Does 'Performance Pay' Pay? The Quantitative Effects of Wage-Setting on Firm Dynamics, 2004-2014

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Abstract

Why do firms choose different wage-setting practices and how do they affect firm dynamics over the business cycle? We introduce a novel theory for explaining the take-up of performance pay versus fixed wage contracting across industries. Firms with lower adjustment costs face a greater option value associated with investment before observing actual product demand, whereas firms with higher adjustment costs benefit by locking in contracts in advance to hedge against cyclical uncertainty. Using new panel establishment-level data from the National Compensation Survey, together with the Quarterly Census on Employment and Wages, in the United States between 2004-2014, we document new stylized facts about the relationship between contractual choices and firm dynamics over the business cycle. We test our theory by quantifying the effects of business cycle shocks on both performance pay and fixed wage establishments. Our baseline identification strategy exploits within-establishment deviations in the fraction of performance pay workers and metropolitan changes in employment.

JEL: H2, J21, J22, J31, I2.

Keywords: Keywords: pay for performance, labor market flexibility, business cycle, partial insurance, firm dynamics.

1. Introduction

The new economics of firm dynamics has emphasized intra-industry reallocation and turnover as quantitatively important mechanisms for explaining, and potentially generating, aggregate fluctuations (Foster et al., 2006, 2008; Schuh and Triest, 1998) and productivity differences across countries (Hsieh and Klenow, 2009; Restuccia and Rogerson, 2008). These empirical facts tend to be explained through theoretical models of selection and entry/exit into markets based on productivity (Jovanovic, 1982; Hopenhayn, 1992; Ericson and Pakes, 1995; Melitz, 2003; Asplund and Nocke, 2006). The underlying sources of these cross-sectional productivity differences remains an active area of inquiry. We introduce a new dimension of firm heterogeneity that we show is important for understanding the cyclical dynamics of firms, namely: whether the firm uses predominantly performance pay (PP) or fixed wage (FW) schemes.[1] Specifically, we build a framework for

[1] While we use the terms firm and establishment loosely since the literature generally refers to "firm dynamics", our empirical analysis focuses on establishments as the unit of analysis.

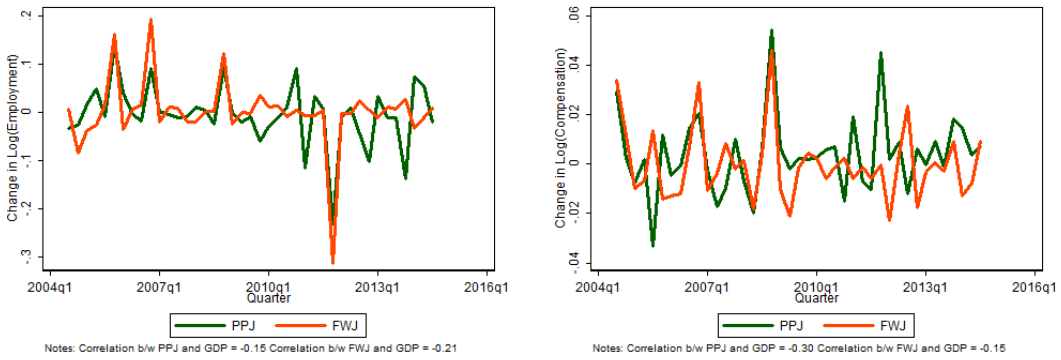

Figure 1: Employment and Compensation in Performance Pay and Fixed Wage Firms, 2004-2014

Notes.–Source: National Compensation Survey. The figures plot the average change in log employment and compensation per employee at an establishment-level between 2004-2014 for each quarter. We weight the change in log employment by the NCS establishment weight and compensation by the employment weight. An establishment is classified as performance pay if 50% of its sampled jobs contain incentive pay (e.g., bonus or commission).

explaining the choice of wage contracts as a strategic decision and document a new set of stylized facts about performance pay and fixed wage firms.

Wage-setting institutions take a variety of forms, ranging from unions (Card, 1986, 1996; Lee and Mas, 2012) to minimum wage laws (Lee, 1999) to performance pay (Lemieux et al., 2012, 2009; Makridis, 2014). We specifically focus on performance pay versus fixed wage contracts at an establishment level because it is an umbrella for a broader variety of organizational features relating to management and human resource policy.[2] Our basic insight is that the relative profitability of using performance pay versus fixed wage contracts depends critically on the degree of adjustment costs that a firm faces. In the presence of larger adjustment costs, firms may find it more profitable to lock-in wage contracts in advance in order to reduce the their exposure over a business cycle. However, firms with lower adjustment costs may prefer to exercise their wait-and-see option value in order to observe how uncertainty unfolds before responding.[3] We use administrative data from the Bureau of Labor Statistics' National Compensation Survey (NCS) and Quarterly Census of Earnings and Wages (QCEW) to study the effects of performance pay on employment and compensation over the business cycle for different types of establishments. While we conduct some robustness to our definition, we classify establishments as performance pay if over 50% of their sampled jobs in the NCS contain incentive pay, otherwise they are classified as fixed wage. At least in the cross-section, fixed wage establishments tend to experience more volatility in employment, but less volatility in compensation per employee (Figure 1).

We document several facts about between performance pay and fixed wage establishments. First, we examine their cross-sectional differences. Using a three-digit industry-level panel from 2004-2014, we show that changes in the fraction of performance pay workers in the economy are associated with greater compensation per employee and value added, but declines in employment and capital intensity. Although performance pay establishments tend to require much less physical capital, they tend to have more information technology

[2]Siegel and Larson (2009) have shown that labor market institutions have large effects on the competitiveness and adaptability of multinational corporations. Using quasinatural for one of the world's largest welding companies, Lincoln Electric, they show that countries with more flexible labor market institutions enhanced Lincoln Electric's ability to adapt to global competitive pressures.

