The Relationship Between Employee Turnover and Employee Compensation in Small Business

by

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Annandale, VA 22003

for

under contract number SBAHQ-05-Q-0012

Release Date: July 2007

SBA Office of Advocacy
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Small Business Research Summary

Advocacy: the voice of small business in government

July 2007 No. 308

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John B. Hope and Patrick C. Mackin, SAG Corporation,
Annandale, VA, 22003. 2007. [44] pages. Under contract number SBAHQ-05-Q-0012

This study explores the relationship between employee turnover and firm size as it relates to compensation using the National Longitudinal Survey of Youth (NLSY). The purpose of this study is to examine whether employee turnover differences between small and large firms are the result of differences in wages and benefits or of some form of self-selection where employees of small businesses are simply more prone to high turnover rates than those in larger firms.

Overall Findings

Employees of large establishments stay in their jobs longer than employees of small establishments. Offering benefits improves employee retention. When a firm offers benefits, it decreases the probability of an employee's leaving in a given year by 26.2 percent and increases the probability of staying an additional year by 13.9 percent.

The earnings results based on the relationship between establishment size and earnings show that firm size has a positive impact on earnings for service and manufacturing occupations. These findings coincide with those of past literature showing an earnings difference based on firm size.

Highlights

The probability of turnover increases by about 3 percent for each additional year of age, and married individuals are 22 percent more likely to leave their jobs than otherwise identical single workers. The effect of tenure is especially large; each additional year of tenure at the present job reduces the probability of turnover by 81 percent. Yet, the tenure results demonstrate that over half of the observed differences in tenure among employees at small and large establishments may be attributable to other factors besides establishment size.

The earnings results based on the relationship between establishment size and earnings demonstrate that for professional occupations, establishment size still seems to have no effect on earnings. However, this is not the case for other occupations. The study shows that other factors, including educational attainment, unionized workplace, and marital status, explain the observed tenure differences. The findings on tenure duration confirm that employees of larger firms are more likely to remain with their employers than employees of small firms. In essence the size of the firm has a positive impact on tenure, all other things being equal.

Scope and Methodology

Data from the National Longitudinal Survey of Youth (NLSY) were used for the current analysis. The Bureau of Labor Statistics of the U.S. Department of Labor directs the NLSY, which gathers detailed information on demographics, labor market activity, job characteristics, and other significant life events of men and women. The survey subjects were interviewed annually from 1979 to 1994, and they are still interviewed biannually. The data have some limitations that affect the analysis. For example, the firm-level data on industry, ownership, location, and firm size are reported by employees and must be considered an estimate at best. Also, significant gaps in some of the variables (e.g., benefit categories) prevent granular exploration.

The first stage uses basic logit regressions and hazard models to determine the stay/leave decision and the effect of the variables on job duration. The second stage estimates earnings using the ordinary least squares method, with firm size, demographic, and compensation as explanatory variables.

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Right truncation of the data..... CENSOR

Executive Summary

Previous studies have examined the relationship between firm size and employee turnover using establishment data. This study instead used employee data from the National Longitudinal Survey of Youth to examine differences in employee turnover between small and large firms. We employed a two-stage estimation technique to determine if small business employees were more likely to stay with their firm or leave to seek employment at large firms. We first estimated the impact of demographic, firm size, and pecuniary factors on the likelihood an employee will continue to work for the small business. The logit regressions using the stay/leave decision as the dependent variable returned significant results for the service industry and the manufacturing industry stratification at the 10 percent level but many of the hypothesized effects, particularly the impact of firm size, were not as expected.

We next used a Cox proportional hazard model to determine the effect of the variables on job duration. These regressions returned results confirming many of our expectations regarding the connection between employer size and an employee's decision to change jobs. We found that firm size had a positive impact on tenure; other things being equal, employees of large firms were more likely to remain with their employers than employees of small firms.

However, our data did not allow us to control for firm age. One reason that smaller firms may experience higher turnover is that they tend to be newer, hence less stable. They may be more likely to close or lay off employees.

Introduction

Employee turnover is a part of normal business activity; employees come and go as their life situations change. Employers realize this and, indeed, large firms typically have entire departments devoted to the management of human resources in order to make the transition as painless as possible for both management and employee and to minimize the associated hiring and training costs. In smaller firms, however, each individual incident of employee turnover has

a relatively larger effect on the firm; in a ten-employee firm, the loss of one employee translates into a 10 percent turnover rate. Therefore, loss can put a strain on the firm's ability to do business. Small firms also have a higher failure rate than large firms and this adds to the employee's side of the risk equation. To mitigate these and other detrimental employment characteristics of small firms, economic theory posits that small businesses should have to pay higher wages than large firms. Empirically, however, we observe that they pay significantly less.

Labor turnover is almost uniformly lower among firms with a large number of employees than among those with fewer employees. Economists have offered several plausible explanations for this observed tendency including the efficiency wage theory (the tendency of large firms to bid up wages through competition for employees); the greater opportunity for lateral transfers at large firms; and the greater deferred compensation (pensions and benefits) offered by large firms.

An employee's decision to continue with their present firm or to seek opportunities elsewhere depends on many factors: working conditions, personal fulfillment, and travel requirements. However, most economists assume that the relevant factors can be addressed through the study of the effects of pecuniary variables. Companies today routinely provide a compensation package that includes both cash benefits (salary, paid leave, paid holidays and bonuses) and non-cash or deferred cash benefits (insurance and retirement plans). Small businesses are expected to be at a competitive disadvantage to larger firms in terms of their ability to match the high salaries and availability of fringe benefits.

Most studies of the wage-size correlation have attacked the problem from the employer point of view; that is, they seek to understand why the correlation between employee wages and firm size exists. In this study we accept *a priori* the existence of the phenomenon and explore what retention effects, if any, these compensation differences have on small businesses.

Literature Review

Economists have long recognized that large firms on average pay higher wages than small firms for the same type of work. This has been confirmed in study after study beginning

with Moore (1911) and continuing through King (1923), Mellow (1982), Oi (1983), and Brown and Medoff (1989) among others. In companies with more than 500 employees, workers earn an average of 35 percent higher wages compared to small companies (Brown et al., 1990) which is in the same range as the gender-wage gap, the race gap, and union/non-union membership gap. The size-wage gap increases with the size differential; Davis et al. (1991) found a 79 percent wage premium at plants with more than 5,000 employees as compared to plants with 20 to 49 employees between 1963 and 1986. Their study also found that 33 percent of the wage gap increase among U.S. manufacturing production workers between 1975 and 1986 was attributable to the size-wage premium. In spite of the large and growing importance of the employer size-wage premium, previous attempts to account for this premium in terms of observable worker or employer characteristics have met with limited success (Brown and Medoff, 1989; Davis et al.,1991; Oi, 1983, 1990; Hamermesh, 1980,1993; Barron et al., 1987; Dunne & Schmitz, 1992).

Empirical evidence shows that the shorter duration of most small firm employment is due to higher failure rates and greater turnover (Brown et al., 1990; Davis et al., 1996). According to the theory of equalizing differences, this should result in higher wages at small firms to compensate for the increase in the unemployment risk (Rosen, 1986).

There are also several possible explanations for the size-wage premium based in economic theory. One explanation hypothesizes that size is related to market power (Weiss, 1966; Mellow, 1982; Akerlof & Yellen, 1990). Large employers are more likely to be monopolists and earn rents; thus, they must share some of these rents with their employees to obtain optimal effort. The wage premium observed is the result of the market power of a worker's firm.

