The Effect of Employer-Provided General Training on Turnover: Examination of Tuition Reimbursement Programs

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Abstract

Tuition reimbursement programs provide financial assistance for college tuition and are a type of general skills training program commonly offered by employers in the United States. Standard human capital theory argues that investment in firm-specific skills reduces turnover, while investment in general skills training could result in increased turnover. However, firms cite increased retention as a motivation for offering tuition reimbursement programs. This rationale for offering these programs challenges the predictions of the standard human capital model. This paper tests empirically whether tuition reimbursement programs increase employee retention. The empirical analysis combines two data sources: a case study of a non-profit institution and the Survey of Employer-Provided Training, 1995 (SEPT95), which consists of training data collected from a cross section of establishments. From the case study analysis, this paper finds that participation in tuition reimbursement increases retention. Results from SEPT95, confirm this finding.

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1.0 Introduction

Becker's (1964) seminal paper on investment in human capital makes a fundamental distinction between general and firm-specific skills, which has implications for investment and turnover. Firm-specific human capital is defined as having value only to the current employment relationship, while general human capital is equally valuable to both current and potential employers. Becker's theory predicts that employees will bear the full cost of general training – either by paying for training directly or by accepting lower wages during training periods – since employers face the threat of not capturing the return on their investment due to "poaching" of trained employees by outside 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 will share the surplus, or rents, from the investment; the relative bargaining power of the two parties determines the how these rents are allocated. Becker's theory 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 perfectly transferable across employers.

Recent empirical evidence shows that firms provide general training to their workers.[2] 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 transparent to outside employers and transferable to many potential employers. Tuition reimbursement programs closely resemble general skills training as described by Becker. A primary reason firms give for offering these programs is to reduce turnover, which challenges the predictions of standard human capital theory.[3] This paper examines empirically whether tuition reimbursement programs increase employee retention.

[2] These include, but are not limited to Loewenstein and Spletzer (1998, 1999), Acemoglu and Pischke (1998, 1999), Autor (1998), and Cappelli (2004).

[3] Increased retention is a response given by human resource professionals in interviews with the author. Cappelli (2004) and Corporate Leadership Council (2002) report the same result.

This paper utilizes two data sources to test the effect of tuition reimbursement programs on turnover: 1) a case study analysis of a tuition reimbursement program, called TRP, offered by a non-profit institution; and 2) a cross section of establishment-level data collected in the Survey of Employer-Provided Training, 1995 (SEPT95). Results from both the case study and SEPT95 indicate that tuition reimbursement programs reduce turnover. Hence, the firm's motivation for offering this program is supported by empirical evidence: general training can increase retention.

The paper is organized as follows. Section 2 documents the prevalence of tuition reimbursement programs and typical program characteristics, as well as reviews previous literature regarding these general training programs. The case study analysis is presented in Section 3, while Section 4 presents the analysis using SEPT95. To facilitate interpretation of the results, Section 5 outlines a mechanism for how general training could increase retention. Conclusions and areas for future research are given in Section 6.

2.0 Tuition Reimbursement Programs

2.1 Prevalence and Characteristics of Programs

Perhaps surprising to many, employer-sponsored tuition reimbursement programs are widespread and constitute a nontrivial part of non-wage compensation. The amount spent on these programs is substantial: *Workforce Management* estimates that companies paid $10 billion towards tuition reimbursements in 2003.[4] Using SEPT95, firms employing 50 or more workers spent $2.8 billion in 1994 on tuition reimbursement.[5] Tuition reimbursement programs represent a significant source of investment in general skills of employees.

A substantial fraction of firms offer tuition reimbursement. Lynch and Black (1998) report that 47 percent of firms employing 20 or more employees offer tuition reimbursement programs using the 1994 National Employer Survey of Educational Quality in the Workforce (NES-EQW). Cappelli (2004) finds that 85 percent of firms with 20 or more employees offer the program using the 1997 NES-EQW.[6] Results from SEPT95 show that 61 percent of firms

[4] *Workforce Management*, May 1, 2004. Copyright 2004 Crain Communications Inc.
[5] Confidence interval for this estimate is $2.6 to $3.0 billion
[6] The difference between the results from these two surveys is likely due to a change in the wording of the question between 1994 and 1997, rather than a surge in the prevalence of these programs.

employing 50 or more workers offer tuition reimbursement programs. This numbers is consistent with Lynch and Black (1998) since the likelihood of offering a tuition program is increasing in firm size (see Section 4.1).

The tax-advantaged status of reimbursements from employer-provided programs has likely contributed to their prevalence. The tax exclusion for employer-provided tuition programs from personal income and payroll tax was passed into law as a part of the Revenue Act of 1978 (P.L. 95-600) and codified in Section 127 of the U.S. Internal Revenue Code.[7] The maximum income exclusion for a single calendar year is $5,250, and is exempt from federal income tax, payroll tax, and state income tax when applicable. The U.S. Federal Government estimates that the tax exclusion will cost $3.2 billion in lost tax revenues from 2006-2010.[8]

In order to qualify for the tax exclusion, a firm must have a written plan for the exclusive benefit of providing employees with educational assistance. The program must meet non-discrimination clauses and employees cannot be offered a choice between educational assistance and other forms of compensation. Previously, all education expenses would fall under Section 162 of the U.S. Internal Revenue Code, which was enacted in 1954. Section 162 excludes employer-provided educational assistance from taxation as long as it is job-related. Over time, this exclusion became narrowly interpreted, thus limiting the educational opportunities of employees in low-level positions relative to employees in higher-level positions who typically have broader job descriptions. The legislative intent of the tax exclusion in Section 127 was to provide educational opportunities at the work place for lower-level employees – those employees who could not take advantage of educational assistance for job-related coursework because they were limited by narrow job descriptions. The tax exclusion impacts program characteristics by requiring firms to establish a separate plan offered to all regular employees and cannot use it to target highly-compensated employees.

Tuition reimbursement programs typically consist of three parts: 1) a maximum reimbursement amount; 2) an eligibility requirements; and 3) a reimbursement policy. A 2002 survey by Eduventures of human resource professionals and managers at over 500 firms finds

[7] 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).

[8] Office of Management and Budget, Fiscal Year 2006.

that 70 percent of firms that offer a tuition reimbursement program cap annual reimbursement, and over half of these firms (57 percent) have maximums that exceed $4,000 (Eduventures 2003).[9] Many firms in the 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 impose service requirements after participation. Service requirements after participation are more common in plans that have unlimited tuition reimbursement. The 2002 survey by Eduventures 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 analyzed in the case study, TRP, 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 only reimburses costs of tuition for participants obtaining a "C" grade or better. Hence, TRP is typical in its reimbursement amount and requirements, making it a good candidate for a case study analysis.

2.2 Literature on Tuition Reimbursement Programs

Despite the prevalence of tuition reimbursement programs, few academic studies have looked explicitly at the topic. These studies attempt to address why firms offer tuition reimbursement programs. The reasons for why a firm offers tuition reimbursement can be grouped into three main categories: 1) tax-advantaged status; 2) to attract a certain type of worker; and 3) to increase employee retention. The below analysis suggests that the first two explanation likely play a role, but cannot fully explain why firms offer tuition reimbursement. Due to data limitations, this paper cannot tests the relative influence of the above three explanations. This paper does examine whether there is empirical evidence for the third explanation: Do tuition reimbursement programs reduce turnover?

As mentioned above, tuition payments are exempt from personal income tax and payroll taxation up to $5,250 a year. One can evaluate the role of the tax-advantaged status by examining the maximum reimbursement amounts. If all employers set their maximum at or below the tax-

[9] Survey was sponsored by Cenquest, a provider of managed education solutions, helping companies with creating and managing tuition assistance programs, (www.cenquest.com). Eduventures, who conducted the survey, is an independent research and advisory firm of corporate, post-secondary, and pre-K-12 learning markets (www.eduventures.com).

exempt maximum, then tax-advantage status would explain why employers offer this program. The 2002 survey by Eduventures gives the distribution of maximum reimbursement amounts of those respondents with a tuition reimbursement program. Table1 gives the distribution of reimbursement maximums, which shows that while a majority of firms choose maximums below or equal to $5,250, a significant 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).

Table 1: Distribution of Maximum Reimbursements for Tuition Programs

No Maximum	**30.65%**
Less than $1,000	**6.22%**
$1,001 to $2,500	**19.12%**
$2,501 to $4,000	**15.67%**
$4,001 to $5,250	**19.82%**
$5,251 to $7,000	**4.84%**
More than $7,000	**3.69%**
Observations	**434**

Source: Eduventures (2003)

This finding has support elsewhere in industry. For example, *Genentech*, Fortune Magazine's top company to work for in 2006, offers its employees $10,000 a year in tuition reimbursement.[10] United Technologies Corporation offers unlimited tuition reimbursement and a bonus of $5,000 and $10,000 in company stock for the completion of an undergraduate and graduate degree, respectively. While a story of comparative advantage could explain why some firms offer tuition reimbursement, it cannot be the only motive because a substantial fraction of firms have reimbursement levels above the tax-exempt limit (Oyer 2005). Future work could more closely examine the impact of tax-except status by looking at tuition reimbursement programs outside the U.S. or before the tax exclusion was passed in 1978.

A firm could use tuition reimbursement programs to attract a certain type of worker. Rosen (1986) proposes a theory of "equalizing differences", which describes how employees efficiently distribute themselves among firms based on their tastes for certain benefits offered by

[10] *Fortune Magazine*; January, 2006.

these firms. Cappelli (2004) develops a model in which tuition reimbursement programs could generate 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 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 since instruction takes place at accredited academic institutions. Because participation is assumed to be more costly to workers with low ability, wages can be set such that all high-ability types participate and no low-ability types participate. Hence, firms use tuition reimbursement programs as a screening device to attract high-ability workers in his model. Cappelli tests his theory using the 1997 National Employer Survey (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.

However, the sharp prediction of his model – all high ability types participate – is inconsistent with some empirical findings. Participation in tuition reimbursement programs by employees is relatively low, typically between three and five percent.[11] Low participation rates imply that workers would need to systematically over-estimate their likelihood of using the program if tuition reimbursement programs could substantially affect the type of workers a firm attracts. Additionally, the Corporate Leadership Council (2002) reports that the low participation rate could be due to the lack of marketing by the firm. If employees lack information about the program, it cannot influence an employee's selection of employer. In addition, while Cappelli (2004) controls for recruiting costs when he obtains his result that the education level of new hires is higher in firms that offer tuition reimbursement programs, he does not control for benefits and wages. This omission could confound his result since high wage, high benefit firms are more likely to offer tuition program and these firms are also more likely to employ workers with greater educational attainment. Analyzing how tuition reimbursement programs affect the recruitment of workers would require evidence that individuals do not select employers based on this program. However, this type of data is difficult to obtain. Despite these potential weaknesses in a story of "recruitment", results from the case study in Section 3 suggest that implementation of a tuition reimbursement program differentially affects new hires and existing employees in terms of the impact of participation on employee retention.