[3]Early work from Oi (1962) treated labor as a quasi-fixed factor arising from fixed hiring and training costs, but our mechanism is very different.

and make more efficient use of their personnel. We do not claim these as pieces of causal evidence, but these facts are consistent with early work from Lazear (2000b) and Lazear (2000a) on the incentive effects of performance pay. Second, the distribution of compensation is skewed much more to the right among performance pay establishments even though their distributions of employment are much more similar.

To examine the cyclical dynamics of these two types of establishments, we exploit local demand shocks proxied with changes in local metropolitan employment. We regress measures of employment and compensation per employee on these local demand shocks interacted with an indicator for whether the establishment is performance pay. We find that performance pay establishments tend to have lower employment volatility and higher compensation per employee volatility, consistent with our theory about performance pay as a strategic decision for firms based on their adjustment costs to capital. We control for a wide array of demographic and compositional factors at an MSA-level to assure that our results are not spurious. We also control for various levels of fixed effects, such as MSA and establishment, in order to assure that our results are not biased by locational sorting or unobserved productivity differences between the two types of establishments. We also examine the robustness of our results using a Bartik-style instrument for local demand shocks.

1.1. Context

Our paper is most closely related to two key veins of literature. The first is a theoretical and empirical literature on performance pay that builds upon seminal contributions from Lazear (1986). Starting with Lazear (2000b) and Lazear (2000a), many papers have documented the incentive effects of piece-rate pay in relatively routine types of job tasks: Paarsch and Shearer (1999), Paarsch and Shearer (2000), and Shearer (2004) on tree planters, Bandiera et al. (2005) on strayberry pickers, and Griffith and Neely (2009) on team work.[4] Companion work of ours emphasizes the impact of performance pay on the allocation of time among employees (Makridis, 2015b), aggregate inequality (Lemieux et al., 2009; Makridis, 2014), work place practices and job engagement (Makridis, 2015a), and partial insurance over the business cycle (Makridis and Zhang, 2015). Our paper is most closely related and consistent with individual-level data from the Panel Study of Income Dynamics detailed in Lemieux et al. (2012) and Lemieux et al. (2014) on the autocovariance of earnings and hours among performance pay and fixed wage workers. Performance pay contracts provide employees with greater flexibility over the business cycle.

The second is a literature on firm dynamics over the business cycle, which was catalyzed by seminal work by Davis and Haltiwanger (1992). While we cannot separately distinguish between hires and fires since we only observe overall employment, we focus instead on the choice of performance pay as a strategic decision based on an establishment's adjustment costs. Our paper is most closely consistent with several recent papers that have emphasized heterogeneity in the cyclical dynamics of different firms. For example, Kahn and McEntarfer (2014) uses data from the Census Bureau's Longitudinal Employer Household Dynamics (LEHD) program to examine the behavior of firms with high versus low wage workers over the business cycle, finding that low-paying firms tend to be stickier during recessions. Counter to the canonical "cleansing" effect

[4]Separate, but related, is an emerging literature on the economics of management and human resource policies; see Bloom et al. (2014) and Ichniowski and Shaw (2003) for surveys, respectively.

of recessions, they find that workers will flock to low-paying establishments during recessions. Similarly, Fort et al. (2013) uses data from the Census Bureau's Business Dynamics Statistics (BDS) from 1981-2010 to examine the behavior of firms with different ages and sizes over the business cycle, finding that young and small business were especially hit by large employment declines and job destruction during the Great Recession. At a more conceptual level, our paper also builds on early work about labor demand (e.g., Clark and Freeman (1980)) and wage bargaining under uncertainty (Hall and Lilien, 1979; Baily, 1974), as well as the complementarity between capital and labor (Sakellaris, 2004; Cooper and Haltiwanger, 2005; Hamermesh, 1989).

1.2. Roadmap

The structure of the paper is as follows. Section 2. establishes a theory for explaining the choice of performance pay contracts as a strategic decision for an establishment. Section 3. describes our data and documents some new facts about performance pay and fixed wage establishments. Section 5. examines the cyclicality of employment and compensation among these two types of establishments. Section 6. concludes.

2. Conceptual Model

What are the forces that motivate firms to designate jobs as performance pay or fixed wage? Why do some industries have more performance pay than others? What is the link between performance pay and the nature of on-the-job tasks? Motivated by the incentive effects of performance pay discussed in Section 1., the answers to these questions are important for understanding the heterogeneous performance and cyclical dynamics of firms with different compensation schemes.

Before delving into our theory for explaining these differences, we first document the incidence of performance pay across industries and occupations (Figure 2). While all industries and occupations, with the exception of leisure/hospitality and service, respectively, have at least some combination of performance pay and fixed wage, the incidence of performance pay is much more heavily skewed in some than others. For example, in the finance industry, nearly 70% of employees are performance pay, whereas only about 35% of employees are in construction. Similarly, nearly 70% of legal practitioners are performance pay, whereas only about 25% of educators are performance pay.

We view performance pay as a strategic decision that is both technological and environmentally constrained. Much like "management as a technology" (Bloom et al., 2015) from the emerging new economics of management literature (Bloom et al., 2014), performance pay schemes may offer improved firm outcomes, but the returns vary based on the underlying environment that a firm operates within. Our objective in this section is to sketch a conceptual framework that explains the role of these environmental factors.

