda,c)\big[1-\lambda\big(1-F^{\eta}\{v_c(\eta_j)|\tau\}\big)\big]+ +\lambda\int_{v_c(\eta_j)}^{\infty}\{W(t,\lambda,c)-c\}dF^{\eta}(t|\tau)\Big).$$

Firms do not incur any hiring costs, so given a wage $w(\eta j)$, the expected payoff of employing a worker with marginal product ηj and cost of quitting c is

equation(2)

$J(\eta j,\lambda,c)=\eta j-w(\eta j)+\beta J(\eta j,\lambda,c)[1-\lambda(1-F\eta\{vc(\eta j)|\tau\})]$.

The cost c enters the firm's value function through the reservation wage $vc(\eta j)$. The firm's disagreement payoff is

$V(\eta j,\lambda,c)=\beta J(\eta j,\lambda,c)[1-\lambda(1-F\eta\{vc(\eta j)|\tau\})]$.

I assume that the wage is determined according to the familiar Nash (1953) bargaining solution when the worker's bargaining power is given by γ:

$(1-\gamma)(W(\eta j,\lambda,c)-U(\eta j,\lambda,c))=\gamma(J(\eta j,\lambda,c)-V(\eta j,\lambda,c))$.

It follows that $w(\eta j) = (1-\gamma)z+\gamma\eta j$. Shimer (2006) points out that strictly speaking, this problem does not constitute Nash bargaining because the set of payoffs can be nonconvex. This wage setting mechanism is similar to the one in Acemoglu and Pischke (1999a), since the difference between the employee's marginal product and her outside option is split between the firm and the worker.

2.2. Comparative statics

A more natural notation in job search models is to write the payoffs W and J as functions of the wage, rather than the marginal product of labor. Since wj is a linear function of ηj, it is possible to substitute wj for ηj in (1) and (2) without affecting any of the results. The distribution function of wj is a linear transformation of $dF\eta(x|\tau)$ and is denoted by $dF(wj)$ when $\tau=\tau^{*}$. Instead of the reservation wage function $vc(\eta j)$ I use its transformation$rc(wj(\eta j))$. Then

$$W(w_j,\lambda,c)=\frac{w_j+\beta\lambda\int_{r_c(w_j)}^{\infty}\{W(t,\lambda,c)-c\}dF(t)}{1-\beta\Big(1+\lambda\Big(1-F\big\{r_c\big(w_j\big)\big\}\Big)\Big)}.$$

Hey and McKenna (1979) show that the optimal reservation wage policy $rc^*(wj)$ is such that $W(rc^*(wj), \lambda, c) = W(wj, \lambda, c) + c$, and the derivative of $rc(wj)$ with respect to wj is strictly between 0 and 1. Two other results they derive are

$$\frac{\partial W\left(w_j, \lambda, c\right)}{\partial c} < 0 \quad \text{and} \quad \frac{\partial r_c\left(w_j\right)}{\partial c} > 0.$$

In addition, it can be shown[6] that

$$\frac{\partial W\left(w_j, \lambda, c\right)}{\partial \lambda} > 0 \quad \text{and} \quad \frac{\partial^2 W\left(w_j, \lambda, c\right)}{\partial \lambda \partial c} < 0.$$

The results in (4) are fairly intuitive: an increase in the job arrival rate improves the value of any job through the higher likelihood of receiving a better offer in the future. This increase in value is not as big for high-mobility-cost workers, who are less likely to take advantage of a new offer.

In the absence of employer-provided tuition assistance, a full-time program is preferred over a part-time one when $W(wj, \lambda_1, c) - W(wj, \lambda_0, c) > TFT - TPT$, and the optimal choice is not to obtain an MBA degree when $W(wj, \lambda_0, c) < TPT$. It follows from (3) and (4) that $W(wj, \lambda_0, c)$ and $[W(wj, \lambda_1, c) - W(wj, \lambda_0, c)]$ are decreasing in c.[7]

Because in this model firms earn zero surplus from workers without a graduate degree, and low-mobility employees are unlikely to find it worthwhile to pay for the education themselves, employers have an incentive to sponsor these high-cost workers. In addition to less mobile workers being more likely to require tuition assistance, the return

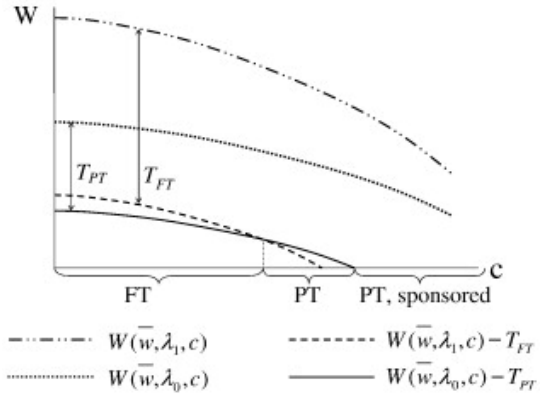
$$J\left(w_j, \lambda, c\right) = \frac{\eta_j - w_j}{1 - \beta\left(1 - \lambda\left(1 - F\left\{r_c\left(w_j\right)\right\}\right)\right)}$$

is increasing in c (because of (3)), so the difference between $J(wj, \lambda, c)$ and the cost of tuition reimbursement is increasing in c. Everything else equal, employers prefer to sponsor workers with high mobility cost c.

For an illustration, consider Fig. 1, which follows from (3) and (4). The first inequality in (4) implies that for a fixed firm-specific match component $\bar{s}$ (and thus fixed post-MBA wage $\bar{w}$), the lifetime return to a full-time degree is higher than the part-time return everywhere along the distribution of c. Both $W(\bar{w}, \lambda_1, c)$ and $W(\bar{w}, \lambda_0, c)$ are downward sloping functions of c because the first partial derivative in (3) is negative. The difference between $W(\bar{w}, \lambda_1, c)$ and $W(\bar{w}, \lambda_0, c)$ diminishes as the mobility cost goes up, which follows directly from the second inequality in (4). These properties characterize the shape of $W(\bar{w}, \lambda_1, c)$ and $W(\bar{w}, \lambda_0, c)$ in Fig. 1. To find the net value of each type of program, I shift the $W(\bar{w}, \lambda_1, c)$ curve down by *TFT* and $W(\bar{w}, \lambda_0, c)$ by *TPT*. The assumption that full-time degrees are more expensive to obtain allows for the situation depicted in Fig. 1. Workers with the lowest

mobility cost *c* enroll full-time. Next, there is an interval in the cost distribution in which workers prefer a part-time to a full-time degree and are willing to pay the full price *TPT*, so firms do not have an incentive to sponsor them. For the rest of the workforce mobility costs are so high that both $W(\bar{w},\lambda_0,c)-T_{PT}<0$ and $W(\bar{w},\lambda_1,c)-T_{FT}<0$. Such workers enroll in an MBA program only if offered tuition assistance.

