Does ‘Performance Pay’ Pay? Wage Flexibility over the Great Recession

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In Review

Abstract

Using the National Compensation Survey between 2004-2014, we document substantial cyclical heterogeneity among performance pay and fixed wage jobs. We find that employment growth in performance pay (fixed wage) jobs is countercyclical (procyclical), whereas compensation per employee growth is procyclical (countercyclical). Our estimates are identified off the response of similar work levels within the same establishment to local area shocks. We provide two mechanisms: (i) procyclical (countercyclical) effort in performance pay (fixed wage) jobs, and (ii) high pay-sensitivity in performance pay jobs. Our results reconcile competing claims about the wage stickiness of new hires versus incumbents in search models.

JEL: J21, J22, J31.

Keywords: Business cycle, unemployment volatility, moral hazard, pay for performance, productivity.

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1. Introduction

Incentive contracts have become increasingly important over time, growing from 15% of the labor force to 50% in the United States since 1970 (Lemieux et al., 2009; Makridis, 2017), and are causally associated with increases in productivity at the micro-level (Lazear, 2000a; Shearer, 2004). Although there is some evidence that the rise of more flexible contracts can help explain the growing long-run earnings variance among both workers (Champagne and Kurmann, 2013) and firms (Comin et al., 2009), how performance pay affects the cyclicality of employment and wages at the micro-level remains an open question.

The primary contributions of this paper are to: (i) quantify the business cycle dynamics of performance pay and fixed jobs, and (ii) use these insights to help reconcile ongoing debates about the unemployment volatility puzzle in the search literature. We find that performance pay jobs have procyclical wage bill growth, but countercyclical employment growth, whereas the opposite holds for fixed wage jobs. These differences emerge from the strength of incentives to cyclical conditions. We subsequently explain how embedding performance pay and fixed wage job heterogeneity in a Mortensen and Pissarides (1994) model can explain the unemployment volatility puzzle. Given that recent period following the 2007-2008 Great Recession has marked the slowest recovery since the Great Depression (Taylor, 2014), it is especially timely and relevant to understand how wage-setting practices explain the heterogeneous post-recession behavior of employment and earnings growth.

Our focus on wage-setting practices is motivated by not only the aforementioned empirical patterns (i.e., the surge in the incidence of performance pay contracts), but also a theoretical literature in macroeconomics with nominal rigidities. Starting at least since Taylor (1980), dynamic stochastic general equilibrium models have assumed some degree of wage stickiness (Christiano et al., 2005; Gertler and Trigari, 2009). There is also a general convention that firms do not cut wages during recessions (Bewley, 1995, 1998). These are at odds with real business cycle models (Kydland and Prescott, 1982; Krusell et al., 2012). To the best of our knowledge, these theoretical differences have not been reconciled with the data.

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1 The presence of employee heterogeneity and imperfect information prompts firms to design compensation contracts that help alleviate shirking problems, balancing between incentives and insurance (Holmstrom, 1979). Performance pay contracts and fixed wage contracts are the two most common types of contracts. The former links compensation with productivity (e.g., piece-rates, bonuses, stock options, commission), whereas the latter guarantees a flat salary independent of employee effort (Lazear, 1986).

2 While there is some microeconomic evidence that wages are sticky Le Bihan et al. 2012; Barattieri et al.
The first part of our paper introduces under-utilized micro-data—the National Compensation Survey (NCS)—that directly measures the presence of performance pay across comparable work levels within establishments over time. While we find that there is considerable cross-sectional variation in the incidence of performance pay across industries (e.g., 70% in management/business and 25% in service), we also document substantial variation even within narrowly defined occupations. For example, roughly 75% of managerial workers have performance pay in the information sector, whereas roughly 32% have it in the transportation and material moving sector. We also show that growth in the share of performance pay workers at a three-digit industry level is associated with increases in the growth of value added, employment, and compensation, but declines in capital intensity. We discuss the implications of these conditional correlations for future work.

The second part of our paper quantifies the asymmetric cyclicality of performance pay and fixed wage jobs. As motivating evidence, Figure 1 shows that the correlation between compensation per worker and the unemployment growth rate is -0.24 (0.56) for performance pay (fixed wage) jobs, whereas the correlation between employment and the unemployment growth is 0.17 (-0.49) for performance pay (fixed wage) jobs. Since these data are potentially contaminated by unobserved shocks, we turn towards local area demand shocks as a source of variation. Our identification strategy compares employment and earnings growth between similar jobs ("work level") within the same establishment in response to local employment shocks. Our data allows us to overcome standard endogeneity concerns about differences in other firm characteristics, such as management and human resource practices, that may also be correlated with the provision of performance pay (Bloom et al., 2014).

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2014, our paper adds at least two unique contributions that we discuss in greater detail. First, household survey data contains significant non-classical measurement error (Bound et al., 2001), whereas we use data that comes directly from employers. Second, most household surveys do not contain measures of non-salary pay, such as bonuses and commission. For example, the Survey of Income Program Participation (SIPP) does not provide this information in the public files until the 2014 wage. Third, there is significant heterogeneity in earnings growth. We show that much of the heterogeneity is coming from differences in the type of wage contract, i.e., performance pay versus fixed wage jobs.

3 We restrict the sample to the private sector among non-self employed workers. We discuss sample selection in greater detail later.

4 We specifically focus on employment growth in metropolitan and micropolitan areas, which we subsequently will refer to as “local areas”. Jobs in the NCS sample are assigned a work level, which is an index constructed on the basis of several ordinal factors describing job duties. The index ranges from 1 to 15 corresponding to the General Schedule for Federal Government jobs. Work level explains a non-trivial portion of individual compensation in our regressions; for example, a regression of logged earnings on work levels produces an $R^2$-squared of roughly 0.70, which illustrates that these classifications capture important differences in skill across jobs.
Notes: Corr with urate growth = −0.24 (PP) and 0.55 (FW)

Notes: Corr with urate growth = 0.17 (PP) and −0.49 (FW)

Figure 1: Compensation/Worker and Employment, Performance Pay and Fixed Wage Jobs
Notes.—Source: National Compensation Survey, 2004-2014. The figures plot logged compensation per worker and logged employment, together with their correlations with the change in the unemployment rate. Compensation is defined as the sum of straight-time wages, plus all benefits included in the BLS Employer Cost of Employee Compensation (ECEC). NCS sample weights are used to collapse the observations by performance pay and fixed wage jobs. Nominal variables are deflated by the 2014 consumer price index.
We find that a one percentage point (pp) rise in the local employment growth is associated with a net 0.017pp decline in employment growth in performance pay jobs (versus a 0.146pp rise in fixed wage jobs) and a net 0.016pp rise in compensation per worker growth in performance pay jobs (versus a 0.006pp decline in fixed wage jobs). These results are robust to the inclusion of layers of fixed effects, as well as instrumenting local employment growth with a Bartik-like measure that exploits heterogeneity in the exposure to different national shocks (Blanchard and Katz, 1992; Autor and Duggan, 2003). We also find that compensation per worker growth among fixed wage jobs has significant left skewness during recessions, providing insight recent results from Guvenen et al. (2014) about the countercyclical skewness of income growth. We also address the Barro critique (Barro, 1977) by providing evidence that: (i) the provision of performance pay over fixed wage contracts is a strategic decision, and (ii) these jobs exhibit differences in the cyclicality of their user costs of labor, which relaxes the use of an employee’s earnings as a proxy for their price.

Why do these jobs have such asymmetric cyclical dynamics? We provide evidence of two mechanisms that are consistent with recent theoretical contributions in optimal contracting. The first mechanism is the strength of incentives. Using residual variation in compensation per worker as a proxy for effort, we find that it has a 0.17 correlation with GDP growth in performance pay jobs, but a -0.16 correlation in fixed wage jobs. The fact that we find that effort is countercyclical in fixed wage jobs is consistent with evidence from Lazear et al. (2016). Unlike prior efficiency-wage models, which suggested that employees work harder during recessions out of fear of losing their jobs (Shapiro and Stiglitz, 1984), we show that performance pay jobs behave radically different. The second mechanism is the flexibility of wage-setting practices. We estimate the pay-sensitivity of non-production bonuses to local employment shocks, finding that a one percentage point rise in employment growth is associated with a 0.01pp rise in bonus income. By distinguishing between the heterogeneous responses among performance pay an fixed wage jobs, our results also help reconcile the view from Bewley (1995) that firms do not want to cut pay during recessions with the view from neoclassical models that labor supply clears the market (Hansen, 1985; Krusell et al., 2012).

While these results as independently interesting and important for the ongoing debate

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5We regress logged compensation on logged employment, hours worked, and establishment fixed effects to recover the residual. While we recognize that effort is an ambiguous term and our proxy captures variation besides effort, we control for employment and hours to remove the component of compensation that is explained by both the extensive margin and quantity component of the intensive margin. As long as compensation is set competitively, the residual captures the quality component of the intensive margin.
about sticky wages (Barattieri et al., 2014), the third part of our paper relates our empirical results with searching and matching models, which have become the benchmark for studying unemployment over the business cycle (Mortensen and Pissarides, 1994). However, such models have had a tough time embedding enough wage stickiness to reproduce observed unemployment volatility (Hall, 2005; Shimer, 2005). We show that the asymmetric behavior between performance pay and fixed wage jobs creates a dynamic selection problem that makes wages seem artificially less rigid when pooling both types. First, using the National Longitudinal Survey of Youth (NLSY), we show that performance pay workers have procyclical match quality, but all of the variation in the difference between performance pay and fixed wage workers is coming from incumbent employees—not new hires. Second, since fixed wage workers have procyclical employment growth, their wages are higher during booms, creating countercyclical effort.

