Does Performance Pay Work?
Preliminary - Please do not quote

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Abstract

This paper explores the prevelance and impact of performance pay using a representative panel of workers in the United States. Previous research has found that at the firm level there evidence that individuals alter their behavior in response to performance pay. However, as Lazear (1986) observes, performance pay is predicted to result in high ability worker's self-selecting into performance pay jobs. It is not know if performance pay itself results in better labor market outcomes for the average worker. We use the panel aspect of the PSID to show that workers who move for a standard wage job to performance pay have higher income and more job stability. In addition, we find that there has been a secular increase in the use of performance pay, likely due technical change and improvements in measuring worker performance.

1 Introduction

It is an article of faith in economics that individuals respond to incentives. What is more controversial is whether or not the introduction of performance pay enhances labor market performance. As Steven Kerr (1975) has observed, despite the best of intentions, performance pay system can often be counter productive. These concerns are reflected in the 1991 National Research Council Study that concludes that "the evidence is insufficient, however, to determine conclusively whether merit pay can enhance individual performance or allow to make comparative statements about merit and variable pay plans." The purpose of this paper is to present evidence on the efficiency consequence of performance pay for using representative panels of US workers. By comparing how workers fare when they switch from performance pay to non-performance pay job, and vice-versa, we are able evaluate the consequence of performance pay for income and job stability.

Our main findings are as follows. First, compensation in performance pay jobs is more variable, and hence in a downturn workers in such jobs have lower wages compared to workers in jobs with no performance pay. Consistent with economic intuition, we also find that hours are *less* sensitive to business cycle fluctuations in performance pay jobs, and hence workers in such jobs work more hours per year, and have longer job tenure.

Azariadis (1975) and Baily (1974) suggest that one reason wages are insensitive to business cycle fluctuations is that workers are risk averse, and prefer to have more stable income in exchange for lower average wages. Among employed workers we find that there is little difference in yearly income inequality between performance pay and non-performance pay jobs. Moreover, once layoff risk is included, we find that workers in performance pay jobs have significantly less income inequality compared to workers with more traditional compensation. Hence, consistent with earlier evidence on nominal wage rigidities, the insurance model of Azariadis (1975) and Baily (1974) does not appear to be consistent with the data. Rather, we find that performance pay jobs deliver more in terms of both higher incomes, longer job tenure, and hence over all better labor market performance.

This result begs the question of why in a competitive market we do not observe all firms moving to performance pay? One reason is that the decision to implement a performance pay system trades off the benefits against the costs, which in turn depends upon the characteristics of the job. Using Bureau of Labor Statistics data Brown (1990) finds evidence supporting this hypothesis, and also shows that the incidence of performance pay varies with job characteristics. MacLeod and Parent (1999) extend these results to control for worker selection using the NLSY (National Longitudinal Survey of Youth) and the PSID (Panel Study of Income Dynamics). They follow individual workers over job changes, and find that job characteristics are an important determinant of whether or not the firm uses pay for performance, that is independent of worker characteristics. The agenda of the paper is as a follows. The next section provides a brief (and incomplete) review of the literature on performance pay. Section 3 introduces a model that illustrates how performance pay can labor market performance. The data is discussed in section 4, with the

results presented in section 5.

2 Literature

The central question in the theory of incentives is not so much whether or not individuals respond to rewards and punishments (they do), but rather how best to *design* rewards as a function of the available performance measures. The early sociology literature has shown that whether or not one should use group or individual incentives depends upon the extent to which employee outputs are complements or substitutes (see Schmitt (1981) for a review). The management literature has explored many aspects of performance appraisal, and has found that good performance evaluation is a complex and expensive activity. In their review of this literature, Bretz, Milkovich, and Read (1992) conclude that

> "...organizations continue to undermine the effectiveness of the appraisal system. Little time is spend on the appraisal system; raters are not systematically trained and are not held accountable."

Consequently, performance evaluation should be viewed as part of the technology, that varies from firm to firm and over time. This observation is important in our work because it implies that firms will vary in their practices, and with performance pay varying with the characteristics of the job.

The economics literature on performance pay has approached the problem from both the individual and the job design perspective. Lazear (1986) focuses upon the selection consequences of performance pay. With a fixed pay system, employees face a fixed standard to ensure continued employment, resulting in more homogeneity in performance across jobs. Performance pay allows workers who have a preference to work hard (or less) that the norm to select an appropriate level of effort. Lazear (2000) explores the impact of introducing a piece rate compensation at a auto glass installation company, and finds much of the enhanced productivity gains arise from the selection of more productive workers into installation positions. If the goal of a compensation system is merely one of selection, then absent an experiment, it would be very difficult to determine the causal effect on performance pay on economic performance. For example, if the variance of worker ability in a population increases, then we would expect this to lead to more use of performance pay. In this case any relationship between performance pay and economic performance is merely a reflection of the underlying variation in employee characteristics, and not a consequence of performance pay per se.

We do know from occupation studies that individuals do respond changes in rewards. Shearer (2004) finds that tree British Columbia respond to changes in the piece rate, while Nagin, Rebitzer, Sanders, and Taylor (2002) find that call center employees vary their behavior as a function of the level of monitoring by the employer. For highly paid individuals, Chevalier and Ellison (1997) find that mutual fund managers investment behavior is affect that the structure of their end of the year bonus pay, while Gibbons and Murphy (1992) find that firms use more explicit incentives to compensate CEO towards the end of their careers.

Given that these studies illustrate the role of incentive pay only for specific occupations, we cannot conclude that performance pay is important for the economy as a whole. Our empirical work builds upon

Brown (1990) and MacLeod and Parent (1999) who show that holding worker ability fixed, compensation varies with job characteristics. This is consistent with the theoretical models of Baker (1992) and Holmström and Milgrom (1991). Recent work, such as Black and Lynch (2001) and Bresnahan, Brynjolfsson, and Hitt (2002), has begun to document the changes in work practices that are occurring in response to increased use of information technologies. Both of these studies use establishment data, making it difficult to control for endogenous matching between workers and firms. Our approach builds upon identifying the effect of compensation by following the same worker through different jobs. In the next section we develop an illustrative model that links characteristics of the monitoring system to worker performance and job tenure holding worker ability fixed to generate predictions on how merit pay should effect overall pay and job tenure.

3 Implications of Contract Theory for Performance Pay Incidence and Level

In this section we introduce a simple model that illustrates the main empirical results. In practice compensation is extremely complex, with employee behavior responding to a variety of rewards, including promotions, career development, future wage growth, market opportunities, piece rates, sales commissions, tips, on the job non-pecuniary rewards and so one. Regardless of the form that a reward take, a key insight of contract theory is that rewards are most effective when they reflect the needs of the firm.

Consider the following simple model of performance pay inspired by Baker (1992) and Holmström and Milgrom (1991). Suppose that the worker has a base productivity of θ that varies over time. In addition, the worker can allocate additional effort, e, to a enhance performance measure $P(e)$. Given that the firm has different information than the worker, it is not always in the best interests of the firm to have the worker increase the measure $P(e)$. For example, suppose that P represents research output of an academic. If the University puts all weight on P, and none on teaching, then there will be no teaching. As long as the performance P is correlated with the goals of the employer, then it will be efficient for them to use it for purposes of assessing performance pay. As Baker (1992) shows, the extent to which pay depends upon P is a function of the quality of the signal.