Our theory is that adjustment costs play a major role in determining the returns to offering incentive pay. Consider two firms who vary only based on their adjustment costs to labor and/or capital inputs. The firm with greater adjustment costs will experience more sluggish investment since the threshold for undertaking an investment is greater—each dollar of investment will require a greater return in order to break even.

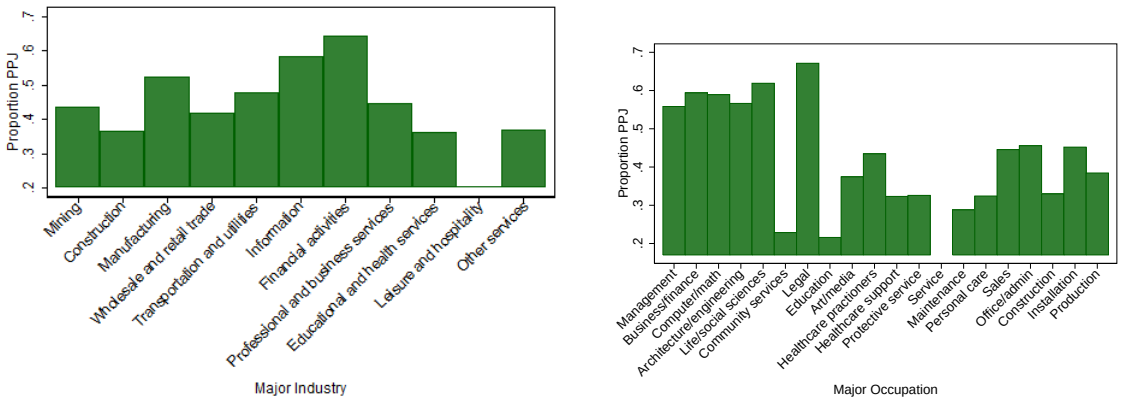

Figure 2: Fraction of Performance Pay, by Major Industry

Notes.–Source: National Compensation Survey. The figures plot the fraction of performance pay employees by major industry and occupation (weighted by the employment size of an establishment).

Suppose adjustment costs to labor represent bargaining with unions and firms are deciding whether or not to adjust wages in response to an anticipated stochastic realizations on output from a looming business cycle. The option value of waiting and seeing early warning signs of the recession's impact on product demand and subsequently adjusting the compensation schedule for employees may or may not be optimal (Dixit and Pindyck, 1994; Abel et al., 1996). Specifically, if the adjustment costs are sufficiently large, firms may prefer to simply agree on wages in advance of the business cycle before any warning signs of the recessionary impact have materialized simply due to the size of the inactivity region associated with the stochastic output realizations.[5]

In our next draft, we will produce a variant of Abel and Eberly (1996) that features a discrete choice between the type of wage contract and, therefore, different conditional choice-specific value functions. We anticipate that this micro-founded form of wage rigidity will help match a number of features of business cycles that traditional real business cycle models have not been able to match.

3. Data and Measurement

3.1. Sources

Our paper combines two major sources of information in order to identify the importance of labor contracting in firm flexibility, namely the National Compensation Survey (NCS) and the Quarterly Census of Employment and Wages (QCEW) spanning between 2004-2014. To our knowledge, we are the first to assemble a comprehensive database containing information on contracts and firm-level data across the U.S. We also use data from the 2005-2014 American Community Survey (ACS) waves in order to control for a number of demographic and compositional changes at an MSA-level, including: race, age educational attainment, gender, bins for the fraction of the population within certain age brackets, and bins for the fraction of the

[5]We do not omit the possibility of additional reasons firms may not want ot reduce nominal wages. Survey evidence on European companies suggests that one reason is to avoid the adverse effects on workers' morale and effort (Du Caju et al., 2015).

population within major industries and occupations. The presence of inter and intra -state mobility makes it important to control for time-varying changes in the composition of the population.

Establishments in the NCS tend to be in the sample for 5 years (20 quarters), providing us with a relatively large panel to track within-establishment outcomes during the Great Recession. While the panel component of the survey does not allow us to observe establishments throughout their entire history, we are able to compute employment growth rates within establishments within the years that they are observed. We are also able to compute the growth of establishments within counties by taking the difference between new establishments in period t and a metropolitan area m and the closing establishments, divided by the sum of half times the establishments in $t-1$ and t. We also are able to observe the establishment's EIN, the 9-digit Federal identification number used by the IRS to identify legal entities; a single firm may have multiple EINs. While the survey represents a cross section of the jobs within each establishment, and thus it does not capture all the jobs, jobs are chosen at random and we believe this provides at least a representative glimpse of the most pervasive jobs in the U.S. economy.

Unless otherwise specified, we weight observations by an employment weight, which is a function of an establishment weight and the establishment's number of employees. Whereas the establishment weight helps make the results representative of the average establishment, the employment weight makes the results representative for the average employee by giving larger establishments more weight. We view the latter as the preferred strategy since most small establishments tend to have weaker incentives (e.g., see Bloom and Van Reenen (2007) on the relationship between managerial quality and firm size) and much less adjustment over the business cycle. However, we still report results with the establishment weight. Generally speaking, our results are less precisely estimated with the establishment weight.

3.2. Descriptive Statistics

Table 1 describes some basic summary statistics. Our data is uniquely defined by an establishment, quarter, and year located in a metropolitan area. Performance pay establishments tend to have approximately 17 employees paid close to \$30/hour, whereas fixed wage establishments tend to have approximately 14 employees paid close to \$22/hour. Given how the NCS surveys jobs, there is not much variation in weeks and hours worked because these requirements are tied to the underlying job, which does not necessarily change much year-to-year. Nonetheless, employees in performance pay establishments tend to work slightly more than their counterparts, consistent with companion work on the incentive effects of pay on time use (Makridis, 2015b). The standard deviation of employment is very large and largest among performance pay establishments. However, interestingly, fixed wage establishments have greater standard deviations of weeks and hours worked, potentially since they incur more lay offs.

