Higher and Higher? Performance Pay and Wage Inequality in Germany

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– Preliminary! –
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Abstract: Performance pay is of growing importance as it applies to a rising share of employees. A parallel trend has been that of growing wage dispersion. From this the question evolves of how is the growing use of performance pay schemes related to the increase in wage inequality? German SOEP data for the years 1984 to 2009 confirm the large increase in the application of performance pay schemes. This growing use of variable pay schemes led to an upward shift of the wage structure by about one log point. However, it did not contribute to the growth in wage inequality. Wage inequality grew within the group of employees who receive performance pay, but even more so within the group who do not receive this. The results are in line with a hypothesis according to which skill-biased technological change (SBTC) changes the returns to skills and this translates into higher wage inequality by means of performance pay schemes. The empirical analysis employs sequential decompositions in a quantile regression framework.

Keywords: Performance Pay, Wage Structure, Quantile Regression, Sequential Decomposition

JEL-Classification: J31, J33, C21

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1 Introduction

Classical labor market theory assumes that wages equal the marginal product of labor, that is: productivity. One mechanism to align wages with productivity is performance pay in which remuneration depends on some measure of performance. This payment scheme has recently gained attention as it applies to more and more employees. A parallel trend has been that of growing wage inequality. From this the following research question evolves: How is the rise in wage inequality related to the growing use of performance pay schemes?

In theory, employers have a choice between paying fixed or variable wages. Variable pay schemes are advantageous in that they induce effort and attract highly productive workers. However, it is costly to monitor effort so that for some employers or certain jobs a fixed wage scheme is more profitable. Lemieux, MacLeod, Parent (2009) argue that due to technical progress, monitoring costs have declined so that more employers now find it profitable to pay wages according to workers’ performance. This could explain why the use of performance pay schemes is growing.

The introduction of performance pay schemes could affect wages through different channels (see e.g. Heywood and Parent, 2009; Booth and Frank, 1999). Above all, it is expected to induce higher effort which would in turn generate higher wages. At the same time, performance pay leads to sorting of workers: As employees know about their own productivity and about their willingness to provide effort, they select themselves into the preferred pay scheme (Lazear, 2000). In consequence, the researcher would observe higher wages within the group of performance pay workers as opposed to the non-performance pay job matches. Moreover, wage insecurity is higher in variable pay schemes which could be compensated by higher wages (Amuedo-Dorantes and Mach, 2003).

In addition to the level effect, performance pay is expected to go along with rising wage inequality. First, wage level differences between the two remuneration schemes generate between-variation. Second, also within performance pay jobs, wage inequality is higher almost by definition. This is because effort is more variable than wages in a fixed wage scheme. To see this, consider a fixed wage scheme in which wages are determined by e.g. educational level and tenure. Under a variable pay scheme the performance depends on many more factors such as career-orientation, ability, health etc. thus generating higher variability in productivity and thus in wages. Additional
variation could be caused through the monitoring mechanism. From all this, one would expect that the rising incidence of variable pay schemes brings about higher wage inequality. In addition, performance pay could serve as a channel to translate changes in returns to skills as induced by skill-biased technological change (SBTC) into wage differences (Lemieux et al., 2009; Heywood and Parent, 2009). Put differently, if SBTC requires larger wage differentiation, then pay for performance could be a mechanism to implement this. Lemieux et al. (2009) conclude that this applies to the case of the U.S. in the last quarter of the past century.

For Germany, this relation has not been studied, yet. Performance pay plays a special role in Germany in the particular context of the German industrial relations system. As performance pay is more flexible compared to collective bargaining, it was seen as a way to increase the competitiveness of German firms and thus to reduce unemployment (Jirjahn, 2002, p. 163). The incidence of performance pay has been increasing in Germany like in other industrialized countries (Pannenberg and Spiess, 2009). One viable data source to analyze this question is the German Socio-Economic Panel (SOEP) which among other things asks explicitly for performance evaluations by the supervisor. According to this, the share of employees whose performance is evaluated in the year 2004 ranges between 25% (Cornelifßen et al., 2011) and 31% (Grund and Sliwka, 2010), depending on the exact specification of the data set. The long-term rising trend for the incidence of performance pay in Germany is described in Pannenberg and Spiess (2009) for the period from 1991 to 2000. This study aims at providing a detailed description of the empirical trends for an even longer time period, i.e. from 1984 to 2009.

Wage inequality has been rising in Germany during the last 30 years (Kohn, 2006; Gernandt and Pfeiffer, 2007; Dustmann et al., 2009; Antonczyk et al., 2009). Recently, the growth in wage dispersion was dramatic (more than 10 log percentage points at the 90-10-differential from 2001 to 2006, see Antonczyk et al., 2010). Growing wage inequality has been found to affect the top as well as the bottom of the wage distribution (ibid.) which makes it an important component in the debate on poverty and the low wage sector. Several explanations are possible, such as skill-biased technological change. However, Antonczyk et al. (2009) find that changes in the tasks cannot explain growing wage dispersion in Germany. Also, deunionization can explain only a small part of the growing wage inequality (Antonczyk et al., 2010). Can performance pay explain it?

Answering this question requires two things: First, in order to capture the
entire distribution of wages, quantile regression methods will be applied to a sequential decomposition. Second, this analysis requires a long panel data set with information on performance pay.

The empirical analyses in this paper are based on data from the German Socio-Economic Panel (SOEP). Performance pay jobs are defined as those job matches which have paid profit sharing, premiums or similar bonuses at least once in the past (similar to Lemieux, MacLeod, Parent, 2009 and Heywood, Parent, 2009). This study provides a detailed description of the use of performance pay in West Germany over the observation period from 1984 to 2009.

The analyses confirm the strong increase in performance pay for Germany. For those employees who receive this type of variable pay, it amounts to one half monthly salary per year at the median, corresponding to 1,700 Euro. Further, the empirical evidence documents the large wage differences between both types of remuneration schemes, and shows that little of this difference is causally due to performance pay. Rather, selection on observables and unobservables explains a large share of the wage difference. The results leave an average wage gain in performance pay jobs of less than 2 percentage points after controlling for individual unobserved heterogeneity. Wage inequality has grown strongly over the observation period. Changes in the coefficients (i.e. the remuneration scheme) are the largest contributor to this trend. Changes in the composition of characteristics also contribute strongly to growing wage dispersion. In contrast, the growing use of pay for performance did not add to wage inequality. Still, there has been a small but significant shift in wages due to the growing use of performance pay. As more employees receive pay for performance, wage inequality grew within the group of performance pay job matches and even more so among those who do not receive pay for performance. The wage difference between both types of jobs also grew over time, but remains flat.