Put together, our results reconcile the conflicting arguments from Bils et al. (2014)—that effort is countercyclical and wages for new hires are higher than for incumbents—and Gertler and Trigari (2009)—that the higher wages among new hires are an artifact of composition bias. In particular, we show how the mechanism introduced by Bils et al. (2014) applies only to fixed wage workers, whereas, because of the dynamic selection problem, performance pay workers will have procyclical wage growth, but more so for incumbents. As Pissarides (2009), among others (e.g., Haefke et al. (2013)) have already established, it is the wage for new hires that matters, not the wage for incumbents, in generating unemployment volatility. The bottom line of our exercise is that the cyclicality of performance pay versus fixed wage jobs is the micro-foundation the search and matching literature needs to credibly incorporate wage rigidity, which addresses the aim from Gertler et al. (2016) that “the focus should be on how to best model wage rigidity, rather than whether it is appropriate to model at all.”

Our paper builds on at least two extensive prior literatures. The first is a literature on contract theory that emphasized the trade-off between risk and incentives (Holmstrom, 1979) and inability to write complete contracts (Hart, 1988; Hart and Moore, 1988). The presence of cyclical fluctuations will prompt rational parties to renegotiate their agreements, which may lead to efficient employment outcomes ex-post, but inefficient investments ex-ante. The presence of variable pay in performance pay jobs allows firms to adapt to cyclical risk without having to continually renegotiate contracts or lay off employees. Lemieux et al. (2014) make a related argument using individual panel data. Our paper is also more broadly related to
a literature on organizational design, which views management as both a strategic decision firms make (Bloom et al., 2015) and as an optimal response to an external environment (Milgrom, 1988). Our paper is also related with Aghion et al. (2017) who found that decentralized firms were more able to adapt to the Great Recession, which is a complementary form of flexibility as the mechanism we document.

The second is a literature on a macroeconomic literature about nominal rigidities, specifically wage rigidities, which form the basis of searching and match models of the labor market (Mortensen and Pissarides, 1994) and New Keynesian models (Christiano et al., 2005; Smets and Wouters, 2007); see Nakamura and Steinsson (2013) for a survey. A recent stream of papers have pointed towards heterogeneity in the stickiness of wages for new versus incumbent hires (Pissarides, 2009; Haefke et al., 2013; Bils et al., 2014). However, one concern with these recent attempts is that variation in wages between incumbents and hires is driven by composition—that more skilled workers are more likely to search for jobs during a boom (Gertler and Trigari, 2009; Gertler et al., 2016). Our results help reconcile these two conflicting views by showing that effort is indeed countercyclical in fixed wage jobs, but these are precisely the jobs that are less likely to grow during recessions.

At a broad level, our methodological approach follows in the tradition of Davis and Haltiwanger (1992) and recent applications that have focused on new dimensions of heterogeneity. For example, Haltiwanger et al. (forthcoming) uses the 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 adjust wages less during recessions. Counter to the canonical “cleansing” effect of recessions, they find that workers will flock to low-paying establishments during recessions. Similarly, Fort et al. (2013) uses the Business Dynamics Statistics (BDS) to examine the behavior of firms with different ages and sizes over the business cycle, finding that young and small businesses were especially hit by large employment declines and job destruction during the Great Recession.

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6See Gibbons and Roberts (2013) for a survey
7Other attempts to generate greater unemployment volatility involve alternate wage bargaining (Hall and Milgrom, 2008) and raising the outside option of unemployment (Hagedorn and Manovskii, 2008).
2. Why Do Firms Use Performance Pay?

Performance pay compensation comes in many shapes and sizes: piece-rates, bonuses, commission, tips, stock options and equity, and profit sharing are the main categories. Firms use performance pay for two reasons: (i) to influence the quality of candidates who select into their firm in the presence of a heterogeneous labor force, and (ii) align incentives to encourage higher productivity in the presence of unobserved effort (Lazear, 1986). While stock options, equity, and profit sharing are typically used more for their selection effects (Oyer and Schaefer, 2005), commission and bonus schemes are typically more associated with incentive effects (Paarsch and Shearer, 1999, 2000; Lazear, 2000a; Shearer, 2004; Bandiera et al., 2005; Griffith and Neely, 2009). However, firms ultimately must balance the provision of incentives with the heightened risk-sharing that performance pay contracts provide over more stable fixed wage schemes since individuals are risk averse (Holmstrom, 1979).

Our starting point is that performance pay has a positive effect on firm and employee productivity (Lazear, 2000a). The labor force is inherently heterogeneous and effort is never fully observed, even when monitoring costs are relatively low. While there is significant dispersion in performance pay across occupations and industries—for example, 72% of the labor force in securities and commodity services have performance pay contracts, whereas only 20% of workers in social assistance have them—there is also dispersion within occupations and industries. Certain environments (e.g., more heterogeneous work forces as in Lazear (2000b)) may raise the returns to using performance pay, but these returns may vary based on an establishment’s underlying productivity or worker preferences.

While we do not take a stance on the single driving source of this dispersion, it is useful to put it in context.\(^8\) In a static setting, there are two main determinants for the use of performance pay (Prendergast, 2011). The first determinant is the noisiness of the individual’s contribution of labor services to output. Take, for instance, bonus compensation. Bonuses are often awarded to individuals based not just on their perceived productivity, but also the performance of their team or division. In such a setting, if it is very difficult to observe the output of any single employee, bonus compensation will be given out more uniformly to

\(^8\)We view the rise of performance pay as a broader macroeconomic phenomenon, much like the rise of information technology in the skill-biased technical change literature popularized by Autor et al. (2003). As we discuss below, there are many plausible theories, so we simply put several compelling explanations on the table as an additional catalyst for future work.
the whole team. However, since doing so can encourage free-riding absent a mechanism for distinguishing individual productivity among the team members, then the returns to using this type of incentive will be lower and, therefore, less common.

The second determinant is the extent of multitasking—that is, when rewarding an easily observed measure of output leads to perverse behavior along other margins. Consider, for example, an employee who is evaluated on the basis of their responsiveness to client emails. Although prompt responses to clients provides one perspective on their customer service, prompt responses do not provide information about the quality employee responses, let alone their adherence to other potential employee responsibilities (e.g., acquiring new clients and strategic planning). If the principal were to reward one performance measure at the expense of another, performance pay can incentivize unintended behavioral responses.

In a dynamic setting with frictions, we suggest that there are at least three potential explanations for explaining the dispersion in performance pay. The first is that information about the benefits of performance compensation might diffuse slowly. For example, if a firm was operating in a highly unionized industry, but it suddenly becomes de-unionized, the benefits of transitioning towards a more competitive compensation scheme might not be obvious or immediate. New industry best practices may take time to form as companies experiment with new human resource practices.

The second is that firms face heterogeneous adjustment costs to capital and labor based on their product or local talent pool. For example, when there are search costs, Merz and Yashiv (2007) show that firms retain some of their market value by avoiding lay offs. Since search is costly—that is, it takes time to find qualified candidates and train them—firms with higher skilled employees may prefer to develop more flexible employment contracts that accommodate cyclical fluctuations. We show in the next section, for example, that growth in the share of performance pay workers is negatively correlated with growth in capital intensity at the three-digit industry level.

The third is that greater competition may produce greater returns among principals to be informed about their agents’ actions (Hart, 1983), avoid costly bankruptcy (Schmidt, 1997), and reduce costs (Raith, 2003). For example, as profits become more volatile and margins decline in response to increasing competition, the value of effort and returns to performance pay contracts may change. Competition might alter the demand for different tasks and, therefore, feed back into the underlying product mix and production technology.
While it is beyond the scope of this paper to take a stance on the underlying mechanisms, we provide some motivating evidence in Appendix Section A1. Specifically, we examine the relationship between skill intensities and the share of performance pay at a three-digit occupation level. We measure skill intensity and frequency from the Occupational and Task Network (O*NET), finding that performance pay is positively associated with cognitive skills, social skills, general skills, and technical skills, but relatively uncorrelated with other, more non-cognitive, skills, like teamwork.

3. Data, Measurement, and Descriptive Evidence

3.1. Sources

3.1.1. National Compensation Survey

We introduce under-utilized establishment micro-data from the National Compensation Survey (NCS) to understand the heterogeneous dynamics of performance pay and fixed wage jobs over the business cycle. We follow prior literature in defining performance pay based on whether at least one of the following conditions hold: (i) the pay is tied, at least in part, to commissions, piece rates, production bonuses, or other incentives based on production or sales, and (ii) the job has a non-production bonus (Gittleman and Pierce, 2013, 2015). Administered by the Bureau of Labor Statistics (BLS), the NCS is unique in that it is the only source that contains detailed data on not only various labor outcomes (e.g., employment and compensation), but also non-wage compensation (e.g., benefits) and the type of contractual arrangement across a subset of sampled jobs within each establishment.