4. New Business Cycle Facts on Contractual Choice

The purpose of this section is to document a series of stylized facts about the relationship between contract form and business cycle shocks. Throughout the section, we will refer to establishments as performance

Table 1: Descriptive Statistics

	Fixed wage establishments					Performance pay establishments				
	2004-2006	2007-2008	2009-2010	2011-2012	2013-2014	2004-2006	2007-2008	2009-2010	2011-2012	2013-2014
Means										
Establishment employment	14.9	14.8	14.1	13.9	14.4	17.6	16.9	16.8	17.6	17.2
Compensation per employee	21.5	21.4	21.3	24.1	24.2	26.3	26.8	29.3	29.0	32.0
Weeks worked	50.7	50.8	50.9	51.0	51.1	51.6	51.5	51.6	51.5	51.6
Hours worked	32.2	32.7	31.9	32.6	33.2	35.9	36.0	35.5	36.3	37.1
Standard deviations										
Establishment employment	2162.8	2109.3	2252.0	2303.3	2520.1	2891.5	2804.8	3160.3	3103.7	3178.9
Compensation per employee	17.1	17.6	18.4	18.3	19.6	22.9	23.8	23.9	25.6	27.8
Weeks worked	4.2	4.2	4.1	3.8	3.6	2.1	1.9	1.7	1.6	1.7
Hours worked	7.1	7.0	7.0	7.1	7.1	5.3	5.1	4.8	4.5	4.3
Observations	58707	53170	61501	52798	39980	56910	50810	50913	39432	27967

Notes.–Sources: National Compensation Survey. Employment is the number of employees; compensation per employees is the average wage per employee. Both weeks worked and hours worked do not have significant variation because they are defined at the job-level within an establishment and these jobs do not necessarily change much over time. Performance pay establishments are those whose share of performance pay compensation is in the top 50% of establishments within the same quarter-year-MSA pair.

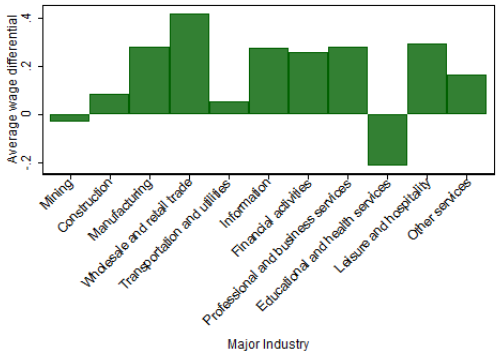

Figure 3: Average Wage Differential, by Major Industry

pay based on whether an establishment j has over half of its employees on pay for performance contracts. While we realize that performance pay is a continuous measure, our primary aim is to distinguish between establishments that use more versus less performance pay and how contract form is causally related with their dynamic behavioral responses to business cycle shocks. We contain robustness checks in the Appendix where we vary the threshold.[6]

4.1. Cross-sectional Differences

Section 2. documented in the incidence of performance pay. Along similar lines, we now document the performance pay premium, or average log compensation differential, across industries (Figure 3). The premium is largest in wholesale/retail trade, amounting to nearly 0.4 log points (50% difference), whereas it is lowest in construction, amounting to a little under 0.1 log points. The only industries where the differential is negative is mining and education where incentive pay has not had much empirical success. While performance pay has been successful in some educational settings (Lavy, 2009; Muralidharan and Sundararaman, 2011), these have generally been narrow, experimental settings.

We subsequently turn to examining the associations between changes in different outcomes with changes in the fraction of performance pay workers at a three-digit industry-level, quarterly disaggregation between 2004-2014. Specifically, we examine how changes in performance pay are associated with changes in log compensation per employee, value added, employment, and capital intensity. By first-differencing these industry averages, we remove all the time-invariant heterogeneity that might be correlated with industry-level outcomes. We have also examined the residualized variables controlling for demographic and compositional differences at a three-digit industry-level and the results are not qualitatively affected.

Figure 4 highlights several interesting facts. While increases in the fraction of performance pay workers are associated with increases in compensation and value added, they are associated with declines in employment and capital intensity. Although far from causal, the first two points are consistent with evidence that the

[6]There is no alternative other than taking a stand on a definition and providing the results consistent with the definition. Analogously, the vast literature on the skill premium defines skilled workers as those with college degrees. Such a classification is equally as arbitrary, but it is still useful for thinking about a range of phenomenon, such as capital-skill complementarity (Krusell et al., 2000).