We consider a simple parameterization of this idea that is rich enough to capture the effects that we observe in the data. It is assumed that the worker effort results in a measured output v with probability $\rho(e)$, where $\rho' > 0$, $\rho'' < 0$ and $\rho(0) = 0$. We introduce the quality of the measurement by letting λ be the probability that v is useful to the firm. It is assumed that this event is independent of the event that generates v. Both v and λ are parameters that can change with time. The former as a result of business cycle fluctuations, while the latter as a result of improvements in monitoring technology. The profit of the firm at time t is therefore:

$$\pi_t = \theta_t + \lambda_t \rho(e_t) v_t - i_t,$$

where i_t is the total compensation (income) paid to the worker. The firm is assumed to employ a worker if and only if profits are at least zero.

The additional effort to produce v costs the worker $c(e_t)$, where $c', c'' > 0$. The utility of the worker is given by

$$u_t = i_t - c(e_t)/\gamma_t,$$

where γ_t is the ability of the worker. It is assumed that the worker's outside option is given by u_t^0, while the firm hires a worker as long as she obtains at least zero profits.
It is assumed that $\rho'(0) v_t > c'(0)$, that is when $\lambda_t = 1$ it is always efficient to have positive effort. However, since $c'(0) > 0$ then for low λ it may be efficient to have zero effort. The efficient effort level conditional upon employment e_t^*satisfies:

$$c'(e_t^*)/\gamma_t \begin{cases} = \lambda_t \rho(e_t^*) v_t, & \text{if } e_t^* > 0, \\ \geq \lambda_t \rho(e_t^*) v_t & \text{if } e_t^* = 0. \end{cases} \tag{1}$$

When λ_t is sufficiently close to zero, the marginal cost of effort is larger than the marginal benefit, and hence effort is zero in those cases.
An efficient compensation package entails the firm paying the worker a bonus $b_t = v_t$ every time the firm finds the worker's effort to be useful and productive. In this case, the firm pays a fixed wage that makes the worker indifferent between this job and her next best market alternative:

$$w_t = u_t^0 - \{\lambda_t \rho(e_t^*) v_t - c(e_t^*)/\gamma_t\}. \tag{2}$$

Thus, the worker is employed if and only if:

$$\pi_t = \theta_t + \lambda_t \rho(e_t^*) v_t - u_t^0 \geq 0,$$

or when

$$\theta_t \geq u_t^0 - \lambda_t \rho(e_t^*) v_t. \tag{3}$$

The parameters θ_t, λ_t and v_t are assumed to be firm specific, while γ_t and u_t^0 are worker specific parameters, though in general we should expect θ_t and u_t^0 to be correlated at both the individual and aggregate level. Given this, the model has a number of testable implications. From expression (1) there is a $\bar{\lambda}_t$ with the property that for $\lambda_t \leq \bar{\lambda}_t$ additional effort and performance pay is zero. This is a non-performance pay job. Performance pay jobs are characterized by $\lambda_t > \bar{\lambda}_t$. Notice that performance pay jobs do not pay bonus every period - they do so only in those periods there is output v_t and this output is valued by the firm. This occurs with with probability $\lambda_t \rho(e_t)$. The empirical implications of the model are as follows:

1. From expression (1):

   (a) If the monitoring technology improves with time, so that λ_t is increasing, this implies that more firms use performance pay.

   (b) More able workers receive larger bonuses and more frequent bonuses.

2. From expression (2) we have:

(a) More able workers get higher wages.

(b) Total compensation is higher in performance pay jobs.

(c) Wages (income less bonus pay) in performance pay jobs are *lower* than in non-performance pay jobs. Moreover, the difference is larger for more able workers.

3. From expression (3) we see that a firm employs a worker if and only if $\theta_t \geq \bar{\theta}_t = u_t^0 - \lambda_t \rho\left(e_t^*\right) v_t$. If $\bar{\theta}_t$ falls there is an increase in employment. In particular, we have that for larger λ_t, the cutoff productivity $\bar{\theta}_t$ is lower, and therefore the likelihood of a layoff falls. Hence we have:

   (a) For two equally productive firms, those with higher λ_t have more employment, and less layoffs in a downturn.

   (b) In performance pay jobs, more able workers have a lower likelihood of a layoffs in a downturn.

Brown (1992) has found with BLS data that performance pay jobs pay less on average than fixed wage jobs, a result that is inconsistent with prediction 2.*b*. If we extend the model to a dynamic framework we can generate Brown's finding as follows. A consequence of performance pay is that turnover is lower on average, and consequently performance pay employees face lower expected job search costs. Therefore, fixed wage workers must be paid a premium to compensate them for the higher turnover risk. If this premium is large enough, the fixed wage workers would earn higher wages while working than performance pay workers, thought average yearly earning that include the layoff risk would be lower.
Finally, we have assumed that wages are flexible, even though there is evidence that standard wage contracts are rigid in the short run (see for example Card and Hyslop (1997)). Given that under performance pay firms adjust bonuses on a yearly basis, this provides extra flexibility relative to fixed wage contracts. Hence, the addition of this feature would merely exacerbate the difference between performance pay and rigid wage jobs. If we include an hours decision into the model, then we expect that hours will be more variable in fixed wage jobs. In bonus pay jobs, a downturn would decrease the likelihood that the worker produced high performance, and hence the firms would be able to correspondingly adjust compensation. This in turn implies that there will be less adjustment of hours in performance pay jobs relative to fixed wage jobs. Therefore we can conclude that the theory predicts that holding worker ability fixed, we should observe a correlation between contract form (performance pay or not), total compensation, hours worked and job tenure. We now turn the empirical analysis to see if indeed these implications are consistent with the data.

4 Data

In order to explore the effect of performance pay we need a panel of employment histories. As a consequence the bulk of our analysis is conducted using data from the PSID (Panel Study for Income Dynamics). The main advantage of the PSID is that it provides a representative sample of the workforce for a relatively long period. A disadvantage of the PSID, however, is that our constructed measures of performance pay are relatively crude and may be fairly imperfect proxies for whether or not workers are

paid their marginal products. To probe the robustness of the results based on the PSID, we thus re-estimate some of the key models using the NLSY (National Longitudinal Survey of Youth). The main advantage of the NLSY is that it asks workers directly whether or not their earnings are based on performance, bonuses, or commissions. This is arguably a better measure of performance pay than what is available in the PSID. Unfortunately, the question about performance pay in the NLSY was only included in the late 1980s and late 1990s. Combined with the fact that the NLSY only follows a narrow cohort of individuals over time, it is not possible to use the NLSY to look at the broad-based impact of performance pay on economic performance.

4.1 The Panel Study of Income Dynamics (1976-1998)

The PSID sample we use consists of male heads of households aged 18 to 65 with average hourly earnings between \$1.00 and \$100.00 (in \$79) for the period spanning the years 1976-1998, where the hourly wage rate is obtained by dividing total earnings in the previous year by hours of work.[1] Individuals in the public sector or who are self-employed are excluded from the analysis. This leaves us with a total sample of 32,514 observations for 3,244 workers. Summary statistics are reported in Table 1 and will be discussed below.