This paper proceeds as follows: The next section gives insight on the economic background and derives clear research questions. Section 6 explains the data, specific data problems and their solution, together with extensive descriptive statistics. Section 4 outlines the sequential decomposition method and presents the results. The final section concludes.
2 Economic background

There are different types of pay for performance. These include piece rates and overtime premia which can be found mainly in production and for low to medium qualified employees (Jirjahn, 2002). In contrast, this study refers to “pay for performance” as profit-sharing, premia and bonuses other than Christmas or vacation pay and also excluding overtime premia (see section 3). This definition is rather general, as it does not differentiate between individual and group incentives. Neither is it possible to differentiate between different mechanisms of how bonus pay is determined (e.g. tournaments). In fact, there is a huge complexity in reward systems (Schaefer, 1998, p. 437) and a huge heterogeneity between or even within firms (Engellandt and Riphahn, 2004). This makes it impossible to find a unifying empirical framework. Therefore the empirical researcher has two options to affront this huge heterogeneity: Either employ case studies or use a more general definition for instrumentalisation. This study choses the latter approach.

How does pay for performance affect wages? Above all, pay for performance intends to stipulate effort and to increase productivity (e.g. Brown and Heywood, 2004). This function as an incentive wage is of particular relevance in situations where the worker-specific effort or corresponding output cannot be observed by the employer. However, the employee herself knows about her effort and productivity and therefore selects into the more profitable payment scheme, i.e. a fix or variable pay scheme. This way, pay for performance induces the sorting of workers across pay schemes (Dohmen and Falk, 2011; Lazear, 2000). In consequence, wage differences that are observed between fixed and variable pay schemes should not be taken as causal, as they could be due to this sorting of workers.

Further, starting from a standard Cobb-Douglas production function, classi-
cal labor economics theory assumes that wages equal the marginal product of labor, that is: productivity. However, wages often differ from this for different reasons, such as delayed compensation, collective bargaining, training contracts etc. Against this background, pay for performance can be seen as a mechanism to align wages with productivity more closely. This holds in particular if productivity or output is observed and rewarded. This corresponds to a tighter definition of pay for performance. Empirical support for this mechanism is given in the study by Lemieux et al. (2009) who show that in a fixed wage regime job and firm characteristics yield higher returns whereas in a variable pay scheme, wages are more closely related to worker’s characteristics.

By definition, wages vary more on the individual level in a variable pay scheme compared to a fixed wage. This is because productivity or performance varies more than the determinants of a fixed wage which usually comprise such characteristics as education and tenure. In contrast, the performance depends on many more factors such as ability, career-orientation, health, etc. which generate higher variability in productivity and thus in wages. Additional variation could be caused by outside factors (cooperating partners, product demand etc.) or the measurement mechanism itself. Hence, wage variability is expected to be higher on an individual level under a variable compared to a fixed wage scheme. The wage insecurity an individual worker faces under a variable pay scheme could pose another explanation for higher wages in this pay scheme (Amuedo-Dorantes and Mach, 2003; Parent, 1999).

Finally, pay for performance could also serve as a mechanism to translate returns to skills into wage differences. Lemieux et al. (2009) argue that skill-biased technological change (SBTC) which changes the relative demand for skilled labor translates into changed returns to observed characteristics. Here, pay for performance could serve as the channel by which changed returns to skills are translated into wages (also see Heywood and Parent, 2009). Hence, SBTC could be the underlying cause for the rising incidence of pay for performance.

An alternative explanation for the growing use of performance pay is given by Lemieux et al. (2009) according to which monitoring costs decreased due to technological progress. The argument goes as follows: Firms face a choice between paying their employees for performance or not. This choice has potential benefits and costs. The benefit is a productivity increase while the price to pay is monitoring costs. If due to technological progress productivity is easier to monitor, these costs decrease. In turn it becomes profitable for
more firms to pay for performance and the overall incidence increases (for
the whole argument see Lemieux et al., 2009).

Both explanations predict a growth in the incidence of performance pay
schemes. This has been confirmed empirically for different countries (Lemieux
et al., 2009; Heywood and Parent, 2009; Pannenberg and Spiess, 2009). An
increase in the incidence of pay for performance is expected to cause a wage
increase if wages are higher under this variable pay scheme, as has been
outlined above. What does this mean for the distribution of wages?

Rising wage inequality is the major empirical trend in labor economics in
recent decades. The strong rise in wage dispersion in the US and the UK
since the 1980s affected the entire distribution (see summary in Antonczyk
et al., 2010). In contrast, in West Germany wage inequality began rising
first at the top of the distribution in the 1980s, and only started to grow
at the bottom since the 1990s (Dustmann et al., 2009; Fitzenberger, 1999).
The early period includes the start of the observation period in this analysis,
which may affect the results.

Different explanations have been offered for rising wage dispersion, still parts
of the trend remain unexplained. One prominent explanation is skill-biased
technical change which is consistent with the German development under
the presumption that labor market institutions such as collective bargaining
prevented wage inequality at the bottom from growing (Fitzenberger, 1999;
Dustmann et al., 2009; Antonczyk et al., 2010). However, Antonczyk et al.
(2009) conclude that the recent rise in wage inequality cannot be traced back
to tasks performed at the workplace. Another possible explanation for ris-
ing wage dispersion is deunionization where the idea is that unions intend
to foster wage equality. However, Antonczyk et al. (2010) conclude that
deunionization can only explain a small share of increasing wage inequality
in Germany while a large share remains in different remuneration schemes
between different industries and firms. As the increasing trend of wage in-
equality runs parallel to the trend in performance pay, the question arises,
whether these two trends are correlated?

How wage inequality is affected by the increasing use of performance pay
depends on where in the wage distribution those bonuses are paid. On the
one hand, if performance pay includes group incentives such as profit-sharing,
then all types of workers could potentially benefit from profit-sharing regard-
less of their effort. In this case, performance pay could affect all workers in
those firms which reward group effort and could thus potentially affect the
entire wage distribution. However, it is also plausible that performance pay
affects mainly high-wage earners such as managers. The reason is that their effort is hard to monitor but decisive for the firm’s success which is a classical situation to implement an incentive pay system. So, from this point, performance pay would be expected to affect mainly the top of the wage distribution. Also, as Heywood and Parent (2009) show, performance pay tends to be associated with higher wage inequality at the top of the distribution. From this, the increasing use of performance pay schemes would be expected to raise wage inequality. As the question is undecided from theory, the following analysis tries to shed light on it from an empirical perspective.

Thus, the key research question is: How would the wage structure have developed, had the incidence of pay for performance not increased?

