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The Effect of Tuition Reimbursement on Turnover
A Case Study Analysis

Colleen Flaherty Manchester

6.1 Introduction

Becker's (1964) seminal work on investment in human capital makes a fundamental distinction between general and firm-specific skills, which has implications for investment and employee turnover. Firm-specific human capital is defined as having value only to the current employment relationship, while general human capital is valuable to both current and potential employers. Becker's theory predicts that employees will bear the full cost of general skills training—either by paying for training directly or by accepting lower wages during training periods—because employers face the threat of not capturing the return on their investment due to "poaching" of trained employees by other employers. In a competitive labor market, workers have the incentive to invest efficiently in general human capital because they receive a wage equal to the value of their marginal

product. In the case of investment in firm-specific human capital, employers and employees share the costs. Neither party is willing to bear the full amount due to the risk of opportunistic behavior by the other. The employer and the employee share the surplus, or rents, from the investment; the relative bargaining power of the two parties determines how these rents are allocated.

This standard theory on investment in human capital has implications for turnover. Investment in firm-specific human capital reduces turnover because rents accrue only if the employment relationship is maintained. However, this result does not hold for investments in general human capital because these skills are transferable across employers. According to standard theory, offering employees general skills training would increase turnover.

Despite the predictions of this theory, recent empirical studies show that firms provide general training to their workers and often argue that firms bear part of the cost.[1] Tuition reimbursement programs are an example of general skills training provided by firms. Employers reimburse employees for direct costs of coursework taken at accredited academic institutions. Because instruction and degree accreditation occur at third-party institutions, skills acquired are transferable—as well as observable—to many potential employers. Hence, tuition reimbursement programs closely resemble general skills training as described by Becker (1964).

A primary reason firms give for offering these programs is to reduce turnover, which challenges standard human capital theory.[2] This chapter examines empirically whether employees who participate in tuition reimbursement have higher retention rates than nonparticipants using a case study analysis of workers at a nonprofit institution. Results from the case study indicate that participation reduces employee turnover. Hence, the firm's motivation for offering this program is supported by this analysis: general skills training increases retention.

The remainder of this chapter is organized as follows. Section 6.2 documents the prevalence of tuition reimbursement programs using the Survey of Employer-Provided Training, 1995 (SEPT95) and describes the typical characteristics of these programs. Section 6.3 reviews previous studies of tuition reimbursement programs, while the case study analysis is presented in section 6.4. Section 6.5 discusses the results from the case study, and section 6.6 concludes the chapter.

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1. These include, but are not limited to, Loewenstein and Spletzer (1999a, b), Acemoglu and Pischke (1998, 1999a, b), Autor (2001), and Cappelli (2004).
2. Increased retention is a response given by human resource professionals in interviews with the author. Cappelli (2004) and the Corporate Leadership Council (2003) report the same finding.

6.2   Background on Tuition Reimbursement Programs

6.2.1   Program Prevalence

Employer-provided tuition reimbursement programs are widespread and constitute a nontrivial part of nonwage compensation. One of the few data sets that collects information on tuition reimbursement programs is SEPT95. This survey collects information on employer-provided training practices for a cross section of establishments. The survey was conducted by the Bureau of Labor Statistics (BLS), part of the U.S. Department of Labor, from May to August of 1995, with the purpose of collecting nationally representative data (Bureau of Labor Statistics 1996). The sample represents private, nonagriculture establishments employing fifty or more workers. The results from SEPT95 show that a substantial fraction of firms offer tuition reimbursement: 61 percent of establishments employing fifty or more workers offer tuition reimbursement programs. Using the 1994 National Employer Survey of Educational Quality in the Workforce (NES-EQW), Black and Lynch (1998) report that 47 percent of firms employing twenty or more employees offer tuition reimbursement programs. The estimates from SEPT95 and 1994 NES-EQW are comparable because larger establishments are more likely to offer a tuition reimbursement program (Frazis et al. 1998; Frazis, Gittleman, and Joyce 2000). Examining the access of workers to this program, over three-quarters of the employees who work in establishments represented in SEPT95 are offered tuition reimbursement by their employer.

In addition, the amount spent on these programs is substantial: establishments represented in SEPT95 spent $2.8 billion in 1994 on tuition reimbursement.[3] The trade magazine *Workforce Management* estimates that companies paid $10 billion toward tuition reimbursements in 2003.[4] Hence, expenditures on tuition reimbursement programs represent a significant source of investment in general skills of employees and appear to be on the rise. However, these programs are relatively unexamined in the academic literature. This chapter examines the effect of participation in the tuition reimbursement program offered by the case study institution on the propensity of an employee to separate from his or her employer.

6.2.2   Program Characteristics

Tuition reimbursement programs typically consist of three components: (1) a maximum reimbursement amount; (2) an eligibility requirement; and (3) a reimbursement policy based on academic performance. The first

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3. The confidence interval for this estimate ranges from $2.6 billion to $3.0 billion (1994 U.S. dollars).
4. See *Workforce Management,* May 1, 2004.

characteristic is affected by the tax-advantage status of these programs. Reimbursements from employer-provided programs are exempt from income taxation under Section 127 of the U.S. Internal Revenue Code.[5] The maximum income exclusion for a single calendar year is $5,250, and reimbursements under this level are exempt from federal income tax, payroll tax, and state income tax. A 2002 survey by Eduventures of human resource professionals and managers at over 500 firms finds that 70 percent of firms offering a tuition reimbursement program cap annual reimbursement, and over half of these firms (57 percent) have maximums that exceed $4,000 (Newman and Stein 2003).[6] Table 6.1 shows the distribution of reimbursement maximums from the Eduventures' survey. The majority of firms choose maximums below or equal to the maximum annual tax exclusion, $5,250, but a sizable fraction of firms have reimbursement maximums that exceed the tax exempt limit or have no maximum reimbursement amount. Among firms offering tuition benefits, nearly 40 percent offer reimbursements beyond the level that receives tax-advantaged status (i.e., amounts greater than $5,250). The fact that firms set annual limits in excess of the tax exempt amount provides evidence that these programs are not solely offered because of their tax-advantaged status.[7]

Most firms in the Eduventures' survey allow employees to become eligible for the program after six months of service; rarely do eligibility requirements exceed one year. Twenty percent of firms in the survey impose service requirements after participation. Service requirements after participation are more common in plans that have unlimited tuition reimbursement. The survey also reports that over 90 percent of programs have a minimum grade standard for reimbursement, typically set at a "C" or better. Many companies tie grades directly to reimbursement percentages, making the cost of participation higher for workers who receive lower grades. The tuition reimbursement program offered at the case study insti-

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5. Section 127 of the Internal Revenue Code outlines the tax-advantaged status of educational assistance plans provided by employers: "Gross income of an employee does not include amounts paid or expenses incurred by the employer for educational assistance to the employee if the assistance is furnished pursuant to a [educational assistance] program" (26 U.S.C.§ 127).

6. The survey was sponsored by Cenquest, a provider of managed education solutions, which helps companies create and manage tuition assistance programs (http://www .cenquest.com). Eduventures, who conducted the survey, is an independent research and advisory firm of corporate, postsecondary, and pre–K-12 learning markets (http://www .eduventures.com).

7. A common reaction to tuition reimbursement programs is to only attribute their provision by firms to their tax-advantaged status. However, this overlooks the trade-off between wage and nonwage compensation. If total compensation reflects the value of a worker's marginal product, then benefits and wages are substitutes at the margin. Firms offer tuition reimbursement program instead of additional wages or other benefits if tuition benefits are more effective at attracting or retaining a certain type of worker. The tax-advantaged status of tuition reimbursement programs increases the value of these benefits to a worker facing a positive tax rate, but it cannot explain the effect of these programs on recruitment or turnover.

Table 6.1   **Distribution of maximum reimbursements for tuition programs**

Amount	% of sample
<$1,000	6.2
$1,001–$2,500	19.1
$2,501–$4,000	15.7
$4,001–$5,250	19.8
$5,251–$7,000	4.8
$7,000+	3.7
No maximum	30.7
No. of observations	434

Source: Newman and Stein (2003).

tution has an eligibility requirement of one year of service and does not have a service requirement after participation. The maximum reimbursement amount is $5,250 for a single year, and the program only reimburses costs of tuition for participants obtaining a "C" grade or better. Hence, the case study program is typical in its reimbursement amount and requirements, making it a good candidate for case study analysis.