4.1.1 Measurement Issues

Identifying performance pay In the PSID, we construct a performance pay indicator variable by looking at whether part of a worker's total compensation includes a variable pay component (either a bonus, a commission, or a piece rate). For interview years 1976-1992, we are able to determine whether a worker received a bonus or a commission over the previous calendar year through the use of multiple questions. First, workers are asked the amount of money they received from either working overtime, from commissions, or from bonuses paid by the employer.[2] Second, we know whether workers worked overtime, and if they are working overtime in a given year, we classify them as not having a variable pay component.[3] Third, workers not paid exclusively by the hour or not exclusively by a salary are asked how they are paid: they can report being paid commissions, piece rates, etc., as well as combinations of salaried/hourly pay with either pieces rates or commissions.[4] Through this combination of questions, we are thus able to identify all non-overtime workers who received performance pay in the form of either a bonus, a commission, or a piece rate. Starting with interview year 1993, there are separate questions on the

[1] In the PSID, data on hours worked during year t, as well as on total labor earnings, bonuses/commissions/overtime income, and overtime hours, are asked interview year t+1. Thus we actually use data covering interview years 1976-1999.

[2] Note that the question refers specifically to any amounts earned from bonuses, overtime, or commissions in addition to wages and salaries earned.

[3] In some years overtime hours are reported while in other years we only know whether they worked overtime or not.

[4] In many survey years workers are not asked if their compensation package involves a mixture of salary/hourly pay and a variable component. All they are asked is how they are paid if not by the hour or a salary. Although there is no way to directly verify it, this likely results in understating the incidence of either form of variable pay because workers are not allowed to answer that they are paid, say, a salary, and then report a commission: they have to choose. Our assertion that it likely understates the extent of variable pay is motivated in part by the fact that workers in the NLSY, to be described below, are not restricted in describing the way they are paid, and workers in the NLSY are more likely to report having part of their compensation package containing a variable pay component.

amounts earned in bonuses, commissions, tips, and overtime work over the previous calendar year. Thus there is no need to back out an estimate of bonuses from an aggregate amount since the question is asked directly. For the sake of comparability with the pre-1993 years, we nevertheless classify as receiving no variable pay all workers who report any overtime work. Thus for each year of the employment relationship we are able to determine whether the worker's total compensation included a variable pay component. One obvious drawback is that it is likely the variable pay component we construct will be noisy. However, due to our treatment of overtime workers, we conservatively lean on the side of misclassifying workers as receiving no variable pay, even if they do.

Defining performance pay jobs One of the main goals of this paper is to see whether employment relationships that involve performance are systematically different from those in which no such performance pay is ever received. Thus we define performance pay jobs as employment relationships in which part of the worker's total compensation includes a variable pay component (either a bonus, a commission, or a piece rate) at least once during the course of the relationship.[5] In some sense, we are not so much interested in what happens within an employment relationship at the time some performance pay such as a bonus is received, as to what is the difference between one type of job and the other.[6] Two related measurement issues arise. The first one is a simple measurement error issue. On the one hand, we are likely to misclassify performance pay jobs as non performance pay jobs if some employment relationships are terminated before performance pay is received. This would be particularly problematic if the first receipt of performance pay, which identifies the job as a performance pay job, tends to occur later instead of sooner in the course of the employment relationship. On the other hand, some of the jobs may be wrongly classified as performance pay jobs. While it is a priori difficult to assess which of the false positive or false negative problems are more important, their consequence is the same: assuming there is a genuine difference between the two types of jobs, misclassification will tend to attenuate such differences.[7] The second related issue is an "end point" problem: given our definition of performance pay jobs, we may mechanically understate the fraction of workers in such jobs at the start of our sample period because most employment relationships started before 1976. Similarly, jobs which started toward the end of the sample period may be performance pay jobs but are classified otherwise because they have not lasted long enough for performance pay to be observed. The basic measurement problem is that, conditional on job duration, we tend to observe a given job match fewer times at the two ends of our sample period than in the middle of the sample period. Consider, for example, the case of a job that lasts for five year. For jobs that last from 1985 to 1989, all five observations on this job match are captured in our PSID sample. For jobs that last from 1973 to 1977, however, only two of the five years of the job match are captured in our PSID

[5] To avoid confusion, note that we use "jobs", "employment relationship", and "job match" interchangeably. Although in most of the survey years spanning the sample period, the PSID does have information on tenure in the position, we are not using it. As is well known, simply determining employer tenure in the PSID can be problematic (Brown and Light (1992))

[6] That being said, we also look at the within job impacts using an alternative definition of a performance pay job. More on that below.

[7] See Lemieux, MacLeod, and Parent (2006) for simple measurement model where we describe the conditions under which our observed performance pay job indicator is informative.

sample, which mechanically reduces the probability of classifying the job as performance pay.
The source of the "end point" problem is thus that it results in an unbalanced distribution of the number of observed job match observations at different point of the sample period. One simple solution to the problem is to "rebalance" the sample using regression or other methods. In practice, what we do is to create a variable counting the number of job matches observed for each job (as opposed to the actual job duration), and then add this variable as an additional control in the regression models. Similarly, the corrected incidence of performance pay over time can be computed by running a linear probability model (or a logit) in which year dummies and the number of times the job-match is observed are included as regressors. The year dummies then capture the corrected incidence of pay for performance job. All the graphs of the incidence of pay for performance reported below are adjusted using this procedure.[8]

4.2 Descriptive statistics

Table 1 compares the sample characteristics of workers on performance pay and non-performance pay jobs, respectively. First notice that over 35 percent of the 32,514 observations are in performance pay jobs, though these raw figures must be interpreted with caution because of the end-point problem discussed earlier. Workers on performance pay jobs tend to earn more and be more educated than workers on non-performance pay jobs. Note that the hourly wage rate includes both regular wage and salary earnings and performance pay in the case of workers on performance pay jobs. Annual hours worked and employer tenure also tends to be higher for workers on performance pay than non-performance pay jobs. Not surprisingly, the unionization rate (percent covered by collective bargaining agreements) is much lower among performance pay workers, suggesting that, as expected, pay structure in union firms tend to have wages attached to jobs instead of workers. Another important difference is that there is a much higher fraction of workers paid by the hour in non-performance than performance pay jobs. On the flip side, workers on performance pay jobs are much more likely to be salaried workers than those on non-performance pay jobs. However, perhaps the most striking feature of Table 1 is the difference in the fraction of individuals reporting that they are unemployed at the time of the interview across both types of jobs. Only 1.7% of those whose current or more recent job had performance pay are unemployed. Naturally, this is only descriptive and it could be that workers in performance pay jobs are "special" relative to other workers. The fact that they are more skilled is certainly indicative of selectivity.
Figure 1 shows that the overall incidence of performance pay jobs has increased steadily since the early 1980's. It is also true that the incidence of performance pay in any given year increased as well. Figure 1 also shows the fraction of workers covered by a collective bargaining agreement. Remarkably, the line showing the fraction of unionized workers is almost the mirror image of the bonus pay job incidence line. However, as we discuss in more details in our companion paper Lemieux, MacLeod, and Parent (2006), the incidence of performance pay jobs increased most markedly in salaried (as opposed to hourly paid) jobs, in

[8] Note that the PSID became a bi-annual survey after 1996. This poses a problem in aligning job information (tenure, industry, etc.) which relate to the job held at the interview to the earnings information, including bonus amounts, which is for the calendar year before the interview.

which union coverage rates were fairly stable (and low) over the sample period. Hence the increase in performance pay job incidence is not just a simple de-unionization story. One might argue that increases in education have increased the benefit from performance pay due to selection, however the upward trends remains even after controlling for education. Hence, this rise in performance pay incidence is consistent with the hypothesis that technical change has lowered the cost of implementing a performance pay system. In Figure 2 we show kernel densities of the distribution of annual hours worked in both types of jobs. We can see that the distribution of hours worked in performance pay jobs is to the right of the one for workers in other jobs, with a greater fraction of people working over 2000 hours per year. The distribution of hours worked for performance pay workers merely confirms that what we report in Table 1 in terms of sample means is an accurate description of what happens to hours worked over the whole distribution. Next in Figure 3 we show the distribution of the share of performance pay in total labor earnings. To compute the share we use the amounts directly reported by respondents over the 1992-1998 period for the amounts earned in commission, bonuses, and tips.[9] Given that the median share is about 3.5% of total earnings, it would appear that whatever makes performance pay jobs different than other jobs, the variable pay component itself is likely not to be the only element making them different, as opposed to the overall total compensation.