Fig. 1. Mobility costs and employer-provided tuition assistance.



All else equal, individuals who do not receive tuition assistance have lower mobility costs. The probability that a worker who earns *wj* changes employers in a given period equals $q(wj) = \lambda(1 - F\{rc(wj)\})$. Then

$$\frac{\partial q(w_j)}{\partial c} = -\lambda dF\{r_c(w_j)\}\frac{\partial r_c(w_j)}{\partial c} < 0,$$

which follows from (3).

A worker who has mobility cost *c* and match-specific draw *sj* before enrolling in business school expects to earn

$$E(w') = \left(1-\lambda\left(1-F\{r_c(w_j)\}\right)\right)w_j + \lambda\int_{r_c(w_j)}^{\infty} tdF(t)$$

in the period after graduation. Keeping the job arrival rate constant at λ_0,

$$\frac{\partial E(w')}{\partial c} = \lambda_0\left(w_j - r_c(w_j)\right)dF\{r_c(w_j)\}\frac{\partial r_c(w_j)}{\partial c} < 0.$$

The observed return to an MBA program is higher for the lower-cost workers, who do not receive tuition assistance. This result can be related to other studies of the return to an MBA, such as Arcidiacono et al., 2008 and Grove and Hussey, 2011, which demonstrate that the return to part-time MBA programs is lower. The difference between the observed return to part-time and full-time programs is not always statistically significant in these studies, particularly when the authors include fixed effects in the specifications. This can also be reconciled with the

theoretical model here because the implied effect of an increase in λ on the expected starting wage of graduates, holding c constant, is ambiguous. This ambiguity arises because the reservation wage increases with the job arrival rate.

2.3. Testable implications

The model yields a set of empirically testable predictions, some of which are consistent with the results of previous studies of MBA education, most notably Arcidiacono et al. (2008). Other implications are unique to this study, and I use the survey of GMAT registrants to test them. Below is a summary of the main predictions of the model:

1. Workers with high mobility cost prefer part-time to full-time degrees, while workers with low c are more likely to opt for a full-time degree.

2. The probability of receiving employer-provided tuition assistance is an increasing function of the cost of changing employers.

3. Workers who graduate from a part-time program are less likely to change employers after degree completion if they received tuition assistance.

4. The wage return to an MBA degree (as measured by the difference between observed pre- and post-MBA wages) is higher for graduates who did not receive tuition assistance. This is supported by Tables 7 and 8 in Arcidiacono et al. (2008), where in the preferred fixed effect specifications the estimated coefficient on the indicator for employer sponsorship is negative and marginally significant both for men and for women.8

Predictions 2 and 3 are similar, but the latter incorporates the result in (5). Testing these two predictions empirically requires different types of data, as discussed in Sections 3.4 and 3.5. Prediction 3 is related to previous studies that argue that reduced turnover is an outcome of tuition reimbursement programs. The result in 2, namely that the heterogeneity in mobility is a prior in the model, is more specific to this study.

The theory presented in this section also relates to Montgomery (2002), who shows that proximity is a strong predictor of the school that a respondent attends. Additionally, $E(w')$ and the difference $(E(w') - wj)$ are both increasing in the initial wage wj. Thus, the model is consistent with studies that find that the return to an MBA, as measured by the observed starting salaries of MBA graduates or the difference between pre- and post-MBA earnings, is increasing in the wage earned prior to enrollment (Tracy and Waldfogel, 1997 and Graddy and Pistaferri, 2000).

3. Empirical results

3.1. Data

To test predictions 1–3 above, I use a panel survey of individuals who registered to take the GMAT between June 1990 and March 1991 and were living in the U.S. at the time of registration.9 Almost all accredited MBA programs in the U.S. require the GMAT for admission, so the universe of test registrants includes virtually all prospective students. This makes the data suitable for studying the choice between full-time and part-time programs and the characteristics of the recipients of employer-provided tuition reimbursement. Using MBA education to test empirically the implications of the model allows me to ignore information asymmetries; in other instances of general training it is possible for the incumbent employer to be better informed about workers' skills (Acemoglu and Pischke, 1999b and Katz and Ziderman, 1990), but information is easily transferable in the case of widely popular degree programs like business school. Other studies find it more difficult to distinguish between general and firm-specific skills (for example Loewenstein and Spletzer (1998) and others who use training data from NLSY79), but an advantage of using graduate management education is that it is hard to dispute the wide applicability of the skills it provides. In addition, MBA education constitutes a big financial and time commitment. Other training programs discussed in the literature take less than a month to complete, which may not be sufficient for any potential effects to set in.

The GMAT Registrant Survey is a four-wave longitudinal study that was administered between 1991 and 1998. The panel aspect makes it possible to observe job changes after degree completion and to check for changes in wages and hours during part-time attendance. The first wave received 5853 responses out of the 7006 test registrants who were randomly selected for the survey, but 1071 of these respondents did not take the GMAT during the survey period and are not used in the estimation. The final sample consists of 3297 respondents: 2025 who enrolled in a part-time or full-time MBA program and 1272 who did not enroll in either one.10Table 1 shows the number of respondents by gender, type of MBA program, and tuition reimbursement status. Since only 4% of men and 6% of women who enroll in a full-time program receive tuition reimbursement,11 compared to 61% of male and 56% of female part-time students, I ignore full-time tuition reimbursement in the rest of the analysis. Thus, the empirical portion of the study is consistent with the theoretical model, but with only 32 such observations the results are not affected.

Table 1. Number of observations by MBA status.

	Part-time		Full-time		Did not enroll	
	Male	Female	Male	Female	Male	Female
Total	791	564	416	254	745	527
Completed MBA degree	378	242	350	218	–	–
Employer paid half or more	480	317	16	16	–	–
Percent with employer assistance	60.68	56.21	3.85	6.30	–	–

There are 135 respondents who switch between part-time and full-time status. They are treated as part-time students in this study, but reclassifying them as full-time does not affect the results.