6.3   Literature on Tuition Reimbursement Programs

The primary reasons given by firms as to why they offer tuition reimbursement programs are recruitment and employee retention. The first reason suggests that tuition reimbursement is a nonwage benefit that affects the type of workers attracted to the firm. One potential mechanism behind the second reason is that tuition reimbursement programs increase employee retention by making the worker more productive at the current firm relative to outside employers. The remainder of this section outlines the existing literature on these two given motivations and discusses the handful of studies on tuition reimbursement.

6.3.1   Tuition Reimbursement Programs and Recruitment

The use of benefits as a recruiting device is prevalent in labor and personnel economics. Rosen's (1986) work on "equalizing differences" establishes a theory for how nonwage benefits affect the composition of workers attracted to a firm. In the case of tuition reimbursement, workers who value continuing education are willing to trade off wages (at some rate) for tuition payments. This trade-off implies that at least part of the incidence of tuition reimbursement is on the worker. Employers may find it profitable to attract such workers if a preference for continued education is correlated with unobservable characteristics, such as ability or motivation.

Cappelli (2004) addresses the effect of tuition reimbursement programs on recruitment by developing a model such that provision of these pro-

grams generates a separating equilibrium in which only high-ability workers choose to work at firms with a tuition program. His model includes two types of agents, low-ability and high-ability, in which ability is known to the worker, but unknown to the firm. Participation in a tuition reimbursement program is assumed to reveal the worker's type to all potential employers because certification takes place outside the firm. Because participation is assumed to be more costly to workers of low ability, wages can be set such that all high-ability types participate and no low-ability types participate. Hence, in his model, firms use tuition reimbursement programs as a screening device to attract high-ability workers. Using educational attainment as a proxy for ability, Cappelli tests his theory using the 1997 NES-EQW and finds that the average education attainment of new hires is higher for firms with tuition reimbursement programs, which is consistent with his theory if educational attainment is a direct measure of ability.

However, the sharp prediction of his model—all high-ability types participate—is inconsistent with empirical participation rates. Participation rates in tuition reimbursement programs by employees are typically around 5 percent.[8] The Corporate Leadership Council (CLC; 2003) reports that low participation rates could be due to a lack of marketing by firms. If employees lack information about the program, it cannot influence an employee's selection of an employer.

Aside from the sharp predictions and possible shortcoming listed in the preceding paragraph, the general idea of Cappelli's (2004) model is attractive because it is consistent with Rosen's (1986) prior work. The low participation rates found empirically could be reconciled in his model by thinking of workers as attaching an option value to participation: nonparticipants at firms that offer the program could be systematically different (i.e., of higher ability) than workers at firms that do not offer this program if high-ability workers are willing to trade off wages for the option of participating in the future. Data on how implementation of a tuition reimbursement program affects the applicant pool would be ideal to test the effect of these programs on recruitment. However, this type of data is difficult to obtain. Results from the case study in section 6.4 provide some evidence that implementation of a tuition reimbursement program affects employee composition because both the determinants of participation and the effect of participation on retention are different for new hires relative to those employees hired before the program was implemented.

6.3.2   Tuition Reimbursement and Retention

In contrast to using tuition benefits as a recruiting device, the claim by firms that they use tuition reimbursement programs to reduce turnover does not have support in the theoretical literature. Rather, the theoretical

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8. References include the Corporate Leadership Council (2003), statistics from Watson Wyatt, and conversations with human resource (HR) personnel at firms with a program.

literature predicts the opposite: provision of general skills training would increase turnover. Becker's (1964) theory of investment in human capital argues that, because general skills are fully transferable (by definition), firms risk having their trained employees poached or "cherry-picked" by outside firms if they provide workers with general skills training. The labor market is assumed to be competitive with the worker's wage set equal to the value of her marginal product. Becker's theory implies that the worker bears the full cost of general training because she captures the full return on the investment. Because the market is competitive and skills are transferable, the worker is indifferent between employers. Therefore, even if the incidence of general skills training falls on the worker, turnover would be nondecreasing in the provision of general skills training. This disconnect between the theoretical literature and the intended use of these programs by firms presents an opportunity to analyze empirically the effect of tuition reimbursement programs on retention.

There are a handful of studies that examine the tuition reimbursement programs offered by the U.S. Department of Defense.[9] The two studies most similar in their econometric methodology to the case study analysis in this paper are Arkes, Garcia, and Trost (2000) and Buddin and Kapur (2005), which both examine the impact of tuition reimbursement on retention in the U.S. Navy. Arkes, Garcia, and Trost (2000) follow a cohort of enlistees who began service in 1992 and study the effect of participation on the probability of remaining with the Navy for at least six years. They find that participation increases the probability of staying in the Navy by nearly 13 percentage points.

Buddin and Kapur (2005) find the opposite: participation in tuition reimbursement decreases the probability of reenlisting after four years by 16.5 percentage points. Buddin and Kapur criticize Arkes, Garcia, and Trost's (2000) definition of retention and instead use reenlistment after the end of a four-year contract as the relevant measure. Buddin and Kapur (2005) argue that the time window for which enlistees have access to participation in tuition reimbursement should be held fixed, so they limit their sample only to those enlistees who served a full four-year contract. These two studies also differ in the variables used as exclusion restrictions in their bivariate probit estimation: Arkes, Garcia, and Trost (2000) use participation in the orientation session for educational opportunities offered to enlistees, while Buddin and Kapur (2005) use the enlistee's proximity to a four-year college before enlistment and an interaction between the number of courses offered on base and the size of the base. Buddin and Kapur argue that the instrument used by Arkes, Garcia, and Trost (2000) fails the exogeneity test.[10]

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9. These include Boesel and Johnson (1988), Garcia, Joy, and Reese (1998), Arkes, Garcia, and Trost (2000), Buddin and Kapur (2002), and Buddin and Kapur (2005).

10. Participation in the orientation session is not random; it is positively correlated with an individual's intention to use the program. Therefore, Buddin and Kapur (2005) argue that it is correlated with the probability of staying in the Navy.

While the exclusion restriction in Arkes, Garcia, and Trost (2000) is untenable, this chapter does not agree with Buddin and Kapur's (2005) criticism that the window of opportunity for participation needs to be held constant for "leavers" and "stayers." If enlistees jointly determine their participation and retention decisions, constraining the duration of service to be the same across participants and nonparticipants imposes restrictions on the effect of the program. By using different criteria for their samples, Arkes, Garcia, and Trost (2000) and Buddin and Kapur (2005) are addressing slightly different research questions. Arkes, Garcia, and Trost (2000) examine the effect of participation on the probability of staying six years, while Buddin and Kapur (2005) analyze the effect of participation on the probability of staying a fifth year after already completing four years with the Navy. Even in the absence of these complications, generalizing results from the Armed Services to civilian workers is difficult due to the fundamentally different employment relationship.

Benson, Finegold, and Mohrman (2004) present an analysis of the impact of participation in tuition reimbursement on retention using a case study of a large U.S. manufacturing firm (roughly 10,000 civilian employees). Employees at this firm have a high participation rate in the tuition program—nearly 60 percent—which may be due to the program's unlimited reimbursement of tuition, stock rewards for degree completion, and the fact that the firm strives to be a leader in the provision of continued education for its workers. This number is also inflated because it includes individuals who took only a single course rather than limiting the sample to those enrolled in a degree program. Hence, their study examines an atypical tuition reimbursement program in terms of characteristics and participation rates.

Benson, Finegold, and Mohrman (2004) use a Cox-proportional hazard model to analyze how participation and degree completion affect the probability of leaving the firm between January 1996 and June 2000. They propose a theory in which promotion after degree completion would reduce the probability of leaving because it produces a better match between responsibilities and skill sets. However, their theory falls short of fully explaining their empirical findings. They find that promotion decreases the probability of leaving for employees who obtain a graduate degree. However, these individuals still have a greater probability of leaving the firm than nonparticipants, and promotion does not affect the turnover propensity for those employees earning either a bachelor's or an associate's degree. Another possible source for concern is the authors' assumption that the effect of participation on the separation hazard is proportional because the authors make note of a sharp increase in the hazard upon degree completion. In addition, their analysis assumes that participation in the tuition program is exogenous to the employee's retention decision. A major advantage to the Benson, Finegold, and Mohrman study is the data used in their analysis because it allows current participants to be distinguished from those who have completed degree programs. Overall, however, it is

difficult to generalize their findings to other establishments because the institution they analyze is an outlier in terms of program characteristics and due to the methodological shortcomings.