[11] References include: Corporate Leadership Council, statistics from Watson Wyatt, Buddin and Kapur (2004), and conversations with HR personnel at firms with a program.

Instead of weighing the credibility of the three explanations against each other, this paper tests whether tuition reimbursement programs reduce turnover to assess the feasibility of this as a primary explanation for why these program are offered. There are several case studies that examine the tuition reimbursement programs offered by the U.S. Department of Defense.[12] The two studies most similar in their econometric methodology to this paper are Garcia, Arkes, and Trost (2000) and Buddin and Kapur (2005), which examine the impact of tuition reimbursement on retention in the U.S. Navy. Garcia, Arkes, and Trost (2000) follow a cohort of enlistees who began service in 1992 and study the effect of participation on the likelihood 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 result: participation in tuition reimbursement decreases the probability of re-enlisting after four years by 16.5 percent. Buddin and Kapur criticize Garcia, Arkes, and Trost's (2000) definition of retention and instead use re-enlistment 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 needs to be held fixed, and so they limit their sample to only those enlistees who served a full four-year contract. These two studies also differ in the variables used as exclusion restrictions (i.e. instruments) in their bivariate probit estimation: Garcia, Arkes, 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 Garcia, Arkes, and Trost (2000) fails the exogeneity test.[13]

While the exclusion restriction in Garcia, Arkes, and Trost (2000) is untenable, this paper does not agree with Buddin and Kapur's (2005) criticism that the window of opportunity for participation needs to be help constant for "leavers" and "stayers". If enlistees jointly determine their participation and retention decisions, then constraining the duration of service to be the same across participants and non-participants imposes restrictions on the effect of the program.

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

[13] Participation in the orientation session is not random, but likely related to intention to use the program, which is likely related to the enlistee's likelihood of retention.

By using different criteria for their samples, Garcia, Arkes, and Trost (2000) and Buddin and Kapur (2005) are addressing slightly different research questions.[14] Regardless 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 a civilian 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 employees). Employees at this firm have a high participation rate in the tuition program – nearly 60 percent – which is likely 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 degree completion affects the likelihood of leaving the firm between January of 1996 and June of 2000 . They argue that promotion after degree completion would reduce the likelihood of leaving because it produces a better match between responsibilities and skills sets. However, their theory falls short of fully explaining their empirical findings. They find that promotion decreases the likelihood of leaving for employees who obtain a graduate degree, however these individuals have a greater likelihood of leaving than non-participants. Additionally, promotion does not affect the likelihood of leaving for those employees earning a bachelor's or associate's degree. More importantly, their assumption that hazard rates are proportional might not be appropriate. They claim that there is a sharp increase in the hazard upon degree completion, which suggests that the effect of participation on the separation hazard is not proportional over time.

While a limited number of 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, could create a wedge between wages and productivity. This wedge could provide

[14] Garcia, Arkes, and Trost (2000) examine the effect of participation on the likelihood of staying six years, while Buddin and Kapur (2005) analyze the effect of participation on the likelihood of staying a fifth year after already completing four years with the Navy.

firms with an incentive to offer general skills training.[15] These studies focus on explaining why firms offer general training, while this paper examines the relationship between general skills training and turnover.

This paper contributes to the literature by evaluating whether tuition reimbursement programs can increase employee retention. The analysis uses data collected from a civilian establishment that offers a tuition reimbursement program with typical characteristics. Using the panel aspect of the data, the analysis estimates the effect of participation on retention controlling for possible endogeneity of participation. The credibility of these results is then tested using SEPT95, a cross section of over 1000 establishments.

3.0 Case Study: TRP

To examine the impact of tuition reimbursement programs on employee retention, this paper analyses data from a single firm as well as from a cross section of firms. This section focuses on the case study, presenting the program specifics, an econometric framework, and results. The data were obtained from a non-profit, institution in the education sector, which implemented a tuition reimbursement program (TRP) in September 1999 (the program will be referred to as TRP in the remainder of the text). Employees considered in this analysis are staff members in supervisory and non-supervisory positions who were employed as of December 15, 1999, and those who were hired between December 15, 1999 and September 1, 2001. 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 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. Individual records of participation in TRP include the amount reimbursed, the degree type, and the major or area of concentration from September 1, 1999 to August 31, 2004.[16] Total expenditure on tuition reimbursement over these five years totaled over $2 million dollars (nominal) with a participation rate of 4.5 percent.

[15] These include, but are not limited to: Black and Lynch (1998), Loewenstein and Spletzer (1999*)* and Acemoglu and Pischke (1999a, 1999b), Autor(2001), and Cappelli (2004). Lazear (2005) presents a model in which all skills are general, but these skills are combined in production is firm-specific, to explain the provision of general skills training by firms.

[16] Major or area of concentration was not available for 22 participants.

3.1 Program Specifics and Descriptive Statistics

As mentioned in Section 2, employees are required to have one year of service to be eligible for TRP. Employees need to be admitted into a degree program, but the program does not need to be job-related. The intent of TRP at the case study institution is given below:

> [TRP] supports employee development by providing partial or full reimbursement of costs of courses, seminars and workshops that enable employees to improve performance in current jobs, prepare for career development, or meet requirements of degree programs related to current performance or planned career development (Administrative Guide Memo 22.11).

The employee's supervisor must approve the request to participate in TRP, but this is not a binding constraint since the employee can appeal directly to the benefits department for reimbursement if her supervisor does not grant the request. A staff member working full-time (more than 30 hours per week) qualifies for $5,250 in reimbursement per year; this amount is pro-rated 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. TRP qualifies under Section 127 of the Internal Revenue Code, allowing reimbursements to be exempt from income and payroll taxation

Under TRP, reimbursements are only allowable for costs of tuition fees. 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 C or better); if not, the funds must be repaid in total to the employer.

Table 2 displays sample means for workers used in the case study analysis. Participants in TRP differ from non-participating employees in terms of observable demographic and employment variables.

Table 2: Sample Means	All Staff	Non-Participants	Participants
Female	67.17%	**66.86%**	**73.77%**
Age	40.6	**40.8**	**34.6**
White	68.67%	**68.96%**	**62.60%**
Black	5.26%	**5.01%**	**10.65%**
Hispanic	7.43%	7.33%	9.61%
Asian	18.63%	18.70%	17.14%
Leave within 5 years	47.64%	**48.32%**	**33.25%**
Weekly Wage ($2001)	$1,474	**$1,485**	**$1,237**
Supervisor (Exempt)	62.22%	**62.88%**	**48.31%**
Non-Supervisor (Non-Exempt)	37.78%	**37.12%**	**51.69%**
Hired Before Sept. 1999	67.63%	**67.86%**	**62.85%**
Years in Tuition Program	0.1	**0.0**	**1.96**
Tuition Spending (nominal)	$233	**$0**	**$5,213**
Participation Rate of Peers	2.00%	**1.98%**	**2.49%**
Observations	8614	8229	385

Bold = Different at 5% level

Participants are more likely to be female, younger, identify themselves as Black or Hispanic, have a lower starting wage and are less likely to be in a supervisory role.[17] Of those who participate between September 1, 1999 through August 31, 2004, average total reimbursement was approximately $5,200 and participants spend 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 employee's department and the general classification of her job in order to define a group of workers whose participation behavior could influence that 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 will be used later in the paper as an exclusion restriction for the separation equation in the econometric analysis.

Tables 3 and 4 show the retention behavior of non-participants and participants.

[17] "Exempt" and "Non-exempt" refer to whether the employee is subject to the Fair Labor Standards Act of 1938 (FLSA), which establishes minimum wage and over-time pay laws for full-time and part-time workers in the private and government sectors. Workers who are non-exempt from FLSA are those paid on an hourly basis and occupy non-supervisory positions; salary of exempt workers must also meet the minimum wage.

Table 3	Retention of Participants (Unconditional)				
First Year Observed	Number of Participants	% Leave within 2 Years	% Leave within 3 years	% Leave within 4 years	% That Do Not Leave by 2005
1999 or Before	253	13.83%	20.95%	30.43%	55.73%
2000	74	12.16%	20.27%	33.78%	48.65%
2001	58	24.14%	31.03%	44.83%	55.17%

Table 4	Retention of Non-Participants (Unconditional)				
First Year Observed	Number of Non-Participants	% Leave within 2 Years	% Leave within 3 Years	% Leave within 4 Years	% That Do Not Leave by 2005
1999 or Before	5868	33.45%	39.35%	42.84%	47.02%
2000	1378	41.51%	51.16%	58.85%	36.07%
2001	983	41.20%	50.05%	56.97%	43.03%

The raw data show that participants are less likely to leave in each year compared to non-participants. The difference in the leaving percentages is largest in the two- and three-year time windows, but the difference still persists after four years.

Figures 1 and 2 graphically show differences between participants and non-participants in propensities to separate from the institution using plots of the survival functions. These survival functions use actual employment start dates, but end dates are randomly assigned for the year in which the employee leaves the institution in order to produce a smoothed curve.[18] Differences in survival rates are largest just before three years of service. Figures 3 and 4 show that survival rates differ by the type of degree pursued: participants in undergraduate programs have higher survival rates than those in graduate programs. The analysis in the next section examines whether this difference between degrees persists when controlling for characteristics of the participants.

[18] For employees hired before September 1999, length of service is measured as the difference between implementation of the program (September 1, 1999) and end date, or censoring date (December 15, 2005) when relevant.

Figure 1: Survival Rate (Hired Before 9/1999)