Finally, in Figure 4 we plot the Kaplan-Meier survivor function for both types of jobs. We see that, as reported in Table 1 for mean tenure levels, performance pay jobs are associated with longer lasting employment relationships. While this may not reflect only the effect of working in a performance pay job, as workers of different types might systematically select themselves into such jobs, we will see below that the visual impression made by Figure 4 is left unchanged when we perform a multivariate duration analysis which accounts for unmeasured worker heterogeneity.[10]

5 Results

5.1 Performance Pay, Earnings, and Hours Worked

In Panel A of Table 2 we report the estimates obtained from a regression of log hourly earnings on a performance pay job dummy as well as on a dummy for having part of the current year's pay based on job performance. The results are shown for both the sample of employed workers at the time of the interview and the sample of all workers, employed and unemployed, with positive earnings at interview time. As we move from columns [1] to [2] and [4] to [5], it is fairly clear that the selection of workers with better productive characteristics is a major factor explaining the differences in wages across types of jobs. In fact, all of the wage premia associated with performance pay jobs go away once we control for unmeasured workers characteristics. Still, as we can see in columns [3] and [6], the effect of having received some form

[9] Note that it also possible to back out an estimate of bonus amounts earned in pre-1992 data by using the set of questions on amounts earned in overtime, bonuses, or commissions and the questions on overtime work and pay method. Turning to "missing" all observations in which respondents either worked overtime of report commissions earnings, we get an estimate of bonuses earned. The resulting distribution of the share of bonuses earned is very similar to the one shown on Figure 3.

[10] This, of course, does not control for the fact that job-match heterogeneity, as opposed to worker heterogeneity, is possibly the reason for lower hazard rates out of performance pay jobs.

of performance pay in the current year is positive, even after we control for worker-employer fixed-effects. This is consistent with the model where all the addition compensation over the base wage occurs when high performance is observed. The additional compensation rewards the worker from her increased effort.[11] Next in Panel B we show the impact of performance pay on annual hours worked. We can see that even when we control for worker fixed effects the visual impression suggested by Figure 2 is left unchanged. Workers in performance pay jobs do seem to work more hours. Interestingly, though, once we control for employer-employee fixed-effects, the evidence is much weaker. At first glance it would suggest that year-to-year variations induced by having a performance pay component contributing to the current year's pay are small. In other words, it seems that workers in performance pay jobs work more throughout the employment relationship, not just when they have some form of performance in a given year. Finally, the results in Panel C represent a combination of those in Panels A and B. Controlling for worker fixed-effects, there is some evidence that workers earn more in performance pay jobs, as we can see in columns [2] and [5]. This is not surprising given the zero effect on hourly wages and the positive effect on hours worked. We also find within employer effects which are fairly similar to those in Panel A.

5.2 The Effect of Local Labor Market Conditions

In Table 3 we explore the way in which worker compensation in performance and non performance pay jobs varies with the conditions of the local labor market. This is measured using the unemployment rate in the county of residence. To allow for separate effects of the regressors we interact each of them with the performance pay dummy indicator in all the regressions underlying the results reported in Table 3. As in Table 2 the results are reported for the employed only as well as for all employed and unemployed workers with positive earnings

Looking first at Panel A we can see in columns [1] and [2] as well as columns [4] and [5] that controlling for worker fixed-effects results in increasing the impact of the local unemployment rate (in both types of jobs) on log hourly earnings.[12] More importantly, though, the impact of local conditions is greater in performance pay jobs. There is even evidence that wages respond to outside conditions within employment relationships. That implies that the effect of local conditions on log wage in performance pay jobs is not only generated by workers switching employers, but that some of the impact comes from worker's wages being adjusted from year to year by their employers, depending on the conditions of the market. We can see that, at least when we control for worker fixed-effects, the hypothesis that the impact of the local unemployment rate is the same in both types of jobs is decidedly rejected. The test is less conclusive when we control for worker-firm fixed-effects.

Moving to Panel B, the conclusion is basically the opposite compared to the results on wages reported in Panel A. Hours are now more responsive to local labor market conditions in *non* performance jobs.

[11] It does not necessarily follows that having part of the current year's compensation based on performance pay results in an increase in hourly pay. If the "base" salary component is partly replaced by a performance pay component, total compensation could be left unchanged. The evidence presented in column [3] of Table 2 suggests that performance pay does not simply displace base pay.

[12] See Solon, Barsky, and Parker (1994) for evidence that compositional effects tend to understate the extent of real wage cyclicality in OLS regressions.

Additionally, all tests of equality in the effect of the local unemployment rate have p-values below 5%. We interpret the evidence reported in Panels A and B as strongly suggestive that when firms cannot adjust wages so that they better reflect the worker productivity, they adjust at the hours margin, consistent with the evidence Card (1986) finds using data on airline mechanics. Conversely when wages are flexible relative to the state of the labor market, we find that hours worked do not change much in response to changes in those conditions. In fact, in Panel B we find no evidence that hours worked in performance pay jobs are influenced by local labor market conditions.

Finally, in Panel C of Table 3 we report the results when we change the dependent variable to be the log of total annual earnings. Interestingly, we find little evidence that total earnings are influenced by local labor conditions differently in performance relative to non performance pay jobs. Except perhaps in column [1], all p-values are suggestive that total earnings respond the same way to the state of the local labor market: some firms, the ones in which workers have some performance pay component, adjust wages while the others adjust hours worked. This is consistent with the hypothesis that the labor market is competitive, with workers earning the same expected utility is both types of jobs.

5.3 Hazard Model Estimates

The results presented in Table 3 indicate that workers in performance pay jobs are better shielded from market fluctuations when it comes to hours worked. We would also like to know whether employers adjust at the extensive margin, that is whether workers in performance pay jobs are less likely to be laid off. The Kaplan-Meier estimates plotted in Figure 4 are indicative that employment relationships are more stable in performance pay jobs than in other jobs. What we do here is to check whether this visual impression is robust to the inclusion of controls for worker characteristics.

We estimate a so-called "grouped-data"-or discrete-hazard model which allows for time-varying covariates. Essentially, such a model accounts for the fact that while the underlying process generating employment duration is continuous, the data is not recorded in continuous format. To incorporate time varying covariates we follow Jenkins (1995) and "split" employment spells into yearly observations. Covariates are thus allowed to vary across those observations but they are considered fixed within them. Finally we allow for a flexible (piece-wise constant) baseline hazard as well as unmeasured worker heterogeneity modeled as a Gamma distribution, following (Meyer (1990)).