While few studies examine tuition reimbursement programs, there have been many studies that examine the provision of general skills training by employers. These studies develop models in which a variety of mechanisms, such as asymmetric information or mobility costs, create a wedge between wages and productivity. This wedge provides firms with an incentive to offer and pay for general skills training.[11] These studies, however, do not focus on the effect of general training on employee retention.

This chapter empirically evaluates the effect of employer-provided general training—provided through tuition reimbursement programs—on employee attachment to the firm. It contributes to the literature by examining the effect of these programs on the retention of civilian workers using a program that is typical in terms of its characteristics. Additionally, this analysis accounts for the interdependence between an employee's participation and retention decisions.

6.4   Case Study Program (CSP)

To examine the impact of tuition reimbursement programs on employee retention, this chapter analyzes data from a single employer. This section presents the program characteristics, an econometric framework, and the results from analyzing the case study program. The data were obtained from a nonprofit institution that implemented a tuition reimbursement program in September 1999. The case study program will be referred to as CSP in the remainder of this chapter. Employees included in this analysis are staff members in supervisory and nonsupervisory positions who were employed on December 15, 1999, and those who were hired between December 15, 1999, and September 1, 2001. There are nearly 8,000 employees in total. A panel of observations was constructed based on seven "point-in-time" observations from administrative records. Individuals are observed on December 15 of each year from 1999 to 2005. The data include information on gender, age, and race as well as start date, job characteristics, and annual wage rates. One shortcoming of the data is that those employees who start and end employment between December 15 of one year and December 15 of the subsequent year are not included in the sample. An additional shortcoming is that the data do not distinguish voluntary separations from involuntary separations.[12] Individual records of partici-

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11. These include, but are not limited to, Black and Lynch (1998), Loewenstein and Spletzer (1999a, b) and Acemoglu and Pischke (1998, 1999a, b), and Autor (2001).

12. Being able to distinguish between the two would improve our understanding of how these programs affect employee attachment; however, this is not possible using these data. Historically, this employer has not used mass layoffs, and most separations appear to have been voluntary.

pation in CSP include the amount reimbursed, the degree type, and the major or area of concentration for those participating from September 1, 1999, to August 31, 2004.[13] The amount reimbursed over these five years totaled nearly two million dollars (in 2001 U.S. dollars), with a participation rate of 5.0 percent.[14]

6.4.1   CSP Characteristics and Data

As mentioned in section 6.2, employees are required to have one year of service to be eligible for CSP. Employees need to be admitted into a degree program, but the program does not need to be job-related. The employee's supervisor must approve the request to participate in CSP, but this is not a binding constraint because the employee can appeal directly to the benefits department for reimbursement if his or her supervisor does not grant the request. A staff member working full time (more than thirty hours per week) qualifies for $5,250 in reimbursement per year; this amount is prorated for members working part time. The maximum reimbursement amount was $2,000 for the first two years of the program, September 1, 1999, through August 31, 2001, but was increased to $5,250 as of September 1, 2001. CSP qualifies under Section 127 of the Internal Revenue Code, allowing reimbursements to be exempt from income and payroll taxation. Under CSP, reimbursements are only allowable for the cost of tuition. Tuition reimbursements are made directly to the institution prior to the quarter or semester. The employee assumes responsibility of satisfactory completion of the course (grade of C or better); if not, the funds must be repaid in total to the employer.

Table 6.2 displays descriptive statistics of worker characteristics for those used in the analysis. Participants in CSP differ from nonparticipating employees in terms of observable demographic and employment characteristics. Participants are younger, are more likely to identify themselves as black, have a lower starting wage, and are less likely to be in a supervisory role.[15] Of those who participated between September 1, 1999, and August 31, 2004, the average total reimbursement amount was nearly $5,200, and participants spent an average of two years in the program.

The participation rate of an employee's peers is also higher for participants. Peer groups were constructed using both the location of an em-

13. Major, or area of study, was not available for twenty-two participants.
14. Participation is measured as having ever participated in the program. It is important to note that data on participation in CSP is only available through August 31, 2004; therefore, this rate likely underestimates actual participation. In particular, this participation rate only includes two years of participation behavior for employees hired in 2001.
15. Workers are categorized as supervisors if they are "exempt," while "nonexempt" workers are those in nonsupervisory positions. Exempt and nonexempt refer to whether the employee is subject to the U.S. Fair Labor Standards Act of 1938 (FLSA), which establishes minimum wage and overtime pay laws for full-time and part-time workers in the private and government sectors. Workers who are nonexempt from FLSA are those paid on an hourly basis and occupy nonsupervisory positions; the salary of exempt workers must also meet the minimum wage.

Table 6.2   **Comparing nonparticipants to participants**

Employee characteristics	Nonparticipants	Participants
Female (%)	70.6	73.8
Age	40.7	34.5**
White (%)	68.3	62.8**
Black (%)	5.4	10.7**
Hispanic (%)	7.9	9.7
Asian (%)	18.4	16.8
Initial weekly wage ($2001)	1,393	1,225**
Nonsupervisor (nonexempt, %)	41.9	52.1**
Supervisor (exempt, %)	58.1	47.1**
Leave before 5 years (%)	47.1	33.2**
Years in tuition program		1.96
Tuition spending (nominal, $)		5,169
Participation rate of peers (%)	2.8	3.2**
No. of observations	7,291	382

**Statistically different at the 5 percent significance level.

ployee's division and the general classification of his or her job to define a group of workers whose participation behavior could influence an individual employee's participation decision, such as through the dissemination of information about the program. The peer participation rate assigned to each employee does not include that particular employee's participation behavior. This variable is used later in the paper as an exclusion restriction in the econometric analysis of the effect of participation on retention.

Tables 6.3 and 6.4 show the (unconditional) retention behavior of nonparticipants and participants. The raw data show that participants have higher retention rates than nonparticipants for each year of service. The largest difference in the separation percentages occurs at the three-year mark, but the difference still persists at the five-year mark. Whether the worker separates from the institution before five years is the primary outcome evaluated in this study. Unfortunately, the data do not contain information on degree completion, so the retention behavior of participants after completing their coursework cannot be directly examined. The five-year time window is used as an approximation for degree completion.

Figure 6.1 graphically displays the difference between participants and nonparticipants in their propensities to separate from the institution by plotting Kaplan-Meier survival functions. These survival functions use actual employment start dates, but the end dates are randomly assigned to a date in the year in which the employee leaves the institution, which produces a relatively smooth curve.[16] The survival function of participants lies

16. For employees hired before September 1999, length of service is measured as the difference between implementation of the program (September 1, 1999) and the employee's end date or censoring date (December 15, 2005) when applicable.

Table 6.3   Retention of participants (unconditional)

Year hired	Number	% leave before:		
		3 years	4 years	5 years
Before Sept. 1999[a]	242	14.5	21.5	30.2
Sept. 1999–Dec. 1999	11	0.0	9.1	36.4
2000	72	12.5	20.8	33.3
2001	57	24.6	31.6	45.6

[a]Service length is measured as of first year observed (Dec. 15, 1999).

Table 6.4   Retention of nonparticipants (unconditional)

Year hired	Number	% leave before:		
		3 years	4 years	5 years
Before Sept. 1999[a]	4,980	31.7	37.3	42.3
Sept. 1999–Dec. 1999	264	48.5	9.1	63.6
2000	1,199	40.6	20.8	57.8
2001	848	43.4	53.1	59.2

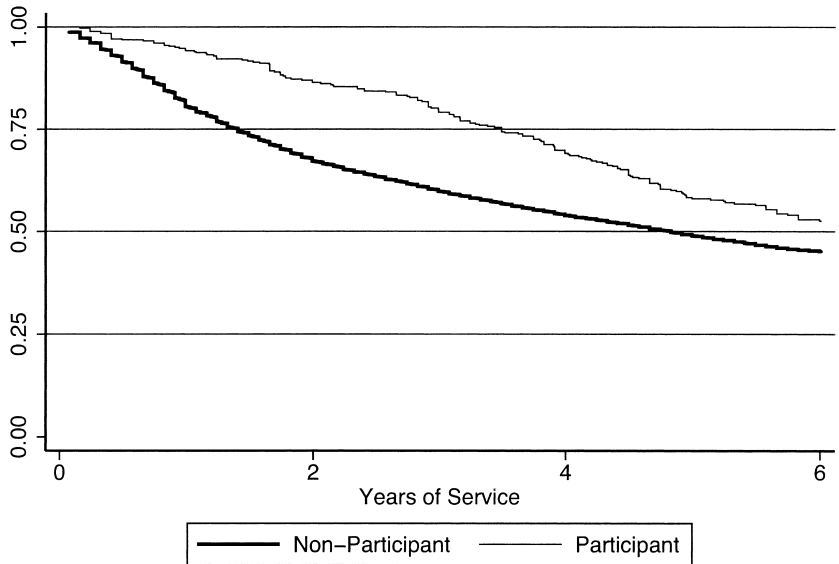[a]Service length is measured as of first year observed (Dec. 15, 1999).