We restrict our sample to private establishments. For the bulk our sample, establishments are tracked for five years, providing us with a panel to track job-level outcomes within an establishment over the Great Recession. We weight all our observations by the NCS job-level sample weights. For most of the sample, data were collected from a three-stage probability

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9Field economists identify workers in jobs as having time-based or incentive-based pay based on whether the worker’s pay is based directly on actual production of the worker versus solely the number of hours worked. Time-based workers are those whose wages are based solely on an hourly rate or salary, whereas incentive workers are those whose wages are based at least partially on piece rates, commissions, or production bonuses. Performance pay is defined as either incentive-based pay or the receipt of non-production bonuses. https://www.bls.gov/opub/hom/pdf/homch8.pdf
sample: local areas (metropolitan), establishments within the sampled areas, and jobs within the sampled establishments. Some areas are selected with certainty according to their size, whereas others are selected based on a probability. Jobs within each establishment are also sampled probabilistically based on their size and number of employees working in each job, respectively. Approximately four to eight unique types of jobs are sampled within each establishment, each of which are labeled as having either an incentive pay component or not, providing within-establishment and within-job variation over time.\(^\text{10}\)

While our data do not contain every job in the United States, it still confers several advantages over existing data sources on top of the direct measurement of performance pay status. First, compared to the Panel Study of Income Dynamics (PSID), which contains heavy measurement error in labor supply and income (Bound and Krueger, 1991; Bound et al., 1994), as well as the National Longitudinal Survey of Youth (NLSY) to a lesser extent, the NCS data comes directly from establishment records. Second, compared to the Current Population Survey (CPS), which contains measurement error in the classification of workers into industries and occupations (Mellow and Sider, 1983; Kambourov and Manovskii, 2013), the NCS coding is based on reports from the establishment, containing information on job titles too. Third, unlike in both the PSID and NLSY, which contain small samples of individuals who cannot be linked to their employer, the NCS surveys roughly 5-8 jobs in the same establishment. The fact that we observe heterogeneity in performance pay contracts within the same establishment allows us to control for important time-invariant differences, like management practices, that have challenged prior contributions (Lemieux et al., 2009, 2014).

3.1.2. Local Area Employment and Demographics

We combine our NCS data with local area employment data from the Quarterly Census of Employment and Wages (QCEW). The Bureau of Labor Statistics gathers establishment data from all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands from Quarterly Contribution Reports (QCRs), which are submitted to State Workforce Agen-

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\(^{10}\)Jobs are selected in the following fashion. When a BLS field economist comes to an establishment, the employer will provide a list of all employees, which is adjusted to match the NCS scope. Individuals are randomly selected with their corresponding jobs and the field economist classifies the job with the appropriate Standard Occupational Classification (SOC) code, together with a number of other characteristics about the job, ranging from job duties to compensation.
cies (SWAs) by employers subject to state and federal unemployment insurance (UI) laws. The data are subsequently aggregated to different geographic and industry levels.

We also supplement our data with state demographic measures from the Current Population Survey. The sample is restricted access to workers with at least 20 hours worked per week and at least a two-dollar hourly wage to keep the sample relatively homogeneous and comparable with the NCS microdata. We create semiparametric measures to flexibly control for changes in each area’s labor force composition by aggregating across all individuals within each state and computing bins for race (e.g., fraction of people who are white), gender (male), age (e.g., fraction of people between ages 20-29, 30-39, ..., 60+), and education (e.g., fraction of people with less than a high school degree, with a degree, some college, and college or more).

3.1.3. Other Microdata

We also draw on two separate micro-data sources. The first is the National Longitudinal Survey of Youth (NLSY) from the BLS between 1979 and 2014 covering the NLSY79 and NLSY97 cohorts. The NLSY79 covers roughly 12,686 youths between ages 14 and 22, interviewed annually each year until 1994 and, since then, have been interviewed biannually. The NLSY97 covers roughly 9,000 youths between ages 12 and 16 in 1996, interviewed annually each year subsequently. Just like the CPS, we restrict the sample to similarly defined workers and deflate annual earnings. The final sample contains 219,763 person-year observations with 163,238 coming from NLSY79 and 56,525 coming from NLSY97; between 4,500 and 8,000 individuals are surveyed every year through one of the two cohorts. Performance pay status is measured using the baseline definition from Lemieux et al. (2009) that a worker must receive bonus, tip, or commission at least once with the same employer.

The second is the Displaced Workers Supplement from the CPS. Although the survey began in 1984, we use samples starting in 1996, covering every other year until 2014. The survey identifies workers who have been separated through both voluntary and involuntary labor market turnover. Unlike the NLSY, there is no measure of performance pay in the dataset, so we classify workers as such based on whether they are in an industry and occupation with over 50% of the labor force receiving performance pay.\footnote{While we recognize the measure is imprecise, the shares are obtained from the NCS and are the only available.}

\footnote{https://www.bls.gov/cew/cewover.htm#Data_Available}
3.2. Descriptive Statistics

We begin by reporting several descriptive statistics in Table 1 at the job-level. We distinguish between performance pay and fixed wage jobs over time, averaging with NCS sample weights. Fixed wage jobs tend to have marginally more workers on average, relative to performance pay jobs, but are less dispersed. Moreover, both the mean and standard deviation of compensation per worker is lower among the set of fixed wage jobs. Compensation is also growing much more slowly over time in fixed wage jobs, which is consistent with a rising performance pay premium (Lemieux et al., 2009; Makridis, 2017), whereas employment in these fixed wage jobs experienced a greater decline, especially between 2004-2006. The standard deviation of compensation per worker growth is larger among performance pay jobs, but employment growth is less. Hours worked is marginally larger in performance pay jobs, but has less dispersion relative to fixed wage jobs.

We now turn towards a more detailed comparison between the types of performance pay and fixed wage jobs. Since part of our identification strategy will exploit differences in employment and compensation outcomes within similar job levels—that is, jobs that have similar responsibilities and fall closely within the same hierarchy—we now examine the differences in pay and employment within these more narrowly defined cells. Table 2 documents these differences. Average compensation per worker grows monotonically throughout the job ladder. However, it is interesting to point out that the differences between job levels are not significantly different in performance pay versus fixed wage jobs. For example, the gap between levels 1 and 10 is 1.58 logged points in performance pay jobs versus 1.62 logged points in fixed wage jobs. Similarly, the gap between levels 5 and 10 is 0.78 and 0.75, respectively.

Turning towards the heterogeneity in employment, the incidence of performance pay is greater at the top of the distribution (e.g., over 60% at job levels 10 and above). Fixed wage jobs also tend to concentrate more heavily in the middle of the distribution. However, the fact that there is so much dispersion—that is, the share of performance pay is not 90% or above at the top—will provide us with important variation when estimating our baseline empirical specification. The fact that there exists such wide heterogeneity is also consistent with the argument that firms treat the provision of performance pay as a strategic decision.
Table 1: Descriptive Statistics from the National Compensation Survey

<table>
<thead>
<tr>
<th></th>
<th>Fixed wage jobs</th>
<th></th>
<th>Performance pay jobs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Means</strong></td>
<td></td>
<td></td>
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<tr>
<td>Employment</td>
<td>5.7</td>
<td>5.8</td>
<td>5.7</td>
<td>5.8</td>
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<td>-0.584</td>
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<td>Compensation per employee</td>
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<td>32.5</td>
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<td>32.8</td>
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<tr>
<td>Growth in Compensation per Employee, pct</td>
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<td>0.124</td>
<td>-0.126</td>
<td>-0.286</td>
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<tr>
<td>Annual Hours</td>
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<td>1856</td>
<td>1854</td>
<td>1852</td>
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<tr>
<td><strong>Standard deviations</strong></td>
<td></td>
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<tr>
<td>Employment</td>
<td>27.1</td>
<td>26.5</td>
<td>24.2</td>
<td>24.5</td>
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<tr>
<td>Growth in Employment, pct</td>
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<td>24.0</td>
<td>23.3</td>
<td>22.0</td>
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<tr>
<td>Compensation per employee</td>
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<td>23.4</td>
<td>24.3</td>
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<tr>
<td>Growth in Compensation per Employee, pct</td>
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<tr>
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<td>228926</td>
</tr>
</tbody>
</table>

Notes.– Sources: National Compensation Survey, 2004-2014. Employment is the number of employees; compensation per employees is the average total compensation per employee. Each observation is a job within an establishment. Growth rates are computed based on quarter-to-quarter growth at the job-by-establishment level. Observations are weighted by NCS sample job-level weights.
<table>
<thead>
<tr>
<th>Job level</th>
<th>ln(Compensation/employee)</th>
<th>ln(Employees)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PP</td>
<td>FW</td>
<td>PP - FW</td>
</tr>
<tr>
<td>1</td>
<td>2.60</td>
<td>2.45</td>
<td>0.16</td>
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<td>5.19</td>
<td>-0.06</td>
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Table 2: Comparison of Compensation/employee and Employment, by Job Level

Notes.—Sources: National Compensation Survey, 2004-2014. The table documents average compensation per employee and the number of employees by work level in performance pay and fixed wage jobs. Work levels are assigned by BLS field economists based on their job duties.