A second explanation assumes that employers care about the mix of workers in the plant and find it more profitable to match high-skilled workers with other high-skilled workers, and low-skilled workers with low-skilled workers (Kremer, 1993; Kremer & Maskin, 1995). If there are fixed costs involved in hiring more-skilled workers, then large firms will be more likely than small firms to match workers by skill level (Barron et al., 1987). The premium results from the overall skill mix of the workforce. Another theory that posits firm size can proxy for worker

ability is the capital-skill complementarity hypothesis (Hamermesh, 1980, 1993; Griliches, 1970). Based on Lucas's (1978) model, it posits that the most-skilled managers will manage the largest firms in terms of employees and capital. If skill and capital are complements, then the firm will also use the most-skilled workers. The premium here results from the capital-labor ratio. Another explanation using the Lucas model theorizes that the most-skilled managers are working for the largest firms. However, in Oi's (1983) model, managers divide their time between monitoring workers and other management tasks. All managers can monitor, but only the more-skilled managers can perform the other functions. More-skilled managers employ more highly skilled and highly paid workers because they require less monitoring. It is not clear why more-skilled managers are not also better monitors or why more-skilled workers necessarily require less monitoring. The premium results from the skill of managers.

Some explanations do not rely on the assumption that worker quality is positively correlated with firm size. In Bulow and Summers (1986) the workers engage in shirking and employers must choose between monitoring employees or paying high wages under the threat of termination if they are caught shirking. If the cost of detection rises with size, large employers will choose to pay higher wages and reduce monitoring. The premium results from the amount of monitoring.

Another explanation holds that there is a positive correlation between high wages and the growth and survival of firms (Brown & Medoff, 1989). This implies that the firm's age should be included in the regressions to account for the premium.

Finally, some studies theorize that larger firms have not only more skilled workers but also more advanced technology, because they have more output to enable easier amortization of the fixed costs (Dunne & Schmitz, 1992; Reilly, 1995). If capital and worker skill are complements, then the larger the firm the more likely it will employ more-skilled workers. The premium results from the firm's access to technology.

Hypothesis

This study will first test two hypotheses: (1) that compensation packages, including non-cash benefits such as health insurance and pensions, affect employees' decisions to stay or leave in small firms, and (2) that employees of small firms self-select their employment situation (i.e., their preference to work in a small or large firm environment) without regard to compensation. Secondly, assuming that there are pecuniary motives involved in the employment decision, we will examine the extent to which compensation affects the decision to leave or stay. The responsiveness of the employee to changes in compensation is measured by elasticity. A high elasticity indicates that small wage changes have large effects on the decision to stay or leave.

It is important from a policy standpoint to analyze the responsiveness of small businesses before implementing any programs designed to improve retention. A high elasticity indicates that compensation is the overriding factor in the decision to stay or leave, and one form of policy may be an effective tool. However, if other factors, such as self-selection, drive the stay-or-leave decision, then an entirely different policy solution may be required.

Model Description

We propose to utilize a two-stage process to first estimate whether or not the employee turnover differences between small and large firms are the result of differences in wages and benefits or are the result of some form of self-selection process where employees of small businesses are simply more prone to high turnover rates than those in larger firms. Assuming that there is some measurable impact of firm size on turnover, the second stage of the process is to estimate a standard earnings equation on the data.

The first stage regressions will use two sets of equations. The first is an attrition model with a binary stay/leave decision as the dependent variable and firm size, employee tenure and various demographic and compensation data as explanatory variables. Attrition models measure the likelihood that an employee will choose to leave the firm as a function of the explanatory variables.

While we are interested in the probability of job turnover, we observed only outcomes: a 1 if the individual left and a 0 if the individual stayed. This probability is a function of several explanatory factors (denoted by the matrix X):

$$\Pr (Y = 1) = f (X\beta)$$

where β represents the vector of parameters. We estimate this model as a logit, taking the following functional form:

$$\Pr(Y = 1) = \frac{e^{X\beta}}{1 + e^{X\beta}}$$

An alternative specification instead uses the duration of employee tenure as the dependent variable, and firm size, compensation, and the usual demographic controls as explanatory variables. We expect to see the effects of the explanatory variables move in the opposite direction; a factor that increases the probability of job turnover should have a negative impact on duration of tenure. The duration equations are estimated using the semi-parametric Cox proportional hazard model where the conditional hazard function, given the covariate value *z*, is assumed to be of the form

$$\lambda(t \mid z) = \lambda_0(t) e^{(\beta^T z)}$$

where β is the vector of regression coefficients, and $\lambda_0(z)$ denotes the baseline hazard function. We estimate the cumulative baseline hazard function, $\Lambda_0(t) = \int_0^t \lambda_0(s) ds$, by

$$\hat{\Lambda}_0(t) = \sum_{i:t_i \le t} \frac{\delta_i}{\sum_{j \in R(t_i)} \exp(\hat{\beta}^T z_j)}$$

and similarly the baseline survival function, $S_0(t) = \exp(-\Lambda_0(t))$.

The second step is to estimate an earnings equation using an OLS model with expected earnings as the dependent variable and firm size, demographic, and compensation data as explanatory variables. Assuming that there is a measurable effect of firm size on turnover, we look at earnings as a possible explanation of the higher turnover. Controlling for other factors that affect earnings (education level, demographic characteristics, industry, and occupation), do individuals employed at smaller firms earn less than those employed at larger firms?

Data Sources

We use the Bureau of Labor Statistics' National Longitudinal Survey of Youth (NLSY). The NLSY surveys a representative sample of 12,686 men and women born in the 1950s and 1960s who were interviewed annually from 1979 to 1994 and are still interviewed on a biannual basis. This survey gathers information on demographics such as sex, race, marital status and education. It also includes information on labor force activity (start and stop dates for each job, reason for leaving the job, tenure with a specific employer, income, insurance and earnings) as well as job characteristics (occupation, class of worker, rate of pay, and collective bargaining activity, occupation, industry, and benefits).

The NLSY does have some limitations that affect the analysis. For example, the firm level data on industry, ownership, location, and firm size is reported by employees and must be considered an estimate at best. There are significant gaps in some of the variables (e.g., benefit categories) that preclude a more granular investigation. The structure makes it difficult for the researcher to track individuals across earnings categories and across employers. The data also lack many measures of human capital effects such as problem-solving skills or educational quality.

Variables

After a brief period of difficulty in locating the proper data dictionary we proceeded to import the dataset into the correct format for our statistical software (LIMDEP). The demographic variables include marital status (MARSTAT) which we changed from a multiple-choice format to a binary variable: 1 for married and 0 otherwise; a binary variable for sex with 1 indicating male; and a binary variable for race with 1 for white and 0 for non-white. The variable for dependent status (DEP) was also changed from the number of dependents to a binary variable with 1 for dependents and 0 otherwise.

The variable for highest grade of education completed (HIGRADE) is in years, with 12 indicating a high school diploma, 16 a bachelor's degree, etc. As expected we see an increase in the data as the cohort ages.

The three-digit industry code was further stratified into 3 industrial classifications (INDUSTRY): (1) indicating manufacturing, (2) services, and (3) professional. The three-digit occupation code (OCCUP) was also further stratified into 3 classifications: (1) indicating professional, (2) service, and (3) manufacturing. These variables remain relatively stable as the members of the cohort change jobs since most individuals will remain in the same industry and occupation and simply change firms.

