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Pay for Performance and Compensation Inequality: Evidence from the ECEC [*]

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Abstract: It is well known that earnings inequality in the United States has been on the rise over the last three decades. Compensation inequality, while much less studied, has been moving upward as well. Motivated in part by an attempt to explain a widening of inequality in the upper part of the distribution, Lemieux, MacLeod and Parent (2009) investigated the relationship between the use of performance pay schemes and wage inequality using the Panel Study of Income Dynamics. Viewing such a contractual arrangement as a channel through which rising demand for skill is translated into increased inequality, they estimated that pay for performance accounts for about one-fifth of the growth in the variance of male wages between the late 1970s and the early 1990s, and for almost all of the increase in wage inequality in the top quintile during the same period. In this paper, we also assess the relationship between performance pay and inequality, making a number of different contributions to the literature. First, the dataset we use, the Bureau of Labor Statistics' Employee Costs for Employee Compensation (ECEC), allows us to look at a much broader concept of pay than that used by LMP, which consists largely of hourly earnings inclusive of performance pay (bonuses, piece-rates and commissions). It is important to relate methods of pay to total compensation because any effects noted on wages may be offset or amplified when one moves to broader definitions of compensation. Second, there are numerous types of bonuses, not all of which fall under the rubric of pay for performance. While LMP are forced by the limitations in the PSID to treat all types of bonuses as being the same, in some of our analyses, we are able to distinguish among them. Third, while the LMP analysis ends in the mid-1990s, our investigation is of a more recent time period, 1994 to 2010. Finally, allowing greater precision in our estimates, our dataset is significantly larger than the PSID. Our results suggest that while the presence of performance pay jobs is associated with higher levels of inequality, such jobs have made only a modest contribution toward an increase in inequality in the period under study.

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I. Introduction

It is well known that earnings inequality in the United States has been on the rise over the last three decades. Compensation inequality, while much less studied, has been moving upward as well (Pierce, 2001, 2010). The character of the growth in pay dispersion has not been constant over time, however. In the 1980s, earnings inequality widened throughout the entire distribution (Levy and Murnane, 1992; Juhn, Murphy and Pierce, 1993). More recently, though, the overall growth in inequality has been less broad-based; it has been driven by a widening in the top half of the distribution, which has, if anything, been partly offset by a narrowing in the bottom half (Autor, Katz and Kearney, 2008; Lemieux, 2010). While not directly comparable to the data used in most studies of inequality, income tax data suggests that the rise in inequality is even faster in the uppermost part of the top half of the distribution (Piketty and Saez, 2003, updated 2012, Bakija, Cole and Heim, 2010). Motivated in part by an attempt to explain trends in the upper part of the distribution, Lemieux, MacLeod and Parent (2009) –henceforth LMP -- investigate the relationship between the use of performance pay schemes and wage inequality, using the Panel Study of Income Dynamics (PSID). Viewing such a contractual arrangement as a channel through which rising demand for skill is translated into increased inequality, they estimate that pay for performance accounts for about one-fifth of the growth in the variance of male wages between the late 1970s and the early 1990s, and for almost all of the increase in wage inequality in the top quintile during the same period.

In this paper, we also look at the relationship between performance pay and inequality, making a number of different contributions to the literature.[1] First, the dataset we use, the Bureau of Labor Statistics' quarterly Employee Costs for Employee Compensation (ECEC), allows us to look at a broader concept of pay than that used by LMP, which consists largely of

[1] For a related analysis in the German context, see Sommerfeld (2012).

hourly earnings inclusive of performance pay (bonuses, piece-rates and commissions). Using the ECEC, one can obtain a comparable measure, which, for reasons of brevity, we will refer to as a wage rate, as well as a much broader measure of compensation, which includes non-wage benefits, which we call total compensation. Total compensation measures actual willingness to pay on the part of companies and it is what, in standard competitive theory at least, should be equated to the value of marginal product. In addition, as Barkume (2004) suggested in a similar context, it is important to relate methods of pay to total compensation because any effects noted on wages may be offset or amplified when one moves to broader definitions of compensation. Second, there are numerous types of bonuses, not all of which fall under the rubric of pay for performance. While LMP are forced by the limitations in the PSID to treat all types of bonuses as being the same, in some of our analyses, we are able to distinguish among them. Third, while the LMP analysis ends in the mid-1990s, our investigation is of a more recent time period, 1994 to 2010. Finally, allowing greater precision in our estimates, our dataset is significantly larger than the PSID, providing data on average covering more than 36,000 jobs per quarter.

The remainder of the paper proceeds as follows: In the next section, we introduce the ECEC, the dataset that we use for the analysis. In section III, we discuss the types of performance pay that can be measured in that dataset, gauge their prevalence and how it has changed over time. In section IV, we assess the relationship between performance pay and the wage structure, while section V uses a decomposition analysis to assess the effect of performance pay on inequality and its change over time. Section VI offers concluding remarks.

II. Employer Costs for Employee Compensation

We conduct the analysis using the quarterly microdata from the Bureau of Labor Statistics' Employer Costs for Employee Compensation (ECEC), which is part of the National

Compensation Survey (NCS). The ECEC measures the cost to employers for wages and salaries and benefits per employee hour worked.[2] As suggested above, it has a number of advantages for our analysis, including the presence of a large representative sample, the availability of information that allows us to construct measures of performance pay, and the measurement not only of wage rates but of a comprehensive measure of compensation. While the ECEC has been conducted since the 1980s, one disadvantage is that the information we need to construct measures of performance pay is only readily available from 1994 on, limiting how far back in time we are able to go.

While the ECEC has not been used previously to study the relationship between performance pay and pay inequality[3], it has been used to study the two topics independently.[4] The scope of the ECEC is the civilian economy, including private industry and State and local government. Excluded from the private industry ECEC sample are the self-employed, farm and private household workers, as well as those who set their own pay. For the purposes of this paper, we focus on private industry, given that, as LMP indicate, in the absence of profit maximization, it is not always clear what pay for performance might mean. The ECEC sample is a probability sample of establishments (not firms). Jobs are sampled proportional to employment in the job, but, when weighted, the data represent the average worker and not the average job. The number of jobs selected generally ranges from 4 to 8 depending on establishment size. In contrast to the case of the microdata traditionally used in analyses of pay inequality, the unit of analysis is a job rather than an individual.

[2] See US DOL, undated, for further details.
[3] Pierce (2010) examined some aspects of the issue, but that analysis was not the main focus of his paper.
[4] See Barkume (2004), Barkume and Moehrle (2010) and Bishow (2009, 2010a, 2010b) for analyses relating to performance pay and Pierce (2001, 2010) for studies of compensation inequality.

Jobs are defined using the employer's most narrow occupational classification. Job-specific information includes a Standard Occupational Classification (SOC) code[5] along with indicators for union coverage, full-time status, and whether the pay is tied, at least in part, to commissions, piece rates, production bonuses, or other incentives based on production or sales (incentive pay). The jobs are also assigned a work level. One major use to which NCS data are put is to enable the President's Pay Agent – which consists of the Secretary of Labor and the Directors of the Office of Management and Budget and the Office of Personnel Management – to compare rates of pay under the General Schedule (GS) to non-Federal rates of pay.[6] As a step in doing so, the NCS collects information on job duties, and uses these to assign to each job a work level ranging from 1 to 15, corresponding to the GS levels. The variables collected in this process have been shown to be of great use in controlling for skill differences across jobs (Gittleman and Pierce, 2011, 2012).