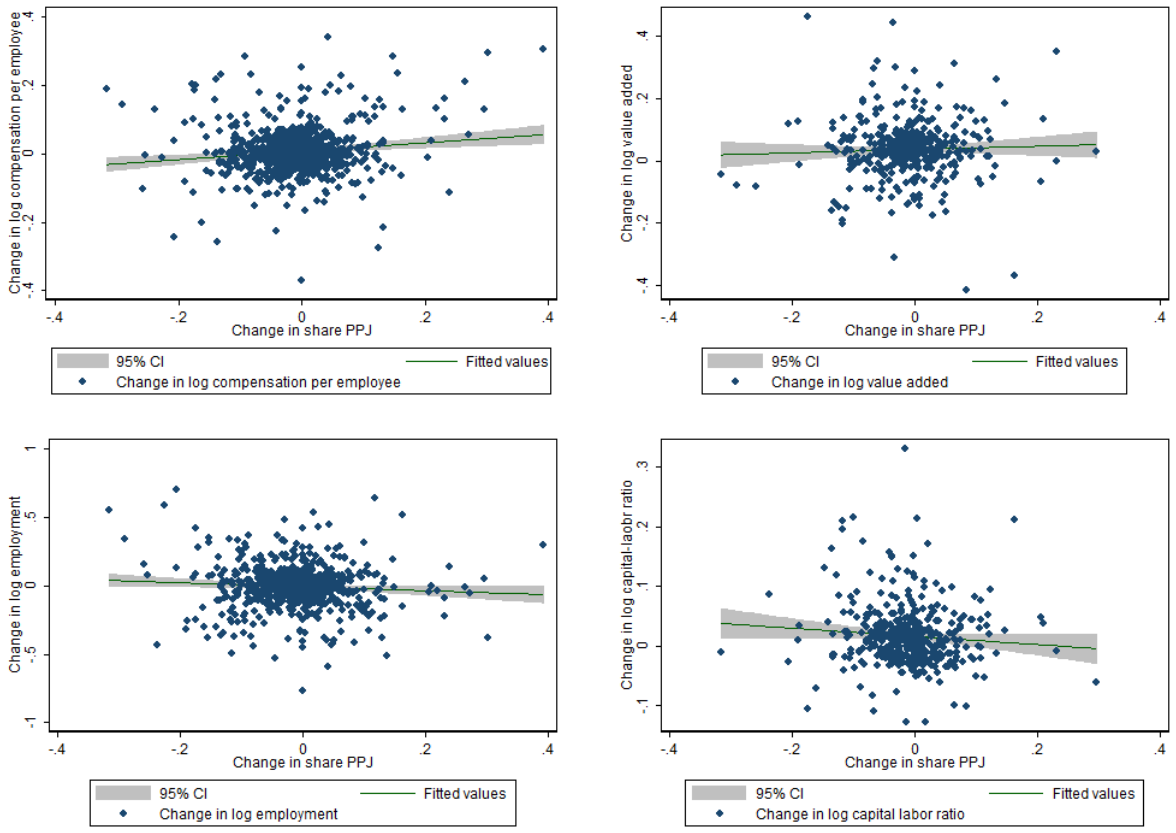

Figure 4: Changes in Industry-level Performance Pay and Economic Activity

Notes.–Sources: National Compensation Survey and Bureau of Economic Analysis. Capital intensity is defined as the ratio between capital and labor (employees).

incentive effects of performance pay raises productivity (Lazear, 2000a) even after controlling for selection through first-differencing. The second two points are new pieces of evidence that are consistent with our theory that the returns to performance pay are lower when adjustment costs (e.g., proxied via capital intensity) are higher. The fact that increases in performance pay are negatively associated with employment is also consistent with the productivity benefits—more can be done with less.

4.2. The Establishment-level Distribution of Employment and Compensation

We begin by characterizing the distribution of employment and compensation based on contractual status. Figure 5 shows that the distribution of average compensation is much more heavily skewed to the right for performance pay establishments, whereas there is more overlap under employment.

We now turn to characterizing the cross-sectional distribution of employment and compensation aggregates across establishments with different contracting environments over the business cycle. Recent literature on the empirical regularities of earnings fluctuations (Guvenen et al., 2015, 2014) and firm dynamics (Davis and Haltiwanger, 1992; Foster et al., 2008) over business cycles has emphasized significant cross-sectional

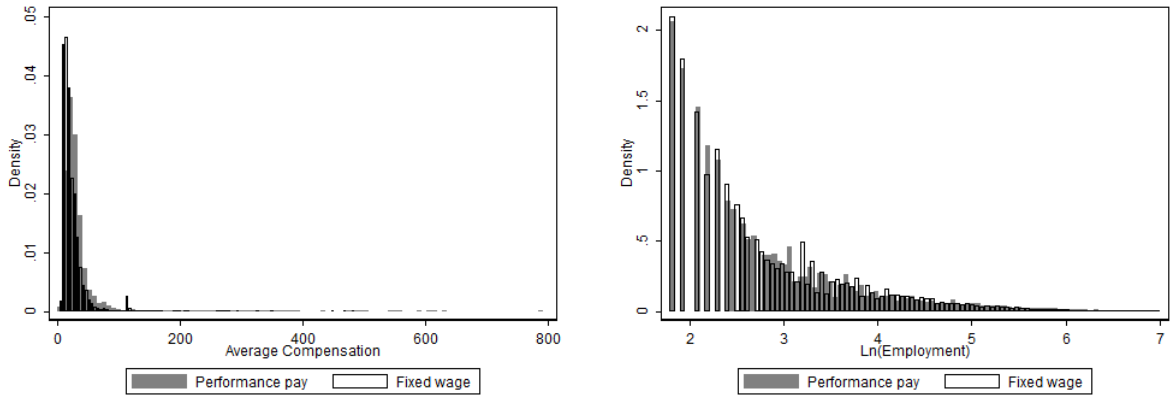

Figure 5: Distribution of Employment and Compensation, by Contract

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Figure 6: Distribution of Employment and Compensation over the Business Cycle

Notes.–Sources: National Compensation Survey. The figures plot the Kelly skewness of markups and standard deviation of log markups where markups are defined as the ratio of sales to cost of goods sold. Kelly skewness is defined as $K = (P90 - P50)/(P90 - P10) - (P50 - P10)/(P90 - P10)$ where the PXX denotes the percentile of the outcome variable and captures dispersion between the top and bottom tails of the distribution.