There are two variables used for firm size. EMPLOC indicates the the number of employees at the location where the individual is employed. This is reported as a discrete number. EMPOTH indicates the number of employees at the firm overall. This is reported as 1 if over 1,000 employees and 0 otherwise. These variables were stratified into binary variables with 1 for size over 1,000 employees and 0 otherwise for consistency. There is a gap in the data for the firm size variables from 1981 to 1986 but the 16-year period from 1986 to 2002 is uninterrupted and should provide enough data to make valid observations for this variable.

Five variables represent firm-provided benefits: health insurance (HLTHINS), life insurance (LIFEINS), paid vacation (VACATION), dental insurance (DENTAL), and retirement plan contribution (RETIRE). All of these are coded with 1 if the firm offers the benefit and 0

otherwise. These variables have some gaps in the early periods but are continuous for the period from 1988 forward; for this reason they were further recoded into a single binary variable (BENEFITS).

Two questions were associated with the variable for collective bargaining (UNION); one asked if the employee was covered under a collective bargaining agreement and the other asked only if there was a collective bargaining agreement in effect at their place of employment. We chose to use the second response since the presence of a union tends to affect the wage structure of the entire firm, not just those covered by the agreement. This variable is coded 1 if the firm has a collective bargaining agreement in force and 0 otherwise.

The income variable (EARNINGS) was not stratified but it was changed in the regressions to income in thousands of dollars so that all the variables would have the same order of magnitude. The income variable was also inflated to real dollars using the CPI. The EARNINGS variable is used “as is” as an independent variable in the logit regressions and is transformed into log income LNINC as the dependent variable for the OLS regressions.

The variable for length of employment with the same firm (TENURE) was changed from number of weeks to number of years of tenure with one firm by dividing by 52. We created a binary stay/leave variable (LEAVE) by observation of the TENURE variable. In cases where the TENURE variable decreased from the previous observation it was assumed that the individual had left their previous position. This variable was then lagged to compare the previous jobs characteristics.

For the hazard/survival model we follow a year cohort from the time that they begin employment through termination (or the last observation in the data). We chose 1985 as a starting point because the sample population was aged 20 and 28. This is roughly the age at which most people are finishing schooling and starting full-time work. Therefore, each observation corresponds to an individual who started a new job in 1985. We created a variable (DURATION) measuring the years until termination of employment. The model also requires a

binary censoring variable (CENSOR) to indicate right truncation of the data (i.e., still working at the last observation).

Descriptive Statistics

We have included the descriptive statistics for the entire NLSY data set in Table 1. The data represent the years 1980 – 2002, inclusive. Many of the demographic variables such as age, marital status, and dependents will naturally increase over time as well as variables such as earnings and tenure due to the effects of truncation. These numbers will serve as a baseline for comparison with the stratified statistics in Tables 2 – 5.

Table 1. Descriptive Statistics

Variable	Description	Mean	Std.Dev.	Minimum	Maximum	Cases
YEAR	Year of observation	1989.530	6.303	1980	2002	24,1034
AGE	Age	28.424	6.711	15	45	24,1034
SEX	Gender	0.504	0.500	0	1	23,9647
RACE	Race	0.705	0.456	0	1	21,3636
MARSTAT	Marital status	0.425	0.494	0	1	19,2993
HIGRADE	Highest grade of education completed	12.954	2.449	1	20	4,1709
INDUSTRY	Industry	2.291	0.870	1	3	14,3098
EMPLOC	Number of employees at the location where the individual is employed	0.109	0.312	0	1	10,4101
EMPOTH	Number of employees at the firm overall	0.585	0.493	0	1	6,0732
BENEFITS	Benefits	0.417	0.493	0	1	24,1034
UNION	Collective bargaining agreement in place	0.150	0.357	0	1	13,8041
EARNINGS	Income	2896.470	8439.200	1000	518000	14,5358
DEP	Dependent status	0.328	0.469	0	1	24,1034
OCCUP	Occupation code	2.056	0.858	1	3	11,1635
LEAVE	Stay/leave variable	0.146	0.353	0	1	24,1034
TENURE	Length of employment with firm	3.527	3.690	1	33	15,8660
MANUFIND	Manufacturing industry	0.275	0.447	0	1	14,3098
SERVIND	Service industry	0.159	0.366	0	1	14,3098
PROFIND	Professional industry	0.566	0.496	0	1	14,3098
PROFOCC	Professional occupation	0.342	0.474	0	1	11,1635
SERVOCC	Service occupation	0.261	0.439	0	1	11,1635
MANUFOCC	Manufacturing occupation	0.398	0.489	0	1	11,1635
AGESQ	Age squared	852.982	397.182	225	2025	24,1034

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Tables 2 and 3 contain the descriptive statistics for the data set broken out by establishment size and overall firm size. In the establishment demographic statistics, we find that

large-firm employees are older, a little more likely to be married, and better educated. In the fiscal statistics we note that they are almost twice as likely to have a unionized workplace, 17 percent more receive benefits, and they make almost $1,000 more annually. They are about one-third less likely to leave their jobs, and they have a year and a half more tenure on the job.

The final two descriptive statistics tables (Table 4 and Table 5) show the same statistics broken out by overall firm size and have similar though slightly less drastic results.

Table 2. Descriptive Statistics for Large Establishments

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
AGE	30.625	5.479	14	45	11,622
SEX	0.488	0.500	0	1	11,601
RACE	0.622	0.485	0	1	11,207
MARSTAT	0.522	0.500	0	1	11,622
HIGRADE	14.500	2.584	2	20	1,807
BENEFITS	0.896	0.305	0	1	11,622
UNION	0.230	0.421	0	1	10,112
EARNINGS	4276.740	12432.500	1000	518000	10,844
DEP	0.480	0.500	0	1	11,622
LEAVE	0.099	0.298	0	1	11,622
TENURE	5.426	4.599	1	27	11,446
MANUFIND	0.309	0.462	0	1	10,637
SERVIND	0.121	0.326	0	1	10,637
PROFIND	0.570	0.495	0	1	10,637
PROFOCC	0.435	0.496	0	1	8,035
SERVOCC	0.289	0.453	0	1	8,035
MANUFOCC	0.276	0.447	0	1	8,035

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 3. Descriptive Statistics for Small Establishments

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
AGE	29.860	6.023	14	45	96,528
SEX	0.528	0.499	0	1	96,301
RACE	0.718	0.450	0	1	93,495
MARSTAT	0.496	0.500	0	1	96,521
HIGRADE	13.198	2.747	0	20	15,041
BENEFITS	0.719	0.449	0	1	96,528
UNION	0.134	0.341	0	1	82,690
EARNINGS	3278.540	9775.260	1000	518000	85,980
DEP	0.470	0.499	0	1	96,528
LEAVE	0.130	0.336	0	1	96,528
TENURE	4.055	4.032	1	33	95,228
MANUFIND	0.278	0.448	0	1	85,238
SERVIND	0.168	0.374	0	1	85,238
PROFIND	0.554	0.497	0	1	85,238
PROFOCC	0.361	0.480	0	1	67,431
SERVOCC	0.262	0.440	0	1	67,431
MANUFOCC	0.377	0.485	0	1	67,431