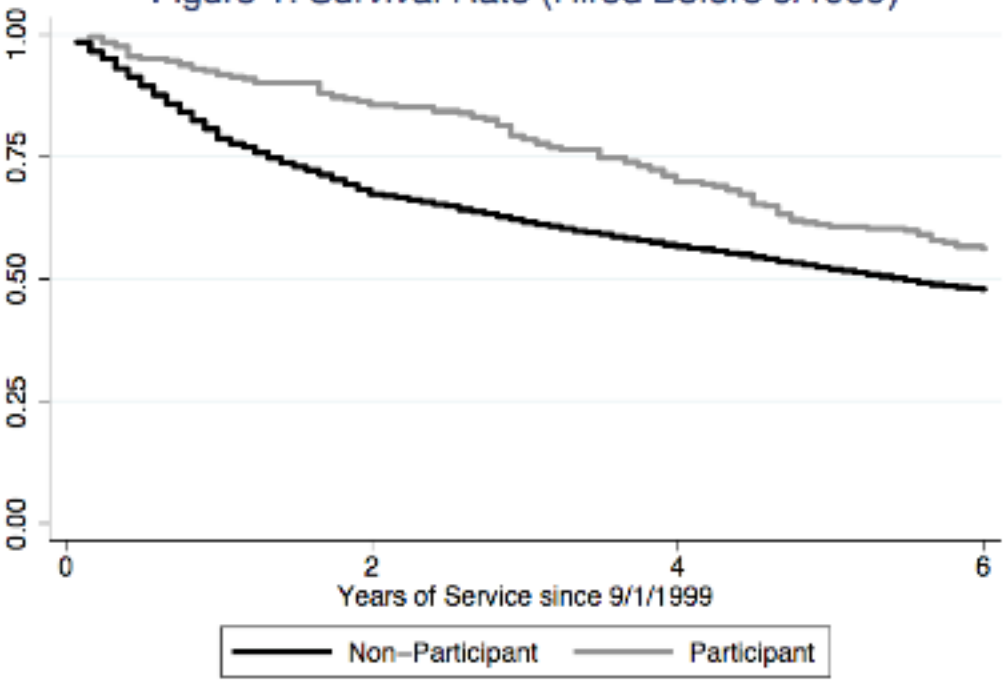
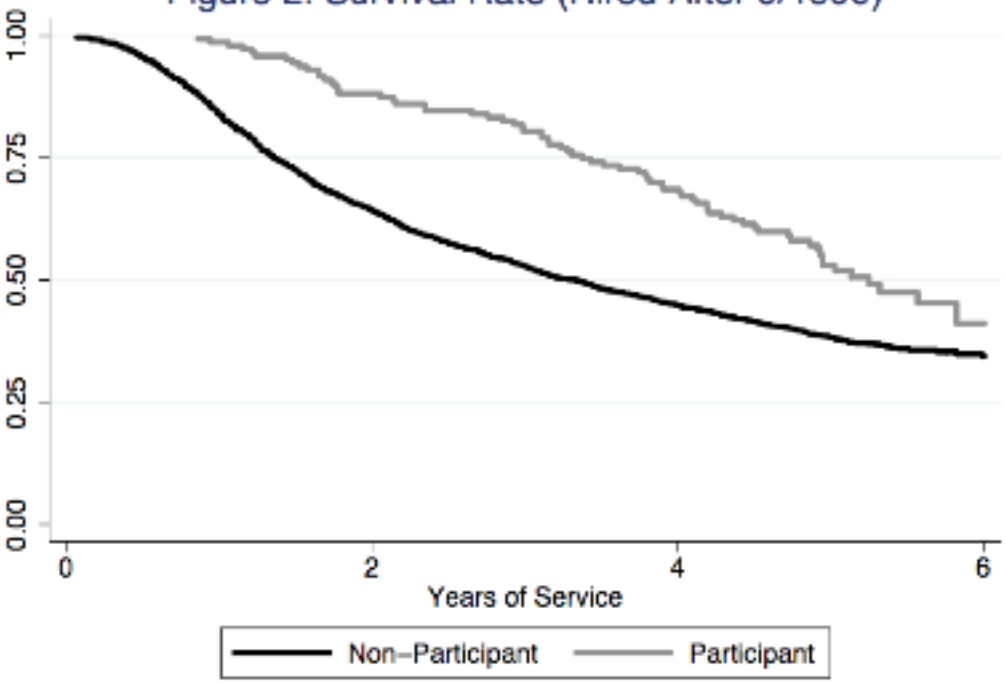
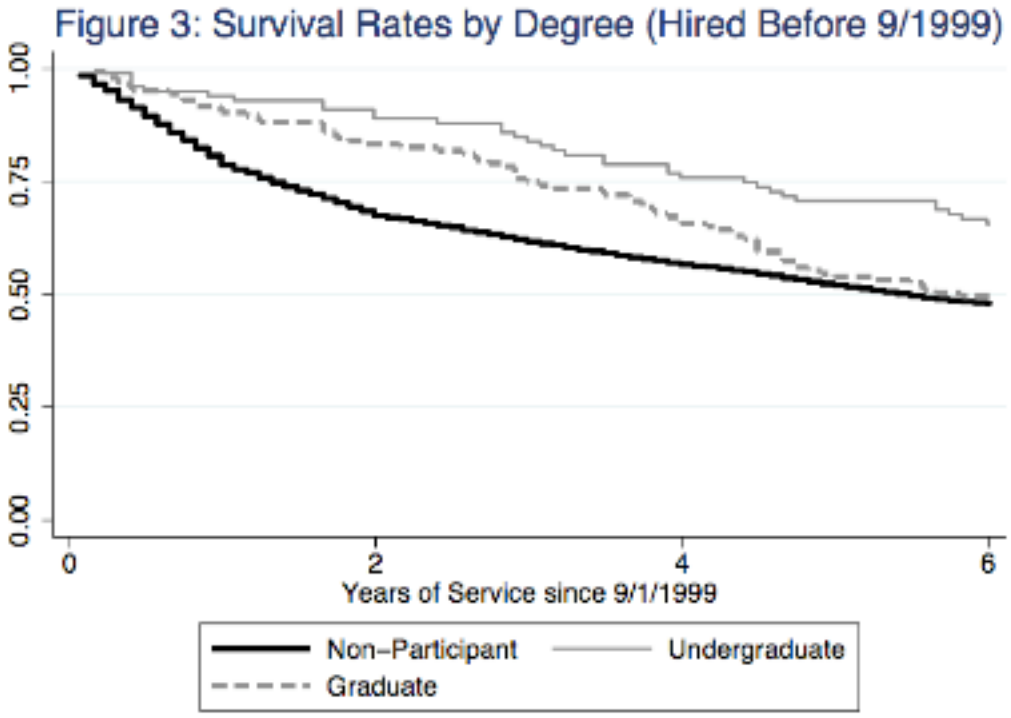
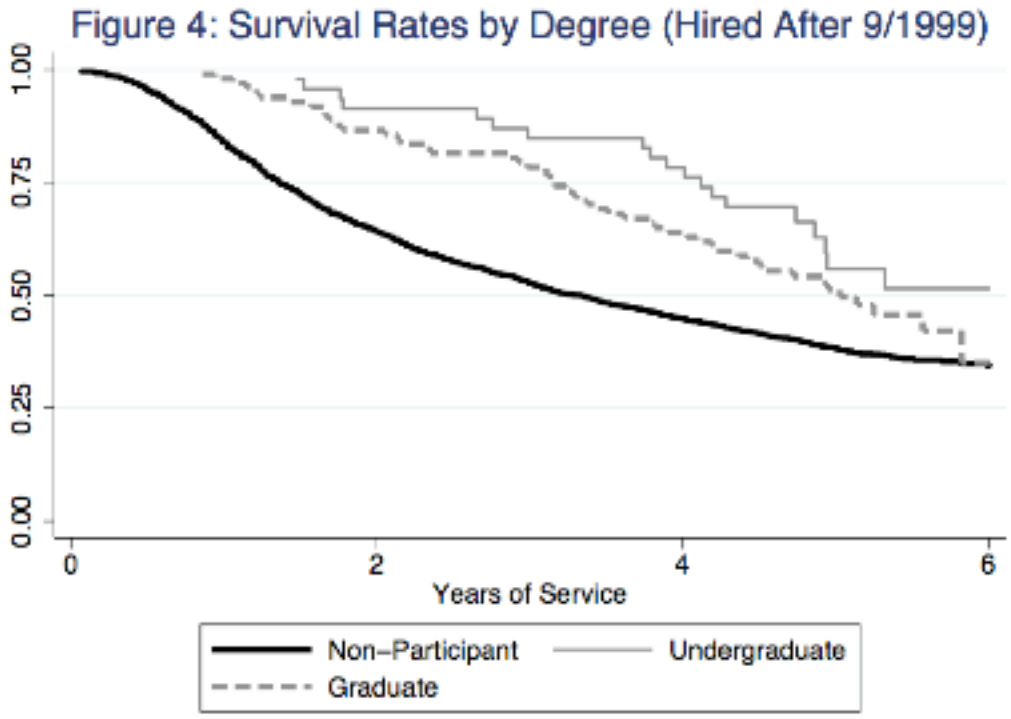


Figure 2: Survival Rate (Hired After 9/1999)







While these tables and figures show higher survival rates for non-participants, a proper analysis of the effect of participation on retention needs to account for differences across individuals and

the interdependence of the participation and retention decision. The next section of the paper will examine how participation affects retention using econometric analyses to control for differences in observable characteristics as well as unobservable characteristics.

3.2 Empirical Estimation

This section models the event of an employee leaving the institution using a latent variable framework. The likelihood of leaving is a continuous variable, but the observed outcome is binary, taking a value equal to 1 if the individual leaves, and equal to 0 otherwise. The likelihood of leaving depends on observable characteristics, *X*, participation in TRP, *P,* and factors unobservable to the researcher, ε. Let *leave** be the underlying index – unobservable to the researcher – that determines whether the individual leaves the employer within a specified time frame:

$$leave^* = X'\beta + \alpha P + \varepsilon \tag{1}$$

$$leave = \begin{cases} 1 \;\; if \;\; leave^* \geq 0 \Rightarrow 'X\beta + \alpha P \geq -\varepsilon \\ 0 \;\; if \;\; leave^* < 0 \Leftrightarrow X'\beta + \alpha P < -\varepsilon \end{cases} \tag{2}$$

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

The same framework can be applied to participation in TRP because participation in 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.

$$P^* = Z'\gamma + u \tag{3}$$

$$P = \begin{cases} 1 \;\; if \;\; P^* \geq 0 \Rightarrow Z'\gamma \geq -u \\ 0 \;\; if \;\; P^* < 0 \Leftrightarrow Z'\gamma < -u \end{cases} \tag{4}$$

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

If participation in TRP were exogenous in equation 1, then α would measure the effect of participation in TRP on the likelihood of leaving. 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 cov(ε,*u*) = 0. However, since participation in TRP affects employment and

promotion opportunities due to an increase in general skills, arguing that the two decisions are uncorrelated is tenuous. This paper assumes that participation in TRP is endogenous in equation 1, or that cov(ε,*u*) ≠ 0. The distribution of (ε,*u*) is assumed to be bivariate normal with cov(ε,*u*) = corr(ε,*u*) = ρ, or that:

$$\begin{pmatrix} \varepsilon \\ u \end{pmatrix} \sim BV\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right) \tag{5}$$

Equations 1 and 2 are estimated jointly using bivariate probit maximum likelihood estimation (Maddala, 1986). Garcia, Arkes 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 needs to include a variable that affects the likelihood of participating, but does not affect the likelihood of leaving (i.e. not contained in *X* from equation 1). This paper uses the participation rate of peers to satisfy this exclusion restriction.

Because the sample consists of both employees hired before and after the implementation of TRP, the empirical analysis will be conducted on two groups: 1) employees hired before September 1, 1999; and 2) employees hired after September 1, 1999. Since the implementation of TRP could affect the applicant pool, the groups need to be separated. The effect of TRP 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 TRP on current and future workers is relevant.

3.3 Results from Case Study

The first set of results estimate the effect of participation in TRP on the likelihood of separating from the employer within 5 years when participation is treated as exogenous. Table 5 lists the marginal effects from a simple probit estimation with *leave* as the dependent variable. For workers hired before TRP was implemented, *leave* = 1 if they separate from institution within five years of September 1, 1999; and = 0 otherwise. For workers hired after implementation, *leave* = 1 if separate within five years of hire date; and = 0 otherwise.