3.3. Cross-sectional Patterns

We now turn to providing a basic measure of the incidence of performance pay jobs. Figure 2 plots the average performance pay shares separately across industry and occupation classifications, whereas Figure 3 plots these shares jointly within each industry-by-occupation pair. Not surprisingly, the share of performance pay is most common in management, business, professional services, and sales jobs; nearly 50% of the labor force in these jobs have some form of incentive pay or non-production bonuses. Other occupations, such as services, tend to have relatively little performance pay (under 30%). Looking across industries, performance pay is most common in finance and information sectors with approximately 60% of the labor force compensated with performance pay, whereas other sectors (e.g., leisure and hospitality) have a very low incidence of performance pay.\(^{13}\)

However, given that performance pay is closely linked with the underlying tasks involved at a job, we argue that it is useful to look at performance pay within industry-by-occupation

\(^{13}\)Leisure and hospitality has many service workers who are compensated through tips. However, the NCS only covers the employer cost, which does not include tips. We believe that this is only an innocuous limitation of the data, especially as our results are robust to excluding service workers.
cells, documented in Figure 3. There are a couple of very stark examples. Consider, for example, the service-by-mining and professional-by-hospitality cells, which contain under 10% and 20% of workers compensated via performance pay, respectively. In this sense, while professional services occupations as a whole tends to have 60% performance pay, certain industries tend to provide very low performance pay (e.g., hospitality sector). We have also explored dispersion within narrowly defined occupation level and found that six-digit occupation fixed effects explain only 34% of the variation in performance pay, which again points towards performance pay as a design feature for an organization.

In Appendix Section A1., we also examine variation in the performance pay premium, which we define as the logged difference in compensation among performance pay and fixed wage jobs. Figure 11 documents these results across industries and occupations. We see considerable heterogeneity, ranging from a 0.10 logged difference in construction to a 0.40 logged difference in wholesale and retail trade, for example. The only industries where the differential is negative is mining and education, which are sectors where incentive pay is infrequently used and generally has been ineffective.¹⁴

Having documented the cross-section of the incidence of performance pay, we now examine whether performance pay is associated with measures of real economic activity. Unfortunately, establishment-level data on output is not available in the NCS, so we aggregate four measures of economic activity—employee compensation, full-time workers, value added, and capital intensity—to the three-digit level between 2004 to 2014.¹⁵ To address the obvious concern that industries with greater shares of performance pay might also vary in other unobserved and systematic ways, we present results in growth rates. We weight each industry-by-year observation by the industry’s long-run employment average.

These results are documented in Figure 4. We find that a one percentage point (pp) increase in the growth rate of performance pay workers as a share of the labor force is associated with a 0.27pp, 0.21pp, and 0.17pp increase in the growth of compensation, employment, and value added growth, but a 0.31pp decline in capital intensity. The first three conditional correlations suggest that increases in the incidence of performance pay are associated with greater labor market dynamism (through employment growth) and compensation and value

---

¹⁴ While performance pay has been successful in some educational settings (Lavy, 2009; Muralidharan and Sundararaman, 2011), these have generally been narrow, experimental settings.

¹⁵ We measure capital intensity as the ratio of the capital stock to full-time employees compensation, but our gradient is also robust to using labor compensation (gradient of -0.20).
Figure 2: Incidence of Performance Pay, by Major Industry and Occupation

Figure 3: Share of Performance Pay Workers, by Industry-Occupation

added growth. While these are clearly not causal estimates, we interpret these conditional correlations as useful macro-level heuristic evidence on existing causal microeconomic evidence about the value added (a proxy for productivity) gains associated with performance pay (e.g., Lazear (2000a)).

Turning towards the last conditional correlation, the negative gradient between growth in performance pay and capital intensity points towards an interesting mechanism that potentially helps explain why some companies use performance pay contracts in the first place. Given that firms make large-scale capital adjustments in a lump manner, there is an option value associated with waiting in the presence of uncertainty (Dixit and Pindyck, 1994; Abel et al., 1996). For example, consider a firm with large adjustment costs to capital. During a boom, these companies might be more reluctant to invest in either new workers or capital equipment since doing so commits them to excess utilization if product demand subsequently demands. In this sense, companies with greater capital adjustment costs may prefer to lock in a price with their employees via fixed contracts during a recession such that, when a boom subsequently arrives, they can expand capital without having to renegotiate wages. As we discuss later in the paper, Bils et al. (2014) develops a related quantitative model with countercyclical effort and sticky wages.

4. The Cyclicality of Performance Pay and Fixed Wage Jobs

4.1. Identification

We aim to understand the potential heterogeneity in business cycle dynamics between performance pay and fixed wage jobs. Our baseline specification measures variables in growth rates and exploits location-specific demand shocks through regressions of the form

\[ \Delta y_{jilt} = \beta X_{st} + \gamma \Delta e_{lt} + \pi PP_{jilt} + \delta (\Delta e_{lt} \times PP_{jilt}) + \phi_i + \lambda_t + \epsilon_{jilt} \]  

where \( y \) denotes the logged outcome variable of interest (e.g., employment or compensa-

---

\[ \text{The two ways for partialling out the long-run trends in a variable are first-differencing and filtering. We present some additional evidence later using filtering, but here we use first-differencing so that we can more cleanly identify our results in a regression format with fixed effects.} \]
Figure 4: Industry Outcomes and the Incidence of Performance Pay, Growth Rates

Notes.—Sources: National Compensation Survey and Bureau of Economic Analysis, 2004-2014. The figures plot the average change in the share of workers with performance pay against total employee compensation growth (deflated with the 2010 personal consumption expenditure index), capital stock growth (deflated using the 2009 chained price index), value added growth (using a similar 2009 chained index), and capital intensity growth (ratio of capital stock to compensation). Each observation is a three-digit industry code weighted by its average employment between 2004-2014.
tion per worker) within a job $j$, establishment $i$, location (e.g., metro / micro area, county) $l$, and period $t$, $X$ denotes a vector of time-varying state covariates (e.g., demographics), $e$ denotes logged employment in the location, $PP$ denotes an indicator for whether the job is performance pay, and $\phi$ and $\lambda$ are fixed effects on establishment and time (quarter and year). We cluster standard errors at the local level to allow for arbitrary degrees of correlation across establishments hit by the same labor demand shock.\(^{17}\)

Our measurement of labor demand shocks using local employment growth follows a large literature in labor economics (e.g., see Notowidigdo (2013) and Diamond (2016)), although some have used state-level employment rates as an alternative (e.g., see Blanchard and Katz (1992) and Haltiwanger et al. (forthcoming)).\(^{18}\) There are, however, two main identification problems that motivate our specification of Equation 1. The first identification concern is the potential for unobserved heterogeneity. Although Equation 1 is already written in first-differences, it is possible that these two types of jobs have different growth rates (e.g., see the trend decline in performance pay jobs from Figure 1). The second identification concern is that changes in employment reflect changes in supply-side conditions. That is, changes in local employment might reflect changes in the production technology of local firms, which could be correlated with the demand for skill in an establishment.

We address these concerns in several ways. To address potential omitted determinants, we introduce establishment fixed effects. These specifications compare changes in employment and compensation per worker among jobs in the same establishment. We also consider an even more restrictive specification including work-level fixed effects, exploiting variation within comparable jobs in the same establishment over time. We view our establishment fixed effect as a control for managerial practices, helping us to distinguish between establishments that have better managers from those with different wage-setting processes.\(^{19}\) Violations

\(^{17}\)Equation 1 would collapse to a standard labor demand regression if we omitted performance pay and its interaction with local demand shocks. We have also experimented with using growth in state unemployment rates as an alternative measure of local demand shocks, but defer to employment since there has been significant controversy over the measurement of unemployment during the Great Recession (given the decline in labor force participation). Nonetheless, our results are qualitatively quite similar under that measure.

\(^{18}\)We use employment growth as our baseline measure of local shocks not only for consistency with prior literature, but also because other measures (e.g., trade flows as in Aghion et al. (2017)) are not as applicable for the services sector, which is a large subset of our sample.

\(^{19}\)The potential for complementarity between managerial and compensation policy may raise an identification concern (Athey and Stern, 1998). However, the evidence we have provided thus far illustrates that there is significant heterogeneity even within establishments over the incidence of performance pay. While we cannot directly measure the quality of managerial practices, the fact that correlation between establishment fixed effects (from a regression of compensation per worker) and the share of performance pay workers is
would require that management practices vary over the business cycle within firms, which we have found does not appear to be the case.\textsuperscript{20}

To address the potential for supply-side effects, we implement two solutions. The first is the inclusion of a flexible spline over various demographic variables helps control for time-varying changes in the composition of workers that might alter the underlying production technology of a firm. For example, we control for the fraction of workers with a college degree (and more), which is a proxy for the skill content of employment. The second is the standard Bartik-like instrumental variables strategy where we use changes in industry employment weighted by the fraction of workers in the area in the corresponding industry. Specifically, we sum over the product of the employment share of an industry for a given geography and the national employment growth for that industry

\[
\hat{\theta}_{lt} = \sum_k \Delta e_{kt} s_{klt} \tag{2}
\]

where \( e_{kt} \) denotes national employment in an industry \( k \) and \( s_{klt} \) denotes the employment share of workers within a particular location. Our identifying assumption with Equation 2 is that unobserved shocks to industry shares at the national level are uncorrelated with area-level supply shocks, i.e. changes in national employment shares provide demand-induced exogenous variation to local employment.\textsuperscript{21}

\subsection*{4.2. Main Results}

If performance pay contracts allow firms greater agility to adapt to uncertainty, we may expect that \( \pi > 0 \) under both outcome variables, which would imply that there is a performance pay premium in both compensation per worker and employment. The main coefficient of interest, however, is \( \delta \), which characterizes the potentially asymmetric response of performance pay jobs over the business cycle. If performance pay jobs adjust more easily on the intensive margin of compensation, then \( \delta > 0 \) when the outcome is compensation per worker.

\begin{itemize}
  \item Management practices take time to form. We test this formally by drawing on the World Management Survey (WMS) detailed by Bloom and Van Reenen (2007) and run regressions of managerial practices on changes in state unemployment rates. The gradients are close to zero and statistically insignificant, suggesting that they are acyclical.
  \item See Goldsmith-Pinkham et al. (2017) for a detailed discussion of the identifying assumptions.
\end{itemize}
and $\delta < 0$ when the outcome is employment. Our main results are consistent with theoretical predictions about the incentive effects of performance pay contracts. In particular, performance pay jobs are more flexible since compensation is inherently variable, allowing employers to simply vary how much an employee is compensated over the business cycle, rather than having to hire and fire them all together.