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 4. Descriptive Statistics for Large Firms

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
AGE	29.789	5.400	14	43	36,675
SEX	0.491	0.500	0	1	36,574
RACE	0.657	0.475	0	1	35,406
MARSTAT	0.511	0.500	0	1	36,674
HIGRADE	13.833	2.552	4	20	6,094
BENEFITS	0.877	0.328	0	1	36,675
UNION	0.218	0.413	0	1	32,218
EARNINGS	3685.650	11063.700	1000	518000	33,978
DEP	0.493	0.500	0	1	36,675
LEAVE	0.110	0.313	0	1	36,675
TENURE	4.687	4.223	1	31	36,186
MANUFIND	0.236	0.425	0	1	32,943
SERVIND	0.216	0.412	0	1	32,943
PROFIND	0.548	0.498	0	1	32,943
PROFOCC	0.449	0.497	0	1	25,565
SERVOCC	0.237	0.425	0	1	25,565
MANUFOCC	0.314	0.464	0	1	25,565

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 5. Descriptive Statistics for Small Firms

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases
AGE	29.291	5.463	14	43	26,237
SEX	0.529	0.499	0	1	26,184
RACE	0.735	0.441	0	1	25,347
MARSTAT	0.494	0.500	0	1	26,237
HIGRADE	13.467	2.726	0	20	4,333
BENEFITS	0.783	0.412	0	1	26,237
UNION	0.138	0.345	0	1	23,635
EARNINGS	3457.810	12694.100	1000	518000	23,890
DEP	0.464	0.499	0	1	26,237
LEAVE	0.133	0.340	0	1	26,237
TENURE	3.806	3.728	1	24	25,913
MANUFIND	0.289	0.453	0	1	22,763
SERVIND	0.158	0.365	0	1	22,763
PROFIND	0.553	0.497	0	1	22,763
PROFOCC	0.401	0.490	0	1	17,835
SERVOCC	0.259	0.438	0	1	17,835
MANUFOCC	0.340	0.474	0	1	17,835

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Employee Turnover Results

The basic specification of the turnover model examined the effect of various factors, including firm size, on the probability that an individual who was employed at the beginning of a time period was no longer employed by the same employer at the end of the time period. This behavior is captured in the binary variable LEAVE. In cases where the TENURE variable decreased from the previous observation we assumed that the individual had left his or her previous position. We then lagged the variable to compare characteristics of the job that the employee left.

In addition to the basic model, we estimated a number of alternative specifications. The NLSY data offered a unique alternative data source for examining the impact of firm size on employee turnover (i.e., observations from the employee viewpoint). However, there are

characteristics of the data set that pose challenges for obtaining reliable estimates. The data do not provide a true pooled time-series, cross-sectional sample. We observed employment actions at a number of points in individuals' careers. However, all individuals observed are of approximately the same age. Therefore, the experiences of older, more experienced workers will be drawn exclusively from the most recently observed years, while those of younger workers are from earlier time periods. Accordingly, shifts in overall employment patterns (e.g., a trend toward more frequent turnover) across time may be incorrectly attributed to variables like age or years of experience.

Also, the dataset does not offer a way to include the age of the firm as a variable. Since firms usually grow as they age, firm age is usually correlated with firm size. The risk of failure is also correlated with firm size; larger firms usually have more reserve resources available with which to weather a recession or other business downturn.

The first stage of the model requires that we estimate an attrition model to determine the effect of the independent variables, with emphasis on the effects of the establishment size variable (EMPLOC) on the dependent stay/leave decision variable (LEAVE). The results of our initial model are shown in Table 6. While several variables exert a strong influence on the stay/leave decision—age, marital status, benefits, unionized workplace, length of tenure, college completion, and the dummy variable for the professional industry were all significant—the coefficient on establishment size (EMPLOC) was not significant.

Moreover, the effects of several of the explanatory variables were not in the hypothesized direction. For example, we would expect older workers and those who are married to be less likely to leave jobs, but the regression results show just the opposite effects. The probability of turnover increases by about 3 percent for each additional year of age and married individuals are 22 percent more likely to leave their jobs than otherwise identical single workers. Tenure and unionized workplace both exhibited the expected negative impact on job turnover. The effect of tenure is especially large; each additional year of tenure in the present job reduces the probability of turnover by 81 percent.

Table 6. Basic Industry Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
AGE	0.0535	0.0053	0.0000	5.5%
MARSTAT	0.4009	0.0796	0.0000	49.0%
EMPLOC	0.1187	0.1061	0.2636	———
BENEFITS	0.3241	0.0705	0.0000	38.1%
UNION	-0.2092	0.0978	0.0324	-18.8%
EARNINGS	0.0058	0.0047	0.2175	———
DEP	0.1063	0.0868	0.2207	———
TENURE	-2.2197	0.0846	0.0000	-89.1%
HSGRAD	-0.0985	0.1166	0.3983	———
COLGRAD	0.3592	0.1276	0.0049	42.9%
SERVIND	-0.0311	0.1157	0.7882	———
PROFIND	-0.2274	0.0869	0.0089	-20.2%
P-value	.000			
Pseudo R^2	.288			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

While TENURE has a strong negative effect, we were concerned that including it as an explanatory variable was inappropriate. LEAVE is a direct translation of the TENURE variable (i.e., LEAVE = 1 if $TENURE_{t+1} < TENURE_t$). Additionally, we found a high degree of collinearity between the EARNINGS and BENEFITS variables; higher-paying jobs are more likely to have benefits.

We also added a time trend variable (YEAR) to account for structural shifts in the labor-market behavior that are otherwise undetectable in our data. This alternative specification improved the results somewhat (see Appendix Table 17). The coefficients on AGE, UNION, EARNINGS and COLGRAD are all significant and, with the exception of AGE, in the hypothesized direction. Unfortunately, firm size was still insignificant (see Appendix Table 17).

We next estimated the model using overall firm size (EMPOTH) rather than establishment size (EMPLOC). In this specification, reported in Appendix Table 18, the same variables are significant: age, union membership, earnings, and both measures of educational attainment, HSGRAD and COLGRAD. Again, the firm size variable (EMPOTH) is not among the significant variables.

Industry-Specific Turnover Equations

We next estimated separate models for each of the industry groups: manufacturing, trade, and professional. For the manufacturing industry, earnings and college completion are statistically significant; establishment size is significant only at the 10 percent level. (See Table 7, or for full results see Appendix Table 19.) As expected, higher earnings result in lower turnover, as does larger establishment size. Table 7 and Appendix Table 20 also show that age, earnings, and educational achievement (HSGRAD and COLGRAD) are all significant for the service industry, but establishment size (EMPLOC) is not. We see the same effect of earnings on turnover, and more highly educated workers are more likely to leave jobs. In the professional industry equation (Appendix Table 21), we also find that establishment size (EMPLOC) is not significant, but age, union workplace, earnings, and college completion are significant, with the expected signs.