In order to answer this question, this study will simulate the wage distribution had the use of performance pay not increased but remained stable. This will be analyzed by means of a sequential decomposition method as explained in section 4.

Another way to think about it is in terms of within vs. between inequality. How did the growing use of performance pay schemes affect the wages of the “insiders”, i.e. those employees who work in a variable pay scheme? For example, do different types of employees receive performance pay now compared to then, so that the composition of the characteristics of this group changes? Put differently, was the positive selection of employees into job matches fostered or washed out over time? Or did the selection into performance pay job matches remain unchanged, but the remuneration scheme changed, i.e. the coefficients? This boils down to the additional research question of how wage inequality changed over time within the group of employees who receive pay for performance?

The same question is interesting to analyze for those employees who work under a fixed wage: Did the selection of this group worsen as more employees switch into a variable pay scheme? That is, how did the characteristics of the group of employees with a fixed wage change over time? And did the remuneration scheme (i.e. the coefficients) of these employees change over time as performance pay increased?

Finally, how did the wage differences between these two groups of workers evolve? As more employees receive pay for performance, did the segregation between the two types raise the wage difference? Or are the two groups becoming more similar in terms of characteristics and/or remuneration and thus in wages?
In summary, the key research question that evolves from this section is: How would the wage structure have developed, had the incidence of pay for performance not increased? Section 4 will shed light on this. Before, let us look at the data and descriptive statistics.

3 Data and descriptive statistics

The empirical analyses in this paper are based on data from the German Socio-Economic Panel (SOEP), a large household survey for the years 1984 to 2009.\(^5\) This study is limited to full-time employees in West Germany aged 25 to 65 and excludes self-employed and public-sector employees, as for these groups the meaning of pay for performance is not clear. This leaves a sample size of nearly 13,000 employees in more than 20,000 job matches. The survey asks for several additional pay components from the employer of which one category is "profit-sharing, premiums and bonuses". It also asks for the gross amount. I will refer to this pay component as "performance pay" in this study.

Given that this variable pay component depends on performance, some employees may not receive a bonus because their performance has not been satisfactory. For this reason, it is not sufficient to measure performance pay in the given year, but rather "performance pay jobs" are defined (à la Lemieux, MacLeod, Parent, 2009; Heywood, Parent, 2009). This is to capture those job matches with a variable pay scheme – regardless of whether a bonus was paid this year or not. Thus performance pay-jobs ("PP jobs" in the following) are defined as those job matches which have paid for performance at least once in the past. This definition differs from the one of Lemieux, MacLeod, Parent (2009) and Heywood, Parent (2009) in that only bonus payments in the past or present define a PP job – not those in the future. This allows observing the new introduction of pay for performance in a job match.

This definition would distort the observed share of employees in performance pay jobs at the beginning of the observation period, because pay for performance that was awarded in a given job match before 1984 is not observed in the data. In order to present descriptive statistics that are comparable over time, an end-point correction is applied à la Lemieux et al. (2009) which is described in the appendix on page 31.

\(^5\)The most recent available wave is from 2010 which refers to pay components in the year 2009.
The goal of this study is to analyze wage changes over time and how they correspond to changes in performance pay over time. In order to document long-run trends, the time period for comparison should be chosen to be as long as possible. However, there is the before-mentioned potential problem of observing too few individuals in PP jobs at the start of the observation period. For this reason, to avoid distortions, the starting year of the comparison will not be 1984, but 1986. Moreover, the case numbers at the start of the observation period are low, so that several years have to be pooled. Therefore, the pooled observations from 1986 to 1989 will serve as the starting period. Correspondingly, a similar time frame will be used for the end period, i.e. the pooled observations from 2006 to 2009.

How has the incidence of performance pay developed in Germany over the past 25 years? Figure 6 and table 3 in the appendix show the answer according to the aforementioned definition (both correct for the end-point problem discussed above). The share of employees working in PP jobs has increased continuously from 15.4% in 1984 to 39.6% in 2009. The steepest increase is observed in the late 1990s, from 25.9% in 1994 to 35.5% in 1999. This period is followed by stagnation and a sharp decline in the year 2002. From then on, the incidence of PP jobs is rising again. In times of the current financial crisis, the use of performance pay has declined mildly in 2007, peaked in 2008 and receded in 2009. Overall, the general trend has been to grow higher and higher. The same data set has been used by Pannenberg and Spiess (2009) for the period 1991 to 2000, but they do not define "performance pay jobs", so that the exact numbers are not comparable. Still, their study also documents an increase in the incidence of performance pay over the 1990s.

An alternative question in the SOEP data asks explicitly for performance evaluations by the supervisor. According to this, the share of employees whose performance was evaluated in the year 2004 ranges between 25% (Cornelißen et al., 2011) and 31% (Grund and Sliwka, 2010), depending on the exact specification of the data set. However, this survey question is only available for the years 2004 and 2008 and thus does not allow for comparisons over a longer time period. In addition it is asked whether bonuses depend on this performance evaluation. The share of employees whose performance evaluation by the supervisor determines their bonus payments is 15% in 2004 and 16% in 2008 in the current data set (not displayed). On the firm level,

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6 The number of job matches in the data set, who benefit from the new introduction of pay for performance is 1,419.

7 Conditional on being evaluated by the supervisor, this evaluation affects bonus payments for 46% of employees in 2004 and 47% in 2008. The salary is affected for 37% of those employees whose performance is evaluated by the supervisor.
Berger et al. (2011) report that 37% of firms use performance-related pay.

The particularity of this data set is that it provides the level of the performance or bonus payments. Among those who receive performance pay in the current year, the median value in this data set is 1700 Euro per year. This corresponds to one half monthly salary in bonuses per year (i.e. the share of yearly performance payments as a share of monthly earnings is 53.3%, see table 4 in the appendix).

Later, the entire wage distribution will be analyzed, for why it is interesting to look at the dissemination of pay for performance over the whole wage distribution. Figure 7 shows how the absolute level of performance pay is distributed (left side) over the wage distribution and how the share of yearly performance payments of monthly earnings (right side). All these numbers condition on receiving pay for performance in the current year. As expected, both indicators for the volume of performance pay increase steeply at the very top of the wage distribution after remaining rather flat up to about the 70th percentile.