As Table 1 shows, part-time students are more likely to enroll and not complete their degree. There are 670 respondents in the sample who enroll in a full-time MBA program; 568 of them complete it. Only 620 of the 1355 respondents who enroll in a part-time program obtain the degree. Part-time programs take longer to complete, so many part-time students may have graduated after the end of the survey.

Table 2 provides summary statistics by type of MBA program and tuition reimbursement status; I also show descriptive statistics for survey participants whom I drop from the sample. The only two variables that vary over time are marital status and tenure. For most of the empirical work I use the first-wave values of these variables for the non-MBA sample, which is what I report in Table 2. First-wave statistics are also reported for the respondents whom I drop. For MBA students, I report marital status and tenure in the last survey wave in which they were not enrolled in business school. Wave 1 is the last pre-MBA survey for 73% of the MBA sample. Full-time MBA students have the highest GMAT scores, followed by part-time students who receive tuition assistance. Minority respondents are oversampled, and so are women to a small degree.12 Full-time MBA students tend to be younger than part-time students, which is reflected in the marital status and tenure averages. Six to seven percent of GMAT registrants hold a graduate degree in something other than business administration.

Table 2. Summary statistics by MBA status.

Variable	FT	PT, not sponsored	PT, employer paid half	Did not enroll	Not in sample
	N = 670	N = 558	N = 797	N = 1272	N = 2023[a]
Female	0.379	0.443	0.398	0.414	0.444
Asian	0.143	0.134	0.107	0.145	0.145
Black	0.121	0.120	0.090	0.156	0.143
Hispanic	0.151	0.163	0.122	0.142	0.146
Married[b]	0.196	0.366	0.447	0.347	0.203
GMAT verbal	30.430	27.885	29.148	26.741	26.891
	(8.068)	(7.451)	(7.573)	(8.174)	(8.568)
GMAT quantitative	32.413	28.129	29.745	27.189	28.569
	(8.212)	(8.112)	(8.198)	(8.888)	(9.058)
Other graduate degree	0.063	0.079	0.070	0.073	0.060
Tenure (years)	1.676	2.793	3.386	3.069	1.617
	(2.306)	(3.829)	(3.940)	(3.711)	(2.859)
Expect MBA to provide connections	0.737	0.622	0.498	0.614	0.683
School location important	0.733	0.909	0.918	0.846	0.816
Expect new employer in 5 years	0.560	0.549	0.439	0.556	0.455

a The number of responses is smaller for some of the variables that have missing values.

b Marital status and tenure are measured at the last wave prior to MBA enrollment for respondents who enrolled and at wave 1 for everyone else.

The last three variables in Table 2 are relevant for analyzing the role of job mobility. In wave 1 of the GMAT Registrant Survey, respondents are asked about their employment expectations. The “Expect new employer in 5 years” variable equals 1 if the survey taker indicated the she expects to be working for a different employer 5 years after the survey date.13Table 2 shows that 55–56% of full-time MBA students, part-time students who do not receive tuition assistance, and respondents who do not enroll in a part-time or full-time program expect to change jobs, while 44% of sponsored part-time students expect to have a new employer. The initial wave of the GMAT Registrant Survey asks each respondent to indicate whether “convenient location of college or university” is important in the selection of her first-choice MBA program. Of respondents in the non-MBA sample, 15% claim that location is not important for their first choice of school. Full-time students are almost 20% less likely to attribute high importance to the location of the business school they attend. Assuming that the costs of relocating for school and relocating for work are strongly correlated, the answer to this question measures inherent job mobility. The variable I use is equal to 1 if a respondent considers business school location to be important and to 0 otherwise.

The variable labeled “Expect MBA to provide connections” is constructed from a seven-point-scale response to the statement “A graduate management education will provide the right connections to getting a good job.” The scale ranges from − 3 (False) to + 3 (True). The binary variable used in the estimation is constructed to equal 1 for positive responses (+ 3, + 2 or + 1) and 0 otherwise. The significance of the results in any of the empirical specifications and the magnitude of the estimated coefficients are not sensitive to the choice of cutoff, or to treating the responses as a continuous variable (results available upon request). Under the working definition of the connections variable, three quarters of full-time MBA students in the sample expect their MBA degree to provide them with valuable networking capital, while only half of the sponsored part-time students do. This is another measure of a worker's propensity to switch employers under the assumption that workers who are inherently more inclined to change jobs will focus on the network-building aspect of MBA education.

3.2. Effect of part-time enrollment on wages and hours

In an empirical study of employer-provided general training, it is important to check whether attending school part-time while working full-time affects wages and hours. Workers may choose to decrease their labor supply if attending classes in the evening. It is also important to establish whether employers tend to pass the cost of general human capital onto workers by lowering wages during periods of training. Feuer et al., 1987, Loewenstein and Spletzer, 1998

and Cappelli, 2004 show that in the particular labor market settings that they study, wages do not drop during periods of general training, while Autor (2001) establishes that temporary help service firms that offer general training pay slightly lower wages. A back-of-the-envelope calculation reveals that a part-time MBA student who works 45 h per week and 50 weeks per year and is paid $14 per hour14 earns $31,500 per year before taxes. If the employer's tax rate is, for example, 25%, a firm paying $5250 in tuition benefits (the tax-exempt amount for workers) will have to lower wages by 12.5% to fully make up for the cost of providing tuition reimbursement, keeping hours constant.

I estimate equations of the form

$$yit=\gamma_1 PTit+\gamma_2 PTit*Si+Xit\beta+ui+f(t)+\epsilon it,$$

where the outcome variable is either reported weekly hours or the natural log of hourly wages.[15] The binary variable *Si* denotes whether a student was sponsored. *PTit* indicates enrollment in a part-time MBA program. The tuition reimbursement status *Si* enters the regression only as an interaction with *PTit*because few full-time MBA students receive tuition reimbursement, and those who do have no valid wage and hour observations while attending school. I control for observed and unobserved time-invariant components of productivity by including the fixed effect term *ui*. The time-dependent controls included in*Xit* are completed MBA degree, marital status, tenure, and a quadratic in experience. Estimating separate regression models for men and women yields no substantial gender differences, so I present the results for the pooled sample. The coefficients of interest are γ_1 and γ_2 because they summarize the effect of part-time graduate business program attendance on hours worked and wages and show whether the effect differs by tuition reimbursement status.