heterogeneity and skewness (e.g., deviations from log-normality). A robust measure of skewness, known as Kelly's skewness, has recently been applied in business cycle analysis (Salgado et al., 2015) and measures the difference between the difference between the bottom and top tails of the distribution. To represent our findings, we compute measures of Kelly skewness of the growth in mean and standard deviation of employment and compensation (Figure 6).[7]

5. The Cyclical Dynamics of Performance Pay and Fixed Wage Establishments

5.1. Identification

Our primary objective is to understand how heterogeneity in wage contracts affects firm dynamics. While our earlier evidence illustrated differences between performance pay and fixed wage firms, we now turn to characterizing the cyclicality of these firms earnings and employment dynamics through regressions of the form

$$\ln(Y_{jmt}) = \beta X_{jmt} + \gamma \Delta \ln(E_{mt}) + \pi PP_{jmt} + \delta \left[\Delta \ln(E_{mt}) \times PP_{jmt}\right] + \phi_j + \lambda_t + \epsilon_{jmt} \tag{1}$$

where Y denotes the outcome variable of interest (employment and compensation), X denotes controls,

[7] To interpet Kelly skewness, consider a case where it equals .1. Since $K = (P90 - P50)/(P90 - P10) - (P50 - P10)/(P90 - P10)$, it measures the difference between the two proportions, and the sum must equal 1. Thus, when $K = .1 = a - b$, where a and b are the two proportions, respectively, then $a = .55$ and $b = .45$, meaning that 55% of the variation is accounted for by the top part of the distribution (90/50).

E denotes local MSA-level employment, PP denotes an indicator for a performance pay establishment, and ϕ and λ are fixed effects on establishment and quarter. Our primary parameter of interest, δ, characterizes the percent change in Y among performance pay establishments, relative to their fixed wage counterparts, based on a percent change in local productivity shock on performance pay firms. π governs the performance pay premium, which has been the subject of attention in recenter literature from the individual's perspective (Lemieux et al., 2009, 2012; Makridis, 2014). We consider Equation 1 under various fixed effects specifications with our preferred specification including both quarter and establishment fixed effects.

We test two main hypotheses from Equation 1 . First, $\pi > 0$ when the dependent variable equals either employment or compensation since PP establishments tend to not only maintain greater flexibility, but also induce greater engagement and learning among their employees (Makridis, 2015a,b). Equation 1 allows us to quantitatively test whether the "wait-and-see" option value associated with PP contracts could be less profitable than the greater advance certainty offered by FW contracts. We are able to disentangle the employee versus employer components of the PP premium through the inclusion of both occupation and work level fixed effects. Specifically, we can compare the employment and compensation outcomes between PP and FW establishments that have similar occupational tasks and work level requirements within their establishments in order to purge the contribution of the employee-side net benefits of PP in contributing to aggregate establishment outcomes. Second, $\delta < 0$ ($\delta > 0$) when the dependent variable is employment (compensation) since our theoretical model predicts that PP establishments have less volatility in employment, but more in compensation. In other words, PP establishments are more flexible with regards to their pay and intensive margin of labor supply, relative to their FW counterparts, so they are more likely to simply raise the hours of their existing employees than hire additional ones. During recessions, they can simply reduce the compensation of their employees, rather than laying them off, whereas a FW establishment may be forced to because of its pre-negotiated wage contracts that it can no longer afford.

The primary identification challenge associated with Equation 1 is the presence of unobserved heterogeneity. Establishments and geographies vary for a variety of reasons. For example, PP establishments might cluster in particular geographic areas that consist of more productive labor markets, making them able to grow quicker. Even more problematic is the fact that PP establishments likely attract more productive employees because of their self-selection into more ambitious and/or competitive environments (Lazear, 1986). Similarly, given that firms own a great deal of assets in real estate (Chaney et al., 2012), and metropolitan areas were heterogeneously affected by the Great Recession based on their exposure to subprime loans (Mian and Sufi, 2009, 2011), we might also be omitting housing shocks that are not absorbed through our controls. We address these concerns by removing the time-invariant sources of heterogeneity across metro areas and establishments, which we examine sequentially to gauge the severity of omitted variables and selection problems.

Despite our inclusion of granular fixed effects, there are potentially two additional endogeneity problems. The first endogeneity problem arises from the fact that establishments strategically might choose their wage-setting practices over time for reasons unrelated to the business cycle. For example, if changes in management are correlated with the business cycle, then we might fall into the classic "reflection problem" Manski (1993) that has challenged the literature on firm dynamics over the business cycle (Schuh and Triest, 1998). The

bias would move in the same direction as the aforementioned selection effects.

While traditionally selection effects are assumed to be time-invariant (Lazear, 2000a; Abbring et al., 2003b,a), we examine this possibility in two ways. (a) We draw on the World Management Survey (Bloom and Van Reenen, 2007; Bloom et al., 2012) matched with Compustat in order to examine the cyclicality of management practices by regressing the standardized management score on state-level changes in employment and GDP. (b) We allow for selection to be time-varying by introducing two sets of instrumental variables. Specifically, we exploit the fact that greater labor market distortions make it more costly for firms to compensate their employees to achieve the same level of output (Makridis, 2014) and introduce supply-side shifters as instruments, including union density and tax progressivity. Following Jakobsson (1976) (and recently applied by Hong et al. (2015)), we measure tax progressivity as $\tau = (1-\overline{\tau})/(1-\hat{\tau})$, where $\overline{\tau}$ and $\hat{\tau}$ are the top marginal income and average income tax rates, respectively, and our measures of unionization are membership and coverage density from Hirsch et al. (2001) at an industry, occupation, and industry -level. Since labor markets with greater distortions will reduce the returns to labor supply among employees by compressing the distribution of pay and adding transaction costs to firms' wage-bargaining, it becomes more difficult for firms to compensate their employees to put in high effort, thereby reducing their demand for labor services. The exclusion restriction requires that unobserved shocks to employment and compensation are uncorrelated with labor markets with changes in distortions after controlling for time-invariant factors, an assumption that has been tested in companion work (Makridis, 2015a,b).