Over time, the incidence of pay for performance has increased. How does this affect the volume of payments for performance? As table 4 shows, the absolute amount of bonus payments has increased from 1,500 to 1,900 Euro per year at the median of the unconditional performance pay distribution. Again, it is important to consider the distribution of these payments over the wage distribution. Therefore, figure 8 shows how the distribution of pay for performance within the wage distribution has shifted over time. Again the left figure displays the absolute amount of performance pay and the right side the relative amount. It can be seen that the volume of pay for performance grew most in the top part of the wage distribution. Note that care has to be taken with the distribution of the volume of performance pay in the early period (from 1986 to 1989) as the case numbers are somewhat low. For this reason these unconditional descriptive statistics shall be sufficient here.

Table 6 in the appendix describes the group of employees in PP jobs and in non-PP jobs. It displays the share of PP jobbers who are female/ have a university degree/ etc. The table shows that PP jobbers are better educated, have longer tenure, and work in larger firms, as compared to non-PP jobbers. The same result has been found e.g. by De la Rica et al. (2010) for Spain. With respect to occupational category it can be seen that out of the group of PP jobbers, 28% work as qualified professionals and 31% as highly qualified professionals. These shares are much lower for the group of non-PP jobbers where a much larger share are trained workers (23%). These results are in line
with Grund and Sliwka (2010) who find that performance pay is found more often with increasing tenure and hierarchical level. All this means strong positive selection of employees into job matches with pay for performance (also see Dohmen and Falk, 2011). As a result, employees who work in PP job matches receive real hourly wages that are 30 log points higher than those of non-PP jobbers (i.e. 36%). However, this is likely not causally due to the PP job, but to selection, and further evidence on this will be shown shortly.

The table also shows the distribution of the covariates for the two time periods which will be compared. As the share of PP jobs has increased over time, it is interesting to see whether the positive selection into these jobs was fostered or washed out over time. Table 6 reflects the educational expansion that affects both, PP and non-PP jobs. The same trend is observed in the occupational categories. Further, for both groups of employees, the average age has increased slightly, while tenure slightly decreased. More females are working nowadays in full-time jobs in the private sector in West Germany. Therefore, the share of females increased in both job types. In addition, the literature has pointed to considerable gender differences in the incidence of performance pay (Jirjahn, 2002; Grund and Sliwka, 2010; Dela Rica et al., 2010). In the present data set, the share of females differs between the two job types by about 6 percentage points.

The wage differences between PP and non-PP jobbers are likely not causally due to the job type but to selection, as has been suggested above. Let us briefly investigate this now.

Table 5 shows the wage difference that remains after controlling for individual characteristics (education, gender, age and age$^2$), job match characteristics (tenure and tenure$^2$, occupational category, and an indicator for temporary contracts), and firm characteristics (firm size, industry, and federal state), as well as year-dummies. The first three columns refer to least squares estimations with standard errors clustered on the job match level. According to this, PP jobs show nearly 8% higher wages (column (1)).$^8$ Results of similar magnitude are found by Booth and Frank (1999) who report a wage gain of 9% for men and 6% for women. In the specific context of a glass company, Lazear (2000) finds even a 44%-increase in productivity resulting from the introduction of pay for performance.

$^8$A discussion of how the covariates contribute to wages is omitted here for brevity. From theory it is expected that personal characteristics yield higher returns in PP jobs compared to non-PP jobs (De la Rica et al., 2010; Lemieux et al., 2009). Likewise, job characteristics are expected to pay off more in non-PP than in PP jobs.
These results could be driven by unobserved differences between employees in the fix and the variable pay scheme. Therefore, the fixed effects estimation analyses those employees who switch between the regimes in order to control for individual unobserved heterogeneity. The share of switchers is 5.8% in the sample, which corresponds to 750 individuals. Controlling for unobserved heterogeneity reduces the wage difference between PP and non-PP jobs to about 2.4% (column (4)). This analysis shows that the large wage difference between PP and non-PP jobs is driven to a very large extent by observed and unobserved differences between employees. This is synonymous to a strong positive selection of employees into PP jobs. For workers who switch between the two job types, the wage difference amounts to less than 2%. Parent (2009) interprets fixed effects estimations as a lower bound to the incentive effect induced by performance pay because switches are endogenous. For comparison, Gielen et al. (2010) find an incentive effect from performance related pay on productivity of 9%. It is an important estimate because the introduction of performance pay schemes often has the goal of increasing productivity.

When comparing the two time periods of interest it becomes evident, that the wage gains from working in a PP job do not differ significantly (columns (2) and (3)). The fixed effects estimations do not show significant results (columns (5) and (6)), which is likely due to the reduced number of observations. From this, there is no indication that the positive selection into PP jobs has changed over time.

The next section will analyze the changes in wage inequality over time. But how has wage inequality developed? Table 1 and figure 1 display the difference between the two unconditional wage distributions from 1986 - 1989 and 2006 - 2009. It shows that wages have on average increased by 7.7 log points over the 20 years. However, at the bottom of the wage distribution there have been notable real wage losses (-4.3 log points at the 10th percentile). At the same time, wage increases have been strongest at the top of the distribution (+17.5 log points at the 90th percentile). Thus, the 90-10 differential widened by 21.6 log points over the observation period of 20 years.

The same trend of a strong growth in wage inequality has been found by Pannenberg and Spiess (2009) based on the same data set, but limited to the period of 1991 to 2000. Moreover, the trend of rising wage dispersion in West Germany has also been documented by Dustmann et al. (2009); Fitzenberger (1999) and Antonczyk et al. (2010). For West Germany, Dustmann et al. (2009) show that wage dispersion began to increase at the top of the wage distribution during the 1980s (see also Fitzenberger, 1999), whereas wage
Table 1: Increase of wage inequality

<table>
<thead>
<tr>
<th>Quantile</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Difference</td>
<td>-0.043</td>
<td>0.022</td>
<td>0.083</td>
<td>0.142</td>
<td>0.175</td>
</tr>
</tbody>
</table>

Figure 1: Difference in unconditional log wage distributions comparing 2006-2009 to 1986-1989

inequality at the bottom of the wage distribution only started to grow during the 1990s. In the 2000s, wage inequality continued to rise strongly at both ends of the wage distribution with strong real wage losses at the bottom Antoniczyk et al., 2010.

Let us now turn to the central question of whether some of this strong increase in wage inequality can be explained by the growing use of performance pay schemes.

4 Decomposition results

The following analysis will decompose changes in the wage structure over time. The question to be answered is: How would the wage structure have developed, had the incidence of pay for performance not increased? To an-
swer this question, a sequential decomposition procedure will be used and applied over the entire wage distribution so as to detect changes in wage inequality. The following subsection will explain in more detail the sequential decomposition method. Then, the results will be presented and explained. Then some further decomposition results will address the aforementioned additional research questions. In the end some sensitivity checks confirm the key result.