The sample used to estimate Eq. (6) includes the first four groups represented in Table 2: full-time and part-time MBA students, as well as respondents who did not enroll in either type of program. Only individuals with at least one valid wage and hours observation are used in the estimation. All survey waves with sufficient data are used for each respondent. The final sample consists of 8719 observations for 3088 individuals.

As the results in Column 2 of Table 3 suggest, workers do not reduce their hours while attending a part-time MBA program. Part-time attendance is associated with about 1.2 extra hours per week, compared to periods of no business school enrollment. The null hypothesis that the sum of $\hat{\gamma}_1$ and $\hat{\gamma}_2$ equals zero can be rejected with a probability value of 0.0007. This result is likely due to the gradual transition into the longer-hour positions held by business school graduates, since most not-in-school observations for part-time students are from the period before enrollment.

Table 3. Does part-time attendance affect hours and wages?

	(1)	(2)	(3)	(4)
	Mean	Hours	Ln(wage)	Ln(wage)
Attending part-time	0.1341	0.6959	0.0203	
		(0.4736)	(0.0151)	
Attending PT, employer paid half	0.0888	0.5028	0.0121	
		(0.5630)	(0.0180)	
Job held while part-time	0.2418			0.0236
				(0.0169)
Job while PT, employer paid half	0.1608			0.0229
				(0.0207)

Fixed effects estimation results. There are 8719 observations from 3088 individuals. The specifications also include controls for completed MBA degree or another graduate degree, marital status, tenure, and a quadratic in time and experience.

Column 3 shows that part-time enrollment does not have a negative effect on hourly wages. The estimates for $\hat{\gamma}_1$ and $\hat{\gamma}_2$ are positive and their sum is statistically different from zero. I next test whether jobs that provide tuition assistance pay lower wages for the complete duration of the employment relationship, not only while workers are enrolled in school. I estimate Eq. (6) replacing the part-time enrollment indicator and its interaction with tuition reimbursement status with controls for whether the job held at time *t* is the same as the job held while attending a part-time MBA program. The estimation results in Column 4 of Table 3 also suggest that employers who provide tuition assistance do not pay lower wages.

3.3. Observable correlates of job mobility

I use the subsample of survey respondents who did not enroll in a part-time or full-time program to infer about the factors that correlate with the cost of changing employers. For MBA students, observed mobility is likely to be directly affected by the choice of program and by tuition reimbursement status. A respondent who plans to attend full-time anticipates leaving her job for the duration of the program, which could make her more likely to expect a job change. Then, if an explanatory variable, such as gender, is found to be correlated with observed mobility, it is impossible to tell whether it is inherent mobility costs or preferences for full-time versus part-

time attendance (unrelated to mobility) that vary with gender. This problem is not as severe in the non-MBA sample, provided that enrolling in business school is not a completely random shock from the point of view of GMAT takers. At the same time, the MBA and non-MBA samples are comparable on other observable characteristics and are likely to be similar in nonobservable dimensions due to the narrow focus of the survey: GMAT takers.

I estimate a linear probability model16 in which the dependent variable is an observed measure of mobility. I use the variable that indicates whether a respondent expects to have a new employer 5 years after the first interview. The main explanatory variables of interest are the two potential predictors of mobility discussed in Section 3.1 – the importance of MBA connections and school location – as well as tenure, which is also expected to correlate with mobility.17 To show that the estimated coefficients for these variables retain their signs and significance when another observed measure of mobility is used, I also include a specification in which the dependent variable equals 1 if a worker reported a new employer in the second survey (about a year and a half after the first interview). The available data allow me to estimate this regression for 1153 of the 1272 respondents in the non-MBA sample. There is no direct interpretation of the magnitude of the coefficient estimates in the framework of the theory in Section 2; it is the sign of these estimates that is of interest.

Column 1 of Table 4 shows the results for reported mobility expectations. The coefficient of the MBA connections variable is positive and highly significant: a GMAT taker who finds networking important is 14.5 percentage points more likely to anticipate changing employers. Respondents who indicate that location is important for their choice of business school are 8.4 percentage points less likely to expect a job change. As expected, tenure is also negatively correlated with mobility expectations.18 These results indicate that the three variables are viable predictors of unobserved inherent mobility.

Table 4. Job mobility of GMAT takers who do not enroll in an MBA Program.

	(1)	(2)
	Expect new employer	Changed employers
Female	0.0306	− 0.0101
	(0.0295)	(0.0306)
Asian	0.0939□□	0.0318
	(0.0411)	(0.0428)

	(1)	(2)
	Expect new employer	Changed employers
Black	0.0745*	− 0.0018
	(0.0412)	(0.0448)
Hispanic	0.0452	0.0677
	(0.0412)	(0.0426)
Married	− 0.0456	− 0.1444**
	(0.0307)	(0.0318)
Other graduate degree	− 0.0095	− 0.0814
	(0.0533)	(0.0577)
GMAT verbal	0.0088**	− 0.0014
	(0.0022)	(0.0023)
GMAT quantitative	− 0.0026	0.0004
	(0.0022)	(0.0023)
Expect MBA to provide connections	0.1449**	0.0545*
	(0.0283)	(0.0299)
Location important for choice of program	− 0.0835**	− 0.1020**
	(0.0381)	(0.0385)
Tenure (wave 1)	− 0.0111**	− 0.0137**
	(0.0039)	(0.0045)
Constant	0.3811**	0.5683**
	(0.0763)	(0.0808)
N	1272	1153
R-squared	0.061	0.057

The sample is restricted to full-time workers (over 30 h per week).

□□ $p < 0.05$.

□ $p < 0.10$.

Column 2 of Table 4 supports these results: valuing MBA connections is positively correlated with observed mobility (significant at the 10% level), while tenure and the importance of school location are negatively correlated with the observed probability of changing employers (both are significant at the 1% level).

3.4. Mobility, part-time attendance and tuition reimbursement

I use the sample of respondents who enrolled in a part-time or full-time MBA program to test the first two implications of the theory in Section 2: that more mobile workers sort into full-time programs and that workers whose cost of changing jobs is higher are more likely to receive tuition assistance, conditional on program type. I include respondents who enroll but do not complete their degree because many of the non-completers are attending business school at the time of their last interview and are likely to graduate at a later time.