Fig. 6.1   Kaplan-Meier survival function plots by participation status (all hires)

to the right of nonparticipants, meaning that for any year of service, participants are more likely to still be employed at the institution. Differences in survival rates are largest just before three years of service. Figure 6.2 charts the survival functions for workers hired after September 1999 (i.e., hired after CSP was introduced).

Figures 6.3 and 6.4 graph the survival function by degree type and major pursued. Survival rates differ by the type of degree pursued: participants enrolled in undergraduate programs have higher survival rates than those in graduate programs (figure 6.3). The analysis in the next section examines whether this difference between degrees persists after controlling for individual characteristics.

While not a part of the administrative record, the relevance of the participant's major to their current job title was imputed. Participants were classified as pursuing a job-related major unless the discrepancy was large (i.e., a computer technician pursuing a major in art history) in an attempt to uncover a "lower bound" for the effect of participation on separation, meaning the effect of participation on retention that can be attributed to the service length requirement prior to eligibility and the fact that the worker needs to continue employment through the completion of his or her course in order to receive reimbursement. As seen in figure 6.4, the survival rate of participants is higher for the first few years of service even for those pursuing majors that are vastly unrelated to their job. The survival function for those pursuing majors that are at least *somewhat* job-related is to
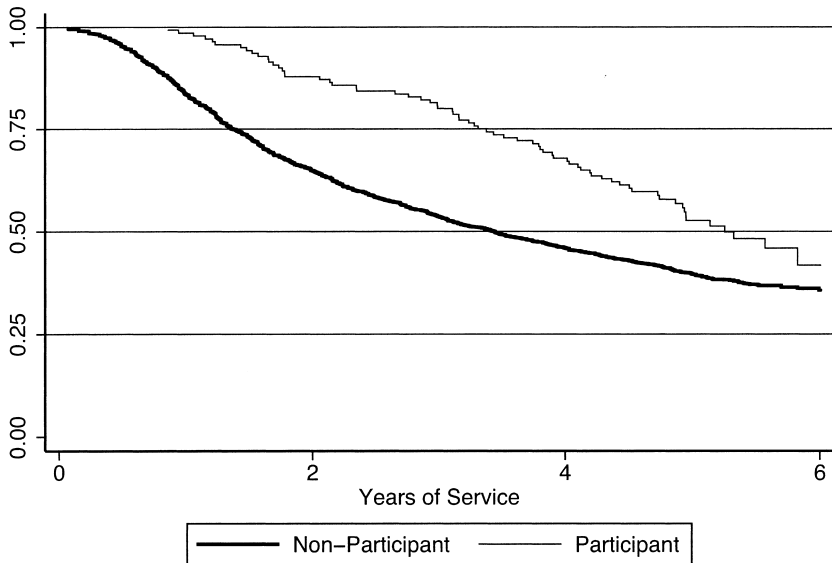

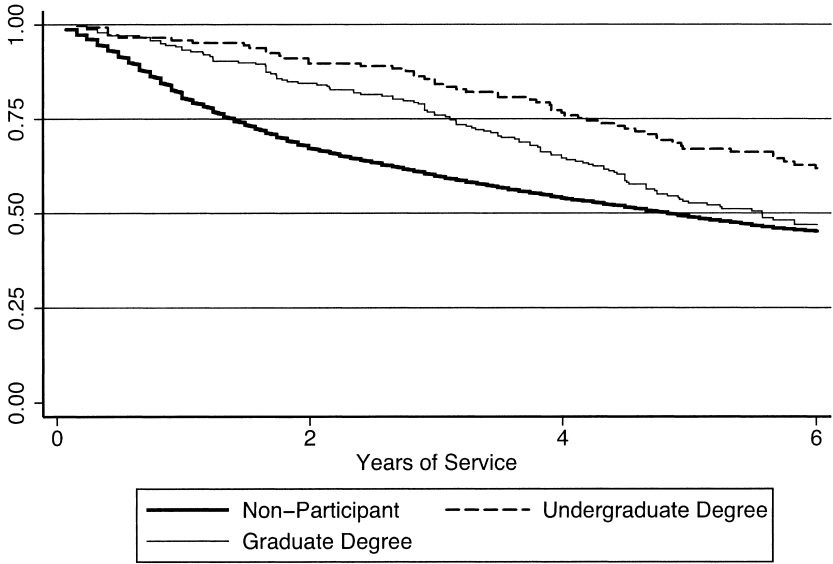**Fig. 6.2   Kaplan-Meier survival function plots by participation status (new hires)**

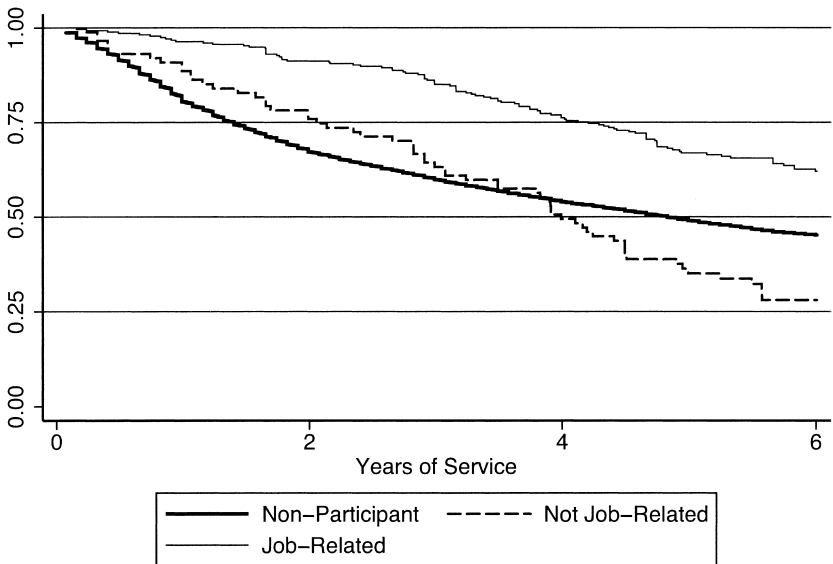**Fig. 6.3 Kaplan-Meier survival function plots by degree pursued (all hires)**

Fig. 6.4 Kaplan-Meier survival function plots by major pursued (all hires)

the right of the survival function of nonparticipants; the right shift persists beyond five years of service.

6.4.2   Estimation

This section models the event of an employee leaving the institution using a latent variable framework. The individual compares the utility from staying with the employer to that obtained from separating. The propensity to separate from the employer is a continuous variable, but the observed outcome is binary, taking a value equal to 1 if the individual separates, and equal to 0 otherwise. The likelihood of leaving depends on observable characteristics, X, participation in CSP, P, and factors unobservable to the researcher, ε. Let S^* be the underlying index—unobservable to the researcher—that determines whether the individual separates from the employer within a specified time frame:

(1) $$S^* = X' \beta + \alpha P + \varepsilon$$

(2) $$S = \begin{cases} 1 \text{ if } S^* \geq 0 \Leftrightarrow X'\beta + \alpha P \geq -\varepsilon \\ 0 \text{ if } S^* < 0 \Leftrightarrow X'\beta + \alpha P < -\varepsilon \end{cases}$$

If we assume ε to have a standard normal distribution, then we can estimate how worker characteristics affect the probability of separating from the institution using a probit model.