4.1 Decomposition method

To analyze the effect of pay for performance on the entire wage distribution, the following empirical analyses are based on linear quantile regression estimations. Specify the \( \tau \)th quantile of log hourly wages \( w \) conditional on the set of covariates as:

\[
q_w(\tau|X) = X'\beta(\tau).
\]

These quantile regressions are estimated separately for both time periods, that is 1986 – 1989 and 2006 – 2009. (For simplicity, in the following the notation will abbreviate these time periods by mentioning only the starting year.) The linear quantile regressions are specified as extended Mincer-type log wage equations and include the following covariates: individual-specific characteristics (educational degree, gender, age and age\(^2\)), job match specific covariates (tenure and tenure\(^2\), occupational category, and a dummy for temporary contracts) and firm characteristics (firm size in categories, industry branch, and federal state).

All procedures use sampling weights provided by the SOEP data in order to obtain representative results. Inference is based on 100 bootstrap replications applying a block bootstrap where individuals are resampled, using all observations over time for the resampled individuals.

In order to obtain results for the entire wage distribution, the standard decomposition approach of Oaxaca (1973) and Blinder (1973) is not sufficient, as it refers only to the mean. The standard method has been extended in the context of quantile regressions by Machado and Mata (2005). In the estimation, the procedure from Melly (2006) and Chernozhukov et al. (2008) is employed. This implies treating \( \tau \) as uniformly distributed over 99 even percentiles and drawing quantiles from the corresponding 99 simulations per observation.
The research question is: How would the wage structure have developed, had the incidence of pay for performance not increased? This question can be reformulated so resemble the decomposition terminology. That is: How would the wage structure have developed if PP job status and the pay scheme had remained constant? Hence, in the decomposition it is not sufficient to measure the contribution of characteristics and of coefficients, but a PP job-term will be added. Therefore, the decomposition follows this equation:

\[
q(X_{06}, PP_{06}, \beta_{86}) - q(X_{86}, PP_{86}, \beta_{86}) = q(X_{06}, PP_{06}, \beta_{86}) - q(X_{06}, PP_{06}, \beta_{86}) \\
+ q(X_{06}, PP_{06}, \beta_{86}) - q(X_{06}, PP_{86}, \beta_{86}) \\
+ q(X_{06}, PP_{86}, \beta_{86}) - q(X_{86}, PP_{86}, \beta_{86})
\]

Overall wage change

Coefficients effect

PP-jobs effect

Characteristics effect

It decomposes the change in the wage structure over time (on the left hand side) into changes in coefficients (1st term on the right), changes in the incidence of PP jobs (2nd term) and changes in characteristics (3rd term). The wage structure from 2006 is taken back to the wage structure in 1986 in three steps.

First, the individuals from 2006 are paid as if they lived in 1986, i.e. according to the remuneration scheme from 1986. This is denoted by the counterfactual wage distribution \(q(X_{06}, PP_{06}, \beta_{86})\). The resulting coefficients effect resembles a treatment effect of time in the treatment literature. Put differently, it quantifies how changes in the remuneration scheme over time have contributed to changes in wage inequality.

Second, the hypothetical individuals from 2006 living in the labor market of 1986 have their PP job status set back to the level of 1986. This is denoted by the counterfactual wage distribution \(q(X_{06}, PP_{86}, \beta_{86})\). This counterfactual wage distribution would have been observed for individuals from 2006 who are paid according to 1986 wages and for whom the incidence of pay for performance is simulated to lie at 1986 levels. Starting from this hypothetical wage distribution, the incidence of pay for performance is then raised to 2006 levels so as to quantify the contribution of this component to changes in the wage structure over time. Put differently, the remuneration scheme from 1986 is applied to individuals from 2006 and in this step, the incidence of PP jobs is raised from 1986 levels up to nowadays’ levels. Alternative orders of decomposition will be considered in the sensitivity checks in section 4.4.

\(^9\)This sequential decomposition follows in spirit Antonczyk et al. (2010) and Antonczyk et al. (2009).
Third, the final step in this sequential decomposition consists of changing the characteristics from 1986 to 2006 levels. This characteristics effect captures changes such as the educational expansion and changes in the industry structure.

The crucial assumption in any decomposition analysis is that a change in the covariates \( X \) will not change the parameters of the conditional distribution of the dependent variable (Fortin et al., 2010; Chernozhukov et al., 2008; DiNardo et al., 1996). In this application it means that changes in the covariates \( X \) (such as educational upskilling or changes in the industry structure) will not change the coefficients of the conditional distribution of the wage \( w \) given \( X \), i.e. will not change the remuneration scheme. Therefore, a decomposition method assumes away general equilibrium effects by definition.

The crucial step in the simulation process concerns the second component, i.e. the PP jobs effect. In order to estimate \( q(X_{06}, PP_{86}, \beta_{86}) \), the hypothetical PP jobs status in 1986 has to be simulated for individuals from 2006. In order to do so, the propensity of working in a PP job is estimated for both time periods separately. From this, the propensity of working in a PP job is predicted for the alternative time period. That is, \( \phi(X_{06} \ast \beta_{86}) \) gives the propensity for individuals from 2006 to have been working in a PP job in 1986 (and vice versa). Then, counterfactual individual wages for both hypothetical stati are estimated, i.e. \( w(X_{06}, PP_{86} = 1, \beta_{86}) \) and \( w(X_{06}, PP_{86} = 0, \beta_{86}) \). For estimation of the quantiles of the counterfactual wage distribution \( (X_{06}, PP_{86}, \beta_{86}) \) both hypothetical wages are included and weighed by the propensity score (for the case with \( PP_{86} = 1 \)) and \( 1 - \) propensity score (for the case with \( PP_{86} = 0 \)). An alternative matching procedure will be explained as a sensitivity check in section 4.4.

4.2 Decomposition results

The results of the decomposition analysis can be found in table 2 and in figure 2. Displaying the confidence bands graphically is not helpful as there would be four different confidence bands within one graph. Therefore only the confidence band that corresponds to the PP jobs effect of interest is displayed in figure 9 in the appendix.