Table 5: Likelihood of leaving institution within 5 years	LHS: Pr(leave=1)	
Probit Model	**Hired Before Sept., 1999**	**Hired After Sept., 1999**
Participation in TRP	-0.217	-0.238
	0.027**	0.042**
Years of Service (as of December 15 of first year observed)	-0.034	0.136
	0.003**	0.149
Years of Service – Squared	0.001	-0.274
	0.000**	0.143
Female	0.010	0.007
	0.015	0.021
Age	-0.062	-0.050
	0.004**	0.006**
Age – Squared	0.001	0.001
	0.000**	0.000**
Black	0.034	-0.019
	0.031	0.046
Hispanic	-0.055	-0.080
	0.026*	0.038*
Asian	-0.087	-0.101
	0.018**	0.025**
Non-Supervisor (Not Exempt)	-0.018	-0.072
	0.016	0.023**
Weekly Wage (in thousands), $2001	0.020	-0.045
	0.010*	0.015**
Observations	5826	2788
Log-Likelihood	-3565.0	-1790.1
dF/dX Listed Above, St. Error Listed Below		
*** significant at 5%; ** significant at 1%**		

If participation in TRP were exogenous, participation would lower the likelihood of leaving 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 those employees hired before September, 1999. For recent hires, the effect is similar to being four and half years older.

Table 6 separates the effect of undergraduate and graduate degrees on retention assuming exogeneity of participation. The effect of pursuing an undergraduate degree in TRP 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 TRP affects retention are inconsistent.

Table 6: Likelihood of leaving institution within 5 years	LHS: Pr(leave=1)	
Probit Model	**Hired Before Sept., 1999**	**Hired After Sept., 1999**
Graduate Degree in TRP	-0.180	-0.204
	0.000**	0.000**
Undergraduate Degree in TRP	-0.267	-0.307
	0.000**	0.000**
Years of Service (as of December 15 of first year observed)	-0.034	0.135
	0.000**	0.364
Years of Service – Squared	0.001	-0.274
	0.000**	0.055
Female	0.010	0.007
	0.512	0.735
Age	-0.062	-0.049
	0.000**	0.000**
Age – Squared	0.001	0.001
	0.000**	0.000**
Black	0.035	-0.015
	0.262	0.744
Hispanic	-0.054	-0.078
	0.040*	0.036*
Asian	-0.087	-0.101
	0.000**	0.000**
Non-Supervisor (Not Exempt)	-0.017	-0.071
	0.311	0.002**
Weekly Wage (in thousands), $2001	0.020	-0.045
	0.046*	0.003**
Observations	5826	2788
Log-Likelihood	-3563.6	-1789.4
dF/dX Listed Above, St. Error Listed Below		
*** significant at 5%; ** significant at 1%**		

Table 7 displays the coefficient estimates from the bivariate probit maximum likelihood estimation for employees hired before and after September 1, 1999, which controls for the interdependence of the participation and retention decisions. The impact of participation in TRP on retention is estimated as negative for both groups and significantly different from zero for those hired after the program was implemented (hired after September 1, 1999). For those hired before implementation of TRP, the likelihood of participation is significantly higher for females (relative to males) and Blacks (relative to those identifying themselves as White), and lower for

Table 7: Bivariate Probit Model				
Likelihood of Participating in TRP and Leaving Institution within 5 years	**Hired Before Sept.,1999**		**Hired After Sept., 1999**	
Dependent Variable	**Pr(TRP=1)**	**Pr(Leave=1)**	**Pr(TRP=1)**	**Pr(Leave=1)**
Participation in TRP		-0.0299		-0.5188
		0.5951		0.4552**
Years of Service as of Dec. 15 of Initial Year	0.0014	-0.0340	-0.0667	0.1521
	0.0148	0.0065**	0.6800	0.3776
Years of Service (squared) as of Dec. 15 of Initial Year	-0.0001	0.0007	-0.0279	-0.2693
	0.0006	0.0002**	0.6335	0.3631
Female	0.0096	0.0071	-0.0024	0.0061
	0.0738*	0.0397	0.0919	0.0534
Age	-0.0002	-0.0607	0.0010	-0.0493
	0.0233	0.0123**	0.0321	0.0159**
Age-squared	0.0000	0.0006	0.0000	0.0005
	0.0003	0.0001**	0.0004	0.0002**
Black	0.0273	0.0264	0.0243	-0.0071
	0.1092**	0.0805	0.1618	0.1152
Hispanic	0.0045	-0.0565	-0.0062	-0.0824
	0.1072	0.0686*	0.1586	0.0937*
Asian	-0.0127	-0.0834	0.0078	-0.0948
	0.0905*	0.0486**	0.1016	0.0622**
Non-Supervisor (Not Exempt)	0.0023	-0.0209	0.0288	-0.0585
	0.0795	0.0424	0.0961**	0.0610*
Weekly Wage (in thousands), $2001	-0.0122	0.0209	0.0121	-0.0422
	0.0918*	0.0260*	0.0639*	0.0382**
Tuition Participation of Peers (%)	0.0100		0.0148	
	0.0294**		0.0383**	
Observations	5826		2788	
Correlation Between Errors	-0.2516		0.5051	
	0.2668		0.2379	
Log-Likelihood	-4488.3		-2317.2	
dF/dX is Above **St. Error of Coef. is Below**				
*** significant at 5%** **** significant at 1%**				

Asians and for those with higher weekly wages. While the magnitude of the marginal effects appears small, they are influential when compared to the average participation rate of 4.5 percent. The likelihood of participation in TRP increases in step with the participation rate of peers. The likelihood of leaving is decreasing (at a decreasing rate) in age and experience, and is lower for Hispanics and Asians, but is increasing in wage. As opposed to the results in Table 5,

the effect of participation in TRP is only slightly negative and not significantly different from zero. The change in the magnitude can be attributed to the correlation between the unobservable characteristics. A negative correlation implies that individuals (those hired before September 1, 1999) who participate in TRP were those predisposed to staying at the institution.

For those hired after September 1, 1999, participation in TRP is significantly higher for workers in a non-supervisory role and is increasing in wage. Participation in TRP has a large effect on retention: it reduces the likelihood of leaving by 50 percent. The correlation between the error terms is positive and significant at the ten percent level. A positive correlation implies that those individuals who are more likely to participate in TRP are more inclined to leave within 5 years.

Estimating the impact of participation in TRP on retention in Table 7 combines the effects of the two separate degree programs. Table 8 gives the estimate for how pursuing an undergraduate in TRP affects retention. The effect is large and negative for both groups of hires: the likelihood of leaving within five years is reduced by over 40 percent for those hired before September 1, 1999, and nearly 60 percent for recent hires. The correlation between the error terms is positive for both groups. Blacks and non-supervisory workers are more likely to pursue an undergraduate degree.

The effect of pursuing a graduate degree in TRP on retention is listed in Table 9. Unlike undergraduate degrees, the effect of pursuing a graduate degree differs across the two groups. For those hired before TRP was implemented, pursuing a graduate degree increases the likelihood of leaving the institution by 22 percent. The correlation between the errors is negative for this group, meaning that those who are more likely to pursue a graduate degree are also more likely to stay. For those hired after September 1, 1999, pursuing a graduate degree reduces the likelihood of leaving within five years by fifty percent. Similar to undergraduate degrees, the correlation between the errors is positive. Hence, those employees pursuing graduate degrees who were hired before September 1, 1999 behave differently than the other three groups of participants.[19]

[19] This difference could be explained by dynamics leading to the implementation of TRP, which is currently being explored.

Table 8: Pursuing an Undergrad degree in TRP and Leaving Institution within 5 years	Hired Before Sept., 1999		Hired After Sept., 1999	
Dependent Variable	**Pr(Ugrad=1)**	**Pr(Leave=1)**	**Pr(Ugrad=1)**	**Pr(Leave=1)**
Undergraduate Degree in TRP		-0.4197		-0.5823
		0.6350**		0.3110**
Years of Service (as of Dec. 15 of initial year)	0.0004	-0.0335	0.0235	0.1342
	0.0194	0.0066**	1.0092	0.3774
Years of Service - Squared	0.0000	0.0008	-0.0191	-0.2716
	0.0008	0.0002**	0.9633	0.3626
Female	0.0040	0.0107	0.0035	0.0087
	0.1049	0.0389	0.1486	0.0535
Age	0.0005	-0.0609	0.0002	-0.0478
	0.0322	0.0111**	0.0492	0.0159**
Age-squared	0.0000	0.0006	0.0000	0.0005
	0.0004	0.0001**	0.0007	0.0002**
Black	0.0136	0.0433	0.03239	0.01678
	0.1385*	0.0788	0.1841**	0.1140
Hispanic	0.0075	-0.0480	0.0086	-0.0660
	0.1346	0.0689	0.1942	0.0933
Asian	-0.0010	-0.0829	0.0021	-0.0971
	0.1174	0.0469**	0.1635	0.0614**
Non-Supervisor (Not Exempt)	0.0131	-0.0051	0.0190	-0.0596
	0.1071**	0.044	0.1662**	0.0590**
Weekly Wage (in thousands), $2001	-0.0015	0.0215	0.0024	-0.0440
	0.112	0.0259*	0.1452	0.0380**
Tuition Participation of Peers (%)	0.0024		0.0029	
	0.0413*		0.0634	
Observations	5826		2788	
Correlation Between Errors	0.5522		0.8128**	
	0.3155		0.1540	
Log-Likelihood	-4027.9		-2002.9	
dF/dX is Listed Above St. Error of Coef. is Below				
*** significant at 5% ** significant at 1%**				

Table 9: Likelihood of Pursuing a Graduate Degree in TRP and Leaving Institution within 5 years	Hired Before Sept.,1999		Hired After Sept.,1999	
Dependent Variable	**Pr(Grad=1)**	**Pr(Leave=1)**	**Pr(Grad=1)**	**Pr(Leave=1)**
Graduate Degree in TRP		0.2198		-0.5024
		0.5202		0.6128*
Years of Service (as of December 15 of initial year)	0.0009	-0.0339	0.0402	0.1345
	0.0179	0.0065**	0.7832	0.3776
Years of Service - Squared	0.0000	0.0008	-0.0101	-0.2589
	0.0008	0.0002**	0.7200	0.3638
Female	0.0048	0.00046	-0.0050	0.0043
	0.0853	0.039	0.1014	0.0535
Age	-0.0004	-0.0588	0.0003	-0.0493
	0.0280	0.0117**	0.0371	0.0159**
Age-squared	0.0000	0.0006	0.0000	0.0005
	0.0003	0.0001**	0.0005	0.0002**
Black	0.0116	0.0237	-0.0152	-0.0363
	0.1345	0.0773	0.2551	0.1148
Hispanic	-0.0011	-0.0560	-0.0161	-0.0888
	0.1310	0.0681*	0.2116	0.0941*
Asian	-0.0108	-0.0790	0.0040	-0.0982
	0.1149**	0.0477**	0.1116	0.0620**
Non-Supervisor (Not Exempt)	-0.0097	-0.0197	0.0065	-0.0734
	0.0938**	0.0419	0.1074	0.0593**
Weekly Wage (in thousands), $2001	-0.0106	0.0219	0.0085	-0.0437
	0.1110*	0.0259*	0.0676	0.0383**
Tuition Participation of Peers (%)	0.0065		0.0111	
	0.0342**		0.0420**	
Observations	5826		2788	
Correlation Between Errors	-0.4449		0.4913	
	0.2120		0.2926	
Log-Likelihood	-4200.2		-2194.4	
dF/dX is Above; St. Error of Coef. is Below				
*** significant at 5%; ** significant at 1%**				

These results indicate that participation in TRP increases retention for those employees hired after the program was implemented, and for those employees hired before implementation who choose to pursue undergraduate degrees. This analysis shows that participation in TRP is endogenous: the correlation between the two error terms is positive for the aforementioned groups. Because of this endogeneity, single-equation estimation of the effect of TRP on the

likelihood of leaving underestimates the impact of participation on retention due to the positive correlation between the error terms. Hence, the effect of TRP on retention is even larger in magnitude when we take into account the correlation between the unobservable factors contained in the error term. For those employees hired before implementation of TRP who pursue graduate degrees, TRP reduces retention. The correlation between the errors in the two-equation system is negative: meaning those more likely to participants are less likely to leave the institution within five years. Hence, participation in TRP accelerates their departure from the institution.