The same framework can be applied to participation in CSP because participation is also a binary outcome. Let P^* be the underlying latent variable that determines whether the individual participates, while Z represents individual characteristics, and let u be unobservable characteristics. Again, the individual compares the utility from participating to that from not participating:

(3) $$P^* = Z'\gamma + u$$

(4) $$P = \begin{cases} 1 \text{ if } P^* \geq 0 \Leftrightarrow Z'\gamma \geq -u \\ 0 \text{ if } P^* < 0 \Leftrightarrow Z'\gamma < -u. \end{cases}$$

As with the analysis of the probability of separation, determinants of participation can be examined using a probit model if u has a standard normal distribution.

If participation in CSP were exogenous in equation (1), then α would measure the effect of participation in CSP on the probability of separation. For participation to be exogenous, the decision to participate cannot be related to the decision to leave the employer in terms of unobservable characteristics, or $\text{cov}(\varepsilon, u) = 0$. However, because participation in CSP affects employment and promotion opportunities due to an increase in general skills, arguing that the two decisions are uncorrelated is tenuous. This chapter

models the two decisions jointly, allowing for participation in CSP to be endogenous in equation (1), or that $cov(\varepsilon,u) \neq 0$. The distribution of (ε,u) is assumed to be bivariate standard normal with $cov(\varepsilon,u) = corr(\varepsilon,u) = \rho$, or that:

$$(5) \qquad \begin{pmatrix} \varepsilon \\ u \end{pmatrix} \sim \text{BVN} \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right].$$

Equations (1) and (2) are estimated jointly using bivariate probit maximum likelihood estimation. Arkes, Garcia, and Trost (2000) and Buddin and Kapur (2005) use this technique in their studies of the U.S. Navy. In order to estimate the model, Z in equation (3) should include a variable that affects the probability of participating, but does not affect the probability of leaving (i.e., not contained in X from equation [1]). This chapter uses an information effect or knowledge "spillover," measured by the participation rate of peers, to satisfy this exclusion restriction. Peer groups were created based on the division (eighteen in total) in which the employee worked and a broadly defined job classification (administrative, professional, or manager). The participation rate of peers attached to each individual does not include the participation decision of that particular individual. This rate is used as a measure of how informed an individual is about CSP.[17]

Because the sample consists of both employees hired before and after the implementation of CSP, the empirical analysis will be conducted on two groups: (1) employees hired before September 1, 1999; and (2) employees hired on or after September 1, 1999. The groups need to be separated because, as discussed in section 6.3.1, implementation of CSP could affect the applicant pool. The effect of CSP on retention for future hires will be determined based on results collected from the second group, which is the measure most applicable to firms who have an established program. If a firm is considering implementing a tuition reimbursement program, the effect of CSP on current and future workers is relevant.

6.4.3   Results from Case Study

Before analyzing the probability of separating from the establishment, this section first examines determinants of participation. Table 6.5 shows the marginal effects from estimating the probability of participating in CSP using a probit model. The estimates in column (1) are for workers hired before CSP was implemented (i.e., before September 1, 1999). For workers in

17. The direction of the effect in unclear: Does the participation of peers inform the individual or does participation by the individual inform her peers? To address this, a robustness check was performed that assigned the current year's participation rate to newly hires employees by peer group. Because these new workers were not eligible to participate in the first year due to the one-year service requirement, the direction of this information effect is clear. This alternative measure of peer participation rates does not affect the results.

Table 6.5   **Determinants of participating in case study program (CSP)**

Probit model (LHS: Pr[P = 1])	Hired before Sept. 1999 (1)	Hired after Sept. 1999 (2)
Female	0.011	–0.005
	(0.005)**	(0.010)
Age	0.000	0.001
	(0.002)	(0.003)
Age^2	0.000	0.000
	(0.000)	(0.000)
Black	0.030	0.027
	(0.014)**	(0.023)
Hispanic	0.005	–0.011
	(0.010)	(0.014)
Asian	–0.016	0.008
	(0.007)**	(0.011)
Nonsupervisor	0.005	0.038
	(0.007)	(0.012)***
Ln of weekly wage (in thousands), $2001	–0.012	0.037
	(0.011)	(0.017)**
Log-likelihood	–922.3	–517.9
No. of observations	5,222	2,451

Note: Numbers reflect dF/dX values; standard errors in parentheses.
***Significant at the 1 percent level.
**Significant at the 5 percent level.

this group, women are more likely to participate than men as well as are individuals identifying themselves as black (relative to those identifying themselves as white); individuals identifying themselves as Asian are less likely to participate. While the magnitudes for the marginal effects seem small, they are substantial when compared to the participate rate: 4.6 percent of workers hired before September 1, 1999, participate, while 5.7 percent of those hired on or after September 1, 1999, participate in CSP (this difference is significant at the 5 percent level).

For workers hired after the introduction of CSP, the probability of participation is increasing in the starting wage rate and workers in nonsupervisory positions are more likely to participate than those in supervisory roles. An additional method for examining determinants of participation is to look at reimbursement amounts, such as the highest annual fraction of reimbursement received by workers (nonparticipants are given a value of zero). Table 6.6 shows the results from using a tobit model; the findings closely resemble those in table 6.5.

The next set of results estimate the effect of participation in CSP on the probability of separating from the employer (voluntarily or involuntarily) within five years when participation is treated as exogenous. Table 6.7 lists the marginal effects from estimating a probit model on the decision to sep-

Table 6.6   **Determinants of case study program (CSP) reimbursement amount**

Tobit model (LHS: Maximum Annual Reimbursement [fraction])	Hired before Sept. 1999 (1)	Hired after Sept. 1999 (2)
Female	0.437	–0.109
	(0.218)**	(0.166)
Age	0.012	0.016
	(0.067)	(0.059)
Age^2	–0.001	–0.001
	(0.001)	(0.001)
Black	0.930	0.370
	(0.32)***	(0.293)
Hispanic	0.202	–0.178
	(0.310)	(0.285)
Asian	–0.613	0.056
	(0.269)**	(0.184)
Nonsupervisor	0.178	0.618
	(0.240)	(0.208)***
Ln of weekly wage (in thousands), $2001	–0.325	0.650
	(0.401)	(0.300)**
Constant	–3.899	–2.798
	(1.334)***	(1.079)***
Log-likelihood	–1,098.0	–598.9
No. of observations	5,222	2,451

Note: Numbers reflect value of coefficient; standard errors in parentheses.
***Significant at the 1 percent level.
**Significant at the 5 percent level.

arate from the case study institution. For workers hired before CSP was implemented, $S = 1$ if they separate within five years measured from September 1, 1999 (start date of CSP); and $S = 0$ otherwise. For workers hired after implementation, $S = 1$ if they separate within five years of their hire date; and $S = 0$ otherwise. Individual and employment characteristics, such as age, weekly wage, and years of service, are taken as of December 15 of the first year observed. Participation in CSP, P is equal to 1 if the individual ever participated in the program beginning September 1, 1999, through August 31, 2004. This binary variable definition is used most often in this analysis because of the intensity at which workers use the program. Table 6.7 also includes results from using the maximum fraction of annual reimbursement received as a measure of participation; the findings are similar to those using the binary definition.

As seen in table 6.7, if participation in CSP were exogenous, participation would lower the probability of separating by over 20 percentage points for employees hired before or after September 1, 1999. This impact on retention is equivalent to the effect of being three and a half years older, or having six additional years of experience (as of December 15, 1999) for

Table 6.7   **Determinants of separating from firm within 5 years**

Probit model (LHS: Pr[S = 1])	Hired before Sept. 1999		Hired after Sept. 1999	
	(1)	(2)	(3)	(4)
Participation in CSP	−0.207		−0.218	
	(0.027)***		(0.043)***	
Maximum annual reimbursement (fraction)		−0.303		−0.238
		(0.044)***		(0.065)***
Female	0.029	0.029	0.003	0.003
	(0.016)*	(0.016)*	(0.023)	(0.023)
Age	−0.066	−0.066	−0.048	−0.048
	(0.005)***	(0.005)***	(0.007)***	(0.007)***
Age^2	0.001	0.001	0.001	0.001
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Black	0.042	0.044	−0.024	−0.026
	(0.032)	(0.032)	(0.047)	(0.047)
Hispanic	−0.060	−0.060	−0.096	−0.095
	(0.026)**	(0.026)**	(0.039)**	(0.039)**
Asian	−0.092	−0.091	−0.117	−0.120
	(0.019)***	(0.019)***	(0.026)**	(0.026)***
Service length[a]	−0.034	−0.034	0.048	0.042
	(0.003)***	(0.003)**	(0.158)	(0.158)
Service length^2	0.001	0.001	−0.182	−0.177
	(0.000)***	(0.000)***	(0.153)	(0.153)
Nonsupervisor	−0.024	−0.023	−0.142	−0.144
	(0.019)	(0.019)	(0.028)***	(0.028)***
Ln of weekly wage (in thousands), $2001	−0.002	0.001	−0.293	−0.295
	(0.027)	(0.027)	(0.042)***	(0.042)***
Log-likelihood	−3,165.9	−3,162.9	−1,550.3	−1,555.6
No. of observations	5,222	5,222	2,451	2,451

Note: Numbers reflect dF/dX values; standard errors in parentheses.