The results are reported in Table 4 in hazard ratio format. We can see that whether we control for unobserved heterogeneity or not, the qualitative conclusion is basically left unchanged: workers in performance pay jobs are much less likely to see the employment relationship being terminated than workers in other jobs. In fact, correcting for worker unobserved heterogeneity only results in decreasing the hazard ratio.

Combining the results in Table 4 with those in Table 3 where we show that hours are much more responsive to local labor market conditions in non performance pay jobs, we conclude that the evidence is strongly suggestive that employment relationships are more durable in performance pay jobs, even after controlling for unmeasured workers characteristics. In other words, the results are not supportive of a simple selection story by which more productive workers who are selected into performance pay jobs also

happen to be "low-mobility types".

5.4 Unemployment at the Time of the Interview and Performance Pay Jobs

Another way to check whether workers are better shielded from unemployment risks in performance pay is to estimate a model in which the dependent variable is simply a dummy indicator for being unemployed at the time of the interview. One possible advantage of doing so is that it allows us to check the robustness of our results to various parametric assumptions in perhaps a more convincing way than is the case in the hazard model.

The results are reported in Table 5. We use various specifications, including panel data methods. Looking first at columns [1] to [4], we can see that the simple probit results are sensitive to the inclusion of sectorial controls. While in column [1] the estimate shows that being in a pay for performance job reduces the probability of being unemployed by over 3 percentage points, adding industry and occupations controls results in reducing this estimate to less than 1 percentage point. What this suggests is that whether one is in a performance pay job depends to a great extent on the sector in which he works. This is consistent with the view that job characteristics are likely to be an important determinant of compensation, as is suggested in MacLeod and Parent (1999).

If we look at the panel estimates reported in columns [5] and [6], it would appear that controlling for worker unmeasured characteristics actually increases the impact of being in a performance pay job. However, we are somewhat skeptical about the magnitude of the coefficients, at least in the case of the fixed-effect linear regression. While using a linear model allows to absorb worker fixed-effects, the fact that little more than 5% of the sample is unemployed at the time of the interview is problematic for the linear probability model.[13] More fundamentally, it would seem unrealistic to think that we could basically reduce the unemployment rate to close to zero if firms adopted performance pay schemes. The fact that many of them have not done so would indicate that they may not be able to do so.

In sum, the evidence reported in Tables 3-5 is strongly consistent with the notion that when firms can adjust compensation so that it better reflects worker productivity, layoff risks are considerably reduced. In short, performance pay is efficiency enhancing.

5.5 Performance Pay and Annual Earnings Inequality

One of our main results is that firms using performance pay do not adjust hours worked in response to business cycle variations, while firms using non performance pay do. Although performance pay allows for a closer connection between worker productivity and compensation, which results in increased hourly wage inequality in performance pay jobs (Lemieux, MacLeod, and Parent (2006)), it does not necessarily follow that *total* compensation need be more unequal in performance pay jobs relative to other jobs.

To check whether annual earnings are more unequal in performance pay jobs, we show in Figure 5 the evolution of total earnings inequality, as measured by its standard deviation, over the sample period. We

[13] As is well known, the cumulative normal distribution function is roughly linear over a fairly wide range around the median, which means that using a linear model or a probit should not make such a large difference. However, things are different in the tails.

can see in Panel A, where we use only the subsample of workers who are employed at the time of the interview, that inequality in performance pay jobs is very similar to what it is in non performance pay jobs. There is simply no evidence in Panel A that annual earnings are more unequally distributed in performance pay jobs. If we look at the figure in Panel B where we use all workers, employed and unemployed, with positive earnings inequality in total earnings is actually substantially smaller in performance pay jobs. While the contrast between the figures in Panel A and Panel B is striking, given the figure in Panel A, what we see in Panel B is actually what we should expect given our earlier result on hours worked. Workers in performance pay work more hours during the year and face a lower layoff risk. Thus it is not surprising that their annual compensation is subject to less variation relative to workers in non performance pay jobs.

6 Conclusion

A substantial fraction of workers in the U.S. are paid some form of performance pay, a fraction that has increased substantially from the late 70's to the late 90's. We find that workers in performance pay jobs earn more and work a greater number of hours, than workers in fixed wage jobs. Moreover, the average hourly earnings of workers whose pay is partly based on performance are more sensitive to variations in the local unemployment rate than is the case for workers in non performance pay jobs.

At the same time, we find that hours worked are more responsive to local labor market conditions in non-performance pay jobs and that the responsiveness of total earnings is roughly the same in both types of jobs, at least in the PSID data. We then show that the hazard out of employment is considerably lower in performance pay jobs than in other jobs, even after controlling for worker unmeasured characteristics. Next we study the relationship between being unemployed at the time of the interview and whether the worker is in a performance pay job if he is still employed or was in such a job if he is unemployed. Not surprisingly, given our hazard model results, we find a negative impact which we interpret as providing evidence that when firms can adjust pay so that it better reflects productivity, workers are less exposed to lay off risks. Again this result is obtained controlling for worker unmeasured characteristics. This means that our findings are not simply the results of different types of workers in performance pay jobs relative to those working in non-performance pay jobs. While we find strong evidence that workers in performance pay jobs are positively selected, our results suggest that workers moving into performance pay jobs would be less likely to face layoff risks at the cost of being exposed to a more variable pay. Finally we show that while hourly earnings inequality is greater among workers in performance pay jobs, total earnings inequality is actually smaller due to the fact that those who are in performance pay jobs are less likely to be unemployed and thus accumulate more hours over the course of year.

Even though this results are at the individual level, they provide some empirical support for the claims of Weitzman (1983) who argued that profit sharing plans would reduce employment fluctuations and increase employee welfare.[14] What we cannot address is the question of why more firms do not adopt performance pay systems. Given that the use of performance pay is increasing over time, this is consistent with the hypothesis that performance pay systems are costly to implement, as suggested by Brown (1990), and that

[14] See also the recent work of Oyer (2004).

these costs relative to their benefits are decreasing over time.
If future research supports this hypothesis, this would imply that popular theories of wage formation used in macro-economics need to be carefully reformulated. In particular, our results do not support that hypothesis that workers enter into insurance contract with firms, as predicted by the implicit contract theory of Azariadis (1975) and Baily (1974). Workers on standard wage contracts appear to face more risk and lower incomes that workers on performance pay contracts. However, as the management literature has repeatedly observed, the creation of a successful performance pay is system is a difficult and complex task.[15] More work is needed to understand the relationship between these complex systems and over all economic performance.

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[15] See for example the excellent textbook on compensation by Milkovich and Newman (1996).