This case study finds that tuition reimbursement programs increase retention of new hires. Hence, this paper finds empirical support for the intention 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 could increase turnover.

It is important to note that implementation of a program could differentially affect existing and future employees. This difference provides some evidence for tuition programs affecting the composition of a firm's applicant pool. However, this evidence is inconclusive due to the fact that it only applies to those workers pursuing graduate degrees.

A shortcoming of a case study is whether the finding can be generalized. Because TRP is a typical program in terms of its characteristics, this paper's findings improve the literature's understanding of this program. The following section tests whether the conclusion of this case study id supported by SEPT95, a dataset containing training information from over 1000 establishments.

4.0 Analysis using Survey of Employer-Provided Training, 1995 (SEPT95)

4.1 Information on SEPT95

SEPT95 was conducted by the Bureau of Labor Statistics (BLS), part of the U.S. Department of Labor, and sponsored by the Employment Training Administration with the purpose of collecting nationally representative data on employer-provided training practices (Bureau of Labor Statistics, Press Release July 10, 2006). The sample represents establishments employing 50 or more workers; smaller employers were not sampled since previous research has shown that they seldom offer formal training.

The survey consisted of personal visits conducted May to October in 1995 of private, nonagricultural business establishments. The 1995 survey was the second Survey of Employer-Provided Training; the first, conducted in 1994, collected information on types of formal training provided or financed by establishments in 1993. The two surveys differ in that SEPT95 collects information from both employers and randomly selected employees.

In SEPT95, establishments report expenditures on training for 1994: payments for wages and salaries of in-house trainers, payments to outside trainers, spending on tuition reimbursement, and payments to training funds. In addition to information on formal training, the employer questionnaire collected information on firm characteristics, such as benefits, work practices, occupation composition, and employee turnover. While SEPT95 also collected a training log from establishments, as well as two questionnaires and training logs from randomly selected employees, this paper only uses responses to the employer questionnaire in its analysis because the other survey instruments have lower response rates.[20] A sample of 1,433 establishments was drawn. Usable employer questionnaires totaled 1,062, giving a response rate of 74.1 percent. Twelve observations were dropped subsequently for this paper's analysis.[21] Detailed information on the universe of firms and sampling procedure is provided in the appendix.

To obtain information on wages, this analysis merged average quarterly wage data from the Quarterly Census of Employment and Wages (QCEW) from 1993, 4th quarter, which was when the sample of establishments was drawn. Access to these wage data was not available for all firms due to variation in confidentiality restrictions across States.[22]

Few authors have used the data collected by SEPT95, likely due to their classification as restricted data.[23] Economists employed by the BLS conducted the two studies that make prior use of the data: Frazis et al. (1998) and Frazis, Gittleman, Joyce (2000). These two studies relate firm and employee characteristics to provision and receipt of training. Frazis et al. (1998) is a

[20] Sample attrition for these other three instruments could be related to the amount of training done at the firm. This paper only uses the responses to the employee questionnaire, which has the highest response rates, to minimize the problem of non-random attrition.
[21] Two were dropped because employment reported in 1995 dropped to one employee, and an additional ten observations were dropped due to outliers in the number of reported hires relative to current employment.
[22] Wage data was acquired for 833 firms. Colorado, Michigan, New Hampshire, New York, Oregon, Pennsylvania, Vermont, Washington, and Wyoming did not allow access to QCEW.
[23] Analysis of SEPT95 requires approval from the BLS that its use will not jeopardize the confidentiality of its respondents; all analysis using SEPT95 must be conducted onsite at the BLS office in Washington, D.C.

descriptive paper and documents provision and spending on formal training. During 1994, establishments with 50 or more employees spent $139 per employee on wages and salaries of in-house trainers, $98 per employee on payments to outside trainers, and $51 per employee on tuition reimbursement. They find evidence of economies of scale in the provision of formal training: larger firms are more likely to provide formal training, and employees at larger firms spend a greater percentage of their training hours in formal training. High-benefit employers and those using innovative workplace practices, such as total quality management and work teams, are more likely to offer training. They find a negative relationship between the provision of training and turnover: employees working at high turnover establishments report receiving less training; these establishments also report lower provision of training than firms with low or medium turnover rates. However, the direction of causation between training and turnover cannot be determined from a simple correlation.

Frazis, Gittleman, and Joyce (2000) provide a clearer picture of how firm characteristics relate to the provision and intensity of training by using multivariate regression analysis. Their main finding mirror those of Frazis et al. (1998); they consistently find a positive relationship between training and fringe benefits and high-performance work practices, whether they look at incidence or intensity, receipt or provision of training.

To give credibility to these data, Frazis, Gittleman, and Joyce (2000) relate estimates of training from SEPT95 to other survey results. Results from SEPT95 show that 93 percent of establishments with 50 or more employees provided some type of formal training activity in the 12 months prior to being surveyed in 1995. Studies using the 1994 EQW-NES report that 81 percent of establishments with 20 or more employees offer formal training (Black and Lynch, 1998). The disparity between these two estimates is attributed to the difference in the size of employers surveyed, because the definition of formal training is similar across the two surveys.[24] The Small Business Administration (SBA) Survey of training in 1992 finds that only 43 percent of firms employing 100 or more workers provide formal training. The estimates from SEPT95 and SBA differ substantially; Frazis, Gittleman and Joyce (2000) argue that the divergence between these estimates stems from differences in the type of training program being reported: SBA asks about training programs, while SEPT95 asks about any type of formal training

[24] The two results are compatible because the provision of training increases with firm size due to economies of scale (Frazis et al. 1998).

activity. A training program could imply a curriculum with multiple courses for instructing a number of participants; in contrast, a solitary incident of training would result in an affirmative response to the SEPT95 survey question.

Information on tuition reimbursement programs provided by firms is difficult to obtain due to the proprietary nature of training practices; SEPT95 provides a limited opportunity for an analysis of this general training program. In SEPT95, firms indicate whether they offer a tuition reimbursement program as a part of their formal training programs, and also report total expenditures on reimbursements for 1994.[25]

Table 10: Means of Firm Characteristics	**Full Sample**	**No Tuition Reimbursement****	**Offer Tuition Reimbursement**
Number of Employees	671	212	927
Average Wage*	$2,965	$2,457	$3,267
Separation Rate	11.14%	17.34%	7.69%
Total Number of Benefits (0 to 11)	6.1	4.9	6.8
Training Programs			
Percent with a Tuition Reimbursement Program	64.29%	--	100.00%
Percent with In-House trainers	45.33%	23.47%	57.48%
Percent that hire trainers from outside the firm	72.19%	50.67%	84.15%
Occupation Composition			
Percent Managers	10.25%	8.65%	11.15%
Percent Professionals	14.76%	8.21%	18.40%
Percent Sales	7.86%	10.51%	6.39%
Percent Administrative Support	13.42%	10.42%	15.09%
Percent Service	8.00%	13.11%	5.16%
Percent Production	45.71%	49.11%	43.81%
Number of Firms	1050	375	675
***Not available for all States (N = 833; 522 offer tuition reimbursement and 311 do not).** ****Means in column 3 are significantly different from those in column 4 at 1% level**			

[25] The National Employer Survey used by Black and Lynch (1998) and Cappelli (2004) asks whether the firm reimburses tuition for employees, but does not collect information on expenditures.

Using sample weights, 61 percent of establishments with 50 or more employees offer tuition reimbursement and 46 percent had positive expenditures on reimbursements. The remainder of the analysis does not use sample weights and instead focuses on the relative characteristics of respondents. Seventy-five percent of respondents offer a tuition reimbursement program, while 14 percent of these firms had zero expenditures on reimbursements in 1994.

Unfortunately, SEPT95 does not contain information on the specifics of these tuition reimbursement programs so these data cannot be used to evaluate how plan characteristics affect participation rates. However, expenditures of $0 for 1994 implies a participate rate of zero for the entire year. In this analysis, firms must indicate that they have a program and have positive expenditures in 1994 to be considered as having a tuition reimbursement program. Using this requirement, 64 percent of firms have a (operational) tuition reimbursement program. Table 10 shows mean characteristics of respondents. The third and fourth columns of Table 10 show the mean value of firm characteristics by whether the firm has a tuition reimbursement program. Firms with a tuition reimbursement plan offer more benefits, have higher wages, have lower separation rates and have more employees than firms without a program.[26]

Whether tuition reimbursement in provided as a complement to other training programs or as a substitute is ambiguous a priori, but can be determined empirically using SEPT95. Table 10 shows that firms with tuition reimbursement programs are more likely to hire trainers from outside the firm and to employee in-house trainers. Firms are classified as hiring an outside trainer if they had positive expenditures for this training category in 1994; similarly for expenditures on in-house trainers (full or part-time). Table 11 gives results from a simple probit model relating the provision of tuition reimbursement to firm characteristics, including other types of training. The likelihood of offering a tuition program is nearly twenty percent higher for firms that also hire outside trainers and ten percent higher for those with in-house trainers. Hence, tuition reimbursement programs are offered in conjunction with other training practices.

If provision of tuition reimbursement and other training are modeled jointly assuming a bivariate normal distribution, the correlation between the error can be estimated. Table 12 shows these results for tuition reimbursement and trainers from outside the firms, while Table 13 gives the result for tuition reimbursement and in-house trainers.

[26] Separation rate = (current employment + hires – previous employment)/(.5*(current employment + previous employment), where previous employment is the number of employees on staff three month prior to survey.