Column 1 of Table 5 reports the results of a linear probability model, in which the dependent variable is an indicator for part-time enrollment:

$$yi=X1i\delta+X2i\beta OLS+\varepsilon i,$$

where X_1i is a 1×2 vector that contains the networking and location variables, and X_2i is the vector of all other exogenous variables that also appear in Section 3.3. The vector X_1i contains the main regressors of interest, which were found to be correlated with a worker's underlying propensity to change jobs. The model in Column 3 of Table 5 is similar, but the dependent variable is an indicator for employer-provided tuition reimbursement, and the sample is restricted to part-time students.

Table 5. Correlates of part-time attendance and tuition reimbursement.

	(1)	(2)	(3)	(4)
	Enrolled part-time		Employer paid half	
Female	0.0130	0.0681□□	0.0001	0.0167
	(0.0208)	(0.0259)	(0.0284)	(0.0304)
Asian	0.0192	0.1374□□	− 0.0802□	− 0.0171

	(1)	(2)	(3)	(4)
	Enrolled part-time		Employer paid half	
	(0.0306)	(0.0412)	(0.0436)	(0.0501)
Black	− 0.1145**	− 0.0314	− 0.0571	− 0.0034
	(0.0334)	(0.0433)	(0.0476)	(0.0522)
Hispanic	− 0.0789**	− 0.0258	− 0.0773*	− 0.0460
	(0.0287)	(0.0360)	(0.0404)	(0.0432)
GMAT verbal	− 0.0010	0.0098**	0.0002	0.0061**
	(0.0016)	(0.0023)	(0.0022)	(0.0028)
GMAT quantitative	− 0.0098**	− 0.0132**	0.0053**	0.0034
	(0.0015)	(0.0019)	(0.0022)	(0.0023)
Married	0.1388**	0.0843**	0.0546*	0.0238
	(0.0218)	(0.0284)	(0.0286)	(0.0314)
Other graduate degree	− 0.0099	− 0.0387	− 0.1003*	− 0.0992*
	(0.0385)	(0.0475)	(0.0519)	(0.0544)
Tenure	0.0160**	0.0014	0.0084**	0.0010
	(0.0029)	(0.0040)	(0.0036)	(0.0043)
Expect MBA to provide connections	− 0.1354**		− 0.1085**	
	(0.0201)		(0.0270)	
Location important	0.2643**		− 0.0039	
	(0.0277)		(0.0476)	
Predicted mobility		− 1.3104**		− 0.6629**
		(0.1527)		(0.1829)
Constant	0.7801**	1.4582**	0.4748**	0.6680**

	(1)	(2)	(3)	(4)
	Enrolled part-time		Employer paid half	
	(0.0576)	(0.0863)	(0.0829)	(0.1045)
N	2025	2025	1355	1355
R-squared	0.165	0.150	0.040	0.038

Results from linear probability model. Columns 1 and 2 report estimation results for respondents who enrolled in a part-time or full-time program. The results in Columns 3 and 4 are for the subsample of part-time students. The standard errors in Columns 2 and 4 are adjusted to account for the use of a generated regressor (Murphy and Topel, 1985).

□□ $p < 0.05$.

□ $p < 0.10$.

Columns 2 and 4 show the results from two-sample two-stage least squares (TS2SLS) estimation along the lines of Murphy and Topel (1985). Ideally, the estimation would include a proxy for mobility such as the "Expect new employer" variable. However, this measure would produce biased results for MBA students: those who anticipate to enroll part-time or to receive tuition assistance will likely adjust their employment expectations accordingly. In the non-MBA sample, the "Expect new employer" variable measures anticipated mobility in the counterfactual case of no graduate school enrollment, which in this case is a more useful predictor of mobility. Thus, the first stage of the estimation is the same as the model in Column 1 of Table 4, estimated on the subsample of 1272 non-enrollees:

$$z_i = X_{1i}^{\text{non-MBA}}\theta_1 + X_{2i}^{\text{non-MBA}}\theta_2 + \nu,$$

where *zi* is the expectation of new employer in the absence of MBA education. Using the estimates $\hat{\theta}_1$and $\hat{\theta}_2$, I construct a predicted mobility measure $\hat{z}$ for the subsample of MBA students:

$$\hat{z}_i = X_{1i}^{\text{MBA}}\hat{\theta}_1 + X_{2i}^{\text{MBA}}\hat{\theta}_2.$$

In the second stage, I estimate

$$y_i = \hat{z}_i\gamma + X_{2i}^{\text{MBA}}\beta_{2SLS} + u_i.$$

Under the very strong assumption that the networking and location variables (the vector $X_1 i$) affect MBA outcomes only through mobility, $\hat{z}$ will be exogenous. This estimation procedure is similar to the two-sample IV approach in Angrist and Krueger (1992) with X_1 used as an instrument for *z*, but Inoue and Solon (2010) show that the TS2SLS method that I rely on is more asymptotically efficient. Table 4indicates that the networking and location variables are correlated with the self-reported propensity to change jobs,[19] but since it is debatable whether the exclusion restriction is satisfied, I report both the TS2SLS results and the estimates from the OLS model, in which the mobility correlates are used directly as explanatory variables. The reported standard errors in the two-stage model are adjusted for the use of a generated regressor (Murphy and Topel, 1985 and Inoue and Solon, 2010).

Column 1 of Table 5 suggests that GMAT takers who expect their MBA degree to provide them with valuable connections are 14 percentage points more likely to enroll in a full-time program; the result is highly significant. Respondents who indicate that school location is important for their choice of school are 26 percentage points more likely to attend part-time; this estimate is also highly significant. Finally, tenure prior to enrollment is also positively correlated with part-time attendance. In Column 2 I omit the networking and location variables from the second stage and instead use the linear prediction of the probability of moving. The estimated coefficient on this variable is − 1.3104, which means that one standard deviation increase in predicted mobility (about 0.12) decreases the probability of part-time attendance by 16 percentage points. Both estimation methods point to a positive relationship between the cost of changing jobs and the probability of enrolling part-time.

To test the second empirical prediction of the theory in Section 2, I estimate the models in (7) and (8) with the dependent variable equal to 1 if the respondent's employer paid at least half of the cost of the part-time MBA degree and to 0 otherwise.20 The estimation sample is limited to respondents who enroll in a part-time MBA program. The estimation results are reported in the last two columns of Table 5: OLS results in Column 3 and TS2SLS in Column 4.