The marginal effect of an employment shock in performance pay jobs, $\gamma + \delta$, governs the relative cyclicality of the employment and compensation per worker growth. Table 3 documents the results associated with Equation 1 under several specifications. Column 1 begins by presenting the unconditional correlation between both job-level employment and compensation growth and local demand shocks, suggesting that a one percentage point (pp) rise in metro employment growth is associated with a 0.178pp rise in employment growth at the job-level in the cross-section, but a 0.139pp decline in performance pay jobs relative to fixed wage jobs (or 0.045 and 0.039 net employment and compensation per worker growth). We similarly observe that a comparable one pp increase in local employment growth is associated with a 0.02pp rise in compensation per worker growth in the cross-section, but an additional 0.025pp rise among performance pay jobs.

However, as we discussed earlier, there are several reasons to suspect that these unconditional correlations are biased. In particular, we are especially concerned that areas with lower growth in performance pay are also less flexible labor markets in other respects. In this sense, a negative unobserved shock to an establishment’s employment or compensation growth may also tend to be negatively correlated with local growth in performance pay jobs. Column 2 addresses this concern by introducing several basic state-level demographic controls and, more importantly, establishment and time fixed effects. Interestingly, now the interaction effect is greater than the direct effect in both Panel A (and it already was for Panel B). In particular, a one pp rise in the employment growth rate is associated with a 0.161pp decline in establishment employment growth in performance pay jobs relative to fixed wage jobs (versus 0.145 without fixed effects), whereas it is associated with a 0.016pp rise in compensation per worker growth (versus a 0.006 decline without fixed effects).

While column 2 points towards an asymmetry in the cyclical behavior of employment and compensation growth for performance pay and fixed wage workers, it is possible that the establishment fixed effects are only isolating variation between low versus high skilled jobs within an establishment, which likely behave very differently. Column 3 addresses this
concern by introducing work (job) level fixed effects, which isolates variation among jobs in the same establishment that are of similar ranks, but simply differ in their employment contract. Including these fixed effects strengthens our results, suggesting that a one pp rise in employment growth is associated with a net 0.027pp decline in employment growth and a 0.014pp rise in compensation per worker growth for performance pay jobs.

Column 4 subsequently introduces two-digit industry by year fixed effects to address the concern that certain industries were trending in different directions that coincided with the provision of performance pay contracts. The fact that the inclusion of these fixed effects does not alter our results also suggests that shifts in industrial composition are not a source of bias. Column 5 introduces two-digit occupation fixed effects, which also helps proxy for heterogeneity in the underlying tasks within an establishment that might be correlated with whether a job is performance pay or not. Column 6 instruments for employment growth using our Bartik-like measure, which isolates demand-induced variation in employment growth. Although our estimates are more noisy, particularly compensation per worker growth, they still point towards a strong asymmetry between performance pay and fixed wage jobs.

Our final two columns investigate where in the distribution of jobs these effects are most operational. Column 7 restricts the sample of jobs between levels 1 and 7, whereas column 8 restricts the sample to those between levels 8 and 15. Columns 7 and 8 suggests that nearly all of the countercyclicality in employment growth for performance pay jobs is coming from the bottom of the distribution with a net 0.028pp decline associated with a one pp rise in local employment growth, compared to a statistically imprecise net positive 0.027pp rise for jobs in the top of the distribution. In contrast, the relative procyclicality of compensation per worker growth in performance pay jobs appears in both parts of the job level distribution, although the estimates are not as precise as our baseline in column 2.

\footnote{Again, while we do not take a stance on the single reason companies choose to offer a performance pay versus fixed wage contract, the essence of the task matters (e.g., observability of output). As long as this variation is uncorrelated with the growth rate of employment or compensation in the job, we are isolating causal effects.}

\footnote{Simply as a point of comparison, it is interesting to compare the difference between our estimates on the interaction between columns 1 and 2. Taking the unconditional least squares estimate as a measure of the selection and incentive effects of performance pay (column 1), whereas the conditional correlation with establishment fixed effects as a measure of the incentive effects (column 2), then incentive effects amount to 64% of the overall effect (= 0.016/0.025). The fraction is quite close to the decomposition in Lazear (2000a) (a result of roughly 50%) who uses person fixed effects to compare the productivity of employees before and after the introduction of piece-rate pay in an otherwise fixed wage job.}

\footnote{We have also added interactions with quarter fixed effects to mitigate concerns about seasonality at an industry level.}
### Table 3: Baseline Asymmetric Cyclicality of Performance Pay & Fixed Wage Jobs

#### Panel A

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<td>(.146^{\ast\ast\ast})</td>
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<td>( \Delta \ln(\text{MSA employment}) )</td>
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**Notes.** Sources: National Compensation Survey and Current Population Survey, 2004-2014. The table reports the coefficients associated with regressions of the change in logged employment and compensation per worker on the change in logged local area (metro/micro) employment, conditional on state demographic controls and fixed effects. Demographic controls include: the fraction of full-time workers in different age, education, and race brackets. Columns 1-5 present OLS estimates on the full sample under different layers of fixed effects. Column 6 presents IV estimates using a Bartik-like estimator that takes the product of the employment share of a three-digit sector in a local area (metro/micro) and the national employment growth it experienced, summed across all sectors. Columns 7 and 8 restrict the sample to jobs between levels 1-7 and 8-15, respectively, to help isolate where in the distribution the main effects are coming from. Standard errors are clustered at the metro-level and observations are weighted by the NCS job-level sample weights. *** Significant at the 1 percent level ** significant at the 5% level * significant at the 10 percent level. Standard errors in parentheses.
It is helpful to view these results through the lens of a broader literature about sticky wages dating back to Taylor (1980) and, more recently, from Le Bihan et al. (2012) and Barattieri et al. (2014). Sticky wages have been featured prominently in dynamic stochastic general equilibrium models, particularly for monetary policy (Erceg et al., 2000; Fehr and Goette, 2005; Christiano et al., 2005). We provide two reasons that reconcile our findings with those from these prior contributions. First, as far as we can see, microeconomic studies thus far have not used measures of wage income that include performance related pay. For example, Barattieri et al. (2014) use the Survey of Income and Program Participation (SIPP), but it was not until the 2014 SIPP wave income that the public files began including bonus and commission income, which are important margins of adjustment for performance pay jobs. Second, there are differences in sample selection. For example, respondents in SIPP tend to be lower income and skilled individuals who are, therefore, less likely to work in a performance pay job in the first place. Similarly, France has a low incidence of performance related pay, which helps explain why Le Bihan et al. (2012) find that wage adjustments are infrequent. Put together, these facts underscore the importance of the institutional environment and measurement strategy.

4.3. The Barro Critique and Robustness Exercises

Ever since at least Barro (1977), researchers have been aware of the difficulty of identifying genuine wage rigidity from heterogeneity in long-term contracting. In a setting where employers are setting and negotiating long-run contracts with their employees, firms can adjust the employee wage profile even if wages do not respond to contemporaneous shocks. In this sense, our results that employment (compensation per worker) growth is countercyclical (procyclical) in performance pay jobs may be a result of the specific long-run contract, rather than actual rigidity in the contracts fixed wage workers face.\footnote{To our knowledge, the only other contribution that has directly confronted this identification concern is Card (1990) who exploited plausibly exogenous variation in unexpected changes to a certain set of union workers in Canada who had their wages indexed to inflation versus other workers who did not. The fact that one group had their wage indexed to inflation, whereas the other did not, allowed him to examine outcomes based on changes in real wages instrumenting for wages with unexpected deviations from trend.}

Our identification strategy addresses this concern in several respects. For example, our inclusion of establishment and job fixed effects removes any time-invariant heterogeneity in underlying contracting between workers and the firm that might be different between these
two sets of jobs. Similarly, since we are looking at employment and compensation per worker growth, we are identifying elasticities from variation in changes in grow rates. We nonetheless implement an additional exercise that focuses on the central burden of proof introduced by Barro (1977)—that “... it is necessary to demonstrate a link between the potential for long-term contracts and the propensity of the private economy to experience cyclical phases of more or less missed opportunities for advantageous trade.”