Table 11: Likelihood of Offering a Tuition Reimbursement Program	Probit		Probit	
	dF/dX	St. Error	dF/dX	St. Error
LHS Variable	**Pr(Tuition = 1)**		**Pr(Tuition = 1)**	
Hire Trainer from Outside Firm (0 or 1)	**0.196**	**0.040**		
In-house Trainers on Staff (0 or 1)			**0.100**	**0.035**
Firm Size: 100 to 500 workers	**0.126**	**0.035**	**0.108**	**0.036**
Firm Size: 500 to 1000 workers	**0.249**	**0.034**	**0.220**	**0.040**
Firm Size: Over 1000 workers	**0.265**	**0.037**	**0.232**	**0.044**
Fewer than 100 workers is Excluded				
Number of Benefits (0 to 11)	**0.085**	**0.010**	**0.089**	**0.010**
Separation rate	-0.175	0.091	**-0.223**	**0.093**
Fraction Managers	**0.736**	**0.239**	**0.763**	**0.238**
Fraction Professionals	0.096	0.097	0.112	0.096
Fraction Sales	0.036	0.106	-0.023	0.104
Fraction Administrative Support	0.225	0.123	0.223	0.122
Fraction Service	0.095	0.101	0.040	0.100
Fraction Production is Excluded				
Industry Controls	Included		Included	
Log Likelihood Value	-470.7		-479.9	
Observations	1050		1050	

Bolded = Significant at 5% Level

Table 12: Tuition Reimbursement and Hiring Trainer from Outside Firm	Bivariate Probit Model			
	Coef.	St. Error	Coef.	St. Error
LHS Variable	**Pr(Tuition = 1)**		**Pr(Outside Trainer= 1)**	
Firm Size: 100 to 500 workers	**0.380**	**0.104**	0.112	0.105
Firm Size: 500 to 1000 workers	**0.918**	**0.182**	0.036	0.164
Firm Size: Over 1000 workers	**1.005**	**0.209**	0.139	0.193
Fewer than 100 workers is Excluded				
Number of Benefits (0 to 11)	**0.271**	**0.028**	**0.175**	**0.025**
Separation rate	**-0.564**	**0.259**	-0.336	0.237
Fraction Managers	**2.298**	**0.588**	**1.397**	**0.656**
Fraction Professionals	0.274	0.278	**0.695**	**0.279**
Fraction Sales	-0.046	0.300	**-0.763**	**0.291**
Fraction Administrative Support	**0.688**	**0.351**	0.332	0.342
Fraction Service	0.148	0.287	**-0.561**	**0.265**
Fraction Production is Excluded				
Industry Controls	Included		Included	
Constant	**-2.039**	**0.269**	**-0.615**	**0.244**
Correlation between error terms	**0.312**	**0.059**		
Log Likelihood Value	-987.1			
Observations	1050			

Bolded = Significant at 5% Level

The likelihood of having a tuition reimbursement program is increasing in the number of benefits offered and decreasing in the separation rate, similarly for the likelihood of hiring trainers from

outside the firm. While firm size in an important determinant of providing tuition reimbursement, it is the primary indicator for whether a firm has trainers on staff. The factors related to hiring outside trainers are more similar to tuition reimbursement than are determinants of having trainers on staff.

Table 13: Tuition Reimbursement and In-House Trainers	Bivariate Probit Model			
	Coef.	St. Error	Coef.	St. Error
LHS Variable	**Pr(Tuition = 1)**		**Pr(In-House Trainer = 1)**	
Firm Size: 100 to 500 workers	**0.381**	**0.104**	0.696	0.107
Firm Size: 500 to 1000 workers	**0.892**	**0.181**	1.094	0.154
Firm Size: Over 1000 workers	**1.005**	**0.210**	1.816	0.186
Fewer than 100 workers is Excluded				
Number of Benefits (0 to 11)	**0.271**	**0.210**	**0.162**	**0.025**
Separation rate	**-0.607**	**0.256**	0.348	0.263
Fraction Managers	**2.326**	**0.687**	**1.415**	**0.583**
Fraction Professionals	0.359	0.267	0.400	0.243
Fraction Sales	-0.039	0.300	0.279	0.304
Fraction Administrative Support	0.676	0.352	0.324	0.317
Fraction Service	0.151	0.288	0.378	0.279
Fraction Production is Excluded				
Industry Controls	Included		Included	
Constant	**-0.203**	**0.270**	**-2.123**	**0.251**
Correlation between error terms	**0.169**	**0.063**		
Log Likelihood Value	-1028.7			
Observations	1050			

Bolded = Significant at 5% Level

5.2 Econometric Framework

Similar to problems confronted in the case study when estimating how participation in TRP affects retention, estimating the effect of tuition reimbursement on separation rates for firms in SEPT95 needs to address the problem of an endogenous right-hand side variable. Recall that increasing employee retention is a primary reason for why firms implement tuition reimbursement programs. This suggests that separation rates and provision of tuition reimbursement programs are simultaneously determined: firms with higher separation rates implement a tuition reimbursement program and this program, in turn, reduces separations from the firm. Equations 6 and 7 constitute the simultaneous equations model, where X and Z are matrices of exogenous variables (firm characteristics) and u and v are error terms.

$$separation\ rate_i = X_i'\beta + \delta\ tuition_i + u_i \quad (6)$$

$$tuition_i^* = Z_i'\pi + \gamma\ separation\ rate_i + v_i \quad (7)$$

where *tuition* is a binary variable and *tuition** is a latent index related by the following:

$$tuition_i = \begin{cases} 1 & if\ tuition_i^* \geq 0 \\ 0 & if\ tuition_i^* < 0 \end{cases} \quad (8)$$

An explanatory variable that is simultaneously determined with the dependent variable is correlated with the error term, except under strong assumptions.[27] If we estimate equation 6 without controlling for the endogeneity of *tuition*, estimates of the coefficients will be biased and inconsistent.

Besides simultaneity, estimation needs to address how firm-specific human capital affects the dependent variables. If there are complementarities between general and firm-specific human capital in production, than the likelihood of providing general training is increasing in firm-specific human capital (Acemoglu and Pischke 1999a 1999b). In addition, firm-specific human capital reduces turnover. Hence, firm-specific human capital should be included in the estimation. However, the degree to which skills are firm-specific is difficult to observe; this analysis uses whether the firm hires outside trainers as a proxy for the presence of firm-specific human capital in production.

Table 14 shows the results from an OLS regression of separation rates on firm characteristics, including tuition reimbursement. The OLS estimates (first column) shows that the relationship between tuition reimbursement programs and separation rates is negative and significant. Estimates from a Tobit model are also presented in Table 15; this model is used to address the fact that separation rates are censored from below at zero. The mean separation rate is 0.111, and the mean conditional on having a positive separation rate is 0.132. Using the conditional mean as a basis for comparison, OLS estimates that tuition reimbursement programs are associated with nearly a 30 percent lower separation rate (35 percent lower using the unconditional mean). The results from the Tobit estimate are slightly larger. However, these

[27] The explanatory variable is exogenous only if the error terms in the structural equation are assumed to be uncorrelated and the dependent variable in the first equation in the system does enter as an explanatory variable in the second equation.

estimates do not take into account the fact that tuition reimbursement and separation rates are simultaneously determined.

Table 14: Separation Rates using OLS	OLS		OLS	
	Coefficient	St. Error	Coefficient	St. Error
LHS: Separation Rate				
Tuition Reimbursement Program	**-0.039**	**0.013**	**-0.038**	**0.014**
Number of Benefits (0 to 11)	**-0.009**	**0.003**	**-0.007**	**0.004**
Ln(Average Wage)	Not Included		**-0.067**	**0.014**
Fraction Managers	-0.120	0.067	-0.003	0.073
Fraction Professionals	**-0.124**	**0.023**	**-0.086**	**0.033**
Fraction Sales	-0.007	0.038	0.020	0.040
Fraction Administrative Support	0.059	0.039	0.042	0.044
Fraction Service	0.019	0.032	0.029	0.038
Fraction Production is Excluded				
Firm Size Controls	Included		Included	
Industry Controls	Included		Included	
Constant	**0.313**	**0.027**	**0.766**	**0.101**
R-squared	0.161		0.188	
Observations	1050		833	

Bolded = Significant at 5% Level

Table 15: Separation Rates using Tobit Model	Tobit		Tobit	
	Coefficient	St. Error	Coefficient	St. Error
LHS: Separation Rate				
Tuition Reimbursement Program	**-0.044**	**0.015**	**-0.044**	**0.016**
Number of Benefits (0 to 11)	**-0.011**	**0.004**	**-0.009**	**0.004**
Ln(Average Wage)	Not Included		**-0.085**	**0.016**
Fraction Managers	-0.119	0.076	0.011	0.083
Fraction Professionals	**-0.132**	**0.034**	**-0.077**	**0.038**
Fraction Sales	-0.001	0.042	0.031	0.043
Fraction Administrative Support	0.069	0.044	0.057	0.050
Fraction Service	0.017	0.037	0.031	0.043
Fraction Production is Excluded				
Firm Size Controls	Included		Included	
Industry Controls	Included		Included	
Constant	**0.312**	**0.030**	**0.891**	**0.114**
Log-Likelihood Value	-76.211		-90.189	
Censored at 0	166		134	
Observations	1050		833	

Bolded = Significant at 5% Level

Instrumental variables can be used to consistently estimate the effect of tuition reimbursement on separation rates in the presence of simultaneity. This requires the use of at least one variable that

affects tuition reimbursement, but does not affect separation rates (i.e. excluded from equation 6). This condition is difficult to satisfy with the establishment-level variables collected in SEPT95, because training and workplace conditions are related to separation rates. However, State variation provides some hope. Similar to the exclusion restriction used in the case study, this section uses a measure of peer effects at the State level: educational attainment by the adult population. The percent of adults (25 years or older) in the state with a bachelor's degree or higher in 1990 and the percent change from 1990 to 2000, which where computed from the U.S. Census, are used as instruments.[28] Table 16 shows the means for these instruments; both the levels and the change are higher for firms with tuition reimbursement programs.

Table 16	Full Sample	Without Tuition Reimbursement	With Tuition Reimbursement
Percent with a BA or higher in 1990 (by State)	20.30%	19.98%	20.48%
Percent with a BA or higher in 2000 (by State)	24.22%	23.72%	24.49%
Percent change from 1990 to 2000 (by State)	19.99%	19.50%	20.26%
Observations	1050	375	675

These two instruments meet the requirement of relevance in the *tuition* equation.[29] The exclusion of these variables from the separation equation is arguably warranted if the education attainment of adults in a State influences the demand for tuition reimbursement programs by workers in those states, but does not affect separation rates of the firm once industry, firm size, and occupational composition of employees are taken into account.[30]

Because offering a tuition reimbursement program is a binary outcome, a probit model is used to compute the predicted probability of offering a tuition program, which is then used as the instrument for the separation rate equation (Wooldridge 2002). Table 17 shows the results using instrumental variables: the effect of tuition reimbursement on separation rates is negative and

[28] Data were constructed using *American Fact Finder*, Summary 3 File for 1990 and 2000 Decennial Censes (www.census.gov).
[29] These instruments were found to be jointly significant with a p-value = 0.025 using a likelihood ratio test.
[30] Even though looking at correlation between separation rates and the instruments does not allow a test of the exclusion restriction, the correlation between separation rates and the instruments are low. The correlation between separation rate and the percent with a BA in 1990 is -.0096, and with the percent change is -.0133. After conduction an over-identification test using the two instruments in a two-stage least squares framework, null of over-identification could not be rejected.

larger in magnitude than the estimate obtained using OLS. The same pattern of estimates is seen in Table 18, which uses instrumental variables in a tobit model due to the censoring of separation rates at zero.