The results show, that over the past 20 years wage inequality in Germany has increased. Strong wage increases at the top of the wage distribution have been accompanied by real wage losses at the bottom (also recall the
Table 2: Result of sequential decomposition

<table>
<thead>
<tr>
<th>Quantile</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>90</th>
</tr>
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<tbody>
<tr>
<td>Total Difference</td>
<td>-0.024</td>
<td>0.030</td>
<td>0.088</td>
<td>0.135</td>
<td>0.162</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.020)</td>
<td>(0.019)</td>
<td>(0.027)</td>
<td>(0.034)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Coefficients Effect</td>
<td>-0.010</td>
<td>0.030</td>
<td>0.063</td>
<td>0.082</td>
<td>0.087</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.019)</td>
<td>(0.015)</td>
<td>(0.019)</td>
<td>(0.022)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>PP-jobs Effect</td>
<td>0.004</td>
<td>0.006</td>
<td>0.010</td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Characteristics Effect</td>
<td>-0.018</td>
<td>-0.006</td>
<td>0.015</td>
<td>0.041</td>
<td>0.061</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.014)</td>
<td>(0.011)</td>
<td>(0.012)</td>
<td>(0.018)</td>
<td>(0.022)</td>
</tr>
</tbody>
</table>

Standard errors are based on 100 bootstrap replication of person-specific blocks.

The coefficients are the largest contributor to this increase in wage inequality. This means that changes in the remuneration scheme have contributed largely to changes in the wage distribution over time. Below the median the coefficients effect is increasing strongly from negative values below the 13th percentile to a value of 6.3 log points at the median. Above the median the coefficients effect is rather flat on the order of 8 log points. This means that changes in the remuneration scheme have contributed to rising wage inequality at the bottom of the wage distribution, but not so much at the top. Still, the top half of the wage distribution has seen strong wage increases due to changing returns. These results are perfectly in line with the prominent skill-biased technological change hypothesis (SBTC, see e.g. Katz and Autor, 1999; Autor et al., 2008). As SBTC changes the relative demand for skilled labor, the prices for skilled labor change. Price changes are reflected in the coefficients effect which subsumes the returns to observed characteristics. If skilled labor is found mainly at the top of the wage distribution, then it is not surprising to find the strongest wage gain from changes in the remuneration scheme in this part, too, like the result shows. The negative coefficients effect found for the very bottom of the wage distribution would in this context.
suggest that unskilled labor were to be found at the very bottom of the wage distribution. However, this would stand in contrast to the task-based approach to SBTC (Autor et al., 2003) which predicts U-shaped wage changes over the wage distribution. In contrast, the wage changes documented here are continously increasing over the distribution.

The characteristics effect, in contrast, affects wage inequality over the entire distribution. Still, it is even more pronounced in the top half of the wage distribution where the coefficients effect is rather flat. The characteristics effect amounts to -1.8 log points at the 10th quantile and 1.5 log points at the median – a 50-10 differential of 3.3 log points. At the 90th percentile the effect is 6.1 log points, implying a 90-50 differential of 4.6 log points. Thus, due to changes in characteristics (such as educational upgrading and industry changes) the top of the wage distribution hast experienced some wage increases, while the bottom saw real wage losses. One possible explanation could be employees with bad labor market characteristics who newly enter full-time work in the private sector in West Germany. Parts of this could be due to labor market reforms which took place in the early 2000s, although these should mainly affect employment in less than full-time jobs.

Finally, the key result is given by the PP jobs effect. The results show that this effect is rather small in magnitude and flat over the distribution.
The PP jobs effect ranges between 0.4 log points at the 10th quantile and 1.3 log points at the 90th percentile. This means that the change of the wage distribution that can be attributed rise in the incidence of pay for performance is an upward shift on the order of one log point. Although the magnitude of the effect seems small, it is not negligible. At the median, for example, the increase in the incidence of PP jobs explains about 11% of the entire change over time (1.0 log points out of 8.8 log points). Taking into account that this is the contribution of only one single component of the wage determination process, this is not negligible. However, despite the contribution of the growing PP jobs incidence to the wage level, this effect did not contribute to wage inequality, because the effect is flat. This result differs from the one found for the U.S. by Lemieux et al. (2009). They find that performance pay contributes to rising wage inequality particularly above the 80th percentile. Notwithstanding, they regard the growing use of performance pay schemes as a consequence of SBTC, a factor that also largely affects relative returns to observable skills as captured by the coefficients effect. They reach their conclusion by analyzing wage changes within the group of performance pay jobs. This will be done next.

4.3 Additional results

How did wage inequality change over time within performance pay jobs? The corresponding decomposition is simpler than the one considered so far, as the PP jobs effect drops out. Hence the decomposition is of the simpler original type á la Oaxaca (1973) and Blinder (1973) and follows this equation:

\[ q(X_{06}^{PP} , \beta_{06}^{PP}) - q(X_{86}^{PP} , \beta_{86}^{PP}) = q(X_{06}^{PP} , \beta_{06}^{PP}) - q(X_{06}^{PP} , \beta_{86}^{PP}) + q(X_{06}^{PP} , \beta_{86}^{PP}) - q(X_{86}^{PP} , \beta_{86}^{PP}) \]

Overall wage change  Coefficients effect  Characteristics effect

The result of this analysis can be found in figure 3. Again, bootstrapped confidence intervals do not improve visibility of the figure, for why the results are displayed without (left) and with confidence bands (right side).

The results show that wages have increased over time for the group of performance pay workers throughout the entire wage distribution. The wage gain over time is increasing over the bottom half of the distribution (from 3.7 log points at the 10th percentile to 10.3 log points at the median) and remains stable above that point (11.2 log points at the 90th percentile). This means that within the group of PP jobbers, wage inequality has increased in the
bottom half of the wage distribution. This increase is driven almost completely by changes in the coefficients, i.e. in the remuneration scheme. This means that returns to education, occupation, industry etc. have changed in a way as to raise wages for this group. In contrast, characteristics have contributed only slightly to an improvement of wages and only in the top half within PP jobbers. This falsifies the hypothesis that the increased incidence of PP jobs leads to decreasing productive characteristics of employees in this wage regime.

What is the picture for employees in non-PP jobs? Figure 4 displays the results. For the group of non-PP jobbers, the growth in wage inequality has been much more pronounced. While real hourly wages at the 10th percentile decreased by 6.9 log points, they increased by 2.5 log points at the median and by 7.5 log points at the 90th percentile. Put differently, over 20 years wage inequality as measured by the 90-10 differential increased by 14.3 log points. Again, a large part of the wage increase over time is driven by changes in the coefficients, i.e. in the remuneration scheme. At the same time, changes in the labor market characteristics of the employees contribute significantly to the wage losses. There are nowadays more employees with worse labor market characteristics in non-PP jobs. This could be reasonable if the labor market reforms of the decade of the 2000s in Germany had the effect of drawing more individuals into full-time employment and if these individuals work in non-PP jobs (at least at first). The curvature of this characteristics effect is rather steep so that it contributes a lot to the growing wage inequality within this group of non-PP jobbers.