Second, employment shocks might reflect a variety of different factors, ranging from technological improvements to changes in demand. If technology within a locality is changing and correlated with changes in employment, then Y might change for reasons unrelated to their contractual choice and the business cycle. To deal with the endogeneity of local demand shocks, we use the Bartik (1991) shift-share approach that has been commonly employed in recent empirical papers (Blanchard and Katz, 1992; Autor and Duggan, 2003; Notowidigdo, 2013; Greenstone et al., 2014). To do this, we interact the fraction of employees within an MSA and time period pair in industry k with the national change in employment in industry k, i.e.

$$\hat{\theta}_{kmt} = \Delta \ln(E_{kt}) \times (E_{kmt}/E_{mt})$$

where E_{kmt} denotes employment in industry k, MSA m, and period t, E_{mt} denotes total employment overall industries in MSA m and period t, and $\Delta \ln E_{mt}$ is the change in employment. Our identifying assumption is that unobserved shocks to industry shares at the national level are uncorrelated with MSA-level supply shocks, i.e. changes in national employment shares provide demand-induced exogenous variation to metropolitan employment.

5.2. Main Results

Table 2 documents the results associated with Equation 1. When our dependent variable is log employment, we find a conditional performance pay premium of 0.47, meaning that performance pay firms tend to have 47% more employees than their fixed wage counterparts. Moreover, a 1% rise in local demand is associated with

a very imprecise 0.12% decline in employment among performance pay establishments. Adding year/quarter and state fixed effects, as well as MSA fixed effects, only marginally affects the relevant point estimates, suggesting that selection into different geographical areas plays a minor role. However, when we include establishment fixed effects, the performance pay premium drops to 0.03, indicating that after controlling for time-invariant differences performance pay establishments are only associated with 3% higher employment. The interaction remains negative and more statistically significant than before. The interpretation of the negative interaction is that performance pay establishments raise employment less relative to their fixed wage counterparts—put differently, fixed wage establishments raise employment more over the business cycle, consistent with our descriptive evidence of greater employment volatility.

Turning attention to the results when our dependent variable is log compensation per employee, we find a large performance pay premium and a positive coefficient on the interaction. Again, as we add geographical fixed effects, the coefficients are only marginally affected, but the inclusion of establishment fixed effects causes the premium to decline to 0.04 and the interaction to decline to 0.02. The positive interaction has the interpretation that compensation is more volatile among performance pay firms, which is the other component of our theory of performance pay as a strategic choice. Given that a great deal of heterogeneity exists even within narrowly defined industry and/or geographical units (Foster et al., 2008; Syverson, 2004), the large performance pay premium is informative—it means that there are many differences that are related with the underlying contracting environment. Even when controlling for establishment fixed effects, the premium is positive, suggesting that there is still heterogeneity within the set of performance pay establishments when it comes to differences in employment or compensation.

5.3. Robustness Exercises

5.4. Alternative Weights

We also present results associated with our main cyclicality regressions under an alternative establishment-level weight. Table 3 documents these results. The qualitative results generally hold up, but the estimates are much less precisely estimated because it does not provide more weight to larger firms that tend to have adjustment over a business cycle and more variation in performance pay jobs.

5.5. Managerial Changes and Recessions

One concern is that unobserved shocks to firm outcomes (e.g., employment or compensation) are correlated with changes in performance pay. For example, if firms under major managerial changes during recessions and those changes affect the prevalence of performance pay, then our coefficients could be biased. To examine the possibility, we draw on data from the World Management Survey (WMS). While Bloom and Van Reenen (2007) provide many more details on the survey tool, the WMS is a comprehensive, double-blind survey that scores companies on their management practices across a number of dimensions. We use these measures to run regressions of management scores in manufacturing plant i in state s and year t of the form

Table 2: Firm Dynamics and Performance Pay

	Dep. var. = Ln(Employment)				
	OLS	OLS	OLS	OLS	Bartik IV
Panel A					
Δ Employment	.01	-.42*	-.25	.01	.01
	[.19]	[.22]	[.22]	[.02]	[1.22]
Performance pay	.47***	.44***	.45***	.03***	.45***
	[.09]	[.08]	[.08]	[.01]	[.03]
Employment × PP	-.12	-.26	-.29	-.06	-.33
	[.51]	[.50]	[.48]	[.03]	[1.58]
R-squared	.01	.03	.06	.99	.06
Sample Size	375799	375799	375799	375602	375799
	Dep. var. = Ln(Compensation/Employee)				
Panel B					
Δ Employment	-.11	-.10	-.05	.00	.02
	[.07]	[.08]	[.03]	[.01]	[.26]
Performance pay	.34***	.34***	.34***	.04***	.34***
	[.02]	[.02]	[.02]	[.01]	[.00]
Employment × PP	.13	.15**	.14**	.02	.21
	[.08]	[.07]	[.07]	[.01]	[.19]
R-squared	.09	.12	.16	.99	.16
Sample Size	375799	375799	375799	375602	375799
Year/Qtr FE	No	Yes	Yes	Yes	Yes
State FE	No	Yes	No	No	No
MSA FE	No	No	Yes	No	Yes
Establishment FE	No	No	No	Yes	No
Demog. Controls	Yes	Yes	Yes	Yes	Yes

Notes.–Sources: National Compensation Survey, Quarterly Census of Earnings and Wages, and American Community Survey. The table reports the regressions associated with log establishment employment and compensation on the difference in log employment at an MSA-level, an indicator for performance pay, and their interaction at a quarterly frequency. Performance pay establishments are tagged on the basis of having at least 50% of their employees covered with performance pay contracts. Controls include: age, fraction of black/white/asians, male, and educational attainment within an MSA. We consider various fixed effects specifications. All standard errors are clustered at the establishment-level.