[a]Measured as of Dec. 15 of initial year observed.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

those employees hired before September 1999. For recent hires, the effect is similar to being four and half years older or having a $750 increase in the worker's starting weekly wage.

Table 6.8 shows the results from examining the effect of participation on retention separately for undergraduate and graduate degrees while still treating participation as exogenous. The effect of pursuing an undergraduate degree in CSP is roughly one and a half times as large as the effect of pursuing a graduate degree across the two groups. However, if participation is endogenous, these estimates of how participation in CSP affects retention are inconsistent.

To allow for interdependence between participation and retention deci-

Table 6.8   **Determinants of separating from firm within 5 years, by degree**

Probit model (LHS: Pr[S = 1])	Hired before Sept. 1999 (1)	Hired after Sept. 1999 (2)
Graduate degree in CSP	−0.169	−0.182
	(0.036)***	(0.053)***
Undergrad degree in CSP	−0.258	−0.286
	(0.036)***	(0.067)***
Female	0.029	0.004
	(0.016)	(0.023)
Age	−0.066	−0.048
	(0.005)***	(0.007)***
Age^2	0.001	0.001
	(0.000)***	(0.000)***
Black	0.042	−0.020
	(0.032)	(0.047)
Hispanic	−0.060	−0.094
	(0.026)**	(0.039)**
Asian	−0.091	−0.116
	(0.019)***	(0.026)***
Service length[a]	0.034	0.047
	(0.003)***	(0.158)
Service length^2	0.001	−0.181
	(0.000)***	(0.153)
Nonsupervisor	−0.022	−0.140
	(0.019)	(0.028)***
Ln of weekly wage (in thousands), $2001	−0.001	−0.292
	(0.027)	(.042)***
Log-likelihood	−3,164.4	−1,549.6
No. of observations	5,222	2,451

Note: Numbers reflect dF/dX values; standard errors in parentheses.
[a]Measured as of Dec. 15 of initial year observed.
***Significant at the 1 percent level.
**Significant at the 5 percent level.

sions, bivariate probit maximum likelihood estimation is used and the correlation between the unobservable characteristics affecting these decisions is estimated. As mentioned in section 6.4.2, the participation rate of an individual's peer group is used for the exclusion restriction that is required for the estimation. One concern is that the members of peer group could all be affected by some exogenous shock that affects both their participation and retention behavior (such as a "supervisor effect").[18] However, because applications for reimbursement through CSP are handled by a central pro-

18. The type of exogenous shock that would be problematic is one that affects both the participation and separation propensities of the group, such that the participation behavior of peers could not be excluded from the individual's separation decision.

gram administrator, this shock is less of a concern. In addition, there is an opportunity to switch departments within the institution in the event of a poor supervisor-worker paring—over 18 percent of individuals made moves that landed them in a different peer group in a span of five years. Furthermore, peer groups were also constructed at the department level (twenty-three groups instead of the original seventy-one) to mitigate the effect of an exogenous shock; the findings are robust to this different specification.

Table 6.9 displays the marginal effects from the estimation on those employees hired before September 1, 1999. As reported earlier, the probability of participation is significantly higher for females relative to males and for blacks (relative to those identifying themselves as white); workers identifying themselves as Asian are less likely to participate. In addition to these individual characteristics, the participation rate by peers is included as a determinant of participating in CSP, but not included as a factor that affects the probability of separating from the employer. The probability of participating in CSP increases in step with the participation rate of peers: a 1 percent increase in the participation rate of peers increases an individual's probability of participating by 0.9 percentage points. The second set of estimates in table 6.9 corresponds to the probability of separating from the firm. The probability of separating is decreasing (at a decreasing rate) in age and experience and is significantly lower for Hispanics and Asians (relative to white workers). As opposed to the estimates in table 6.7, where participation was assumed to be exogenous, the effect of participation in CSP on turnover is positive, but not significantly different from zero for this group. The change in the magnitude of the estimate can be attributed to the negative correlation between the unobservable characteristics. A negative correlation implies that individuals (hired before September 1, 1999) who participated in CSP were predisposed to staying at the institution and, thus, the program did not significantly affect their retention behavior.

Table 6.10 presents the results from the joint estimation of the probability of participating in CSP and separating from the employer within five years for workers hired on or after September 1, 1999. For these workers, participation in CSP is significantly higher for workers in a nonsupervisory role and is increasing in the starting wage: a $100 higher starting weekly wage corresponds to a 0.43 percentage point increase in the probability of participating in CSP. The participation rate of peers positively affects an individual's probability of participation: a 2 percentage point increase in the participation rate of one's peers increases an individual's probability of participating by 1 percentage point. As for the probability of separating from the employer, workers identifying themselves as Hispanic are nearly 10 percentage points more likely to separate than those identifying themselves as white; workers of Asian descent are over 11 percentage points less

Table 6.9   **Determinants of participating in CSP and separating from firm within 5 years (existing hires)**

	Hired before Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Participate in CSP		0.098
		(0.183)
Female	0.011	0.024
	(0.005)**	(0.017)
Age	0.001	−0.063
	(0.002)	(0.005)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	0.030	0.030
	(0.013)**	(0.032)
Hispanic	0.005	−0.062
	(0.009)	(0.026)***
Asian	−0.014	−0.085
	(0.006)**	(0.019)***
Service length[a]		−0.033
		(0.003)***
Service length^2		0.001
		(0.000)***
Nonsupervisor	0.002	−0.142
	(0.007)	(0.028)***
Ln of weekly wage (in thousands), $2001	−0.009	−0.027
	(0.012)	(0.019)
Participation in CSP by peers (%)	0.009	
	(0.003)***	
Correlation between Errors	−0.387	
	(0.200)*	
Log-likelihood	−4,081.7	
Observations	5,222	

Note: Numbers reflect dF/dX values; standard errors in parentheses.
[a]Measured as of Dec. 15 of initial year observed.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

likely to separate relative to white workers. Employees in nonsupervisory positions are over 14 percentage points less likely to separate than those in supervisory roles. Participation in CSP has the largest effect on retention: it reduces the probability of separating within five years by nearly 48 percentage points. The correlation between the error terms is positive and marginally significant (*p*-value of 0.15). A positive correlation implies that those individuals who are more likely to participate in CSP are also more inclined to separate from the employer within five years. Hence, by failing

Table 6.10   **Determinants of participating in CSP and separating from firm within 5 years (new hires)**

	Hired after Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Participate in CSP		−0.479
		(0.115)***
Female	−0.004	0.002
	(0.010)	(0.023)
Age	0.001	−0.048
	(0.003)	(0.007)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	0.025	−0.013
	(0.023)	(0.047)
Hispanic	−0.012	0.098
	(0.014)	(0.039)**
Asian	0.006	−0.114
	(0.011)	(0.027)***
Service length[a]		0.053
		(0.155)
Service length^2		−0.183
		(0.155)
Nonsupervisor	0.034	−0.142
	(0.012)***	(0.028)***
Ln of weekly wage (in thousands), $2001	0.043	−0.027
	(0.017)**	(0.019)
Participation in CSP by peers (%)	0.005	
	(0.002)***	
Correlation between Errors	0.435	
	0	
Log-likelihood	−2,063.7	
No. of observations	2,451	

Note: Numbers reflect dF/dX values; standard errors in parentheses.
[a]Measured as of Dec. 15 of initial year observed.
***Significant at the 1 percent level.
**Significant at the 5 percent level.

to account for endogenous participation behavior, the effect of participation on retention is underestimated.