In the ECEC, earnings are defined to include incentive pay but exclude premium pay for overtime, holiday, and weekend work; shift differentials; bonuses not directly tied to production; payments by third parties such as tips; and payment in kind such as room and board. Premium pay for work in addition to regularly scheduled work, shift differentials and nonproduction bonuses (to be explained below) are measured as benefits. The ECEC also measures the following types of benefits: paid leave—vacations, holidays, sick leave, and personal leave; insurance benefits—life, health, short-term disability, and long-term disability insurance; retirement and savings benefits—defined benefit and defined contribution plans; and legally required benefits—Social Security, Medicare, Federal and State unemployment insurance, and

[5] In the early years of the ECEC, Census occupation classification systems were used, so that SOC-based codes are available only from 2002 on.
[6] For additional details on work level assignment, see U.S. DOL, 2003.

workers' compensation. The ECEC data are converted to a cost per hour worked using work schedule information common to all workers and averaged over the incumbents within a job.

As is detailed in Pierce (2010), there are caveats to be kept in mind when considering these data. First, as the name implies, the data refer to employer costs, which will differ from employee valuations due to a number of considerations including taxes, the fact that the same benefits are being provided to a large group, and to any divergence between an employer's price for a benefit and what an employee would have to pay as an individual (Famulari and Manser, 1989). Second, there is a certain amount of measurement error involved in getting job-specific data for some of the components of the ECEC because respondents are sometimes able to report data only for a broader group than the job incumbents, such as the average for all white-collar workers or for all workers. Third, though we can use work level and other variables as predictors of wages, we do not have demographic information on the incumbents of the job. As a result, we implicitly consider men's and women's jobs together, something that is not usually done in the inequality literature.

In line with the way data are collected, there are two routes for a job to be designated as pay for performance. First, a job can be considered performance pay if pay is tied, at least in part, to commissions, piece rates, production bonuses or other incentives based on production or sales. Such jobs are referred to as incentive pay jobs (Barkume and Moehrle, 2001). Second, as noted, the ECEC also captures non-production bonuses, which, despite its name, includes a number of different payment schemes that seek to better align pay and productivity. The NCS places non-production bonuses into five different categories: employment-incentive awards; performance-based awards; recognition awards; union-related bonuses and a catch-all category, other. Details on non-production bonuses are offered in the appendix.

The most appropriate measure of performance pay would take into account whether a job is eligible to receive such pay, independent of whether such pay is received in a given time frame. The NCS definition of incentive-pay jobs satisfies this criterion. Assuming that the mere presence of a plan is sufficient to influence such things as the degree of monitoring, straight-time wages and promotions, we would want to also count as pay for performance all jobs where a non-production bonus program is in place. We do not know this for certain for parts of the sample and, as a result, we base our main definition on whether job incumbents receive a bonus payment.[7] We recognize that this approach – using costs instead of plan presence -- puts us at some risk for understating pay for performance incidence, but any understatement of performance pay that results is lessened by the fact that the non-production bonus amounts are job-wide averages. Thus, if any individual in a job receives a non-production bonus, all incumbents are considered to be in a performance-pay job. In addition, some non-production bonuses are smoothed over time, so that if a bonus is annual – for example, a year-end bonus – NCS procedures indicate receipt over four quarters.

LMP's measure of pay for performance is affected by analogous concerns. They only know when bonuses, commissions or piece rates have been received in a particular year, though, given the panel nature of the PSID, their preferred measure of pay for performance takes into account receipt in every year that an employment relationship is observed.[8] Nonetheless, LMP

[7] The appendix describes a robustness check based on a more inclusive alternative definition. As noted, our analysis is complicated by the fact that for parts of the sample it is not known without error whether there is a bonus plan in place. We examined the sensitivity of our results to the exclusion of this group, and found that, while there are minor impacts on incidence rates, trends in such rates are little affected. In addition, there is little qualitative difference in our results on the impact of performance pay on the level and trends in inequality.

[8] One of our robustness checks experimented with observing receipt of non-production bonuses in jobs that were in the sample before and after the current quarter. Such an approach raises the prevalence of performance pay, without having much of an impact on trends or the relationship between performance pay and the level of and changes in inequality.

note that their measure is an understatement because a job may terminate before performance pay is received or because part of the time in the job is either before or after the sample range.

The period of analysis in this paper is from 1994, the first year in which data on incentive pay jobs are readily available, to 2010, the latest year for which data were available at the time the analysis began. Because of breaks in series and changing availability of data, we also repeat some of the analysis for the mid-year, 2002. For example, because occupations were dual coded in 2002, it is possible to compare 1994 to 2002 and 2002 to 2010, but 1994 cannot be compared directly to 2010. In addition, data on work level are only available from 2002 forward. In most of our analysis, our definition of pay for performance jobs is a broad one that includes all incentive-pay jobs and all jobs where non-production bonuses are paid. For 2010, it is possible to consider a more narrow definition that includes all incentive-pay jobs and only the non-production bonus jobs where performance-based bonuses are received, as opposed to the other possible types of non-production bonuses.[9]

III. The Prevalence of Pay for Performance

As LMP note, in the standard competitive model, the entire labor market is aware of a worker's marginal product and competition ensures that workers are paid their marginal product. In the real world, however, circumstances such as uncertainty about a worker's ability and the dependence of effort on wage levels may provide scope for pay for performance schemes – which we loosely define as any attempt to better align pay with productivity. According to the theory and some empirical evidence[10], firms will use piece rates and other pay for performance schemes to elicit higher levels of effort and/or attract more productive workers. Such schemes cannot be used everywhere, however, in part because of the presence of monitoring costs.

[9] Only in recent years is information on non-production bonus types available for all establishments in the sample.
[10] See, among others, Lazear (1986, 2000) and Brown (1990, 1992).

LMP's theoretical model, based on Lazear (1986), has among its implications that more productive workers will be paid for performance and that increases in returns to ability will enhance the attractiveness of pay for performance.

We begin by assessing the prevalence of pay for performance in the private economy in 2010. We use two definitions of pay for performance jobs: a broad one that includes all incentive-pay jobs and all jobs where non-production bonuses are paid and a narrow one that includes all incentive-pay jobs and jobs where the non-production bonuses received are performance-based awards.[11] LMP use a broad definition, as they define performance-pay jobs as "employment relationships in which part of the workers total compensation includes a variable pay component (bonus, commission or piece rate)". The PSID does not allow a distinction to be made among different types of bonuses but some bonuses may not be performance-related or only weakly so, for example, if a bonus is received instead of a benefit payment or for referring a worker to the company. Thus, an examination of the sensitivity of the results to the definition is warranted.

Table 1 shows how prevalent pay for performance is, for the private sector as a whole and by various worker and establishment characteristics. In 2010, the share of all hours in pay for performance jobs, as measured by the broad definition, was 0.42, nearly double that by the more restrictive definition. How does prevalence vary with skill, as represented by work level groups?[12] By the broad definition, the incidence rate climbs steadily as work level rises, with the highest work level group having a rate (0.64) well exceeding that of the bottom (0.34). The

[11] For the small portion of the sample for which bonus type is unavailable, it is assumed that bonuses are not performance-based. The results are not sensitive to this decision.