Table 7. Industry Turnover Effects

Manufacturing Industry Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.10%
EARNINGS	-2.20%
COLGRAD	75.60%
P-value	.88121
Pseudo R^2	.02112
Service Industry Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.20%
AGE	5.60%
EARNINGS	-3.50%
HSGRAD	90.20%
COLGRAD	131.70%
P-value	.43343
Pseudo R^2	.02881
Professional Industry Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.10%
AGE	2.60%
EARNINGS	-2.40%
HSGRAD	22.00%
COLGRAD	70.70%
P-value	.00132
Pseudo R^2	.01486

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Occupation-Specific Turnover Equations

We next focused on the differential effects of occupation (rather than industry) on turnover. In the basic specification of the occupation equation (Appendix Table 22) age, union, earnings, and college completion are significant and show effects in the hypothesized direction. Neither establishment size nor the occupation dummies had a statistically significant effect. Appendix Table 23 reports the same model substituting the firm size variable (EMPOTH) for the establishment size variable (EMPLOC). Unfortunately, this did not improve the results on the size variable. Age, union, earnings, and college degree are significant and with the expected sign.

We estimated the same basic turnover equation separately for the three occupational group samples. Table 8 and Appendix Table 24 report the results for professional occupations. Establishment size is not significant, but age, union workplace, and earnings have significant coefficients and effects in the expected direction. For the service occupation sample (Appendix Table 25), establishment size (EMPLOC) is again insignificant, and age, earnings, college completion are significant and of the expected sign. Finally, establishment size is insignificant for the manufacturing occupation sample (Appendix Table 26); only age was statistically significant at the .05 level and of the expected sign.

Table 8. Occupation Turnover Effects

Professional Occupation Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.10%
AGE	2.70%
UNION	-32.10%
EARNINGS	-3.80%
P-value	.17453
Pseudo R^2	.01932
Service Occupation Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.10%
AGE	4.70%
UNION	-20.70%
EARNINGS	-4.70%
P-value	.60679
Pseudo R^2	.02780
Manufacturing Occupation Turnover Equation	
Variable	**Marg. Effects**
YEAR	-0.10%
AGE	2.70%
UNION	-6.50%
EARNINGS	0.00%
P-value	.58114
Pseudo R^2	.01334

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Models of Employee Hazard

Because the initial set of models did not show a clear relationship between firm size and employee turnover, we tested an alternative specification. In this model, we examined the effects of firm size and other variables on the duration of job tenure measured as the number of years from entry to exit in the current job. From the original dataset (20 observations for 12,686 individuals) we chose a year cohort (1985) such that a significant number were at a workforce eligible age (20 to 28). We then examine the subset of observations where the individuals start a new job in 1985 (4,469) and follow each individual until they exit from that position to determine the duration of their tenure in that particular job.

Table 9. Tenure Duration Frequency

Duration	Frequency		Cumulative	
1	2868	64.18%	2868	64.18%
2	560	12.53%	3428	76.71%
3	304	6.80%	3732	83.51%
4	163	3.65%	3895	87.16%
5	125	2.80%	4020	89.95%
6	112	2.51%	4132	92.46%
7	40	0.90%	4172	93.35%
8	32	0.72%	4204	94.07%
9	27	0.60%	4231	94.67%
10	26	0.58%	4257	95.26%
11	0	0.00%	4257	95.26%
12	25	0.56%	4282	95.82%
13	0	0.00%	4282	95.82%
14	23	0.51%	4305	96.33%
15	0	0.00%	4305	96.33%
16	24	0.54%	4329	96.87%
17	0	0.00%	4329	96.87%
18	140	3.13%	4469	100.00%

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 10 reports the results of the basic specification. Establishment size has a significant negative effect on the hazard equation. This means that, holding all other factors constant, employees of larger establishments are less likely to leave their jobs in any given year than otherwise similar individuals employed in smaller establishments. Earnings, benefits, and highest grade completed also have a negative impact on the hazard equation as well as union workplace and service occupation at the 10 percent level.

Table 10. Basic Proportional Hazard Equation

Variable	Coeff	Std. Error	P[Z>z]
AGE	-0.0084	0.0087	0.3369
SEX	-0.0349	0.0391	0.3710
RACE	-0.0550	0.0404	0.1737
MARSTAT	-0.0614	0.0454	0.1762
HIGRADE	-0.0208	0.0089	0.0189
EMPLOC	-0.2386	0.0776	0.0021
BENEFITS	-0.3032	0.0386	0.0000
UNION	-0.0971	0.0584	0.0960
EARNINGS	-0.0604	0.0214	0.0048
DEP	0.0049	0.0474	0.9169
SERVIND	-0.0080	0.0586	0.8920
PROFIND	-0.0059	0.0449	0.8950
PROFOCC	-0.0693	0.0484	0.1520
SERVOCC	-0.0846	0.0463	0.0672
Pseudo R^2	.0034668		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 11 shows the effect of a unit change in the significant variables on the hazard and survival functions. The effect of going from a small establishment (EMPLOC = 0) to a large (EMPLOC = 1) in the hazard function, (i.e., the chance of an employee leaving in any given year) decreases by 21.22 percent while conversely the effect on the survival function (the chance of staying for another year) increases by 9.78 percent. The effect of a one-year increase in

employee education (HIGRADE) decreases the hazard function by 2.06 percent and increases the survival function by 0.9 percent. The effect of an establishment offering benefits versus no benefits decreases the chance of leaving in a given year by 26.16 percent and increases the chance of staying an additional year by 13.88 percent. The presence of a union decreases the hazard function by 9.26 percent and increases the survival function by 4.14 percent. For the non-binary earnings variable we tested the effect of a 10 percent increase in earnings and found that this caused a 1.01 percent decrease in the hazard function and a 0.44 percent increase in the survival function. Employment in a service occupation decreases the hazard function by 8.12 percent and increases the survival function by 3.65 percent.

Table 11. Hazard and Survival Rates

	Percent
EMPLOC	
Hazard	-21.22%
Survival	9.78%
HIGRADE	
Hazard	-2.06%
Survival	0.90%
BENEFIT	
Hazard	-26.16%
Survival	13.88%
UNION	
Hazard	-9.26%
Survival	4.14%
EARNINGS	
Hazard	-1.01%
Survival	0.44%
SERVOCC	
Hazard	-8.12%
Survival	3.65%
Pseudo R^2	.0031339

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Earnings Equations

The lack of a clear-cut relationship between firm size and the stay/leave decision is surprising. There are several possible explanations for this result. There could be problems with the data. (The NLSY data are individual level data which are not linked to employer data, and there are gaps in some of the variable years). There could be a problem with the model specification in terms of form or omitted variables. Finally, it is possible that a relationship between firm size and the stay/leave decision does not exist. We were able to establish a fairly robust relationship between establishment size and job tenure, which again maybe attributable to smaller establishments being younger.

The tenure equation results demonstrated that over half of the observed differences in tenure among employees at small and large establishments might be attributed to other factors besides establishment size. Unionized workplace, provision of fringe benefits, and earnings differentials all help explain tenure differences. These observable differences may have important policy implications.

In this section of the paper we attempt to address the impact of earnings somewhat more systematically. That is, we construct earnings equations controlling for establishment and firm size along with other factors known in the literature to affect earnings. The model we estimated was a standard age-earnings equation, in which we regressed AGE, AGE^2 (or AGESQ), and other factors on the log of earnings. We estimated the model both for the entire sample and for each of the three occupational groups.

The basic earnings equation is shown in Table 12. While we observed the hypothesized positive effect of age on earnings, the coefficient on AGESQ is not significant. Typically, the coefficient on AGESQ would be negative, so that a predicted age-earnings profile would increase at a decreasing rate, reach a peak, and finally decline. One reason we might not be able to see that pattern is that the oldest individuals in our sample are 45 years old, while earnings typically peak in the mid-50's. Removing AGESQ from the equation does not affect any of the significant results and improves the significance of some other variables (Table 13). In neither case do we find a significant relationship between establishment size and earnings, however.