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Figure 1. Performance Pay Job Incidence

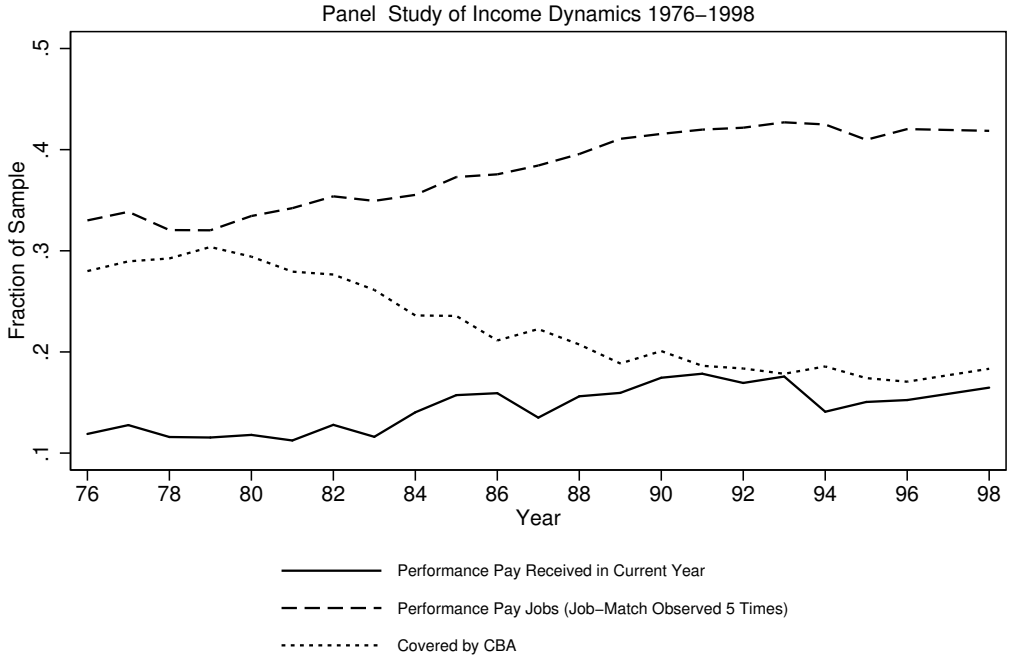


Figure 2. Distribution of Hours Worked

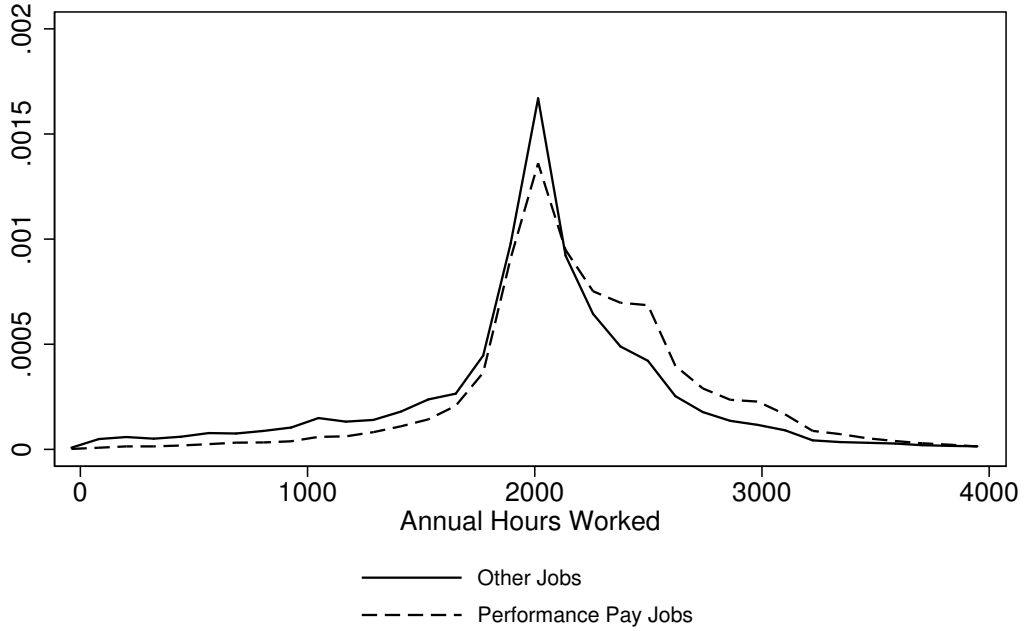
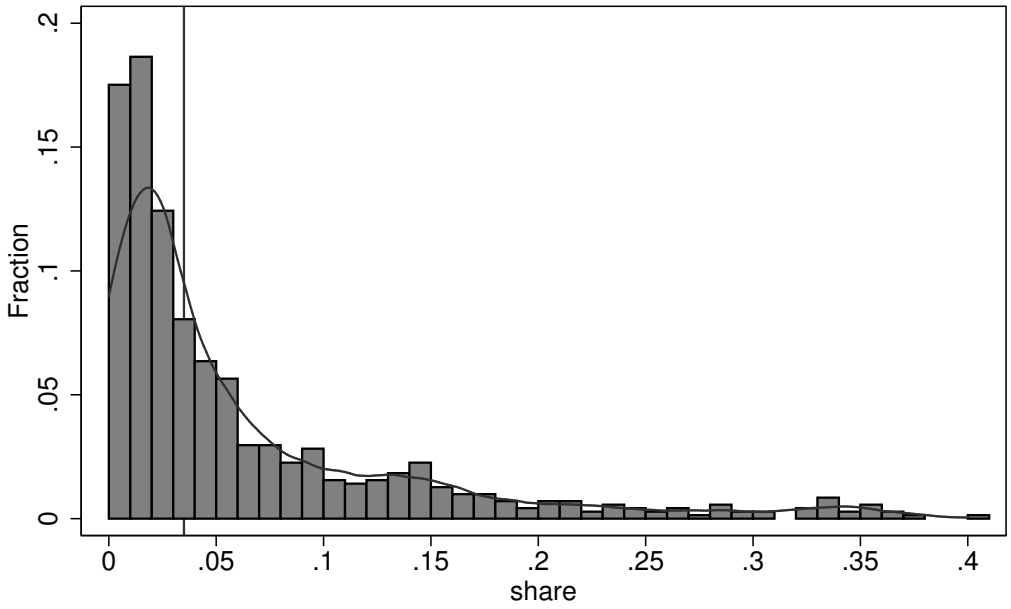


Figure 3. Share of Performance Pay in Total Earnings
PSID 1992–1998



Vertical Line Indicates Median Share (3.5%)