[12] The distribution of work level groups is as follows: some 51 percent of employment is in the bottom work level group, 26 percent in the second, 11 percent in the third and 1 percent in the top. The remaining share of employment has work level missing, owing to respondent unwillingness or inability to provide information needed to assign a work level.

situation is different with the narrow definition, however, as the prevalence levels off after a steep increase from the bottom to second work level group. The difference under the two definitions suggests that many at the top work levels are receiving non-production bonuses that are not performance-based awards, but instead are bonuses of a different nature.

The proportion of performance pay hours rises by wage quartile under the broad definition, but there is little increase past the first quartile under the narrow definition. Both, however, show evidence of a high incidence rate at the top-most wage levels. For instance, the incidence rate for the top 1 percent is 0.65 and 0.36, under the narrow and broad designations, respectively, versus overall rates of 0.42 and 0.22.

As measured by the broad definition, the rate of incidence by major occupation ranged from 0.56 for management, business and financial occupations to 0.26 for service occupations. While service occupations have the lowest incidence (0.11) under the narrow definition as well, sales have the highest incidence (0.38), owing to the use of commissions in cases where it is relatively straightforward to measure performance through the level of sales. Not surprisingly, pay for performance tends to be much more widespread among full-timers than part-timers, while, consistent with the results in LMP, such schemes are more common for non-union employees than for union ones. According to Freeman (1982), unions prefer standard payment systems because a sense of solidarity is built by having all workers in the same job paid at the same rate and because they seek to avoid supervisory arbitrariness.

Irrespective of definition, the point estimates for pay for performance are largest in financial activities, and smallest among leisure and hospitality; however, the standard errors are too large to make definitive statements. No consistent relationship by size of establishment is shown. Under the broad definition, larger establishments (500 or more employees) are more

likely than their smaller counterparts to have pay for performance schemes, but, under the narrow definition, it is the smallest establishments (under 50 employees) who have the highest incidence rates.

Figure 1 plots a time series of the prevalence of performance pay jobs, under the broad definition, for 1994 through 2010. The point estimates for incidence climb steadily through 2001, before beginning a descent that left it below its starting point in 1994.[13] This up and down movement contrasts with the steady rise in performance-pay jobs noted by LMP between the late 1970s and the early 1990s. Under their preferred definition, the overall incidence climbed from about 0.38 to 0.45 over this span, a rise they attribute to two factors: 1) a lowering of monitoring costs coming about from innovations in information and communication technologies; and 2) shifts in demand in the direction of more skilled workers that raise the benefits of the use of pay for performance schemes without their necessarily having been a change in monitoring costs. Given an absence of evidence that these two factors have moved in the opposite direction in the last decade, other forces must be at work. Candidates include cyclical factors related to the deep recession at the end of the period and to the possibility that some of the use of performance pay was a fad or at least experimental. Shifts in the industrial and occupational composition of the economy, do not seem to have played an important role, as the decline in performance pay incidence occurred within, rather than between, industries and occupations.

In Table 2, we move beyond the topside numbers in examining changes in the prevalence of pay for performance across the years used in the pay and inequality analysis that follows: 1994, 2002 and 2010. We are forced to restrict our attention to the broad definition of pay for performance because data on non-production bonus types for the whole sample are only

[13] The point estimates for the three years at the focus of this study, 1994, 2002 and 2010, are all significantly different from each other at the 1 percent level.

available for recent years. Using this definition, the prevalence rose from 0.45 in 1994 to 0.49 in 2002 before tumbling to the 0.42 already noted in 2010.

A glance at Table 2 suggests, however, that the overall trends in prevalence are masking important relative shifts in incidence, particularly with respect to position in the wage distribution. Those in the bottom quartile of the distribution saw their relative incidence rates steadily erode during the period, while those in the top quartile saw marked increases. These shifts will be important to keep in mind when we assess the effects of performance of pay on changes in the distribution of compensation. Other notable changes are that performance pay became increasingly concentrated among full-timers and among larger establishments.

IV. Performance Pay and the Wage Structure

As a precursor to our examination of the connection between performance pay and inequality in the next section, we now measure performance-pay differentials. These are displayed in Table 3 and have been estimated by regressing the log of wages or compensation on an indicator of pay for performance, along with controls for establishment size, major industry, major occupation, full-time status, union status and quarter. In addition, for 2002 and 2010, when work level controls are available, regressions are run with and without these controls. The inclusion of such controls allows a better isolation of the impact of pay for performance, while excluding such controls facilitates comparisons over time.

Starting with 1994, we see that, all else equal, wages are higher in pay-for-performance jobs by 0.105 log points, consistent with sorting leading to higher-ability workers in pay for performance jobs, as well as with such workers providing higher levels of effort. [14] Importantly, the inclusion of non-wage benefits into the measure of pay has virtually no impact on this result,

[14] A third explanation for a finding that those with performance pay have higher wages is that they receive a compensating differential for sharing in the risks of production.

as the coefficient in the total compensation regression is almost the same. Thus, it does not appear to be the case that increased pay for performance is offset by components of non-wage compensation. For 2002, a regression of the same form, that is, without work levels, generates quite similar point estimates, 0.10 log points for both wages and compensation. When work levels are included, to take account of sorting on skill, the coefficients are 0.08 log points.

Consistent with the growing relative incidence of pay for performance at the upper end of the distribution, in 2010, in regressions without work level, the return to performance pay is up by about two-fifths over 2002 for both wage and compensation. Interestingly, however, when work levels are controlled for, the increase is much smaller. Finally, we also examine returns to the more narrow measure of pay for performance, which could be higher or lower, depending upon the location in the pay distribution of those who have pay for performance jobs under the broad regime but not the narrow one. The return to the narrow definition is lower, particularly when work level controls are included.

V. Performance Pay and Inequality[15]

In this section, we examine the relationship between pay for performance and level and changes in wage and compensation inequality, where pay for performance is measured both in terms of the narrow and broad definitions. One would expect performance pay to tend to increase the level of inequality at a firm at a point in time. In the simplest case, one could have one type of job and all workers of an uncertain ability paid a fixed wage. A switch to pay for performance would clearly increase dispersion as pay becomes better aligned with productivity. The overall impact on inequality is harder to assess, as it depends on where in the distribution the pay for performance workers are located. As LMP point out, the situation is similar to the

[15] We have not calculated standard errors for the decompositions in section V. Accordingly, statements of comparison have not been tested for statistical significance.

relationship between labor unions and inequality, where unions tend to reduce the dispersion among unionized workers but may increase inequality relative to nonunion workers. To be clearer, the point is not that performance pay and unions have a similar impact on inequality, but that one needs additional information to move from incidence rates of performance pay and performance pay differentials to estimates of performance pay's impact of inequality, such as the location in the distribution of those receiving pay for performance.