Expecting the MBA degree to provide valuable connections is associated with an 11 percentage point decrease in the likelihood of receiving tuition reimbursement; this result is estimated fairly precisely. There is not enough variation in the location variable to estimate an effect: only 116 part-time students indicate that they are not concerned about location. As a result, the estimated coefficient is essentially zero. Appendix A presents the results from an alternative specification, which uses indicators for the single most important reason for the first choice of MBA program. Although not available for the full sample, this measure of the importance of location offers more variation, and consequently the estimated coefficient is positive and significant at the 10% level.

The results in Column 4 are obtained from the TS2SLS estimation, which excludes the networking and location variables from the main regression but includes predicted mobility instead. I obtain a coefficient estimate of − 0.6629 on predicted mobility, so one standard deviation increase in the propensity to move decreases the probability of receiving employer-sponsored general training by 8 percentage points. The coefficient on tenure is 0.0084 in the OLS specification (significant at the 5% level), which is consistent with a negative relationship between mobility and the probability of receiving tuition reimbursement. This coefficient is close to 0 in the TS2SLS specification.

Overall, the results in Table 5 indicate that the relationship between worker mobility and the type of program attended or the probability of observing employer-sponsored general training is consistent with the predictions of the theory. The two-sample 2SLS specifications rely on strong assumptions, but the predictions from this empirical model are similar to the implications of the OLS estimates.

3.5. Observed job changes

Previous studies have shown that participation in tuition reimbursement programs is associated with reduced turnover (Feuer et al., 1987, Garcia et al., 2002, Benson et al., 2004, Cappelli, 2004 and Manchester, 2008). In this section I demonstrate that, as predicted by the model in Section 2, this holds true for employer-sponsored MBA education as well. I estimate a linear probability model in which the dependent variable equals 1 if the job from the first wave after MBA completion matches the job from the previous survey. The dependent variable equals 0 if the reported employers are different. The sample used in the estimation is restricted to MBA graduates. Of the 1188 MBA graduates in the main sample, post-graduation employment information is available for 1130.

The regression in Column 1 of Table 6 includes both an indicator for tuition reimbursement, and the two correlates of mobility used in the rest of the empirical analysis: the networking and location variables. Full-time MBA graduates are 30 percentage points more likely to change employers than part-time graduates who did not receive tuition assistance. Tuition reimbursement increases the probability of staying with one's current employer by 12 more percentage points. Tenure prior to MBA enrollment also has a positive and significant effect on the probability of staying. The coefficients on the networking and location variables have signs that confirm the pattern: workers who are inherently less mobile are less likely to change

employers. The p-values for these variables are larger (0.064 and 0.115 respectively), but the theory and the empirical results suggest that the indicator for tuition reimbursement should absorb part of the effect of the mobility parameters. Married workers are less likely to change employers.

Table 6. Probability of staying with pre-MBA employer after degree completion.

	(1)	(2)	(3)
Full-time degree	−0.3045**	−0.3205**	−0.3654**
	(0.0325)	(0.0319)	(0.0281)
Part-time degree and employer paid half	0.1151**	0.1214**	
	(0.0316)	(0.0315)	
Tenure prior to MBA enrollment	0.0077**	0.0077**	0.0086**
	(0.0037)	(0.0037)	(0.0037)
Expect MBA to provide connections	−0.0477*		−0.0556**
	(0.0257)		(0.0257)
Location important for choice of MBA program	0.0537		0.0567*
	(0.0341)		(0.0342)
Married	0.0444*	0.0492*	0.0497*
	(0.0261)	(0.0261)	(0.0262)
Constant	0.8750**	0.8905**	0.9439**
	(0.1452)	(0.1426)	(0.1448)
R-squared	0.227	0.223	0.218

Dependent variable: whether the employer from first survey after MBA completion is the same as the last reported employer. Results from linear probability model. The regressions include

controls for gender and race, as well as a quadratic in time. The sample consists of respondents with a completed MBA degree. N = 1130.

□□ $p < 0.05$.

□ $p < 0.10$.

Because of the correlation between mobility and the indicator for tuition assistance, in Columns 2 and 3 of Table 6 I exclude either the mobility variables (Column 2) or the tuition reimbursement status indicator (Column 3). The results are not surprising: the absolute value of the point estimates for the coefficients of the remaining variables increases slightly. Even with a relatively small sample size, the observed mobility patterns are stable and support the predictions of the model.

4. Conclusion

The endogeneity of worker mobility in a situation in which firms sponsor the accumulation of general human capital is addressed in this paper theoretically, with a job search model, and empirically, using survey responses that are shown to be correlated with unobserved mobility costs. I model MBA education using a search model that incorporates a specific feature of graduate management education: part-time MBA degrees are less costly but provide less networking capital than full-time degrees. This difference is modeled through variations in the job arrival rate. The model also incorporates heterogeneous costs of switching jobs. I use a unique data set of GMAT takers to perform reduced-form tests of the empirical implications of the model.

The theory predicts that part-time degrees are preferred by workers with high mobility costs, who are less likely to take advantage of the increase in the likelihood of a job offer. Firms extract a positive surplus, which is increasing in tenure, from hiring MBA graduates. Employers are willing to sponsor workers with low propensity to quit, who have high reservation wages and a low likelihood of accepting an outside offer.

I utilize two survey questions to measure inherent job mobility, one about the importance of location and another about the importance of the networking value of an MBA degree. I use these correlates of the cost of changing jobs to show that more mobile workers are more likely to enroll in a full-time MBA program. I also show that among part-time MBA students, those who are inherently less likely to switch employers are also more likely to receive tuition assistance from their firm. My results are in line with other studies of employer-provided general training,

like Cappelli (2004), that suggest that by paying for general skills, employers change the composition of their workforce. One mechanism through which firms can target tuition assistance programs at less mobile workers is through the hiring process: Barron et al. (1997) make a similar argument and show that employers who offer extensive training programs go through a more thorough screening process to select high-ability workers.

While I exploit some features specific to graduate business education, the main conclusions can be generalized to other settings in which workers and their employers invest in human capital accumulation. There is no obvious reason for mobility costs to affect only decisions related to MBA program choice. The cost of switching employers can be related to other schooling decisions, for example whether to attend college and how much to invest in an undergraduate degree.