Given that one of the fundamental determinants of the provision of performance pay is the degree of employee heterogeneity within a market (Lazear, 2000b), we ask whether industries with greater concentrations of low-dispersion occupations tend to have lower shares of performance pay. If, for example, the correlation between performance pay and employee heterogeneity is negative, then, based on revealed preference, these industries are optimally choosing to provide these fixed wage contracts. Figure 5 indicates that there is a robust positive association—a standard deviation rise in logged earnings is associated with a 0.64 percentage point rise in performance pay. Since one concern with the gradient is that occupations with more performance pay might also be more productive, the correlation might be spurious. First-differencing these two variables produces a qualitatively similar gradient of 0.283, which is also significant at the one percent level.

**Figure 5:** The Incidence of Performance Pay and Earnings Dispersion

*Notes.* Sources: National Compensation Survey, 2004-2014. The figure plots the share of performance pay contracts with the standard deviation in logged earnings (taken across jobs within the same three-digit occupation). Observations are weighted by average employment between 2004-2014 obtained from the Occupational Employment Statistics.
As a second test, and motivated by Hall (1980) who argues that what matters is the implicit asset price of labor contracts, we adopt a specification introduced by Kudlyak (2014) for measuring the discounted user cost of labor services, estimated separately for performance pay and fixed wage jobs. Letting $w$ denote the logged hourly wage, we use the NLSY 1979 cohort from 1980 to 2014 to estimate

$$ w_{it\tau} = \beta X_{it} + \sum_{d_0=1}^{T} \sum_{d=d_0}^{T} \chi_{d_0,d} D_{d_0,d} + \eta_i + \text{year}_t + \epsilon_{\tau} $$

where $i$ denotes the individual, $t$ denotes the year the individual is hired, $\tau$ denotes the actual year, $j$ denotes their job, $D$ denotes a vector of controls, $D$ denotes a dummy equal to one when $d_0 = t$ and $d = \tau$—that is, all wage observations in year $\tau$ for the employment relationships that start in year $t$ for $t \in [1, T]$ and $\tau \in [t, T]$. After recovering these predicted wages, $\hat{w}_{it\tau}$, then we substitute it into the user cost formula

$$ UC_{it} = w_{it\tau} + \mathbb{E}_t \left[ \sum_{\tau=t+1}^{\infty} (\beta(1-\delta))^{\tau-t} (w_{it\tau} - w_{i,t+1,\tau}) \right] $$

where we calibrate the discount rate, $\beta$, to 0.957 and the separation rate, $\delta$, to 0.295 as in Kudlyak (2014). We subsequently regress the logged user cost on the unemployment rate, separately for performance pay and fixed wage workers, producing coefficients of -0.0242 and -0.0154, respectively. After multiplying by 100, these coefficients have the interpretation of the cyclical of the user cost of labor. Performance pay jobs have roughly twice as much cyclicity as their fixed wage counterparts.

Having now examined the main empirical concern with our results, we now implement several other robustness exercises. One natural concern, for example, is the presence of reverse causality since increases in employment and compensation at the job-level might induce changes in employment at the local level. While these forces must clearly align in the aggregate, the likelihood that reverse causality exists at the micro-level is low since none of the establishments are market makers in their respective local areas. We nonetheless run a regression of the change in logged local employment on logged job-level establishment compensation and employment, conditional on location and time fixed effects, producing coefficients almost next to zero with $p$-values of 0.992 and 0.834, respectively.

We now turn to a more careful examination of the distribution of earnings growth, displayed in Figure 6, focusing on 2004-05 and 2008-09. There is a remarkable difference in the
left tail of the earnings growth distribution between the two sets of jobs. Whereas fixed wage jobs have a considerable mass of observations with earnings growth declines during 2004-05, performance pay jobs have very little with most of the mass concentrated above zero earnings growth. These facts are consistent with our earlier evidence about the procyclicality of earnings growth for performance pay jobs. There is also slightly greater mass in the lower part of the distribution among fixed wage jobs during the recession. Although an earlier literature pointed towards countercyclical earnings (Storessletten et al., 2004; Storesletten et al., 2004), more recent evidence from administrative data suggests that the skewness (not the standard deviation) of earnings growth is countercyclical (Guvenen et al., 2014). Viewed in this light, the right-skewed procyclical compensation per worker growth in performance pay jobs points towards an important dimension of heterogeneity.
4.4. Understanding the Mechanisms

What explains the observed asymmetric cyclicalities of performance pay and fixed wage jobs? We provide two theories. The first is that the strength of incentives are greater during booms for performance pay workers, whereas they are greater during recessions for fixed wage workers. One reason, for example, could be based on efficiency wages (Shapiro and Stiglitz, 1984). Since the incentive in fixed wage jobs is purely based on the threat of dismissal (Lazear, 2000b), and these workers have worse outside options during recessions since their human capital is lower (Makridis, 2017), then incentives are likely to be countercyclical for fixed wage workers and procyclical for performance pay workers.

While a perfect measure of effort does not exist, we proxy for it by regressing logged compensation on logged employment, hours worked, and other covariates and establishment fixed effects. Given that we are removing all of the variation in compensation that is driven by the quantity of labor (number of employees and hours worked), we interpret the residual as a proxy for the quality of time spent net of any selection effects. Figure 7 plots the estimated time series and shows that correlation between effort and GDP growth is remarkably asymmetric: 0.17 for performance pay jobs and -0.16 for fixed wage jobs.

The second mechanism is that compensation in performance pay jobs is a lot more flexible because of its reliance on bonus compensation. We can directly estimate the pay-sensitivity of bonus compensation to local or national shocks. After restricting our sample to the industries that have at least 50% of jobs covered with non-production bonuses (manufacturing, information, and FIRE), we estimate the gradient separately for each job level and plot it against the corresponding job level. Figure 8 documents the relationship and provides some evidence that higher job levels have more cyclical pay, consistent with our argument that performance pay jobs, especially those where it matters more, are adaptable to cyclical risk since firms can simply ramp down the variable component of an employee’s pay.

Our results are related with several recent contributions on the role of reallocation over the business cycle. The bulk of the literature has largely focused on the employment paths and outcomes of workers in routine jobs. For example, Jaimovich and Siu (2014) shows that

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26 Although the residual may still contain time-varying unobserved heterogeneity in match quality within-jobs, it still remains a suitable proxy.

27 Some jobs, especially at the bottom of the distribution, have a negative gradient. Our measure of non-production bonuses, however, is not ideal because it does not cover all of the conventional types of bonuses that may come to mind.
Figure 7: Cyclicality of Effort Proxy over Business Cycle

Notes. Sources: National Compensation Survey. The figure plots the average residual from a regression of logged compensation on logged employment, hours worked, and industry and time fixed effects and correlates it with national GDP growth.
Figure 8: Pay Sensitivity of Performance Pay Jobs

Notes. – Sources: National Compensation Survey, Quarterly Census of Employment and Wages. The figure plots the gradient obtained from a regression of logged non-production bonus compensation per hour on metropolitan employment growth, conditional on establishment and time fixed effects, separately estimated for each job level. The sample is restricted to the set of finance, real estate, insurance, information, and manufacturing sectors where over half of jobs have non-production bonuses.
much of the decline in employment during the Great Recession occurred in occupations with relatively high routine task intensities. Hershbein and Kahn (2016) explores the mechanism further by showing that firms use recessions as an opportunity to upskill their labor force by hiring higher quality workers.\textsuperscript{28} Complementary to these contributions, our results underscore another margin for reallocation and adjustment—compensation policy and the relative composition of performance pay versus fixed wage jobs. Since pay is easy to adjust in performance pay jobs, firms can simply respond to unexpected shocks by reducing variable pay without having to lay off workers. Given that performance pay workers also tend to be more skilled, these results are also consistent with a novel theory of countercyclical restructuring introduced by Berger (2016).\textsuperscript{29} He argues that firms use recessions as opportunities to re-organize their internal structures, meaning that the firms that survive the recession and enter into a recovery have a more efficient labor force.

5. Implications for Search Models

5.1. The Unemployment Volatility Puzzle

Searching and matching models have been hugely important for understanding flows into and out of unemployment over the business cycle, but have been unable to fully reproduce the observed volatility in the data (Shimer, 2005; Hall, 2005). Put simply, the standard model has two countervailing forces in response to a positive labor productivity shock, and these forces tend to offset in equilibrium. On one hand, a positive shock raises the incentive for employers to post vacancies since the marginal product of labor is higher. This, in turn, raises the job finding rate and shifts unemployment down. On the other hand, raising the job finding rate increases an employee’s threat point in the wage bargaining process and, therefore, also raises their present discounted value of wages among new hires. In this sense, higher wages absorb the bulk of the productivity gain and counteract the impact of the shock on vacancy creation, thereby generating too little unemployment volatility.

While several strategies have emerged to explain the observed features of the data—including

\textsuperscript{28}There is some evidence, however, that the Great Recession was unique in that, while prior recessions have reallocated resources from less productive areas to others, the most recent recession did not (Foster et al., 2016). Similarly, Haltiwanger et al. (forthcoming) show that higher quality workers tend to flow into higher paying jobs during booms, creating a procyclical job ladder.

\textsuperscript{29}See Koenders and Rogerson (2005) for an earlier version of the argument
introducing a greater outside option to employment (Hagedorn and Manovskii, 2008) and alternative wage bargaining (Hall and Milgrom, 2008)—the literature has broadly taken one of two strategies. On one hand, starting largely with Hall (2005), introducing wage stickiness into the matching process. For example, Gertler and Trigari (2009) embed a multi-period staggered wage contracting process into a search model. Importantly, they showed that, in addition to explicit stickiness embedded through staggered wages, spillover effects emerge through the effect of the initial wage stickiness on employees’ outside option. Gertler et al. (2016) extend this setting by embedding on-the-job search and, therefore, heterogeneity in the composition of workers searching for jobs over the cycle.