It is important to compare the coefficients effect within PP jobs to the group of non-PP jobbers. The coefficients effect is larger in the former compared to the latter group. This means that returns to observable characteristics
have increased more strongly for within PP jobs. This resembles the result found by Lemieux et al. (2009) who explain this by SBTC: According to this, performance pay serves as a channel to translate underlying changes in the productivities of different skill groups into higher wage inequality (ibid. p.45). The idea is that SBTC changes the relative demand for skilled labor and firms respond to this by using more performance pay schemes. This mechanism translates into higher wage inequality. The empirical results presented here are in line with this hypothesis.

With the increasing use of pay for performance, the wage difference between the two groups could have changed. If the selection of individuals between the two groups changes over time, the characteristics effect determining the wage difference would grow over time. In order to analyze this, now the wage difference between PP and non-PP jobs is decomposed. Hence the decomposition is as follows:

$$ q(X_{06}^{PP}, \beta_{06}^{PP}) - q(X_{06}^{no}, \beta_{06}^{no}) = q(X_{06}^{PP}, \beta_{06}^{PP}) - q(X_{06}^{no}, \beta_{06}^{no}) + q(X_{06}^{PP}, \beta_{06}^{no}) - q(X_{06}^{no}, \beta_{06}^{no}) $$

Overall wage change  Coefficients effect  Characteristics effect

Analogously, the wage difference between both job types is analyzed within the early period of 1986 to 1989.

Figure 5 displays the decomposition results of the wage difference between PP and non-PP jobs for the early period (left) and the large period (right side). It shows that the wage difference between the two types of jobs is rather flat within both time periods. There are no significant differences over the distribution in the total wage difference. Over time, the level of the wage difference between PP and non-PP jobs has shifted upwards from 26.0 log
points at the median in 1986 to 33.8 log points at the median in 2006. In both
time periods, characteristics explain a very large share of the wage difference.
This reflects the strong selection of employees in the two wage schemes. How
has this selection evolved over time? It can be seen that the characteristics
effect has shifted upwards over time, particularly at the bottom of the wage
distribution where the shift is significant. This suggests that the selection on
observables plays a growing role in explaining the wage difference. This is
likely due to the growing labor force participation of individuals who formerly
would not have worked (full-time). Apparently, these individuals who on
average have less valued labor market characteristics mostly work in non-PP
jobs. This explains the growing wage differential between both job types
and the growing contribution of characteristics to the wage difference. In
addition, the contribution of coefficients to the wage difference is growing
slightly over time, but the change is not significant.

What have we learned? Wage inequality has increased over the observation
period of 20 years in West Germany. As more employees received pay for
performance, wage inequality grew within the group of PP jobs and even
more so within the group of non-PP jobs. The wage difference between both
types of jobs also grew over time, but remains flat. These considerations
add further evidence to the core result that the growing incidence of pay
for performance did not contribute to growing wage inequality. Still, there
has been a small but significant upward shift in wages which is due to the
growing use of performance pay.
4.4 Sensitivity checks

Sequential decompositions are sensitive to the order of the decomposition (Fortin et al., 2010; Antonczyk et al., 2009; Chernozhukov et al., 2008; DiNardo et al., 1996). Therefore, to check the sensitivity of the results, the order of the decomposition will now be altered.

The original order of decomposition first extracted the coefficients effect, then the PP jobs effect and last the effect of characteristics. (The shorthand notation for this order will be: $\beta$, PP-job, X.) Now, let us alter the order of the decomposition the following way (i.e. to $\beta$, X, PP-job):

$$q(X_{06}, PP_{06}, \beta_{06}) - q(X_{86}, PP_{86}, \beta_{86})$$

Overall wage change

$$q(X_{06}, PP_{06}, \beta_{06}) - q(X_{06}, PP_{06}, \beta_{86})$$

Coefficients effect

$$q(X_{06}, PP_{06}, \beta_{86}) - q(X_{86}, PP_{06}, \beta_{86})$$

Characteristics effect

$$q(X_{86}, PP_{06}, \beta_{86}) - q(X_{86}, PP_{86}, \beta_{86})$$

PP-jobs effect

The first step remains the same. However, the last step now consists of changing the PP job status from the labor market of 1986 to the level 2006. The difference to the original order of decomposition is that the characteristics of the employees in 1986 are used now instead of the characteristics from 2006. Thus the propensity score is now based on the probit regression from 2006 rather than from 1986.

The results for two more permutations of the order are also displayed in figure 10 in the appendix. Note that changing the order of a sequential decomposition can change the results completely as the underlying sequence of counterfactual wage distributions changes. This said, it is astonishing to see how robust the results in figure 10 are. The PP jobs effect is always very flat which confirms the result that it did not contribute to the rise in wage dispersion. At the same time, the significance of the PP jobs effect is not always given. So the result of a constant upward wage shift does not always hold with significance when changing the order. Still, the result concerning wage inequality proves extremely robust in this test.

Next, there is a methodological change in the prediction of the PP job status. So far, both potential outcomes (i.e. PP job = 0 and = 1) and weighed by the propensity score. Now, to check for robustness, instead of applying the probabilistic procedure in the simulation process, a deterministic procedure is used. Again, the propensity of working in a PP job in the other time period is
employed. However, instead of using the propensity score for weighing of the two potential states, the propensity score is now used to cut off unambiguously between the two states. The cut-off point is chosen so that the simulation of the PP jobs status generates the same share of individuals in this job type as has been observed in reality. In 1986, 17.9% of employees worked in a PP job. For those 17.9% of employees in 2006 who have the highest propensity score, assume that they would have had a PP job in 1986. This procedure yields the results displayed in figure 11.

Again, the PP jobs effect is extremely flat across the wage distribution, re-confirming that it did not contribute to rising wage ineqaulity. The only difference is a small reduction of the effect at the top of the distribution, which is however not significant. Hence, the core result is reconfirmed by this test.

To conclude, the result that the growing use of performance pay jobs has no direct effect on wage inequality is very robust to alternations in the estimation process.

5 Conclusions

This study provides a detailed description of the contribution of performance pay to the German wage structure. The growing incidence of variable pay schemes affects ever more employees and their productivity and wages. The share of employees working in a performance pay job (defined as a job match that has paid for performance at least once in the past) in Germany increased steadily from 15% in 1984 to 40% in 2009. The steepest increase took place in the late 1990s. The empirical evidence shows that there are large wage differences between fix and variable remuneration schemes, but little of this difference is causally due to performance pay. Rather, selection on observables and unobservables explain a large share of the wage difference. Nevertheless, the volume of performance pay is not negligible as it amounts to one half monthly salary per year or 1,700 Euro at the median.