Appendix A. Part-time attendance and tuition reimbursement: alternative specifications

	Enrolled PT	Employer paid half
Tenure	0.0153□□	0.0079□□
	(0.0029)	(0.0036)
Expect MBA to provide connections	− 0.1373□□	− 0.1174□□
	(0.0205)	(0.0270)
Single most important reason for choice of program		
Location	0.2150□□	0.1654□
	(0.0658)	(0.1002)
Curriculum	0.1075	0.1830□
	(0.0672)	(0.1026)
Prestige	0.0602	0.2712□□
	(0.0667)	(0.1028)

	Enrolled PT	Employer paid half
Faculty	0.1474□	0.1873
	(0.0860)	(0.1250)
Know people	0.1866	− 0.0609
	(0.1457)	(0.2062)
Cost	0.1186	0.0214
	(0.0766)	(0.1148)
Financial aid	− 0.1914□	− 0.3695□
	(0.1078)	(0.2064)
Accredited	0.1638□□	0.2254□
	(0.0833)	(0.1207)
Diversity	0.0811	0.0992
	(0.0926)	(0.1375)
Employer will pay	0.3378□□	0.3979□□
	(0.0792)	(0.1122)
Ranking	0.0779	0.2776*
	(0.1039)	(0.1578)
Class schedule	0.3076□□	0.2225□□
	(0.0802)	(0.1131)
N	1988	1329
R-squared	0.161	0.074

Results from linear probability model. Column 1 reports estimation results for respondents who enrolled in a part-time of full-time program. The results in Column 2 are for the subsample of part-time students. The omitted category for the main reason for the choice of MBA program is "Other". The specifications include controls for gender, race, marital status, GMAT scores, other graduate degree, and a constant term.

□□ $p < 0.05$.

□ $p < 0.10$.

References

Daron Acemoglu, Joern-Steffen Pischke. The structure of wages and investment in general training. Journal of Political Economy, 107 (3) (1999), pp. 539–572

Daron Acemoglu, Jorn-Steffen Pischke. Beyond Becker: training in imperfect labour markets. The Economic Journal, 109 (453) (1999), pp. F112–F142 February

Ronald Alsop. The full-time advantage. The Wall Street Journal, R.4–R.4 (2005) September 21

Joshua D. Angrist, Alan B. Krueger. The effect of age at school entry on educational attainment: an application of instrumental variables with moments from two samples. Journal of the American Statistical Association, 87 (418) (1992), pp. 328–336

Peter Arcidiacono, Jane Cooley, Andrew C. Hussey. The economic returns to an MBA. International Economic Review, 3 (2008), pp. 873–899 August

David H. Autor. Why do temporary help firms provide free general skills training? Quarterly Journal of Economics, 116 (4) (2001), pp. 1409–1448 November

John M. Barron, Mark C. Berger, Dan A. Black. On-the-Job Training Books from Upjohn Press. W.E. Upjohn Institute for Employment Research (1997)

Gary S. Becker. Human Capital. Columbia University Press for the National Bureau of Economic Research (1964)

George S. Benson, David Finegold, Susan Albers Mohrman. You paid for the skills, now keep them: tuition reimbursement and voluntary turnover. The Academy of Management Journal, 47 (3) (2004), pp. 315–331

Kenneth Burdett, Dale T. Mortensen. Wage differentials, employer size, and unemployment. International Economic Review, 2 (1998), pp. 257–273 May

Simon M. Burgess. A search model with job changing costs: ‘eurosclerosis’ and unemployment. Oxford Economic Papers, 1 (1992), pp. 75–88

Peter Cappelli. Why do employers pay for college? Journal of Econometrics, 121 (1–2) (2004), pp. 213–241 Higher education (Annals issue)

Michael Feuer, Henry Glick, Anand Desai. Is firm-sponsored education viable? Journal of Economic Behavior & Organization, 8 (1) (1987), pp. 121–136 March

Christopher Flinn. Labor market search and schooling investment. Carlo Alberto Notebooks Working Paper (2011), p. 212

Federico Garcia, Jeremy Arkes, Robert Trost. Does employer-financed general training pay? Evidence from the US Navy. Economics of Education Review, 21 (1) (2002), pp. 19–27 February

Kathryn Graddy, Luigi Pistaferri. Wage differences by gender: evidence from recently graduated MBAs. Oxford Bulletin of Economics and Statistics, 62 (Supplement 1) (2000), pp. 837–854 December

Graduate Management Admission Council. Profile of Graduate Management Admission Test Candidates, 1990–91 to 1994–95. Technical Report (1996)

Wayne A. Grove, Andrew Hussey. Returns to field of study versus school quality: MBA selection on observed and unobserved heterogeneity. Economic Inquiry, 49 (3) (2011), pp. 730–749 July

John D. Hey, Chris J. McKenna. To move or not to move? Economica, 46 (182) (1979), pp. 175–185 May

Atsushi Inoue, Gary Solon. Two-sample instrumental variables estimators. The Review of Economics and Statistics, 92 (3) (2010), pp. 558–561

Eliakim Katz, Adrian Ziderman. Investment in general training: the role of information and labour mobility. The Economic Journal, 100 (403) (1990), pp. 1147–1158

Mark A. Loewenstein, James R. Spletzer. Dividing the costs and returns to general training. Journal of Labor Economics, 16 (1) (1998), pp. 142–171 January

Colleen Flaherty Manchester. The effect of tuition reimbursement on turnover: a case study analysis.

Andersson Freddrick, Lane Julia, Shaw Kathryn (Eds.), The Analysis of Firms and Employees: Quantitative and Qualitative Approaches, University of Chicago Press, Chicago (2008), pp. 197–227 chapter 6

Steven D. McLaughlin, Terry R. Johnson. Characteristics of GMAT registrants and their likelihood of taking the test. Technical Report, Battelle Human Affairs Research Centers (1993)

Mark Montgomery. A nested logit model of the choice of a graduate business school. Economics of Education Review, 21 (5) (2002), pp. 471–480

Mark Montgomery, Irene Powell. Does an advanced degree reduce the gender wage gap? Evidence from MBAs. Industrial Relations, 42 (3) (2003), pp. 396–418 July

Dale T. Mortensen. Wage dispersion: why are similar workers paid differently?, Vol. 1 of MIT Press BooksThe MIT Press (2005) January

Kevin M. Murphy, Robert H. Topel. Estimation and inference in two-step econometric models. Journal of Business & Economic Statistics, 3 (4) (1985), pp. 88–97 October