Marital status, union membership, and a college degree all exerted a strong positive effect on earnings.

Table 12. Basic Earnings Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]
AGE	0.0998	0.0422	0.0181
AGESQ	-0.00008	0.0009	0.9281
MARSTAT	0.8845	0.2597	0.0007
EMPLOC	0.3022	0.3311	0.3614
UNION	0.7884	0.2903	0.0066
DEP	-0.2768	0.2810	0.3247
HSGRAD	0.1462	0.4849	0.7631
COLGRAD	0.9199	0.5318	0.0837
SERVIND	0.1133	0.4024	0.7783
PROFIND	-0.7219	0.2978	0.0154
SERVOCC	-0.4893	0.2956	0.0979
MANUFOCC	-0.6629	0.2881	0.0214
R^2	0.0152		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 13. Basic Earnings Equation Excluding AGESQ

Variable	Coefficient	Standard Error	Prob [|Z| > z]
AGE	0.0962	0.0159	0.0000
MARSTAT	0.8840	0.2597	0.0007
EMPLOC	0.3038	0.3306	0.3582
UNION	0.7903	0.2895	0.0063
DEP	-0.2798	0.2790	0.3158
HSGRAD	0.1695	0.4097	0.6790
COLGRAD	0.9449	0.4536	0.0372
SERVIND	0.1214	0.3924	0.7571
PROFIND	-0.7150	0.2878	0.0130
SERVOCC	-0.4839	0.2896	0.0947
MANUFOCC	-0.6535	0.2686	0.0150
R^2	0.0152		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

We explored the relationship between establishment size and earnings further by estimating the same earnings equation (absent the occupation dummies) for each of the three occupation groups in our data. The results of these regressions are shown in Table 14, Table 15,

and Table 16. For professional occupations, establishment size still seems to have no effect on earnings; however, establishment size has a positive impact on earnings for employees in service and manufacturing occupations. As expected, educational attainment, union membership and marital status have a strong, positive effect on earnings.

Table 14. Earnings Equation for Professional Occupations

Variable	Coefficient	Standard Error	Prob [|Z| > z]
AGE	0.1145	0.0354	0.0012
MARSTAT	1.1371	0.4668	0.0149
EMPLOC	0.2238	0.5905	0.7047
UNION	0.8763	0.5509	0.1117
DEP	-0.2918	0.5169	0.5724
HSGRAD	-0.4558	1.0217	0.6555
COLGRAD	0.6255	1.0578	0.5543
SERVIND	0.4625	0.8073	0.5667
PROFIND	-0.9831	0.6114	0.1078
R^2	0.0105		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 15. Earnings Equation for Service Occupations

Variable	Coefficient	Standard Error	Prob [|Z| > z]
AGE	0.0785	0.0052	0.0000
MARSTAT	0.5429	0.0887	0.0000
EMPLOC	0.4006	0.1047	0.0001
UNION	0.7515	0.0995	0.0000
DEP	-0.2235	0.0943	0.0177
HSGRAD	0.4787	0.1380	0.0005
COLGRAD	0.7968	0.1621	0.0000
SERVIND	-0.2517	0.1263	0.0463
PROFIND	-0.7823	0.0925	0.0000
R^2	0.2129		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 16. Earnings Equation for Manufacturing Occupations

Variable	Coefficient	Standard Error	Prob [|Z| > z]
AGE	0.0685	0.0037	0.0000
MARSTAT	0.5160	0.0854	0.0000
EMPLOC	0.2943	0.1260	0.0195
UNION	0.6018	0.0876	0.0000
DEP	-0.2531	0.0867	0.0035
HSGRAD	0.2738	0.0894	0.0022
COLGRAD	0.2910	0.1225	0.0175
SERVIND	-0.1452	0.1092	0.1837
PROFIND	-0.3340	0.0761	0.0000
R^2	0.1743		

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

We used the results shown in Table 15 and Table 16 to generate predicted earnings by age for a typical employee in service and manufacturing occupations (the two samples showing a significant effect of establishment size on earnings). Figure 1 shows two profiles for service occupations, where the only variable that differs is establishment size. Predicted earnings for an employee of a large establishment are clearly higher (49 percent) than those of a similar employee at a small establishment. The earnings differential for manufacturing occupations is also clear, albeit smaller (a 34 percent differential, as shown in Figure 2).

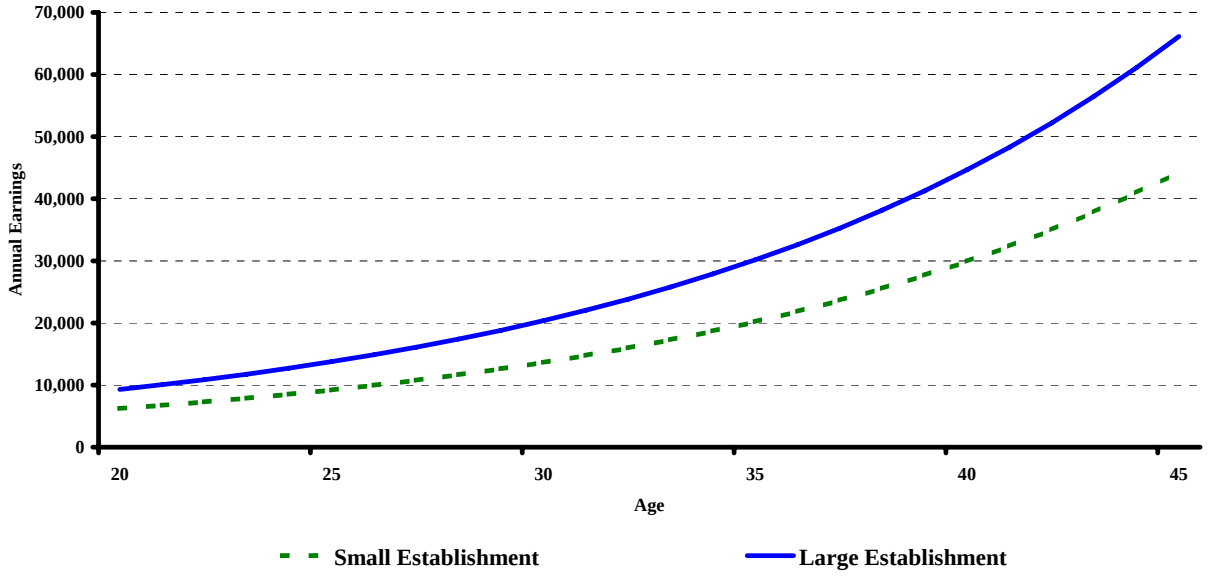

Figure 1. Predicted Annual Earnings by Age and Establishment Size (Service Occupations)