Table 17: Effect of Tuition Reimbursement on Separation Rates	**Instrumental Variables**		**Instrumental Variables**	
	Coefficient	**St. Error**	**Coefficient**	**St. Error**
LHS Variable	**Separation Rate**		**Separation Rate**	
Tuition Reimbursement Program	**-0.279**	**0.100**	**-0.229**	**0.086**
Number of Benefits (0 to 11)	**-0.008**	**0.007**	0.006	0.007
Ln(Average Wage)			**-0.062**	**0.016**
Fraction Managers	0.003	0.098	0.104	0.093
Fraction Professionals	**-0.105**	**0.039**	**-0.077**	**0.037**
Fraction Sales	-0.006	0.087	0.020	0.044
Fraction Administrative Support	0.104	0.047	0.084	0.052
Fraction Service	0.032	0.038	0.041	0.043
Fraction Production is Excluded				
Hire Trainer from Outside Firm (0 or 1)	0.025	0.021	0.022	0.022
Firm Size Controls	Included		Included	
Industry Controls	Included		Included	
Constant	**0.285**	**0.034**	**0.708**	**0.114**
F-statistic	8.48		7.91	
Observations	1050		833	

Bolded = Significant at 5% Level

Table 18: Effect of Tuition Reimbursement on Separation Rates	**IV Tobit**		**IV Tobit**	
	Coefficient	**St. Error**	**Coefficient**	**St. Error**
LHS Variable	**Separation Rate**		**Separation Rate**	
Tuition Reimbursement Program	**-0.320**	**0.010**	**-0.269**	**0.099**
Number of Benefits (0 to 11)	**-0.008**	**0.007**	0.006	0.008
Ln(Average Wage)	Not Included		**-0.079**	**0.018**
Fraction Managers	0.020	0.098	0.134	0.105
Fraction Professionals	**-0.111**	**0.039**	-0.065	0.042
Fraction Sales	0.001	0.039	0.032	0.050
Fraction Administrative Support	0.121	0.054	0.109	0.060
Fraction Service	0.035	0.043	0.047	0.048
Fraction Production is Excluded				
Hire Trainer from Outside Firm (0 or 1)	0.031	0.024	0.027	0.025
Firm Size Controls	Included		Included	
Industry Controls	Included		Included	
Constant	**0.277**	**0.038**	**0.819**	**0.131**
Log Likelihood Value	-398.9		-278.2	
Observations	1050		833	

Bolded = Significant at 5% Level

After controlling for the simultaneity of provision these programs and separation rates, the effect of tuition reimbursement programs on retention is even larger.

The magnitude of the effect compared to the mean separation rate of 0.111 is a bit surprising. Based on the first set of estimates in Table 17, a 95-percent confidence interval around the estimate spans from -0.111 to -0.447, Using the second set of estimates, which controls for average wages using the smaller sample in which wage data are available, the confidence interval ranges from -0.060 to -0.398. One possibility is that separation rate could be measured with error since it is only taken from a three-month window in the Spring/Summer of 1995. If tuition reimbursement programs affect a firm's steady state turnover rate, then using a three-month separation rate would overstate the effect if there was a systematic shock to separates rates in the first quarter of 1995. Despite the shortcomings of the data, the results from SEPT95 are consistent with the finding from the case study: tuition reimbursement programs increase employee retention.

The large estimated impact of tuition programs on retention implies that these programs must affect the turnover rate of non-participants since participation rates are typically less than five percent. This "spillover" effect could be possible if non-participants intend to be participants in the future (i.e. they place a high option value on participation) or if the provision of these programs improves the workplace environment or worker satisfaction.[31]

5.0 General Training and Turnover

This section presents a mechanism that could results in general skills training increasing employee retention, which provides a context for interpreting the empirical finding that tuition reimbursement programs reduce turnover. By definition, general skills improve worker productivity at all potential employers. If employers provide general skills training in a competitive market, turnover would increase due to poaching of trained workers by outside firms (Becker 1964). The standard theory of investment in human capital implies that workers bear the full cost of general training due to this risk of poaching. Hence, turnover would be non-decreasing in general skills training under standard human capital theory because the worker is indifferent between employers since skills are perfectly transferable. Pencavel (1972) first

[31] Tuition reimbursement program are offered by many of Fortune Magazine's "Top 100 Companies to Work for".

incorporates turnover into the firm's set of choice variables, which implies that firms can reduce turnover rates by increasing compensation. He shows evidence that firms pick a wage-quit strategy, which depends on how costly turnover is to the firm, or how much firm-specific human capital is used in production. The use of tuition reimbursement programs to influence turnover requires that general skills training be more cost-effective at reducing turnover than wage increases.

How could general skills decrease turnover? If workers use firm-specific human capital in production, mechanisms exist in which provision of general skills training could increase employee retention. Recall that investment in firm-specific skills lowers turnover because rents from the investment are shared between the worker and firm; both parties have an incentive to continue employment because rents only accrue if the relationship is maintained. If provision of general skills training by a firm increases the stock or the productivity of firm-specific skills, then general skills training could reduce turnover.

If complementarities exist between general and firm-specific human capital in production, general skills training could increase employee retention. Acemoglu and Pischke (1999a, 1999b) argue that complementarities between general and firm-specific human capital is one possible mechanism by which wage structures become compressed, thereby giving firms an incentive to provide general skills training. Acemoglu and Pischke define compression in the wage structure to mean that profits from trained workers are higher than those from untrained workers.[32] With complementarities between general and specific human capital, general skills acquired through participation in tuition reimbursement could increase the productivity of firm-specific human capital, thereby increasing employee retention.

For motivation and clarity, the following is a simple model to outline how complementarities in production could result in general skills training increasing retention. Suppose that a worker's production at the current firm (c) is a simple function of her stock of general human capital (g) and firm-specific human capital (s), while production at any other potential employer (p) is only a function of her general human capital:

$$f_C(g,s) = g + h(s), \text{ where } h'(s) > 0 \text{ and } h''(s) < 0 \qquad (9)$$

[32] Acemoglu and Pischke (1999a, 1999b) list several other market imperfections that could result in compressed wages, including search costs, mobility costs, and minimum wage laws.

$$f_P(g,s) = g \tag{10}$$

Since *g* is transferable across employers, workers with general skills *g* will be paid a wage equal to their marginal product. Normalizing the price of output to one, a worker's outside wage option is $wage_P = f_P(g,s) = g$. At the current firm, rents from firm-specific human capital will be shared between the worker and the firm. Her wage is given by:

$$wage_C = f_C(g,s) = g + \beta\, h(s) \tag{11}$$

Where β is the relative bargaining power of employees and $0 < \beta < 1$.[33] Costs of the investment in firm-specific human capital are also shared, so h(s) is negative when the worker starts to accumulate firm-specific human capital. The worker pays her share of the investment in the form of a lower wage during training: she is paid a wage lower than her outside option, *g*, but above her actual productivity while in training. Thus, the firm contributes to its share of the investment cost by paying her a wage above her productivity initially. As rents accrue with the accumulation of firm-specific human capital, *s*, the worker and firm split the difference between the worker's productivity at the current firm and her outside option, with the share being determined by the relative bargaining power *(*β = .5 corresponds to the Nash equilibrium). If the worker separates from her current firm, she will incur a wage loss of:

$$loss(s) = \beta\, h(s) \tag{12}$$

When $s > s^*$, where s^* is defined as the level of firm-specific capital such that $h(s^*) = 0$, wage loss is increasing in *s* and the employee will not want to separate from the firm.

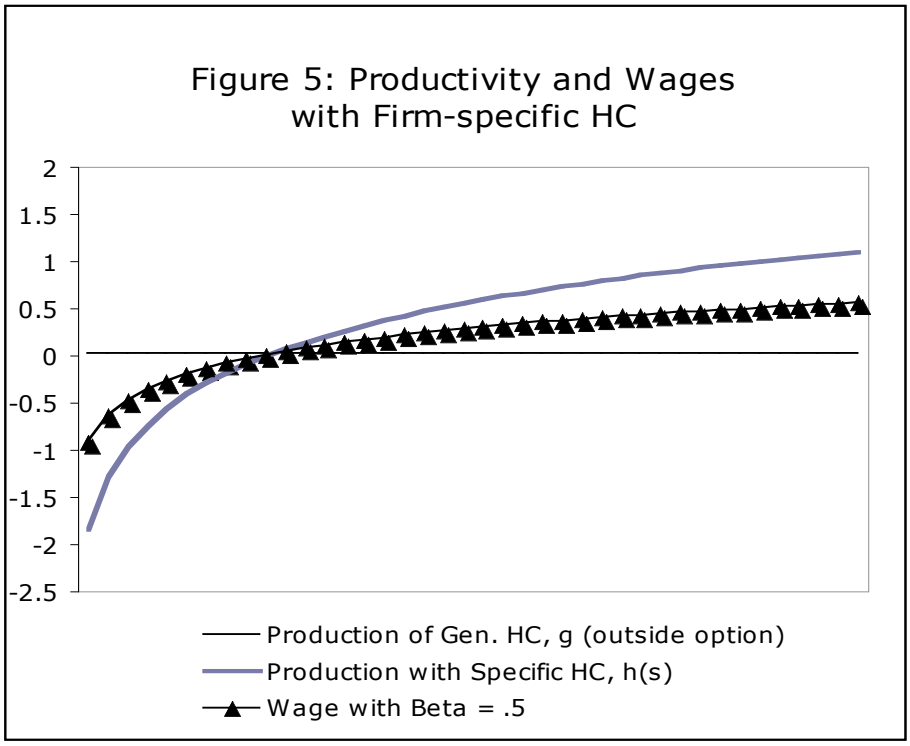
Profits at the current firm from a worker with general human capital *g* and firm-specific human capital *s* are given by[34]:

$$\pi_C = g + h(s) - (g + \beta\, h(s)) = (1 - \beta)\, h(s) \tag{13}$$

As in the case of the worker, the firm has an incentive to maintain the employment relationship when $s > s^*$ because profits are increasing in *s* after this point. Figure 5 shows productivity and wages with investment in firm-specific human capital at the current firm, as well as the outside option for the worker (i.e. $wage_P = g$), for a hypothetical production function, *h(s)*. Notice that the outside option is flat because there is no investment in general human capital in this case.

[33] This condition needs to be satisfied since if β =0, the worker has no incentive to stay with the firm since his wage at the current firm is equal to his outside option, g. Similarly, the firm has no incentive to maintain the employment relationship if β =1.

[34] Because the market is competitive, profits at firms only employing general human capital are zero.