John Nash. Two-person competitive games. Econometrica, 21 (1) (1953), pp. 128–140

Robert Shimer. On-the-job search and strategic bargaining. European Economic Review, 50 (2006), pp. 811–830

Joseph Tracy, Joel Waldfogel The best business schools: a market-based approach. Journal of Business, 70 (1) (1997), pp. 1–31

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1 In addition to other incentives that firms and workers face, there are tax benefits to tuition reimbursement programs. Employers can deduct the full cost of educational assistance if the firm has a tuition reimbursement plan. According to a provision known as Section 127 Benefits, employer contributions towards tuition are treated like other fringe benefits (they have to be reported on employees' W2 forms) but are tax exempt up to $5250. Benefits amounting to a larger sum can be exempt if the reimbursement qualifies as a “working condition benefit”. In 1990, an amendment to Section 127 qualified graduate education for the $5250 exemption. A 1996 amendment excluded graduate education from Section 127, but graduate courses were once again included in 2001. In the empirical part of the paper, I study men and women who took the GMAT in 1990 or 1991 and are observed until 1997 or 1998. I assume that all decisions about graduate education were made between the 1990 and 1996 changes in tax legislation and do not consider the consequences of the amendments.

2 Explicit lock-in contracts that require workers to remain with their firm after obtaining the degree are not the norm. The 2002 Corporate Recruiters Survey conducted by the Graduate

Management Admission Council finds that 31% of employers who provide tuition assistance require employees to remain with the firm for a certain number of years. As a comparison, 72% of employers who sponsor MBA degrees have a requirement that students maintain a certain grade point average or some other MBA performance goal.

3 This assumption is consistent with the data. Waves 3 and 4 of the GMAT Registrant Survey ask respondents who have attended business school whether their graduate management program has "Provided [them] with the right connections to get a good job." Responses are given on a seven-point scale ranging from − 3 (False) to + 3 (True). Sample members who completed a full-time MBA degree average 0.409 (with a standard deviation of 1.799) in wave 3 and 0.189 (with a standard deviation of 1.921) in wave 4. Part-time graduates in the sample average − 0.3443 and − 0.5086 in waves 3 and 4 (the standard deviations are 1.615 and 1.660, respectively). The differences across type of program are highly significant.

4 The assumption that workers are employed in the initial period guarantees that a higher job arrival rate is less valuable to workers whose mobility cost is high.

5 Mortensen (2005) shows empirical evidence from matched Danish firm-worker data suggesting that bargaining is a more likely wage setting mechanism than the profit maximization wage posting game in Burdett and Mortensen (1998). Flinn (2011) is another recent study that introduces a job search model with endogenous schooling decisions and a Nash bargaining process that governs how the surplus from education is split between workers and firms. The main source of heterogeneity in Flinn's (2011) theory is inherent ability, and the model is used to analyze the choice between high school and college.

6 A proof is available from the author upon request.

7 Note that when wj approaches infinity, $W(wj, \lambda, c)$ approaches $wj/(1 - \beta)$ and $W(wj, \lambda 1, c) - W(wj, \lambda 0, c)$ goes to zero. Intuitively, workers who have an extremely good productivity draw do not benefit from the higher job arrival rate associated with full-time degrees and do not have an incentive to pay the higher cost of these programs.

8 I find that the significance level increases if the variable of interest is the interaction between sponsorship and part-time education.

9 The survey was conducted by the Batelle Memorial Institute on behalf of the Graduate Management Admission Council. For examples of other studies using this survey, see Arcidiacono et al., 2008 and Montgomery and Powell, 2003. Some of the descriptive statistics I show are similar to McLaughlin and Johnson (1993).

10 For the non-MBA sample I use only respondents who reported working full-time (over 30 h per week) at the time of the first interview, which eliminates 909 GMAT takers with low or missing hours. I also drop observations with missing values for the variables I use in the

estimation. I use information on start and end dates for each reported job to construct a tenure variable, but such information is missing for about 10% of the survey completers.

11 I define tuition reimbursement as having at least half of the cost of the MBA degree covered by an employer.

12 In the 1990–1991 testing cycle, women constitute 36.8% of test takers, and 83.7% of people taking the test self-report their race as white (non-Hispanic) (Graduate Management Admission Council, 1996).

13 The exact wording of the question is: “Five years from now I expect to be… PLEASE CIRCLE ONLY ONE: (1) Working for my current or most recent employer in a similar position. (2) Working for my current or most recent employer but in a different position or at a higher level of responsibility. (3) Working in a position similar to my current or most recent one but with a different employer. (4) Working in a new position or at a higher level of responsibility with a different employer.” I construct a binary variable that equals 1 if the survey taker chose statement (3) or (4) and 0 otherwise.

14 These numbers are close to the medians for part-time students in the GMAT Registrant Survey sample. Wages are measured in 1991 dollars. As a comparison, median usual weekly earnings for full-time, not self-employed, wage and salary workers in the CPS are $432 in the fourth quarter of 1991, as reported by the Bureau of Labor Statistics.

15 Respondents can choose what period to report earnings over, so I use reported hours to construct hourly wages.

16 For all of the linear probability models in 3, 4 and 3.5, the specifications were also estimated as similar probit and logit models. The results are almost identical, with two small but noteworthy differences. In the specifications that include tenure, the marginal effect of this variable is slightly larger and more statistically significant when estimated by probit or logit, compared to the linear probability model. This is likely due to the distribution of tenure being heavily right-skewed. Similarly, in the probit and logit specifications that correspond to Table 6, the significance level of the “Location important” variable is slightly higher. In a way, the linear probability model yields the most conservative estimates, but the difference is minor.

17 Since the median age of GMAT registrants is about 25 years, experience is highly correlated with tenure, and the sample sizes do not allow me to identify separately the effects of tenure and experience. For this reason, experience (or age) is not included in the regressions, but replacing tenure with experience reveals similar patterns.

18 This is consistent with the theory in Section 2. While I assume that the cost of changing jobs is time-invariant, the observed quit rate is decreasing in c, which leads to a positive relationship between c and tenure.

19 These variables' F-statistic equals 16.50 for the model in Column 1.

20 Using an indicator for any employer-provided tuition assistance does not change the results, which suggests that the level of tuition reimbursement is not too important once the zero threshold is exceeded.