The estimated effect of participation in CSP on retention in tables 6.9 and 6.10 uses a specification in which the type of degree pursued does not matter for separation rates. A second specification is found in tables 6.11 through 6.14, which allows the effect to vary by degree pursued. Tables 6.11 and 6.12 give the estimates for how pursuing an undergraduate in CSP affects retention. The effect is negative for both groups of hires: the probability of leaving within five years is reduced by 11 percentage points for

Table 6.11   **Determinants of pursuing an undergraduate degree and separating from firm within 5 years (existing hires)**

	Hired before Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Undergraduate degree in CSP		–0.114
		(0.406)
Female	0.005	0.027
	(0.003)	(0.017)
Age	0.001	–0.064
	(0.001)	(0.005)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	0.016	0.035
	(0.009)*	(0.033)
Hispanic	0.007	–0.061
	(0.006)	(0.027)**
Asian	0.000	–0.087
	(0.004)	(0.019)***
Service length[a]		–0.034
		(0.003)***
Service length^2		0.001
		(0.000)***
Nonsupervisor	0.016	–0.023
	(0.005)***	(0.021)
Ln of weekly wage (in thousands), $2001	0.005	0.001
	(0.007)	(0.027)
Participation in CSP by peers (%)	0.003	
	(0.001)*	
Correlation between errors	–0.194	
	0.474	
Log-likelihood	3,642.4	
No. of observations	5,222	

Note: Numbers reflect dF/dX values; standard errors in parentheses.

[a]Measured as of Dec. 15 of initial year observed.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

those hired before September 1, 1999, and 56 percentage points for the group of new hires. However, the effect is not statistically significant for those hired before September 1, 1999. For those hired after the introduction of CSP, the correlation between the error terms is positive and significant.

The effects of pursuing a graduate degree in CSP on retention for the two cohorts of employees are listed in tables 6.13 and 6.14. Again, the effect of pursuing a graduate degree differs across the two cohorts of employees. For those hired before CSP was implemented, pursuing a graduate degree increases the probability of separating from the institution by nearly 28 per-

Table 6.12   **Determinants of pursuing an undergraduate degree and separating from firm within 5 years (new hires)**

	Hired after Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Undergraduate degree in CSP		−0.562
		(0.237)***
Female	0.005	0.007
	(0.004)	(0.023)
Age	0.000	−0.047
	(0.002)	(0.007)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	0.037	0.011
	(0.018)**	(0.046)
Hispanic	0.007	−0.081
	(0.009)	(0.039)**
Asian	0.003	−0.111
	(0.006)	(0.026)**
Service length[a]		0.030
		(0.155)
Service length^2		−0.166
		(0.150)
Nonsupervisor	0.024	−0.127
	(0.008)***	(0.028)***
Ln of weekly wage (in thousands), $2001	0.013	−0.283
	(0.009)	(0.042)***
Participation in CSP by peers (%)	0.001	
	(0.001)*	
Correlation between errors	0.894	
	(0.435)**	
Log-likelihood	1,760.1	
No. of observations	2,451	

Note: Numbers reflect dF/dX values; standard errors in parentheses.

[a]Measured as of Dec. 15 of initial year observed.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

centage points (statistically significant at the 10 percent level). The correlation between the errors is negative for this group and statistically significant, meaning that those who are more likely to pursue a graduate degree are also more likely to remain with the employer. For workers hired on or after September 1, 1999, pursuing a graduate degree reduces the probability of leaving within five years by 49 percentage points. Similar to workers in this cohort who pursued an undergraduate degree, the correlation between the errors is positive.

These results indicate that participation in CSP substantially increases

Table 6.13   Determinants of pursuing a graduate degree and separating from firm within 5 years (existing hires)

	Hired before Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Graduate degree in CSP		0.277
		(0.161)*
Female	0.005	0.023
	(0.003)	(0.016)
Age	0.001	−0.062
	(0.001)	(0.005)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	0.016	0.031
	(0.009)*	(0.031)
Hispanic	0.007	−0.06
	(0.006)	(0.026)**
Asian	0.000	−0.082
	(0.004)	(0.019)***
Service length[a]		−0.033
		(0.003)***
Service length^2		0.001
		(0.000)***
Nonsupervisor	0.013	−0.023
	(0.005)***	(0.019)
Ln of weekly wage (in thousands), $2001	−0.013	0.002
	(0.009)	(0.027)
Participation in CSP by peers (%)	0.006	
	(0.002)***	
Correlation between errors	−0.497	
	(0.182)**	
Log-likelihood	−3,796.7	
No. of observations	5,222	

Note: Numbers reflect dF/dX values; standard errors in parentheses.
[a]Measured as of Dec. 15 of initial year observed.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

the retention of those employees hired after the program was implemented; however, participation has a weak negative effect on retention for those employees hired before the introduction of CSP. The differential effect across the two cohorts suggests that the introduction of the program affected the pool of workers attracted to and hired by the employer. The results from tables 6.5 and 6.6 show that the observable individual factors that affect participation are different across the two groups. More important for estimating the effect of participation on separation rates, the two

Table 6.14   **Determinants of pursuing a graduate degree and separating from firm within 5 years (new hires)**

	Hired after Sept. 1999	
Bivariate probit model	Pr(P = 1)	Pr(S = 1)
Graduate degree in CSP		−0.489
		(0.137)***
Female	−0.007	−0.001
	(0.008)	(0.023)
Age	0.001	−0.048
	(0.003)	(0.007)***
Age^2	0.000	0.001
	(0.000)	(0.000)***
Black	−0.017	−0.041
	(0.011)	(0.047)
Hispanic	−0.020	−0.105
	(0.009)**	(0.039)***
Asian	0.002	−0.115
	(0.009)	(0.039)***
Service length[a]		0.044
		(0.155)
Service length^2		−0.176
		(0.150)
Nonsupervisor	0.007	−0.140
	(0.009)	(0.029)***
Ln of weekly wage (in thousands), $2001	0.024	−0.282
	(0.013)*	(0.044)***
Participation in CSP by peers (%)	0.003	
	(0.001)**	
Correlation between errors	0.497	
	0.361	
Log-likelihood	−1,940.9	
No. of observations	2,451	

Note: Numbers reflect dF/dX values; standard errors in parentheses.
[a]Measured as of Dec. 15 of initial year observed.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

groups differ in terms of the correlation between the unobservable factors that affect the participation and retention decisions. For those hired on or after September 1, 1999, there is a strong positive correlation between the probability of participating in CSP and separating from the employer. Hence, estimating the effect of CSP on the probability of separation in a single-equation framework underestimates the impact of participation on retention. Participation in CPS decreases the probability of separating from the employer within five years by 48 percentage points when partici-

pation is treated as endogenous, substantially higher than the 22 percentage point decrease in the probability of separation when participation is treated as exogenous.

For employees hired before CSP was implemented, the correlation between the unobservable factors affecting participation in CSP and separation from the employer is negative, meaning that those workers who are more likely to participate have higher attachment to the institution. Hence, the estimated effect of participation on separation rates treating participation as exogenous overestimates the effect on retention. The effect of participating in CSP using a single-equation framework is a 21 percentage point decrease in the probability of separating from the employer; however, when we treat participation as endogenous, the effect changes signs (becomes a 10 percentage point increase) and loses statistical significance.

This case study finds that tuition reimbursement programs substantially increase the retention of new hires. Hence, this chapter finds empirical support for the explanation given by firms for providing tuition reimbursement programs—to increase employee retention—despite the predictions of the standard theory of human capital that provision of general training would increase turnover. It is important to note that implementation of a program appears to affect current and future employees differentially; this difference provides some evidence that tuition programs affect the composition of a firm's applicant pool. Because of the prevalence of these programs, the results regarding new hires are likely to be most useful to employers.

6.5   Interpreting the Results

The result that participation in employer-provided general training programs increases worker retention contradicts the predictions of Becker's standard model of investment in human capital. However, there are possible mechanisms by which this result can be reconciled within standard theory. The first is the structure of tuition reimbursement programs, which Cappelli (2004) takes note of in his analysis.[19] Recall that eligibility for CSP is subject to a one-year service length requirement, which mechanically reduces the turnover rate for participants relative to nonparticipants in the first year. In addition, the duration of coursework increases attachment while the employee is participating because he or she needs to successfully complete the course, as well as continue employment, to receive his or her reimbursement. After course completion, however, this mechanism is no longer operative, and the worker's propensity to separate would increase. If this is the primary mechanism creating increased retention, then Becker's theory would be applicable following course completion.