To obtain this additional information needed to assess the relationship between performance pay and inequality, we use the reweighting approach of DiNardo, Fortin and Lemieux (1996) and compute estimates of what distributions would look like if performance pay jobs were not present. As elaborated in LMP, we can calculate the counterfactual distribution of pay that would prevail if all workers were paid like workers in non-performance pay jobs by reweighting all non-performance-pay observations using a factor that, for any given observation, is the ratio of the share of non-performance pay jobs to the probability that the observation is non-performance pay given its characteristics. We estimate this denominator, the conditional probability of being non-performance pay, by running a logit for the probability of being paid for performance as a function of the observable X characteristics.[16]

Before turning to this section's results, it may be useful to situate the levels of inequality and its trend in the ECEC within the context of the patterns of the more familiar CPS. Appendix Table 1 shows the 90-10, 50-10 and 90-50 percentile wage gaps for 1994 and 2010 for the ECEC and the CPS. These are measured by the log of the ratio of the two relevant percentiles. Comparing the statistics for the ECEC, which cannot be separated by sex, to those for the CPS for both men and women, one sees that the levels of inequality are quite similar. The trends over

[16] X characteristics used for 1994 are dummy variables for establishment size, major industry, major occupation, full-time status, union, and quarter. For 2010, and when 2002 is compared with 2010, work level is added.

time are also fairly close; both datasets show a widening of the 90-10 gap that is the result of the expansion of the 90-50 gap more than offsetting the narrowing of the 50-10 gap.

To see how wage inequality in the ECEC compares with compensation inequality in the same source, we show both, in Figures 2 and 3, respectively, from 1994 through 2010. While the patterns are not identical, one can discern in both series the following: 1) a widening of the 90-50 percentile gap; 2) a narrowing of the 50-10 percentile gap; and 3) a resulting mild increase in the 90-10 percentile gap.

We begin our examination of the relationship between performance pay and the wage distribution for 2010 using the broad definition of the former. One can see by the counterfactual distribution, which has a lower variance, that the presence of pay for performance jobs tends to widen inequality, but its overall effects are relatively mild, on the order of 6 percent (Table 4). What effects there are tend to be concentrated at the top of the distribution. The effect of performance pay jobs is to widen the 90-10 difference by 0.035 log points, but the 99-90 gap is increased by 0.039 log points.

We now consider the impacts of performance pay jobs on total compensation, shown in the second panel of Table 4. The effects could be greater or lesser, depending upon whether the non-wage components are magnifying or offsetting. In this case, we find a slightly offsetting effect. The impact of pay for performance is to increase overall variance by 4 percent, instead of 6 percent. The general pattern of other effects tends to be the same as for wages, just somewhat smaller.

Under the more narrow definition of performance pay, the effects on inequality could be greater or smaller than under the broader definition, as the impacts depend not just on incidence but how the performance pay jobs are spread throughout the distribution. As it turns out, the

effects of performance pay jobs are more muted for the narrow than for the broad definition, both for wages and compensation, though the effects that are present are still concentrated toward the upper part of the distribution.

What would the trends in inequality noted at the start of this section have been like if not for the presence of performance pay jobs? As LMP discuss in detail, there are two ways that pay for performance jobs can affect trends in inequality. One is through changes in the proportion of jobs that are pay for performance and the other is through fluctuations in the inequality-enhancing effect of performance pay jobs over time. These two channels have different implications for what might be driving changes in inequality. In the first case, it may be that an exogenous change, for example a reduction in monitoring costs, has led to increased use of performance pay. In the second case, underlying shifts in demand toward more skilled workers, coming about from technical change and globalization, lead both to wider inequality and increased use of performance pay schemes. In this case, it is the relative demand shift toward more skilled workers that is the real cause and performance pay is an important channel through which the demand shifts are transmitted. LMP conclude that, in their results, most of the impact of performance pay on wage inequality is attributable to the fact that returns to observable skills increased faster in performance pay jobs than in non-performance pay jobs, which is consistent with the second channel. While distinguishing between these two scenarios is not an easy task, it will be of interest in the present examination to see what can be learned from comparing the two sub-periods, given that prevalence of performance pay moved upward in one and sharply downward in the other.

We now turn to Table 5, which summarizes the results of an analysis of the 2002-2010 period. During this time, the overall inequality of wages, as measured by the log variance,

increased to 0.363 from 0.331, a rise of about 10 percent. When one looks at the change in the 90-50 (0.083 log points) and 50-10 percentile log differences (0.011 points), it is clear that virtually all the increase in inequality was occurring in the top half of the distribution, consistent with what has been found with CPS-based studies. To calculate the contribution of performance pay to wage inequality, we first use reweighting to estimate what the variance and percentile log differences would look like in the absence of pay for performance jobs for each year. Calculating that change and dividing it by the actual change yields the percentage of change explained by the performance pay jobs in the final column.

During this period, when the incidence of performance pay declined from 0.49 to 0.42, the effect of performance pay was relatively modest. It accounts for 9.4 percent of the overall increase in variance, 7.2 percent of the widening of the 90-50 gap and 11.7 percent of the increase in the 90-10 gap. As percentages, the results for the other percentile gaps tend to be larger, but these are over a small or sometimes even negative base.

It may, however, be surprising that performance pay accounts for any of the increase in inequality at all, given that its prevalence fell. That it does indicates that the remaining performance pay jobs are playing more of an inequality-increasing role than the previously larger performance pay sector. This, in turns, suggests that if performance pay jobs return to previous levels, they could play a larger role in boosting inequality.

Turning to compensation, the patterns are fairly similar to those for wages. The log variance increased by 13 percent. The 90-10 gap widened a bit more than for wages, primarily because there was more movement in the 50-10 gap, though, as with wages, the 90-50 gap widening was the driving force behind the overall increase. The explanatory power of performance pay continues to be modest, 16.7 percent of overall variance, 13.6 percent of the 90-

10, and 9.0 percent of the 90-50. Once again, however, it needs to be kept in mind that the incidence of performance pay declined during the period.

To see what happened when prevalence was on an upswing, we now turn to the 1994-2002 period.[17] During this time, overall inequality actually declined both for wages and for total compensation, as the 50-10 gaps narrowed appreciably, while the 90-50 gaps widened slightly. For overall inequality and for percentile gaps that do not involve the 99th percentile, the reweighting estimates suggest that pay for performance worked in the direction of increasing inequality, although the absolute impact was not great. For instance, for log wages, the estimates suggest that the 90-10 percentile gap would have narrowed by 0.021 log points more if not for the presence of pay for performance jobs, while for compensation, the comparable magnitude is 0.015. Interestingly, for wages, the 99-90 and 99-75 percentile gaps would have been about 0.03 log points wider if not for pay for performance, though there was less of an impact on these gaps for total compensation

VI. Conclusions

In this paper, we examined the link between pay for performance and pay inequality using the microdata from the quarterly Employer Costs for Employee Compensation over the period 1994-2010. Several interesting findings emerged. First, in contrast to trends noted in the PSID by LMP, the incidence of performance pay has not been moving decidedly upward. It is an open question as to whether the share of performance pay jobs will recover as economic growth strengthens. Second, the trends for the private sector as a whole mask a growing relative incidence at the top of the wage distribution. Third, the impact of pay for performance jobs on the levels of inequality tends to be fairly modest in the ECEC relative to the PSID, especially

[17] The two sets of 2002 results are not identical because the one matched with 2010 includes controls for work level, while the one matched with 1994 does not.

when a narrow definition of pay for performance is used. Fourth, owing to an increase in impact of pay for performance on the levels of inequality, pay for performance did push in the direction of a small increase in inequality during the period.