Now suppose that general human capital and firm-specific human capital are complements in production. Worker productivity at the current firm becomes:

$$f_C(g,s) = g + h(s,g)\text{, where } h(s,0) \equiv h(s) \text{ and } \frac{\partial^2 h(s,g)}{\partial s\, \partial g} > 0 \qquad (14)$$

The condition on the cross-partial derivative implies complementarities in production. Suppose the firm invests u in general human capital of its workers. Then wage of the worker at the current firm and other potential employers becomes:

$$wage_C = f_C(g,s) = g + u + \beta\, h(s, g+u) \qquad (15)$$

$$wage_P = f_P(g,s) = g + u \qquad (16)$$

The wage loss incurred upon separation from the current employer is even larger under the complementarities assumption:

$$loss(s) \equiv loss(s,0) < loss(s, g+u) \rightarrow \beta\, h(s,0) < \beta\, h(s, g+u) \qquad (17)$$

Hence, the employee has a greater incentive to stay with the current firm because her relative productivity at the current firms compared to other potential employers is higher with complementarities between general and firm-specific human capital.

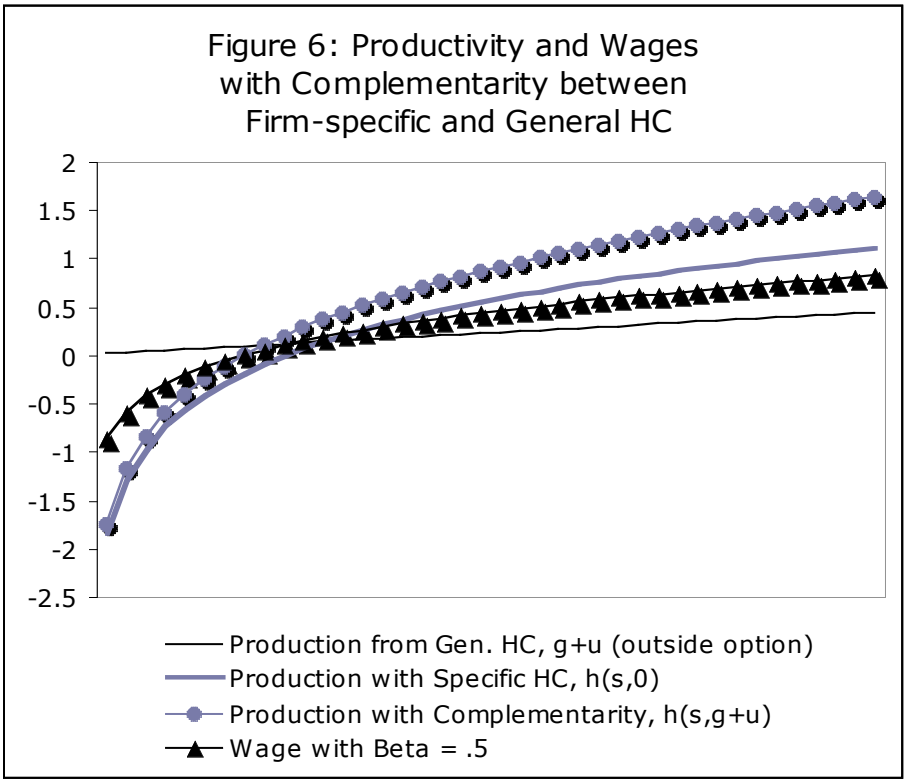
Since courses are typically taken outside of the firm, investment in general skills through tuition reimbursement does not decrease the worker's productivity. However, the firm must pay for the reimbursement. With investment of u in general skills, firm's profits become:

$$\pi_C = g + u + h(s, g+u) - (g + u + \beta\, h(s, g+u)) - u = (1-\beta)\, h(s, g+u) - u \qquad (18)$$

Whether the firm will provide general training, u, depends on the present value of the additional rents accrued though $h(s, g+u)$ relative to the cost u, as well as β. The firm's incentive to continue the employment with the worker is greater under the complementarities assumption if:

$$(1-\beta)\, h(s,0) < (1-\beta)\, h(s, g+u) - u \Leftrightarrow h(s,0) < h(s, g+u) - u \qquad (19)$$

Figure 6 displays the productivity and wages with complementarities between firm-specific human capital and general human capital. Notice that the outside option is now increasing due to the investment in general skill by the firm. This figure does not include cost of investment in general skill, u, but profits of the firm (excluding u) are represented by the area between $h(s, g+u)$ and the wage.



There are other mechanisms that could result in general skills training reducing turnover in the presence of firm-specific human capital. Firms could use general training as an insurance mechanism: if workers are reluctant to work at a firm which requires investment in firm-specific human capital due to the risk of wage loss in the event of involuntary separation, firms could offer general training as a way to mitigate this risk (Feuer, Glick, and Desai 1987). Additionally, if provision of general training attracts a type of worker who values investment in human capital, these workers likely have a lower discount rate, and thus could be less likely to turnover a priori. For the case of tuition reimbursement programs, participation could increase the amount of firm-specific skills if these skills increase over time because coursework takes several semesters to complete. Service length requirements before and after participation would add to this effect (Cappelli 2004).

The above discussion outlines a mechanism that could result in general training increasing employee retention in the presence of firm-specific human capital. It is important to note that the presence of firm-specific human capital is not required for the provision of general training if other market imperfections exist (Acemoglu and Pischke 1999a,1999b). However, evidence from SEPT95 indicates that firms who offer tuition reimbursement programs are more likely to offer other types of training programs (see Section 4.1). Since "high-training" firms are more likely to offer tuition reimbursement programs, this suggests that these firms rely more heavily on firm-specific training in production. Testing this hypothesis would require the development of some index of firm-specificity, which could then be related to the provision of tuition reimbursement programs.

6.0 Concluding Remarks

Tuition reimbursement programs are a type of general training commonly offered by employers. Firms claim that they use these programs to increase employee retention, which challenges the predictions of standard human capital theory. Using both a case study and a cross-section analysis, this paper finds that provision of these programs increases employee retention. Results from the case study imply that participation in TRP substantially reduces the likelihood of leaving the institution: participation by those hired after the program was implemented

reduced their likelihood of leaving within five years by over 50 percent. From the cross section of establishments, tuition reimbursement programs have a large negative impact on employee turnover, This suggests that these programs affect the retention of both participants and non-participants. Future work is needed to examine this "spill-over" effect and to test explicitly how the use of firm-specific human capital in production affects a firm's likelihood of providing general skills training such as tuition reimbursement programs.

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Appendix on SEPT95 Survey Methodology

The universe of firms represented by the firms in SEPT95 are all private establishments in 50 U.S. states and the District of Columbia with 50 or more employees during the fourth quarter of 1993. The data was collected by experience field economics in BLS regional offices. Establishments were first contacted by telephone to request a personal visit to the establishment. The BLS economists administered the employer questionnaire using computer-assisted personal interviewing, while training log data were either collected during the visit or the log was left to be completed by the employer over the following two weeks. The availability and quality of existing training records and schedules determined this decision.

The sample was drawn from the Bureau of Labor Statistics' Universe Data Base (UDB), and limited to firms with two-digit Standard Industrial Classifications (SIC codes) that indicated nonagricultural, private establishments.[35] The UDB is based on reports for Unemployment Insurance purposes to state Employment Security Agencies. The sample was drawn after stratifying the sample frame into categories based on industry and size.[36] A sample size of 170 establishments was set for each of the 9 industries. Within industry, the sample was allocated to the employment classes approximately proportional to their total employment. Within each stratum, a sample was randomly selected. Each unit was given a Sampling Weight that was the ratio of the number of frame units to the number of sampled units. If the UDB entry contained more than one establishment, one of these was randomly selected for the sample. Each establishment was assigned a Sub-sampling Factor that was equal to the number of establishments in its frame unit. Each sampled establishment was assigned a 14-day contiguous interval within the reference period, May – October, 1995 (Bureau of Labor Statistics, July 10, 2006).

There were 1,543 establishments selected, and 1,433 were eligible for the survey (out-of-business or out of the scope of the universe resulted in exclusion). Usable employer

[35] SIC Codes based on the 1987 SIC Manual include: Mining (SIC 10, 12-14); Construction (SIC 15-17); Nondurable Manufacturing (SIC 20-23, 26-31); Durable Manufacturing (24,25,32-39); Transportation and Public Utilities (SIC 41, 42, 44-49); Wholesale Trade (SIC 50-51); Retail Trade (SIC 52-59); Finance, Insurance, and Real Estate (SIC 60-65, 67); Services (SIC 07, 70, 72, 73, 75, 76, 78-84, 86, 87, 89).

[36] Five size classes: 1) 50 – 249; 2) 250-499; 3) 500 – 2499; 4) 2500 – 5000; 5) 5000 and above. Nine industries: 1) Mining; 2) Construction; 3) Nondurable Manufacturing; 4) Durable Manufacturing; 5) Transportation and Public Utilities; 6) Wholesale Trade; 7) Retail Trade; 8) Financial, Insurance and Real Estate, and 9) Services.

questionnaires totaled 1,062, giving an adjusted response rate of 74.1 percent. Usable employer logs were collected from 949 establishments, for an adjusted response rate of 66.2 percent. A usable questionnaire was required in order for the employer log to be considered for use. For missing information in otherwise usable surveys, the BLS employed a hot-deck procedure to impute a value for any item for which the establishment could not provide a response. Final weights were computed based on non-response adjustments and sampling weights.[37]

In addition to the establishment surveys, over 1,000 employees were surveyed. BLS field economists requested permission to select two employees for interviews from responding establishments. The employee questionnaire was administered during the interview, as well collecting the past three days of training information for the training log. The log was left for the employee to complete over the next seven days, and then mail back to the BLS economist. The employee questionnaire collected demographic and employment information, as well as formal and informal training received while at the current employer. The training log collected detailed information on training and learning activities. In total, 1,074 usable questionnaires and 1,013 usable training logs were collected from employees. Taking the 1,062 participating establishments s the eligible pool, the number of eligible employees was 2,214, giving a 50.6 percent response rate for the questionnaire and 47.7 percent from the training log (Bureau of Labor Statistics, December 19, 2006). Breaking these numbers down further, 470 establishments have two employee records, while 134 establishments have data on one employee questionnaire. Hence, nearly 60 percent of the 1,012 establishments include information on at least one randomly selected employee.

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This paper only uses the employer questionnaire for its analysis. It uses the sample weights to compute what percentage of firms employing 50 or more workers offer tuition reimbursement program, and what percentage have positive spending. However, analyses of the effect of tuition reimbursement programs on turnover do not use sample weights.

[37] Final weights were computed for each establishment by computing the product of the Sampling Weight, Questionnaire Non-response Adjustment, and Sub-sampling factor. Similarly, the Final Weight is the product of the Sampling Weights, Non-response Adjustment, Sub-sampling factor, and the constant 13.143, which is the total number of days in the Survey's reference period divided by 14 days (Bureau of Labor Statistics, July 10, 2006).