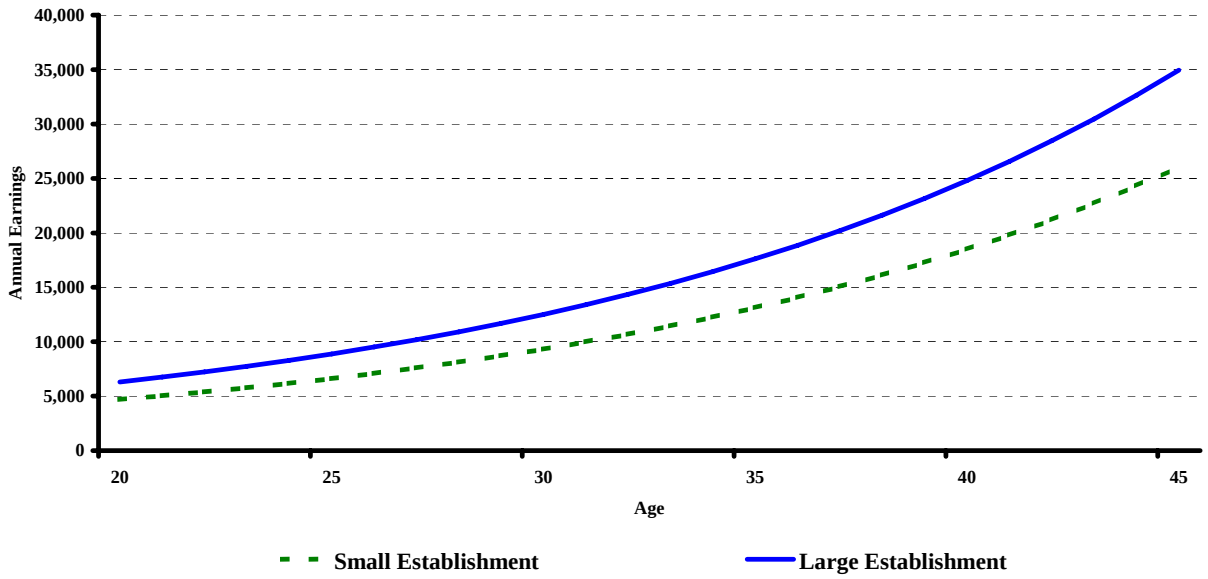

Figure 2. Predicted Annual Earnings by Age and Establishment Size (Manufacturing Occupations)

Conclusions

This study has revealed a number of consistent patterns in employee turnover behavior. By using a unique set of data drawn from the National Longitudinal Survey of Youth (NLSY), we were able to determine that, even after accounting for the effects of union membership, fringe benefits, and earnings differences, employees of large establishments stay in their jobs longer than employees of small establishments.

This study used data from the NLSY to examine the relationship between employee turnover and firm size. We estimated models of the factors that affect turnover and alternative models of employee tenure, a measure related to turnover behavior. In addition, we estimated models of earnings to isolate the effects of firm size. The results of the turnover equations generally found no clear, statistically significant effect of firm size on turnover, and many of the coefficients on other explanatory variables were either statistically insignificant or showed effects that were not in the hypothesized direction.

The tenure duration equations provided differing results. The alternative specification confirmed that employees of larger establishments, which are often older than smaller establishments have, on average, longer tenure durations at their jobs than otherwise similar employees of smaller establishments. Other factors—including unionized workplace, provision of benefits, and education levels—help explain the observed tenure differences.

A separate set of regressions systematically examined the effects of establishment size on earnings. After controlling for other factors proven to affect earnings (including age, educational attainment, occupation and industry), we did not find a significant difference in earnings based on establishment size for employees. Creating separate models by occupation resulted in an establishment size and earnings relationship for service and manufacturing occupations. These findings are consistent with much of the past literature that has shown an earnings difference based on firm size.

Due to limitations with the NLSY dataset we were unable to include a variable for firm age. The age of the firm is thought to be a possible explanation for the wage-size phenomenon. Larger firms are generally older and better established, making them more stable in terms of length of employment. Younger firms have a greater risk of failure and this may partially explain why there are fewer long tenures associated with their employees.

Appendix A: Turnover Equation Results (Tables 17-27)

Table 17. Industry Turnover Equation Omitting Tenure and Benefits Variables

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0013	0.0001	0.0000	-0.1%
AGE	0.0316	0.0062	0.0000	3.0%
MARSTAT	0.0434	0.0691	0.5299	———
EMPLOC	-0.1080	0.0895	0.2278	———
UNION	-0.3316	0.0854	0.0001	-24.9%
EARNINGS	-0.1122	0.0208	0.0000	-2.6%
DEP	-0.0013	0.0746	0.9861	———
HSGRAD	0.2514	0.1376	0.0677	23.3%
COLGRAD	0.6719	0.1434	0.0000	75.2%
SERVIND	0.2016	0.1062	0.0577	———
PROFIND	-0.0625	0.0825	0.4490	———
Pseudo R^2	.01525			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 18. Industry Turnover Equation Using Firm Size

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0015	0.0002	0.0000	-0.1%
AGE	0.0350	0.0083	0.0000	3.4%
MARSTAT	-0.0417	0.0857	0.6263	———
EMPOTH	-0.0652	0.0755	0.3873	———
UNION	-0.3918	0.1008	0.0001	-29.0%
EARNINGS	-0.1367	0.0257	0.0000	-3.4%
DEP	0.0264	0.0931	0.7769	———
HSGRAD	0.6663	0.2200	0.0024	72.2%
COLGRAD	1.1209	0.2248	0.0000	155.9%
SERVIND	0.2155	0.1273	0.0905	———
PROFIND	-0.1791	0.1035	0.0834	———
Pseudo R^2	.02105			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 19. Manufacturing Industry Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0012	0.0002	0.0000	-0.1%
AGE	0.0248	0.0156	0.1116	———
MARSTAT	-0.0946	0.1802	0.5996	———
EMPLOC	-0.3723	0.2137	0.0815	———
UNION	0.2327	0.2089	0.2655	———
EARNINGS	-0.0860	0.0435	0.0480	-2.2%
DEP	0.0304	0.1894	0.8724	———
HSGRAD	-0.0958	0.2488	0.7001	———
COLGRAD	0.6713	0.2687	0.0125	75.6%
Pseudo R^2	.02112			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 20. Service Industry Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0018	0.0003	0.0000	-0.2%
AGE	0.0565	0.0159	0.0004	5.6%
MARSTAT	0.1289	0.1821	0.4790	———
EMPLOC	0.2713	0.2533	0.2842	———
UNION	-0.2674	0.1995	0.1800	———
EARNINGS	-0.1436	0.0518	0.0055	-3.5%
DEP	-0.0404	0.1949	0.8359	———
HSGRAD	0.8238	0.3849	0.0323	90.2%
COLGRAD	1.0554	0.4111	0.0103	131.7%
Pseudo R^2	.02881			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 21. Professional Industry Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0013	0.0001	0.0000	-0.1%
AGE	0.0278	0.0075	0.0004	2.6%
MARSTAT	0.0610	0.0823	0.4790	———
EMPLOC	-0.1122	0.1076	0.2842	———
UNION	-0.4610	0.1077	0.1800	———
EARNINGS	-0.1121	0.0268	0.0055	-2.4%
DEP	0.0095	0.0896	0.8359	———
HSGRAD	0.2387	0.1857	0.0323	22.0%
COLGRAD	0.6367	0.1904	0.0103	70.7%
Pseudo R^2	.01486			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 22. Basic Occupation Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0013	0.0001	0.0000	-0.1%
AGE	0.0335	0.0068	0.0000	3.2%
MARSTAT	0.0227	0.0770	0.7681	———
EMPLOC	-0.1193	0.1037	0.2502	———
UNION	-0.3088	0.0963	0.0013	-23.4%
EARNINGS	-0.1301	0.0241	0.0000	-3.0%
DEP	-0.0421	0.0839	0.6156	———
HSGRAD	0.2147	0.1591	0.1772	———
COLGRAD	0.6484	0.1677	0.0001	72.2%
SERVOCC	0.0912	0.0854	0.2858	———
MANUFOCC	-0.0400	0.0902	0.6575	———
Pseudo R^2	.01631			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 23. Occupation Turnover Equation Using Firm Size