All in all, however, the results stand in sharp contrast to the finding of LMP that pay for performance played an important role in rising male wage inequality between the mid-1970s and early 1990s, particularly above the 80th percentile.[18] Given the differences between the employer-based ECEC and the household-based PSID and that the time periods in the two studies hardly overlap, there are a number of possible explanations for the contrast in the results. One involves the fact that the ECEC includes women while LMP's PSID sample does not. A recent study by Heywood and Parent (2012) concludes that the tendency for performance pay to be associated with greater wage inequality at the top of the male earnings distribution applies only to white workers and not to black workers. Whites are more likely to be in pay for performance jobs and receive a higher differential when they are in such jobs. The higher differential is attributable in part to a greater relative likelihood of whites receiving bonuses at the top of the distribution, while blacks are subject to piece rates at the bottom. While one would not expect an identical story for women relative to men, it is still possible that the relationship between performance pay and wage inequality found by LMP applies only to men and not to women, or at least not to the same extent. Unfortunately, that speculation is impossible to check directly because the PSID data on bonuses and commissions are only available for heads of households and heads are assumed to be male in husband-wife pairs. Thus, the sample of females with the necessary data is small and unrepresentative.

[18] On the other hand, using a different approach, Sommerfeld (2012) did not find a relationship between the growing use of performance pay and the widening of inequality between 1984 and 2009 in Germany.

Further investigations did not, however, provide additional support for the hypothesis that we would get very different results with the ECEC if we were able to exclude women from the sample. As shown in Appendix Table 1, while men alone have a bigger 50-10 gap than does the overall sample, other patterns look similar to those for a sample as a whole. We also recalculated the incidence of performance pay in the ECEC by benchmarking the weights for industry x occupation cells to that found for men in the CPS, and found that this has little impact.

It is unfortunate that it is not possible to conduct an ECEC-based study for the same period as LMP did, but it would be fruitful for future research to examine trends in the PSID from the mid-1990s forward. We are saying this not only because this would help in any reconciliation with our results, but also because it appears that the PSID may have diverged somewhat from the CPS in inequality during the period LMP study. For instance, the 90-10 in LMP's sample increased by 0.372 log points from 1976-79 to 1990-93, while using data underlying Autor, Katz and Kearney (2008), we find an increase of 0.210 over the same period in the March CPS. The majority of the difference can be found in the top of half of the distribution. Whether this divergence is related to LMP's results is an open question.

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Table 1. Prevalence of Pay for Performance

	Broad Definition	Narrow Definition
Private sector	0.42	0.22
Work level		
1-4	0.34	0.18
5-8	0.49	0.27
9-12	0.55	0.27
13-15	0.64	0.29
Missing work level	0.54	0.26
Position on basis of hourly wage		
Lowest 10 percent	0.18	0.11
Lowest 25 percent	0.24	0.13
Second 25 percent	0.43	0.24
Third 25 percent	0.47	0.26
Top 25 percent	0.56	0.27
Top 10 percent	0.60	0.28
Top 5 percent	0.62	0.29
Top 1 percent	0.65	0.36
Major occupation group		
Management, business and financial	0.56	0.28
Professional and related	0.48	0.18
Sales	0.51	0.38
Office and Administrative Support	0.46	0.25
Service	0.26	0.11
Construction and extraction	0.33	0.20
Installation, maintenance and repair	0.47	0.28
Production	0.44	0.23
Transportation and material moving	0.39	0.21
Full-time	0.46	0.25
Part-time	0.21	0.10
Union	0.35	0.10
Non-union	0.43	0.24
Major industry		
Mining	0.40	0.11
Construction	0.35	0.24
Manufacturing	0.51	0.27
Wholesale and Retail Trade	0.45	0.31
Transportation and Utilities	0.44	0.22
Information	0.62	0.23
Financial Activities	0.66	0.36

Professional and business services	0.44	0.22
Education and health services	0.35	0.11
Leisure and hospitality	0.22	0.10
Other services	0.34	0.24
Establishment size		
1 to 49 workers	0.38	0.27
50 to 99 workers	0.39	0.20
100 to 499 workers	0.42	0.19
500 to 999 workers	0.52	0.18
1000 workers or more	0.57	0.20

Notes. Fraction of Hours Worked. Employer Costs for Employee Compensation, 2010

Table 2. Changes in the Prevalence of Pay for Performance

	1994	2002	2010
Private sector	0.45	0.49	0.42
Position on basis of hourly wage			
Lowest 10 percent	0.28	0.29	0.18
Lowest 25 percent	0.35	0.38	0.24
Second 25 percent	0.46	0.48	0.43
Third 25 percent	0.50	0.54	0.47
Top 25 percent	0.49	0.58	0.56
Top 10 percent	0.48	0.60	0.60
Top 5 percent	0.49	0.63	0.62
Top 1 percent	0.54	0.70	0.65
Full-time	0.48	0.51	0.46
Part-time	0.29	0.37	0.21
Union	0.41	0.46	0.35
Non-union	0.46	0.50	0.43
Establishment size			
1 to 49 workers	0.48	0.47	0.38
50 to 99 workers	0.44	0.41	0.39
100 to 499 workers	0.42	0.50	0.42
500 to 999 workers	0.47	0.57	0.52
1000 workers or more	0.43	0.56	0.57

Notes. Fraction of Hours Worked, Broad Definition, Employer Costs for Employee Compensation, 2010

Table 3. Regression Estimates of the Effect of Performance Pay on Log Hourly Pay

Year	Level Info Included?	Broad or Narrow?	Log Wages		Log Compensation	
			Coefficient	S.E.	Coefficient	S.E.
1994	No	Broad	0.105**	(0.011)	0.105**	(0.012)
2002	No	Broad	0.101**	(0.011)	0.098**	(0.012)
2002	Yes	Broad	0.079**	(0.010)	0.076**	(0.011)
2010	No	Broad	0.142**	(0.009)	0.149**	(0.009)
2010	Yes	Broad	0.087**	(0.007)	0.093**	(0.007)
2010	No	Narrow	0.126**	(0.011)	0.125**	(0.011)
2010	Yes	Narrow	0.061**	(0.008)	0.059**	(0.008)

Notes. Coefficient of regression of log pay on pay for performance indicator. Besides performance pay and possibly work level, covariates are dummies for establishment size classes, major industry, major occupation, full-time status, union status and quarter. Sample Sizes: 75,948 in 1994, 116,125 in 2002, and 252,065 in 2010.
Employer Costs for Employee Compensation, 1994, 2002 and 2010
* significant at 5 percent level, ** significant at 1 percent level

Table 4. Reweighting Estimate of the Effect of Pay for Performance Jobs on Measures of the Distribution of Pay, 2010