On the other hand, Pissarides (2009) has argued that “... a good explanation of the unemployed volatility puzzle needs to be consistent with the observed proportionality (or near proportionality) between wages in new matches and labor productivity. Models that imply nontrivial departures from unit elasticity between wages in new matches and productivity go against a large body of evidence.” Building on Pissarides (2009), Haefke et al. (2013) highlighted the important contribution of composition bias by controlling for educational and demographic characteristics, recovering estimated cyclical wage elasticities of 0.80 and 0.20 for new hires versus incumbents, respectively. Motivated by these pieces of evidence, Bils et al. (2014) introduce wage bargaining over intra-period effort. Taking as given the fact that new hires receive higher wages during booms, they argue that these higher wages allow employers to extract greater effort from their employees during recessions.

The important point, however, is not whether new hires receive higher wages, but rather whether the higher wages are accounted for by a time-varying bias in the composition of workers searching for jobs, which dates back to an ongoing controversy about the cyclicity of new hires versus incumbents in Vroman (1977). For example, using the Survey of Income Program Participation (SIPP), Gertler et al. (2016) find that the bulk of the procyclicality in wages is driven by composition effects between individuals entering from an existing employment relationship versus unemployment. In this sense, the reason wages among new hires appear larger is not because of greater elasticity, but rather previously omitted composition effects. The existing literature is lacking a consensus over the potential for composition effects in explaining the perceived greater cyclicality of wages for new hires.
5.2. Reconciling Two Views

Before detailing our solution to this tension in the literature, we remind readers about two important observations from Gertler and Trigari (2009). First, available evidence (e.g., Pissarides (2009) and Haefke et al. (2013)) is based exclusively on worker-level data, rather than firm-level data, which makes it tough to compare new hires with existing workers in the same firm. Composition effects in the quality of firms could be correlated with the demand for different types of workers over the business cycle. Second, while previous approaches have controlled for demographic characteristics, these explain only a small fraction of the variation in wages. Significant variation exists in the quality of observed worker flows.

We now provide a reconciliation of these two views. To fix concepts, consider the following two equilibrium conditions that appear in some form or another in all search models.

\[
\frac{(p - w)}{(r + s)} = \frac{c}{q(\theta)}, \quad \frac{w = (1 - \beta)z + \beta(p + c\theta)}{}
\]

where the variables follow the notion from Pissarides (2009), i.e. \( p \) denotes the productivity shock, \( w \) the wage, \( r \) the risk-free interest rate, \( s \) the job separation rate, \( c \) the cost of posting a vacancy, \( q(\theta) \) the transition rate for each vacant job, \( \beta \) the bargaining weight, \( z \) the flow benefit of unemployment, and \( \theta \) the tightness of the market. We now explain how our dimension of heterogeneity helps reconcile the tension inherent in the canonical model.

On one hand, since effort is procyclical in performance pay jobs, the presence of a positive labor productivity shock does not lead to as much of an expansion in vacancies during booms—firms can get more out of the same number of workers. During booms, firms post relatively fewer vacancies for performance pay jobs since they can simply motivate workers to supply higher effort, thereby allowing wages to adjust without a counteracting force that simultaneously raises vacancy postings. On the other hand, since effort is countercyclical in fixed wage jobs, those who are hired during a boom, holding constant the quality of workers, will have higher wages. Following a similar logic as in Bils et al. (2014), workers who were hired during a boom had their wages set above trend, thereby allowing firms to extract greater output (effort) from their employees without a counteracting force that simultaneously raises wages. Figure 9 provides evidence consistent with these facts by plotting the growth in the spread between the job posting / unemployment rate and the share of performance pay
workers, separately by two-digit industries. The strong negative correlation is consistent with the aforementioned channel that industries with greater performance pay will exhibit countercyclical employment growth and, therefore, countercyclical job postings.\(^{30}\)

The crucial feature is that these two forces occur at precisely the opposite points in time—that is, vacancies expand at precisely the time when wage growth is declining for performance pay workers (since their employment growth is countercyclical), whereas vacancies expand at a time when wages are sticky for fixed wage workers (since their employment growth is procyclical). However, cross-sectional comparisons of workers will confound these two opposing forces since fixed wage workers are more likely to get laid off during a recession and, therefore, face greater difficulty in obtaining a new match due to unemployment duration (Faberman et al., 2017) or human capital depreciation effects (Jarosch, 2016). It is, therefore, not surprising that least squares estimates of the cyclicality of match quality

\(^{30}\)We work with growth rates since industries with greater fractions of performance pay also have greater labor market dynamism (e.g., see Figure 4).
will tend to pick up variation from performance pay workers during booms, despite the fact that employment growth in these jobs is actually declining due to the expansion of effort.

### 5.3. Empirical Evidence

While it is beyond the scope of this paper to create and simulate a quantitative model with the features of performance pay and fixed wage job heterogeneity, we now provide two pieces of descriptive evidence about the time-varying composition bias and how it relates to the unemployment volatility puzzle. We begin by examining heterogeneity in the cyclicality of match quality among these types of workers. Following Gertler and Trigari (2009), we now use the NLSY 1979 cohort again to estimate regressions of the form

\[ w_{it} = \beta X_{it} + \gamma \Delta u_t + \pi PP_{it} + \delta (\Delta u_t \times PP_{it}) + \lambda_t + \epsilon_{it} \]  \hspace{1cm} (3)

where \( w \) denotes logged earnings, \( X \) denotes a vector of controls, and \( \Delta u \) denotes the growth rate of national unemployment, and \( \lambda \) denotes year fixed effects.\(^{31}\) Our primary coefficient of interest in Equation 3 is \( \delta \), which describes how match quality responds to cyclical fluctuations among performance pay workers, relative to their counterparts. The identifying assumption is that fluctuations in unemployment for performance pay workers are uncorrelated with unobserved shocks to earnings.

Table 4 documents these results. We begin with the first three columns, which pool together all workers. Much like the results from Gertler et al. (2016), we see that a percentage point rise in the growth rate of unemployment is associated with a 2.27% decline in earnings. And yet, there are stark differences in the responses between new hires versus incumbents. For example, a percentage point rise in the growth rate of unemployment is associated with a 5.30% decline in earnings among new hires, whereas only a 1.41% for incumbent workers. What matters, however, is the composition effect.

We now turn to the last three columns, which explore heterogeneity between performance pay and fixed wage workers. When we pool new entrants and incumbents together, we find that a percentage point rise in the growth rate of unemployment is associated with a 1.75% decline in earnings, but, more importantly, the effect is an added (and large) 8% for

\(^{31}\)Equation 3 is similar to our earlier baseline results from Equation 1, but is now at the individual-level, which allows us to not only validate our earlier results, but also separate out for new hires and incumbents.
performance pay workers. Motivated by the stark differences between these two workers, we now further partition the sample into new hires versus incumbents.

Among new hires, we see that earnings are much more elastic in the cross-section for all workers—the interaction with performance pay is statistically insignificant—but, remarkably, the results are reversed for incumbent workers. In particular, we cannot reject the null that earnings are unresponsive to unemployment shocks among workers in the cross-section, but we do find an elastic 9% decline among performance pay workers. The fact that the direct effect is insignificant, but the interaction is robustly negative and large, is not only consistent with our earlier results that earnings are countercyclical for fixed wage workers, but also indicative of countercyclical match quality for these workers.

Table 4: The Cyclicality of Match Quality, Performance Pay & Fixed Wage Jobs

<table>
<thead>
<tr>
<th></th>
<th>Dep. var. = ln(annual earnings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>performance pay</td>
<td>all new incumbent</td>
</tr>
<tr>
<td></td>
<td>.28*** .27*** .24***</td>
</tr>
<tr>
<td></td>
<td>[.01] [.01] [.01]</td>
</tr>
<tr>
<td>Δ unemployment rate</td>
<td>-2.27*** -5.30*** -1.41***</td>
</tr>
<tr>
<td></td>
<td>[.35] [.90] [.44]</td>
</tr>
<tr>
<td>× performance pay</td>
<td>-1.76*** -3.86*** -.37</td>
</tr>
<tr>
<td></td>
<td>[.34] [.74] [.39]</td>
</tr>
<tr>
<td></td>
<td>-.08** .03 -0.09***</td>
</tr>
<tr>
<td></td>
<td>[.03] [.08] [.03]</td>
</tr>
<tr>
<td>R-squared</td>
<td>.38 .54 .59</td>
</tr>
<tr>
<td>Sample Size</td>
<td>190839 60163 130676</td>
</tr>
<tr>
<td>Controls</td>
<td>Yes Yes Yes</td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes Yes Yes</td>
</tr>
</tbody>
</table>

Notes. — Sources: National Longitudinal Survey of Youth, 1979-2014. In columns 1-3, the table reports the coefficients associated with regressions of logged earnings on the growth in the unemployment rate, conditional on controls and fixed effects. In columns 4-6, performance pay and its interaction with unemployment rate growth are included. Controls include: a quadratic in age and education, marital status, family size, race, and gender. Earnings is deflated by the 2010 personal consumption expenditure index. Standard errors are clustered at the person-level and observations are weighted by the NLSY sample weights. *** Significant at the 1 percent level ** significant at the 5% level * significant at the 10 percent level. Standard errors in parentheses.