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0015	0.0002	0.0000	-0.1%
AGE	0.0366	0.0094	0.0000	3.5%
MARSTAT	-0.0133	0.0963	0.7681	———
EMPOTH	0.0089	0.0847	0.2502	———
UNION	-0.3643	0.1133	0.0013	-27.4%
EARNINGS	-0.1550	0.0298	0.0000	-3.9%
DEP	-0.0237	0.1059	0.6156	———
HSGRAD	0.4722	0.2443	0.1772	———
COLGRAD	0.9438	0.2524	0.0001	122.8%
SERVOCC	0.0703	0.1084	0.2858	———
MANUFOCC	0.0187	0.1172	0.6575	———
Pseudo R^2	.02003			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 24. Professional Occupation Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0010	0.0002	0.0000	-0.1%
AGE	0.0286	0.0095	0.0026	2.7%
MARSTAT	-0.0476	0.1018	0.6398	———
EMPLOC	-0.1634	0.1359	0.2293	———
UNION	-0.4472	0.1337	0.0008	-32.1%
EARNINGS	-0.1434	0.0306	0.0000	-3.8%
DEP	0.0437	0.1135	0.7003	———
HSGRAD	-0.3222	0.3280	0.3261	———
COLGRAD	0.1979	0.3280	0.5463	———
Pseudo R^2	.01932			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 25. Service Occupation Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0015	0.0003	0.0000	-0.1%
AGE	0.0477	0.0137	0.0026	4.7%
MARSTAT	-0.0340	0.1623	0.6398	———
EMPLOC	-0.0323	0.2023	0.2293	———
UNION	-0.2688	0.2109	0.0008	-20.7%
EARNINGS	-0.2241	0.0580	0.0000	-4.7%
DEP	-0.2332	0.1751	0.7003	———
HSGRAD	0.5418	0.3655	0.3261	———
COLGRAD	1.0087	0.3855	0.5463	———
Pseudo R^2	.02780			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 26. Manufacturing Occupation Turnover Equation

Variable	Coefficient	Standard Error	Prob [|Z| > z]	Marg. Effects
YEAR	-0.0015	0.0002	0.0000	-0.1%
AGE	0.0291	0.0139	0.0026	2.7%
MARSTAT	0.3353	0.1728	0.6398	———
EMPLOC	-0.1603	0.2740	0.2293	———
UNION	-0.0771	0.1926	0.0008	-6.5%
EARNINGS	0.0013	0.0473	0.0000	0.0%
DEP	-0.0782	0.1804	0.7003	———
HSGRAD	0.2455	0.2132	0.3261	———
COLGRAD	0.4789	0.2627	0.5463	———
Pseudo R^2	.01334			

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Table 27. Hazard and Survival Rates

	Zero	One	Diff	Pct
EMPLOC				
Hazard	0.4395	0.3462	0.0933	21.22%
Survival	0.6444	0.7074	-0.0630	-9.78%
HIGRADE				
Hazard	0.4373	0.4283	0.0090	2.06%
Survival	0.6458	0.6516	-0.0058	-0.90%
BENEFIT				
Hazard	0.4970	0.3670	0.1300	26.16%
Survival	0.6084	0.6928	-0.0845	-13.88%
UNION				
Hazard	0.4378	0.3973	0.0405	9.26%
Survival	0.6455	0.6721	-0.0267	-4.14%
INCOME				
Hazard	0.433	0.429	0.0044	1.01%
Survival	0.649	0.651	-0.003	-0.44%
SERVOCC				
Hazard	0.4416	0.4058	0.0358	8.12%
Survival	0.6430	0.6665	-0.0235	-3.65%

Note: Data prepared by SAG Corporation based from the National Longitudinal Survey of Youth

Appendix B: Areas for Further Study

This study has revealed a number of consistent patterns in employee turnover behavior. By using a unique set of data drawn from the NLSY, we were able to determine that, even after accounting for the effects of union membership, fringe benefits, and earnings differences, employees of large establishments stay in their jobs longer than employees of small establishments. However, the lack of detailed information on employers prevented us from further investigating other differences that might be correlated with establishment size. Higher turnover may result from less established firms or lower earnings, for example. We did find, in some cases, a measurable earnings gap for employees based on establishment size. There are a number of theories as to why this earnings gap exists; for example, larger establishments may employ more capital-intensive employees (and therefore hire more highly trained and more highly compensated employees). Again, the NLSY data provide no information on the establishments themselves to allow us to explore this theory further.

In the course of our analysis we discovered a new data set that might offer additional insights into the issue of employee turnover and firm size. The Longitudinal Employer-Household Dynamics (LEHD) database was considered as an alternative to the NLSY but we did not have enough time to acquire and use the data for this study.

The LEHD contains confidential linked employer and worker micro data administered by the U.S. Census Bureau's Center for Economics Studies and made available through eight Research Data Centers. Due to the confidential nature of the data, access to the database is restricted to researchers who are associated with the centers through both a special sworn status and an approved research project. The application and maintenance process of obtaining special sworn status is arduous and time consuming including the submission of several required forms and a full set of fingerprints. There are also substantial financial costs involved in the approval process that may be recouped through the imposition of user fees.

Researchers are expected to develop a preliminary research proposal working in concert with the center's administrator. The proposal must include the researcher's personal information, research site, purpose, funding source, requested datasets, desired software, and a description of the project including the benefits to the Census Bureau. Once a preliminary proposal has been submitted, the review process begins and may go through several iterations before final approval is given. This approval process requires a minimum of three months between submission and commencement of research and for this reason the decision was made to continue with the NLSY data set.

Once all of the obstacles to access are overcome, the LEHD is unmatched in describing the interactions between workers and firms by allowing the researcher to match workers with past and present employers. The LEHD uses the unemployment insurance wage record file that includes the quarterly employment and earnings records of approximately 98 percent of those employed in each state. The resulting dataset is longitudinal for both employers and employees. The information on industry, ownership, location, and firm size comes directly from the employer is extremely accurate due to financial penalties for misreporting. The database structure allows the researcher to track individuals across earnings categories and across employers. Other advantages include the time currency and size of the dataset which make up roughly 60 percent of total U.S. employment. The data allow for the estimation of jointly fixed worker and firm effects as well as human capital measures such as: innate ability, people skills, problem solving skills, perseverance, family background, and educational quality. Firm specific factors such as: physical capital, organizational structure, managerial skills, rent sharing and extent of unionization allow for measures of the wage premiums which are able to explain 90 percent of earnings variations.

One of the disadvantages of the LEHD is its use of quarterly earnings from the owners reports so neither wage rates nor hours worked are available. The unemployment insurance data lack even the most basic demographic information on workers but by integrating this data with some other administrative data in the Current Population Survey and the Survey of Income and Program Participation, the LEHD is able to impute data on date and place of birth, gender, race, residency, and years of education.

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