Figure 4. Kaplan–Meier Survivor Function
PSID 1976–1998

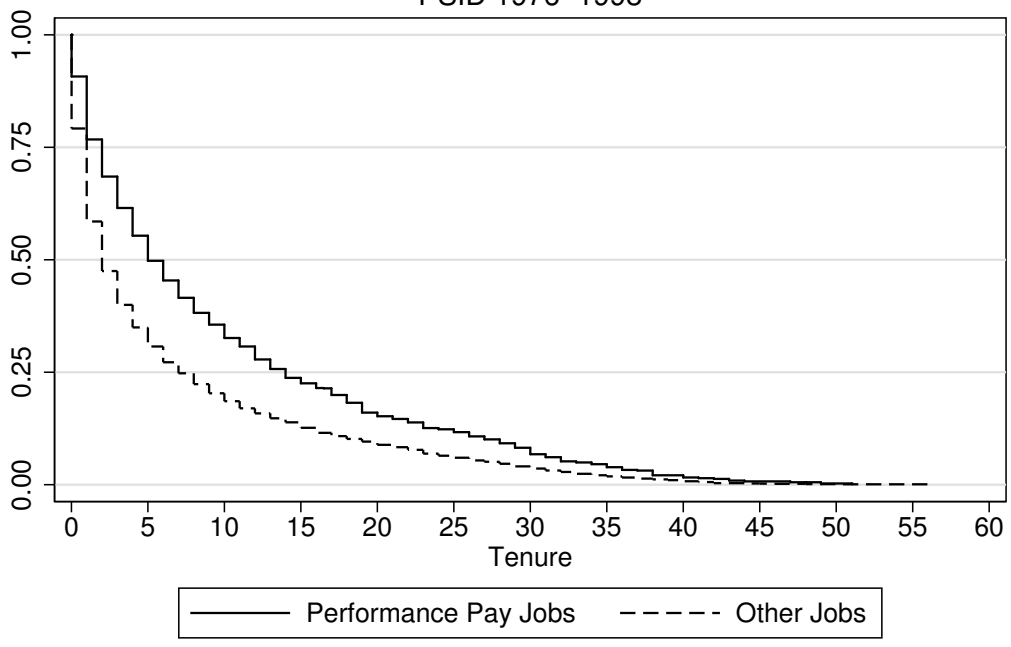
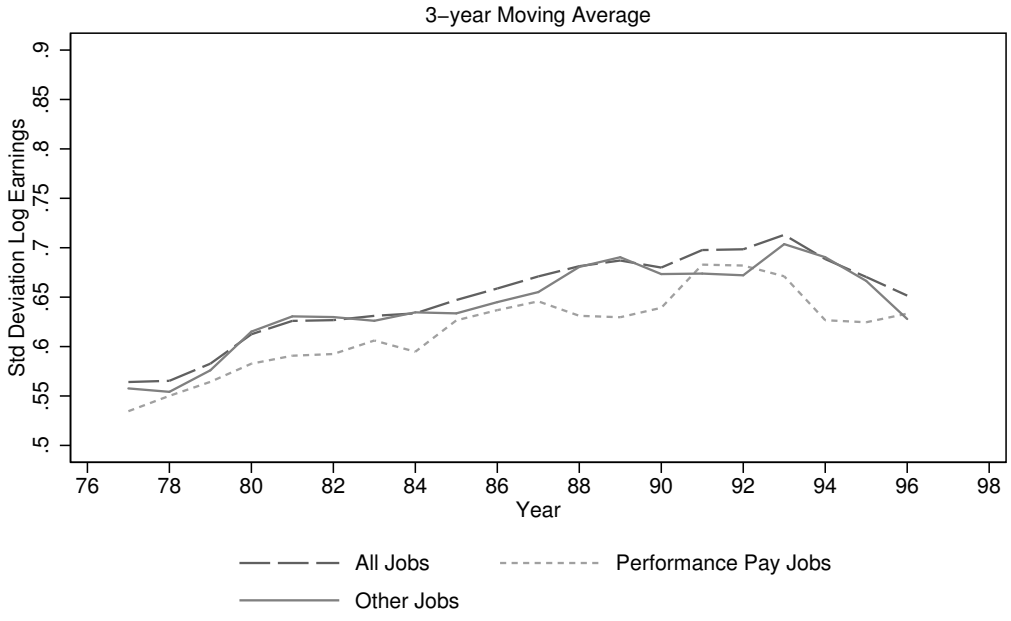


Figure 5. Total Log Earnings Inequality

Panel A: Sample Includes Only Employed Workers



Panel B: Sample Includes Employed and Unemployed Workers

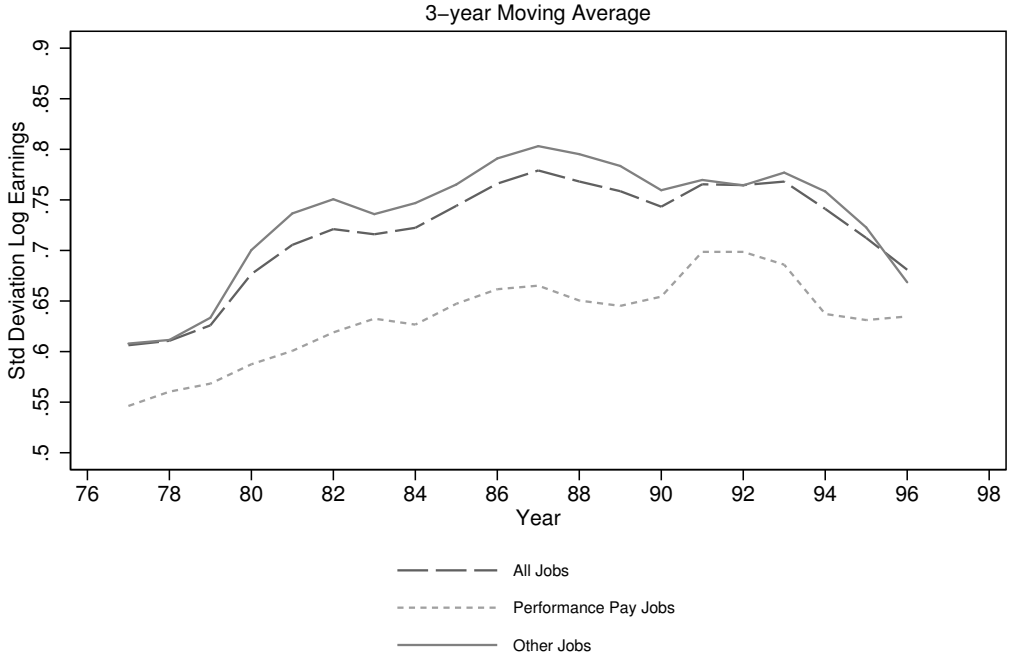


Table 1. Summary Statistics: Panel Study of Income Dynamics 1976-1998

	Non Performance Pay Jobs	Performance Pay Jobs
Average Hourly Earnings ($79)	8.25	10.58
Education	12.49	13.30
Potential Experience	18.58	18.75
Employer Tenure	7.20	9.10
Married	0.74	0.78
Covered by CBA	0.27	0.15
Non White	0.14	0.10
Paid by the Hour	0.62	0.32
Paid a Salary	0.30	0.49
Fraction Unemployed at Interview	0.075	0.017
Annual Hours Worked	2046.59	2256.14
# workers (Tot:3244)	2886	1496
# Job Matches (Tot: 10145)	7993	2152
# Observations (Tot: 32514)	20898	11616

Notes. Temporarily layed off workers are included among the unemployed.
For unemployed workers at the time of the interview, the type of job they have refers to the last job they had. Performance pay jobs are employment relationships in which part of the worker's total compensation includes a variable pay component, (bonus, commission, piece rate). Any worker who reports overtime pay is considered to be in a non performance pay job.