Before continuing, it is useful to take stock of the implications thus far. First, these results provide new insight into business cycle job-ladder models (i.e., Lise and Robin (2017)) that use countercyclical match quality to replicate the cleansing effect of business cycles. In particular, we show that the countercyclicality is coming from fixed wage, not performance pay, workers who are more likely to be laid off during recessions. Second, these results also help understand why Gertler et al. (2016) find that nearly all the variation in the elasticity of wages comes from new hires—performance pay workers are precisely the ones who are more
likely to retain a job during a boom, potentially switch, and experience greater growth in their wage bill. In this sense, we agree with both Gertler et al. (2016)—that there is composition bias—and Bils et al. (2014)—that fixed wage workers have countercyclical effort—and show how the combination of these forces gives rise to both of their observations.

Motivated by these results of countercyclical (procyclical) match quality for fixed wage (performance pay) workers, and the presence of composition bias, we now provide more explicit evidence on the historical employment status of current performance pay and fixed wage workers. We are specifically interested in testing for the presence of upskilling along the margins of performance pay as described by Hershbein and Kahn (2016), but based on a different mechanism—a restructuring of jobs towards more flexible arrangements during recessions to better adapt to cyclical risk. To examine this, we use the Current Population Survey (CPS) Displaced Workers Supplement, which is implemented biannually between 1996 and 2014, and classify workers as those in an industry and occupation with over 50% of the labor force with performance pay contracts (obtained from the NCS).

We begin by examining whether performance pay workers are less likely to lose their job by running a logit regression for being displaced once in the past three years on an indicator for performance pay status, conditional on controls. We find that performance pay workers are 4% less likely, although the $p$-value is 0.143 because our measure of performance pay is a proxy based on the worker’s industry-by-occupation. We subsequently run a regression of an individual’s logged hourly wage on an indicator for performance pay status, whether they were displaced in the past three years, and an interaction, conditional on controls. While we find, not surprisingly, that performance pay workers earn 20% more than their counterparts and workers who were previously displaced earn 10% less than their counterparts, which is consistent with models of unemployment scarring (Huckfeldt, 2016; Jarosch, 2016), we find that workers who are now performance pay and were previously displaced earn 7% higher wages. The fact that being a performance pay worker almost completely offsets the lower wages that are typically associated with unemployment spells is remarkable and is consistent with our earlier evidence on composition bias.\footnote{We also run regressions of logged weekly earnings and hours worked as outcome variables. Most interestingly, we find that displaced workers work 4.5% fewer hours per week, but performance pay workers who were displaced work 4.4% more hours per week. In this sense, there is effectively no change in labor supply for performance pay workers who were previously displaced, which suggests that they are able to find jobs that are close substitutes.}
6. Conclusion

This paper provides the first microeconomic evidence on the role of performance pay over the business cycle using restricted access job-by-establishment data from the National Compensation Survey (NCS). After documenting several cross-sectional patterns in the data, we estimate the cyclicality of compensation per worker and employment among performance pay and fixed wage jobs. Our preferred specification exploits variation within jobs of similar rank within the same establishment over the business cycle.

We find that a one percentage point (pp) rise in metro employment growth is associated with a net 0.017pp decline in employment growth in performance pay jobs, whereas it is associated with a net 0.146pp increase in fixed wage jobs. Similarly, we find that a one pp rise in metro employment growth is associated with a 0.016pp rise in compensation per worker growth in performance pay jobs, but a 0.006pp decline in fixed wage jobs. Motivated by Guvenen et al. (2014), we also show that much of the procyclical skewness in compensation per worker growth comes from performance pay jobs. We find that the bulk of the employment results are driven by movement in the bottom half of the job level distribution, whereas the compensation per worker results occur throughout. Our results also build upon recent evidence of heterogeneity in job quality (Haltiwanger et al., forthcoming) and upskilling of skill requirements over the cycle (Hershbein and Kahn, 2016) by showing how different employment arrangements might be more versus less adaptive to cyclical risk.

We also address the Barro (1977) critique that the heterogeneity might simply capture differences in long-run contracting between employees and their employers. First, we show that performance pay is weaker in occupations that have more homogeneous labor forces, which is consistent with theory and shows that the choice of performance pay is a strategic decision made by firms (Lazear, 2000b). Second, we estimate the user cost of labor services and find that it is much more elastic and procyclical for performance pay workers, which is consistent with the view that the price of labor services is not just a static equilibrium object (Kudlyak, 2014).

We subsequently identify the mechanisms behind these results. First, using variation in compensation that is not explained by the quantity of labor services or quality of the establishment as a proxy for effort, we find that it is procyclical in performance pay jobs and countercyclical in fixed wage jobs. This suggests that the strength of incentives is cyclical and
more influential in performance pay jobs during booms, whereas the threat of termination and prospect of job loss behave as stronger incentives for fixed wage jobs during recessions. Second, we estimate the pay sensitivity in performance pay jobs across the continuum of job levels and find evidence of wage flexibility, which is increasing in the job rank within an establishment. This suggests that adaptability to cyclical risk through the provision of performance pay is an important adjustment margin.

We finally apply our results to an ongoing debate about a resolution to the unemployment volatility puzzle (Pissarides, 2009) that differentiates between the wages of new hires versus incumbents Bils et al. (2014). Although new hires obtain higher wages, Gertler et al. (2016) show that these results reflect a composition bias between non-employed and currently employed workers moving into new arrangements. We reconcile these two views by showing that the asymmetric cyclicality of performance pay jobs creates a dynamic selection problem. In particular, we show that the mechanism from Bils et al. (2014) about the countercyclicality of effort applies only to fixed wage jobs that have procyclical employment growth. We also show that performance pay workers are precisely the workers who exhibit procyclical match quality and face higher wages upon new matches during booms. In this sense, allowing for heterogeneity between performance pay and fixed wage workers provides the micro-foundations for staggered contracts called for by Gertler and Trigari (2009).

While our paper provides new insights on a number of ongoing areas of macroeconomic inquiry, our broader aim is to raise many new questions. What does the career ladder look like for a performance pay worker, versus a fixed wage worker? Why is earnings growth less skewed for performance pay workers? How do other forms of compensation and non-wage compensation respond to cyclical fluctuations? How do performance pay contracts influence adaptation to uncertainty? These are just a few questions that our results raise as viable topics for future research.

References


A Online Appendix (Not For Print)

A1. Supplemental Evidence on Descriptive Statistics

Some tasks might be more complementary with performance pay than others due to, for example, the ease of observing output in their jobs. Using the average share of performance pay, coupled with measures of skill and work environment intensities, Figure 10 shows the cross-sectional associations at a three-digit occupation level. Some skills, such as cognitive, social, and general skills, are concentrated in occupations with high performance pay, whereas...
Figure 10: Performance Pay Across Occupations, by Skills and Work Environment

Notes.–Sources: National Compensation Survey and O*NET. The figure plots the average three-digit share of performance pay (using 2006-2015 shares) with standardized \( z \)-scores for the concentration of different skills and work environment measurements. The skill groups are as follows: (1) cognitive skills (decision making, learning strategies, listening, learning, problem solving, coordination, and critical thinking), (2) manual (repairs, equipment maintenance, equipment selection, installation, instruction), (3) technical (programming, quality control analysis, systems analysis, systems evaluation, technology design), (4) social (persuasion, social, speaking, negotiation), (5) service (management of financial resources, of material resources, of personnel resources, monitoring, service, operations control, operations monitoring, operations analysis, troubleshooting), and (5) general (math, writing, time management, reading, science). The work environment variables measure the degree of team work, competitiveness among peers, and structure involved in the jobs.

they have a null relationship with others, such as manual and service skills. Similarly, performance pay is also associated with more competitive environments with structure around responsibilities, but has a null association with team work. The conceptual framework here is consistent with the dominant paradigm in personnel economics that views personnel practices in part as a byproduct of the underlying environment, such as industry competition and union concentration (Gibbons and Roberts, 2013).

While the main text describes the cross-section of performance pay, we now document the performance pay premium—which we define as the logged compensation differential—across industries and occupations (Figure 11). Across industries, the premium is largest in wholesale/retail trade, amounting to nearly 0.40 log points (50% difference), whereas it is lowest in construction, amounting to a little under 0.10 log points. The only industries where the differential is negative is mining and education where incentive pay has not had much empir-
ical success. Across occupations, the premium is largest in sales occupations, amounting to nearly 0.60 log points (80% difference), whereas it is much lower in office & administrative support and even negative in construction. The fact that the premium varies dramatically across the distribution of industries and occupations points towards heterogeneous returns to using performance pay (Lazear, 1986).

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While performance pay has been successful in some educational settings (Lavy, 2009; Muralidharan and Sundararaman, 2011), these have generally been narrow, experimental settings.
Figure 11: Performance Pay Wage Premia, by Major Industry and Occupation

Notes.—Source: National Compensation Survey, 2004-2014. The figures plot the average compensation per worker logged difference for performance pay and fixed wage jobs by industry and occupation. We construct these wage bill differentials by averaging across all workers in performance pay and fixed wage jobs, respectively, weighted by the NCS sample weights and taking their logged difference.