	Broad Definition			Narrow Definition	
	Log Wages				
	Actual Dispersion	Dispersion without PP Jobs	Difference	Dispersion without PP Jobs	Difference
Variance	0.363	0.344	0.019	0.356	0.007
Percentile gaps					
90-10	1.519	1.484	0.035	1.509	0.010
50-10	0.647	0.626	0.021	0.640	0.007
90-50	0.872	0.859	0.013	0.869	0.004
99-90	0.716	0.678	0.039	0.692	0.024
75-50	0.450	0.433	0.018	0.446	0.004
99-75	1.138	1.104	0.034	1.114	0.024
	Log Compensation				
	Actual Dispersion	Dispersion without PP Jobs	Difference	Dispersion without PP Jobs	Difference
Variance	0.410	0.395	0.015	0.405	0.005
Percentile gaps					
90-10	1.678	1.648	0.030	1.666	0.012
50-10	0.776	0.761	0.015	0.770	0.006
90-50	0.902	0.887	0.015	0.896	0.007
99-90	0.647	0.616	0.030	0.632	0.015
75-50	0.468	0.450	0.018	0.467	0.001
99-75	1.081	1.054	0.027	1.061	0.020

Notes. The counterfactual measures of pay dispersion are computed by reweighting the sample of non-performance-pay jobs. Employer Costs for Employee Compensation, 2010

Table 5. Reweighting Estimate of the Effect of Pay for Performance Jobs on Measures of the Distribution of Pay, 2002-2010, Broad Definition

Log Wages

	2002 Actual Dispersion	2002 Dispersion without PP Jobs	Difference	2010 Actual Dispersion	2010 Dispersion without PP Jobs	Difference	Percentage of change explained by PP jobs
Variance	0.331	0.315	0.016	0.363	0.344	0.019	9.4
Percentile gaps							
90-10	1.425	1.400	0.024	1.519	1.484	0.035	11.7
50-10	0.636	0.618	0.018	0.647	0.626	0.021	27.3
90-50	0.789	0.782	0.007	0.872	0.859	0.013	7.2
99-90	0.737	0.714	0.023	0.716	0.678	0.039	-76.2
75-50	0.419	0.406	0.013	0.450	0.433	0.018	16.1
99-75	1.106	1.090	0.016	1.138	1.104	0.034	56.3

Log Compensation

	2002 Actual Dispersion	2002 Dispersion without PP Jobs	Difference	2010 Actual Dispersion	2010 Dispersion without PP Jobs	Difference	Percentage of change explained by PP jobs
Variance	0.362	0.355	0.007	0.410	0.395	0.015	16.7
Percentile gaps							
90-10	1.553	1.540	0.013	1.678	1.648	0.030	13.6
50-10	0.741	0.735	0.006	0.776	0.761	0.015	25.7
90-50	0.813	0.805	0.007	0.902	0.887	0.015	9.0
99-90	0.639	0.638	0.001	0.647	0.616	0.030	362.5
75-50	0.432	0.428	0.003	0.468	0.450	0.018	41.7
99-75	1.020	1.015	0.005	1.081	1.054	0.027	36.1

Notes. Employer Costs for Employee Compensation, 2002 and 2010

Table 6. Reweighting Estimate of the Effect of Pay for Performance Jobs on Measures of the Distribution of Pay, 1994-2002 Broad Definition

Log Wages

	1994			2002			
	Actual Dispersion	Dispersion without PP Jobs	Difference	Actual Dispersion	Dispersion without PP Jobs	Difference	Percentage of change explained by PP jobs
Variance	0.339	0.326	0.013	0.331	0.312	0.019	-75.0
Percentile gaps							
90-10	1.470	1.456	0.015	1.425	1.389	0.036	-46.7
50-10	0.700	0.681	0.019	0.636	0.610	0.027	-12.5
90-50	0.770	0.775	-0.004	0.789	0.779	0.009	68.4
99-90	0.714	0.647	0.067	0.737	0.701	0.036	-134.8
75-50	0.428	0.430	-0.002	0.419	0.405	0.014	-177.8
99-75	1.056	0.991	0.065	1.106	1.075	0.031	-68.0

Log Compensation

	1994			2002			
	Actual Dispersion	Dispersion without PP Jobs	Difference	Actual Dispersion	Dispersion without PP Jobs	Difference	Percentage of change explained by PP jobs
Variance	0.381	0.375	0.006	0.362	0.353	0.009	-15.8
Percentile gaps							
90-10	1.620	1.618	0.002	1.553	1.536	0.017	-22.4
50-10	0.811	0.806	0.005	0.741	0.730	0.011	-8.6
90-50	0.808	0.812	-0.004	0.813	0.806	0.007	220.0
99-90	0.616	0.589	0.027	0.639	0.623	0.017	-43.5
75-50	0.447	0.449	-0.002	0.432	0.429	0.002	-26.7
99-75	0.977	0.952	0.025	1.020	0.999	0.021	-9.3

Notes. Employer Costs for Employee Compensation, 1994 and 2002

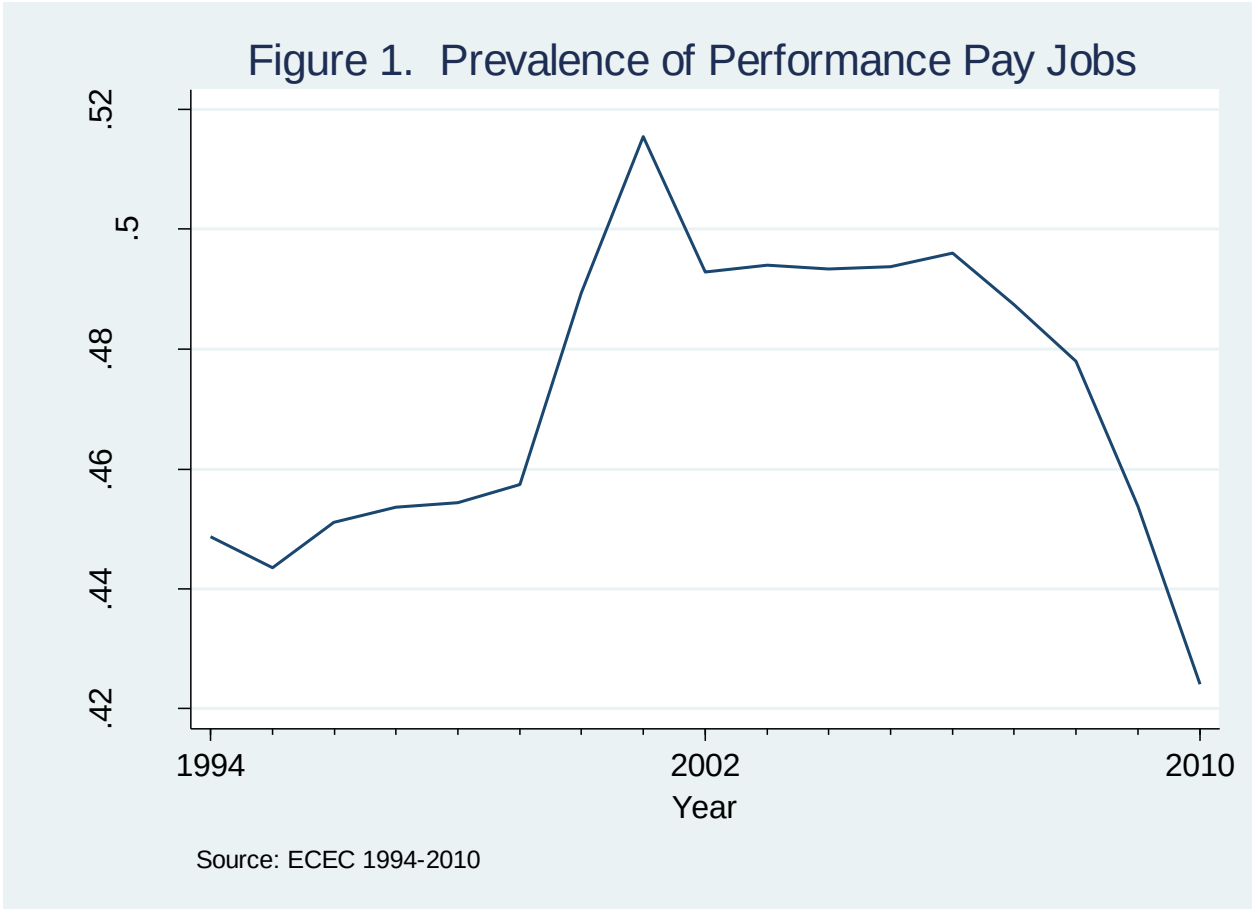
Figure 1. Prevalence of Performance Pay Jobs
Performance Pay
.42
.44
.46
.48
.5
.52
1994
2002
2010
Year
Source: ECEC 1994-2010