Table 2. The Effect of Pay-for-Performance on Earnings and Hours Worked: PSID, 1976-1998

Panel A: Log Hourly Earnings

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
	[1]	[2]	[3]	[4]	[5]	[6]
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Performance Pay Job Dummy	0.0331	-0.0016	-	0.0329	-0.0014	-
	(0.0153)	(0.0124)		(0.0151)	(0.0120)	
Current Year's Earnings Based Partly on Performance Pay Component	0.1073	0.0593	0.0499	0.1099	0.0630	0.0493
	(0.0155)	(0.0090)	(0.0060)	(0.0154)	(0.0091)	(0.0102)
Unemployed at Interview	-	-	-	0.0754	0.0262	-0.1792
				(0.0257)	(0.0237)	(0.0717)
Number of Observations	30424	30424	30424	32514	32514	32514

Panel B: Annual Hours Worked

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Performance Pay Job Dummy	71.31	61.68	-	70.66	58.03	-
	(15.16)	(15.94)		(15.22)	(15.84)	
Current Year's Earnings Based Partly on Performance Pay Component	78.69	26.54	11.60	81.66	29.85	13.81
	(16.01)	(11.43)	(12.59)	(15.98)	(11.60)	(12.92)
Unemployed at Interview	-	-	-	-677.23	-589.34	-683.86
				(30.80)	(30.30)	(77.55)
Number of Observations	30424	30424	30424	32514	32514	32514

Panel C: Log Annual Earnings

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Performance Pay Job Dummy	0.0674	0.0241	-	0.0688	0.0232	-
	(0.0158)	(0.0142)		(0.0159)	(0.0144)	
Current Year's Earnings Based Partly on Performance Pay Component	0.1426	0.0731	0.0556	0.1457	0.0768	0.0556
	(0.0161)	(0.0092)	(0.0099)	(0.0161)	(0.0094)	(0.0103)
Unemployed at Interview	-	-	-	-0.5314	-0.5103	-0.7386
				(0.0376)	(0.0350)	(0.0837)
Number of Observations	30424	30424	30424	32514	32514	32514

Notes. Performance pay dummy is equal to 1 if the worker's total annual earnings are based partly on performance pay at least once over the course of the employment relationship. Other covariates include polynomials (cubic) in potential experience and tenure, years of completed schooling, the number of times a job-match is observed, and dummies for occupation, industry, race, marital status, collective bargaining, calendar year, and having part of current year's earnings based on performance pay. Standard errors are clustered at the job-match level.

Table 3. The Effect of Local Labor Market Conditions: PSID, 1976-1998

Panel A: Log Hourly Earnings

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
	[1]	[2]	[3]	[4]	[5]	[6]
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Unemployment Rate in County X Non Performance Pay Job	-0.0006 (0.0021)	-0.0044 (0.0017)	-0.0027 (0.0019)	-0.0008 (0.0015)	-0.0056 (0.0017)	-0.0027 (0.0019)
Unemp. Rate in County X Performance Pay Job	-0.0106 (0.0021)	-0.0130 (0.0020)	-0.0075 (0.0025)	-0.0100 (0.0021)	-0.0139 (0.0020)	-0.0082 (0.0025)
P-Value of Test of Equality	0.0000	0.0005	0.1207	0.0001	0.0008	0.0865
Unemployed at Interview	-	-	-	0.1027 (0.0251)	0.0395 (0.0238)	-0.1502 (0.0619)
Number of Observations	30424	30424	30424	32514	32514	32514

Panel B: Annual Hours Worked

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Unemployment Rate in County X Non Performance Pay Job	-7.01 (1.91)	-10.26 (2.45)	-9.78 (2.95)	-9.34 (1.89)	-12.25 (2.49)	-9.77 (2.99)
Unemp. Rate in County X Performance Pay Job	2.32 (2.13)	2.76 (2.86)	-1.05 (3.46)	1.14 (2.17)	0.85 (2.89)	-0.14 (3.60)
P-Value of Test of Equality	0.0010	0.0003	0.0166	0.0003	0.0003	0.0390
Unemployed at Interview	-	-	-	-652.27 (30.68)	-560.79 (30.86)	-628.74 (74.20)
Number of Observations	30424	30424	30424	32514	32514	32514

Panel C: Log Annual Earnings

Sample:	Employed Individuals			All Employed and Unemployed Individuals		
Variable	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer	OLS	Fixed-Effects Within Worker	Fixed-Effects Within Employer
Unemployment Rate in County X Non Performance Pay Job	-0.0051 (0.0018)	-0.0098 (0.0020)	-0.0086 (0.0026)	-0.0072 (0.0019)	-0.0123 (0.0022)	-0.0070 (0.0024)
Unemp. Rate in County X Performance Pay Job	-0.0102 (0.0022)	-0.0143 (0.0023)	-0.0074 (0.0023)	-0.0100 (0.0022)	-0.0158 (0.0023)	-0.0101 (0.0026)
P-Value of Test of Equality	0.0505	0.1118	0.7465	0.2944	0.2467	0.4022
Unemployed at Interview	-	-	-	-0.4864 (0.0386)	-0.4813 (0.0369)	-0.6955 (0.0747)
Number of Observations	30424	30424	30424	32514	32514	32514

Notes. Estimates come from unrestricted regressions in which all covariates are interacted with the performance pay job dummy. Other covariates include polynomials (cubic) in potential experience and tenure, years of completed schooling, the number of times a job-match is observed, and dummies for occupation, industry, race, marital status, collective bargaining, calendar year, and having part of current year's earnings based on performance pay. Standard errors are clustered at the county X year level.

Table 4. Grouped-Data Hazard Model Estimates

Variable	Without Control for Heterogeneity	With Control for Heterogeneity
Bonus Job Dummy	0.4857*	0.4121*
	(0.0133)	(0.0145)
Potential Experience	0.9909*	0.9905*
	(0.0011)	(0.0013)
Education	0.9830*	0.9844*
	(0.0058)	(0.0070)
Union Coverage	0.6993*	0.6755*
	(0.0219)	(0.0253)
Married	0.8359*	0.8313*
	(0.0201)	(0.0236)
Nonwhite	0.9918	0.9821
	(0.0241)	(0.0298)
Unemployment Rate	1.0186*	1.0239*
in County of Residence	(0.0044)	(0.0052)
Industry Dummies	Yes	Yes
Occupation Dummies	Yes	Yes
Year Dummies	Yes	Yes
- Log Likelihood	16387.82	16277.49
LR Test of Zero Gamma Variance	-	220.66
[p-value]		[0.0000]
Number of Job Matches	10145	10145
Number of Interval-Specific Obs.	32514	32514

The parameter estimates are the exponentiated coefficients and thus represent the hazard ratio. *Significantly different from 1 at the 1% level. Worker heterogeneity is modeled using a gamma distribution function while the baseline hazard is estimated as being piece-wise constant using interval-specific dummy variables (9 intervals).

Table 5. Unemployment and Performance Pay Job Probits: PSID, 1976-1998

Dependent Variable: Whether the individual is unemployed at time of interview

Variable	[1]	[2]	[3]	[4]	Random-Effects Probit [5]	Fixed-Effects Linear Regression [6]
Performance Pay Job Indicator	-0.0328 (0.0023)	-0.0142 (0.0014)	-0.0151 (0.0014)	-0.0092 (0.0011)	-0.0367 (0.0025)	-0.0339 (0.0055)
Controls for 1-digit Occupation	No	Yes	No	Yes	Yes	Yes
Controls for 1-digit Industry	No	No	Yes	Yes	Yes	Yes
Fraction Unemployed n Sample: 5.21%*						
Number of Observations; 32514						

Notes. Other covariates include potential experience, years of completed schooling, and dummies for race, marital status, collective bargaining, and calendar year.
All estimates represent marginal probability effects. *Includes workers who are temporarily layed off. The fraction unemployed in the sample if we exclude those is 3.76%.
Standard errors are adjusted for clustering at the worker level.