The raw plots of the survival functions begin to address this concern. As

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19. This point was also rightly emphasized by one of the referees for this volume.

discussed in section 6.4.1, figure 6.4 plots the Kaplan-Meier survival functions for participants relative to nonparticipants, separating those participants who are pursuing majors vastly unrelated to their jobs (Not Job-Related) from the remaining participants (Job-Related). The survival function of the Not Job-Related group can be interpreted as showing the pure mechanical retention effect attributable to the tuition program's structure: the survival rate for this group is initially higher than nonparticipants, but then drops below after three years of service. The survival function of participants in the Job-Related group starts above that of nonparticipants and remains above throughout the duration of the data. While these results are not definitive, they suggest that the retention effect is stronger than that simply implied by the program's structure.

An alternative explanation is that the general skills acquired through tuition reimbursement programs make the worker more productive at the current firm relative to outside employers through complementarities between firm-specific and general human capital. If complementarities exist between general and firm-specific human capital in production, general skills acquired through participation in tuition reimbursement could increase the productivity of firm-specific human capital, thereby increasing employee retention. Acemoglu and Pischke (1999a, b) argue that if general and firm-specific human capital are complements, wage structures could become compressed, thereby giving firms an incentive to provide general skills training.[20] The complementarities mechanism implies that the effect of participation on retention would persist after coursework has been completed.

It is important to note that complementarity between general and firm-specific skills is not necessary for tuition programs to have a continued effect on retention after courses are completed. Other mechanisms could result in this effect in there is investment in firm-specific human capital. For tuition reimbursement programs, participation would increase the amount of firm-specific skills if these skills are acquired over calendar time (or tenure) because coursework takes several semesters to complete. Service length requirements before and after participation would result in additional investment (Cappelli 2004). Alternatively, Lazear (2005) presents a model in which all skills are general, but how these skills are combined in production is specific to the firm. Hence, in his model, providing general skills training is essentially equivalent to investing in firm-specific skills, which would result in increased retention. In addition, firms could use general training as an insurance mechanism: if workers are reluctant to work at a firm that requires investment in firm-specific human capital due to the

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20. Acemoglu and Pischke (1999a, b) define compression in the wage structure to mean that profits from trained workers are higher than those from untrained workers. They list several other market imperfections that could result in compressed wages, including search costs, mobility costs, and minimum wage laws.

risk of wage loss in the event of involuntary separation, firms could offer general training as a way to mitigate this risk and thereby encourage investment in firm-specific skills (Feuer, Glick, and Desai 1987).

Examining the effect of participation on retention after course completion is one way to test the role of firm-specific human capital relative to the mechanical effect due to the structure of these tuition programs. However, the data used in this analysis are not well suited for this test because they do not include exact course dates or departure dates, just the year in which participation and separation occur. This analysis attempts to capture the effect on retention following degree completion by using a five-year window for the separation outcome, but this measure is not ideal. Future work should examine the effect on retention following course completion as well as the firm-level determinants of providing these programs to improve our understanding of the role played by firm-specific skills.

6.6   Conclusion and Future Research

Tuition reimbursement programs are a type of general training program commonly offered by employers. Counter to the prediction of Becker's theory of investment in human capital, firms claim that they use these programs to increase employee retention. Results from the case study show that participation in tuition reimbursement substantially reduces the probability of separating from the employer: participation by those employees hired after the program was implemented reduced their probability of separating from the employer within five years by nearly 50 percentage points. This result challenges the prediction of standard theory that investment in general human capital by firms increases employee turnover. However, there are several mechanisms that can explain this result within standard theory, such as by allowing for an interaction between firm-specific and general human capital. To evaluate the merits of this hypothesis relative to others, such as the mechanical effect on turnover due the structure of tuition programs, future work should analyze the effect of participation on retention using data that include course and degree completion dates.

This case study analysis also provides evidence that offering tuition reimbursement affects the type of worker attracted to the firm. The participation rate in the program is significantly higher for new hires relative to existing hires, and the determinants of participation also vary across the two cohorts. After taking into account the interdependence between participation and retention decisions, the effect of the program on the probability of separation differs across the cohorts as well. Future work could examine the effect of this program on retention rates over a longer time horizon to see if the difference between the two cohorts persists.

A shortcoming of the case study analysis is whether the findings can be generalized to other employers and programs. While the tuition reim-

bursement program is typical in terms of its program characteristics, future work should examine the effect of tuition reimbursement programs on turnover rates using the cross section of firms, such as those surveyed in the SEPT95.

References

Acemoglu, Daron, and Jorn-Steffen Pischke. 1998. Why do firms train? Theory and evidence. *Quarterly Journal of Economics* 113:1: 79–119.

———. 1999a. Beyond Becker: Training in imperfect labour markets. *The Economic Journal* 109 (February): F112–F142.

———. 1999b. The structure of wages and investment in general training. *Journal of Political Economy* 107 (3): 539–72.

Arkes, Jeremy, Federico Garcia, and Robert Trost. 2000. Does employer-financed general training pay? Evidence from the US Navy. *Economics of Education Review* 21:19–27.

Autor, David H. 2001. Why do temporary help firms provide general skills training? *Quarterly Journal of Economics* 116 (4): 1408–48.

Becker, Gary S. 1964. *Human capital.* Chicago: University of Chicago Press.

Benson, George S., David Finegold, and Susan Albers Mohrman. 2004. You paid for the skills, now keep them: Tuition reimbursement and voluntary turnover. *Academy of Management Journal* 4 (3): 315–33.

Black, Sandra E., and Lisa M. Lynch. 1998. Beyond the incidence of employer-provided training. *Industrial and Labor Relations Review* 52 (1): 64–81.

———. 2001. How to compete: The impact of workplace practices and information technology on productivity. *The Review of Economics and Statistics* 83 (3): 434–45.

Buddin, Richard, and Kanika Kapur. 2002. Tuition assistance usage and first-term military retention. Santa Monica, CA: RAND.

———. 2005. The effect of employer-sponsored education on job mobility: Evidence from the U.S. Navy. *Industrial Relations* 44 (2): 341–63.

Boesel, David, and Kyle Johnson. 1988. The DoD Tuition Assistance Program: Participation and outcomes. Arlington, VA: Defense Manpower Data Center.

Bureau of Labor Statistics (BLS). 1996. BLS reports on the amount of employer-provided formal training. *United States Department of Labor News,* July 10.

Cappelli, Peter. 2004. Why do employers pay for college? *Journal of Econometrics* 121:213–41.

Corporate Leadership Council (CLC). 2003. Trends in tuition aid programs. Corporate Executive Board Catalogue no. CLC1-1100OH. Washington, DC: Corporate Leadership Council.

Feuer, Michael J., Henry A. Glick, and Anand Desai. 1987. Is firm-sponsored education viable? *Journal of Economic Behavior and Organization* 8:121–36.

Frazis, Harley, Maury Gittleman, Michael Horrigan, and Mary Joyce. 1998. Result from the 1995 Survey of Employer-Provided Training. *Monthly Labor Review* 121 (6): 3–11.

Frazis, Harley, Maury Gittleman, and Mary Joyce. 2000. Correlates of training: An analysis using both employer and employee characteristics. *Industrial and Labor Relations Review* 53 (3): 443–62.

Garcia, Federico, Ernest H. Joy, and David L. Reese, 1998. Effectiveness of the vol-

untary education program. Report no. CRM-98-40. Alexandria, VA: Center for Naval Analyses.

Lazear, Edward P. 2005. Firm-specific human capital: A skill-weights approach. NBER Working Paper no. 9679. Cambridge, MA: National Bureau of Economic Research.

Loewenstein, Mark, and James R. Spletzer. 1999a. Formal and informal training: Evidence from the NLSY. In Research in labor economics. Vol. 18, ed. John Robst, 403–38. Stamford, CT: JAI Press.

———. 1999b. General and specific training: Evidence and implications. *Journal of Human Resources* 34 (4): 710–33.

Newman, Adam, and Matt Stein. 2003. Tuition assistance plan benchmark: Managing TAP as a strategic asset. Boston: Eduventures.

Rosen, Sherwin. 1986. The theory of equalizing differences. In *Handbook in labor economics.* Vol. 1, ed. Orley Ashenfelter and Richard Layard, 641–92. Amsterdam: North-Holland.