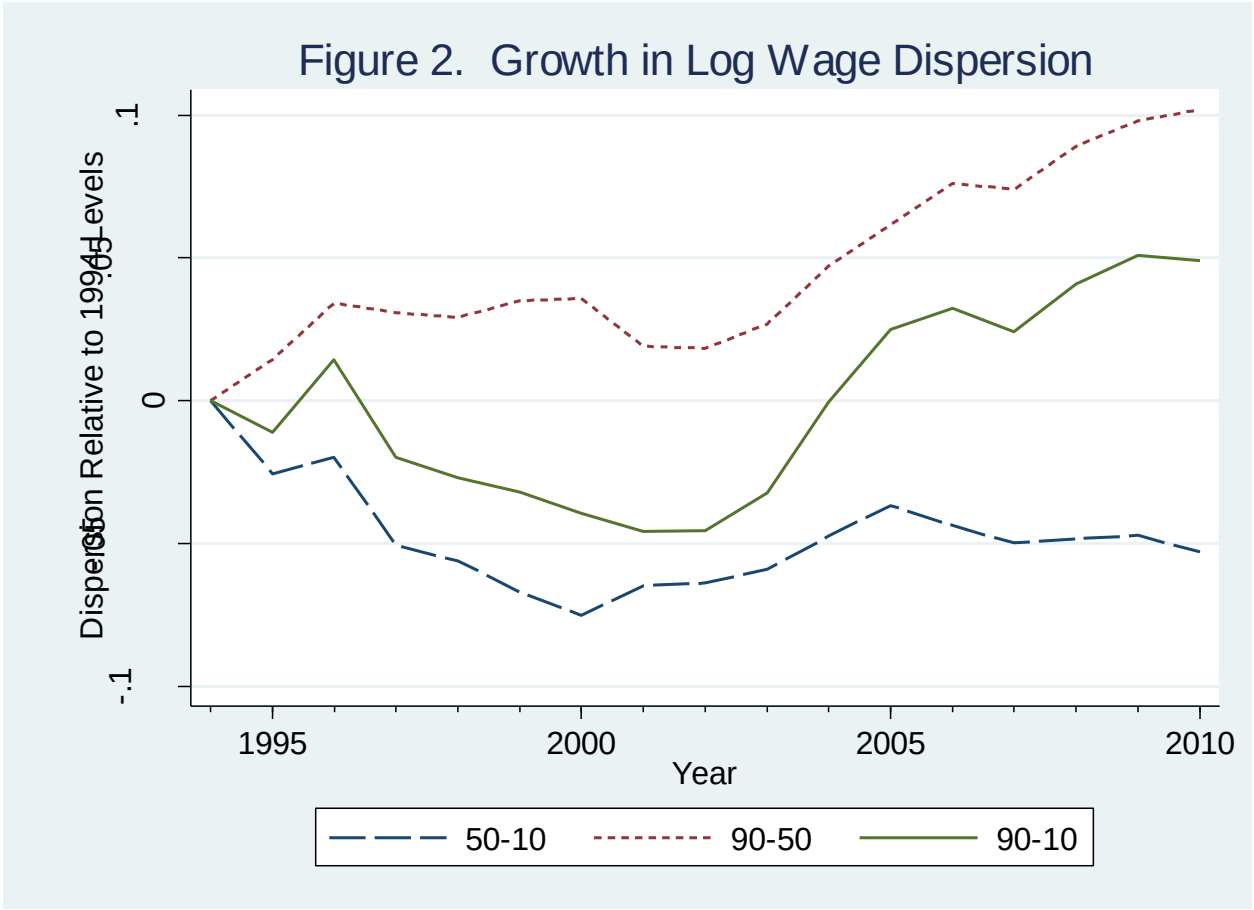
Figure 2. Growth in Log Wage Dispersion
Dispersion Relative to 1994 Levels
-.1
0
.05
.1
1995
2000
2005
2010
Year
50-10
90-50
90-10

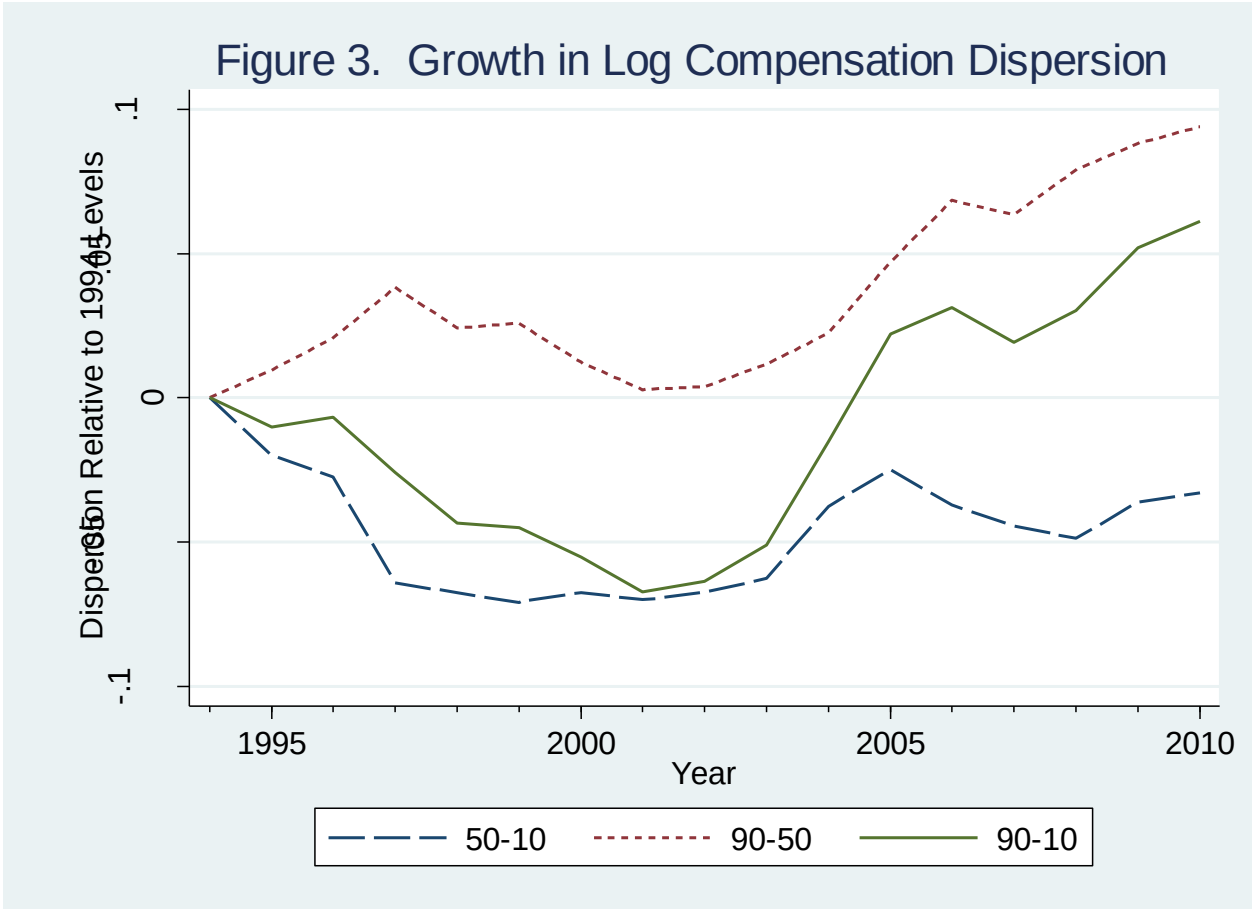
Figure 3. Growth in Log Compensation Dispersion
Dispersion Relative to 1994-95 Levels
-.1
0
.05
.1
1995
2000
2005
2010
Year
50-10
90-50
90-10