Table 3: Firm Dynamics and Performance Pay with Establishment Weight

	Dep. var. = Ln(Employment)				
	OLS	OLS	OLS	OLS	Bartik IV
Panel A					
Δ Employment	.05	.05	.10	.02	.50
	[.16]	[.17]	[.14]	[.03]	[.98]
Performance pay	-.01	.01	-.00	.03	-.00
	[.08]	[.07]	[.06]	[.02]	[.01]
Employment × PP	-.44*	-.48**	-.40*	-.15***	-.59
	[.24]	[.23]	[.21]	[.04]	[.75]
R-squared	.00	.03	.10	.97	.10
Sample Size	375799	375799	375799	375602	375799
	Dep. var. = Ln(Compensation/Employee)				
Panel B					
Δ Employment	.09	-.02	.05	.00	.26
	[.19]	[.20]	[.13]	[.01]	[.44]
Performance pay	.26***	.27***	.30***	.04***	.30***
	[.04]	[.03]	[.02]	[.01]	[.01]
Employment × PP	-.12	-.06	.01	.04	.00
	[.17]	[.17]	[.14]	[.03]	[.33]
R-squared	.07	.12	.25	.98	.25
Sample Size	375799	375799	375799	375602	375799
Year/Qtr FE	No	Yes	Yes	Yes	Yes
State FE	No	Yes	No	No	No
MSA FE	No	No	Yes	No	Yes
Establishment FE	No	No	No	Yes	No
Demog. Controls	Yes	Yes	Yes	Yes	Yes

Notes.–Sources: National Compensation Survey, Quarterly Census of Earnings and Wages, and American Community Survey. The table reports the regressions associated with log establishment employment and compensation on the difference in log employment at an MSA-level, an indicator for performance pay, and their interaction at a quarterly frequency. Performance pay establishments are tagged on the basis of having at least 50% of their employees covered with performance pay contracts. Controls include: age, fraction of black/white/asians, male, and educational attainment within an MSA. We consider various fixed effects specifications. All standard errors are clustered at the establishment-level.

$$\ln(M_{ist}) = \beta X_{ist} + \gamma \Delta \ln(E_{st}) + \mu_s + \lambda_t + \epsilon_{ist}$$

where M denotes management practices, X denotes a vector of controls, E denotes employment, and μ and λ are fixed effects on state and year. Even without the use of any controls and/or fixed effects, the coefficient on the log employment change is statistically and economically significant (0.002 and 0.003 with p-values of 0.566 and 0.359) when our dependent variable is the overall management index and the people index, respectively. These results are not surprising since management tends to be sticky due to organizational challenges associated with adjusting work place practices, but they provide strong evidence against the endogeneity concern.

5.6. Reverse Causality

[TBD: add in instrumental variables results]

6. Conclusion

Recent empirical and theoretical evidence has pointed towards the importance of management (Bloom and Van Reenen, 2007; Bloom et al., 2012, 2015) and human resource policy (Ichniowski et al., 1997; Ichniowski and Shaw, 1999; Bartel et al., 2007) as important determinants of firm productivity. We introduce an additional dimension of heterogeneity, namely based on firms use of performance pay versus fixed wage contracts. We provide a preliminary theoretical explanation that recognizes wage setting as a strategic choice that is also influenced by the external environment—adjustment costs to labor or capital. These adjustment costs may be influenced by labor market distortions, such as high degrees of union density, or simply technology requirements in the production process, such as high capital intensity. We provide a conceptual theory that links together a firm's adjustment costs and their returns to adopting performance pay. Under low adjustment costs, firms incur a higher option value since they can observe product demand before adapting their production process. Under high adjustment costs, firms may prefer to lock in wage contracts in advance to hedge against cyclical uncertainty.

We use restricted-access data from the National Compensation Survey, combined with the Quarterly Census of Earnings and Wages to empirically test our theory and examine the cyclicality of these types of establishments. We provide the first, to our knowledge, stylized facts about performance pay and fixed wage establishments. Performance pay establishments tend to have higher compensation per employee, hours worked per employee, and slightly higher employment. We also find that changes in the fraction of performance pay are positively associated with compensation and value added, but negatively associated with employment and capital intensity at a three-digit industry level.

We find that performance pay establishments incur greater volatiltiy in compensation, but less in employment, whereas the opposite is true for fixed wage establishments. To address concerns associated with omitted variables bias and selection, our baseline results contain establishment fixed effects and detailed metropolitan demographic controls. Our results are also robust to instrumenting local employment changes

with a Bartik-like measure that weights national industry-level changes in employment by the local share. We interpret our results as preliminary evidence of theory since it predicts that performance pay firms adjust more on the intensive margin of labor suply (e.g., how much to pay each worker), whereas fixed wage firms adjust on the extensive margin (e.g., how many workers to hire).

We are building a stylized quantitative model with performance pay and fixed wages as a discrete choice followed by a decision about capital and labor investment. In addition, our analysis more broadly highlights a number of exciting areas for future work. Incorporating contract heterogeneity into business cycle models provides an additional source for amplification and propagation since labor supply among performance pay workers becomes more elastic, while still allowing for downward wage rigidity among other jobs that has been documented in the data (Barattieri et al., 2014).

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