Appendix
Defining Pay for Performance in the National Compensation Survey

We consider a job to be a pay for performance job if it has incentive-based pay or if some job incumbents receive a non-production bonus. Here we describe how the NCS operationalizes each of these concepts.

Incentive Pay. When a job is sampled in the NCS it is classified according to a number of dimensions, one of which is whether the job is time-based or incentive-based. Time-based jobs have pay tied solely to an hourly pay rate or salary and not to a specific level of production. In contrast, incentive pay jobs have pay tied, at least in part, to commissions, piece rates, production bonuses or other incentives based on production or sales. The incentive payment is non-discretionary in the sense that it follows an explicit formula.

For incentive pay jobs, NCS data collectors determine information sufficient to capture an hourly wage rate, which includes any base pay plus realized incentive payments. The NCS data capture systems do not uniformly capture the job's particular incentive payment formula[19], or the split between base pay and incentive pay premiums.

Non-production bonuses. Non-production bonuses are cash payments that are not explicitly related by formula to productivity. Such payments may stem from annual or year-end bonus plans, but may also reflect a variety of incentive plans. In the NCS, non-production bonus plans are currently placed into five categories:

1. Employment incentive awards
    - -hiring bonus
    - -referral bonus
    - -retention bonus
2. Performance-based awards
    - -cash profit-sharing bonus
    - -end-of-year bonus
    - -holiday bonus
    - -management incentive bonus
3. Recognition awards
    - - Attendance bonus
    - - Employee of the month award
    - - Longevity bonus
    - - Safety bonus
    - - Suggestion bonus
4. Union-related bonuses
    - - Contract signing bonuses
    - - Lump sum bonuses
5. Other

[19] However, incentive-pay formulas usually reflect commissions among sales occupations and piece rates or other production bonuses among skilled production workers. Barkume (2004) considers these two occupational groups separately.

- In lieu of benefit payment
- Flexible benefit plans
- Paid leave buyback
- Other non-formula related cash payments
- Ad hoc bonuses

NCS data systems only capture this plan type detail in later years, but these categories reflect the scope of bonus plans throughout our analysis periods. It is unclear whether all of these plan types reflect substantial pay for performance. Employers may, of course, offer multiple plans.

Non-production bonus payments are considered to be a benefit in the NCS data collection scheme, with hourly cost values calculated separately from the wage rate. Therefore, unlike with incentive pay, NCS data allows us to discern the relative magnitudes of wages and non-production bonuses. However, we cannot discern costs separately for each individual bonus plan.

Presence of a bonus plan does not imply positive bonus payments. We, however, have chosen to consider a job pay for performance on the basis of non-production bonuses only if there are positive bonus payments. If an employer decides not to fund a plan in a given year, this definition means its sampled jobs will not be labeled as pay for performance jobs in that year, unless they are incentive pay jobs as described above.

The reason we have made this decision is because, as noted in the text, we cannot always determine whether a bonus plan is in place. As a practical matter, NCS benefits data elements often must be allocated or imputed; these processes may affect how jobs are classified, as they assign non-production bonus costs to be positive or zero. For non-production bonuses, the respondents often know whether plans exist, but do not always know the amount of payments. In this situation, imputations usually assign a positive cost.[20] Furthermore, some respondents might offer information about certain components of the ECEC, but not about non-production bonuses. In this case, it is not clear whether a plan exists. Positive costs have generally been imputed in such cases, though, over time, there have been improvements in the imputation process for this scenario. With current procedures, first the presence of a plan is imputed and then, if one is considered to be in effect, costs are then imputed. These improvements have, however, complicated trend analysis.

These issues have led us to devise alternative definitions of pay for performance as robustness checks. In our main analysis, we define a job as being pay for performance in two ways, one broader and the other more restrictive. The broader definition includes all jobs that are either incentive-based or those that receive a non-production bonus. The narrow definition still includes jobs that are incentive-based, but only adds jobs receiving non-production bonuses if those bonuses fall into the second category of non-production bonuses detailed above, performance-based awards.

We also conduct separate analyses using the broader concept, but defining non-production bonuses based on whether the jobs had positive costs at some time within an 8-year period,

[20] An important exception is when prior quarter costs for the job are known to be zero, in which case the imputation is for a rate of change applied to prior quarter costs, resulting in a zero cost value for the current quarter.

instead of just the current quarter, provided they are not jobs that clearly do not have a plan in place in the current quarter. This shift in definition raises incidence of pay for performance jobs (by roughly 5-6 percentage points) because it reclassifies some zero bonus cost jobs to be pay for performance jobs. This alternative definition has small effects on our results on trends in incidence or the contribution of performance pay jobs to changing inequality, and does not alter results qualitatively.

Finally, we perform a separate analysis excluding the part of the sample where we do not know whether a bonus plan exists. The purpose of this analysis is to confirm that imputation methods for this situation do not unduly affect our results. This alternative sample gives results very similar to those shown in the paper.

Appendix Table 1
Percentile Wage Gaps
Comparison Between the ECEC and the CPS, 1994-2010

	90-10	50-10	90-50
ECEC-All			
1994	1.470	0.700	0.770
2010	1.519	0.647	0.872
Change	0.049	-0.053	0.102
CPS-All			
1994	1.484	0.700	0.784
2010	1.551	0.680	0.872
Change	0.067	-0.020	0.087
CPS-Men			
1994	1.531	0.760	0.772
2010	1.604	0.731	0.873
Change	0.072	-0.029	0.101
CPS-Women			
1994	1.381	0.613	0.769
2010	1.449	0.622	0.827
Change	0.067	0.009	0.058

Notes. Source for CPS data is Economic Policy Institute, *The State of Working America 12th edition,* Tables 4.4, 4.5 and 4.6. ECEC is for private sector only, while CPS covers the entire economy.