One of the most important trends in empirical labor economics over the past few decades is growing wage inequality. Several factors contribute to this trend such as globalization, skill-biased technological change and de-unionization. As the increasing use of pay for performance runs parallel to the growth in wage inequality, it constitutes another potential contributing factor. So the question analyzed in this study is whether performance pay
correlates with growing wage dispersion. This question is analyzed using quantile regressions and a sequential decomposition method (Chernozhukov et al., 2008; Fortin et al., 2010; DiNardo et al., 1996).

The results show that the growing use of performance pay did not contribute to the growth in wage dispersion. Still, there has been a small but significant shift in the wage distribution which is due to the growing use of performance pay. The magnitude of this shift is one log point which explains about 11% of wage growth at the median. The growth in wage inequality is instead explained by changes in the characteristics of the workforce (particularly in the top half of the wage distribution) and returns to these characteristics (particularly in the bottom half). Changing returns to characteristics could reflect changes in the relative demand for skilled labor as induced by skill-biased technological change (SBTC). Finally, as more employees receive pay for performance, wage inequality grows within performance pay jobs – but even more so within those job matches that do not reward performance. The returns to observed characteristics increased more within performance than within non-performance pay jobs. The wage difference between both types of jobs grew over time but remained rather flat.

The empirical evidence presented here is in line with the results and explanations in Lemieux et al. (2009). They argue that the changed demand for skilled labor as induced by SBTC is translated into larger wage inequality via pay for performance. Hence, performance pay could serve as a mechanism to implement changed returns to skills.

Future work could analyze in more detail how the volume of performance pay contributes to growing wage inequality. However, due to the inherent endogeneity problem of the level of performance pay in wages, a methodological solution is not trivial. Finally, a coherent explanation for the steep growth in wage inequality seems to be missing still (at least for Germany). It appears that the main driving factor is not deunionization, nor changes in the job tasks, nor performance pay. So the search continues.
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dynamics and the incidence of profit-sharing in West Germany. *ASTA
6 Appendix

End-point correction

"Performance pay jobs” are defined as jobs which have paid for performance at least once in the past. Thus, job matches that are observed over a longer period are more likely to be observed as PP jobs. For this reason, job matches that are observed at the beginning of the observation period in 1984 may be misclassified as non-PP jobs if they paid for performance before 1984. In order to correct for this, an end-point correction is applied in analogy to Lemieux et al. (2009). It proceeds in three steps: First, PP jobs are estimated as a function of calendar year and the number of years an individual job-match is observed in the sample. Second, the distribution of years that the job-matches are observed in the sample is held constant at a time in the middle of the observation period. Third, the share of PP jobs is predicted based on this hypothetical distribution of observation years. These shares deviate from the uncorrected shares at the beginning of the observation period. The corrected shares are depicted in the following figure 6 and table 3.
Figure 6: Development the incidence of performance pay jobs (with end-point correction)

![Graph showing development of performance pay jobs](image)

Table 3: Share of PP-jobs in percent (with end-point correction)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Share</td>
<td>15.4</td>
<td>21.4</td>
<td>25.9</td>
<td>35.5</td>
<td>36.3</td>
<td>39.6</td>
</tr>
</tbody>
</table>

Figure 7: Volume of PP over the wage distribution

Absolute amount of PP

Relative amount of PP
Table 4: Volume of performance pay

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Quantile</th>
<th>N. obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Absolute value of pay for performance in Euro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All times</td>
<td>4191</td>
<td>325</td>
<td>705</td>
</tr>
<tr>
<td>1986 - 1989</td>
<td>3539</td>
<td>361</td>
<td>722</td>
</tr>
<tr>
<td>2006 - 2009</td>
<td>4976</td>
<td>385</td>
<td>841</td>
</tr>
</tbody>
</table>

|                |      |          |         |       |      |       |       |
| Relative share of pay for performance as of monthly earnings |      |          |         |       |      |       |       |
| All times      | 90.3%| 12.2%    | 24.3%   | 53.3% | 108.8%| 207.6%| 8450  |
| 1986 - 1989    | 83.1%| 13.4%    | 26.1%   | 55.0% | 96.2% | 193.0%| 625   |
| 2006 - 2009    | 102.3%| 12.9%   | 28.1%   | 61.2% | 125.0%| 235.3%| 2218  |

Figure 8: Comparison over time of volume of PP over the wage distribution
<table>
<thead>
<tr>
<th>Estimation method</th>
<th>OLS</th>
<th>Fixed Effects</th>
</tr>
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<tr>
<td>Time</td>
<td></td>
<td></td>
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<tr>
<td>All years</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>1986-1989</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006-2009</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th></th>
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<tr>
<td></td>
<td>0.078</td>
<td>0.068</td>
<td>0.077</td>
<td>0.024</td>
<td>-0.015</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.006)</td>
<td>(0.018)</td>
<td>(0.013)</td>
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<table>
<thead>
<tr>
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<td>No</td>
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<table>
<thead>
<tr>
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<tr>
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<td>1986-1989</td>
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<tr>
<td>2006-2009</td>
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<table>
<thead>
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<tr>
<td>All years</td>
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<td>3,232</td>
<td>4,550</td>
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<td></td>
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<tr>
<td>2006-2009</td>
<td></td>
<td></td>
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Standard errors are adjusted for clusters in job matches.

Figure 9: Result of sequential decomposition with confidence bands
Table 6: Descriptive Statistics

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>PP job</td>
<td>Non-PP job</td>
<td>PP job</td>
<td>Non-PP job</td>
<td>PP job</td>
<td>Non-PP job</td>
</tr>
<tr>
<td>Share of this job-type</td>
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<td>0.20</td>
<td>0.28</td>
<td>0.25</td>
<td>0.34</td>
</tr>
<tr>
<td>No training degree</td>
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<td>0.13</td>
<td>0.08</td>
<td>0.03</td>
<td>0.17</td>
<td>0.09</td>
</tr>
<tr>
<td>Training degree</td>
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<td>0.72</td>
<td>0.65</td>
<td>0.73</td>
<td>0.74</td>
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<td>0.20</td>
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<td>0.17</td>
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<td>Age</td>
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<td>41.0</td>
<td>42.2</td>
<td>43.3</td>
<td>40.7</td>
<td>41.7</td>
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<tr>
<td>Tenure</td>
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<td>10.7</td>
<td>14.7</td>
<td>13.9</td>
<td>11.5</td>
<td>10.2</td>
</tr>
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<td>Temporary contract</td>
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<td>0.04</td>
<td>0.00</td>
<td>0.03</td>
<td>0.02</td>
<td>0.07</td>
</tr>
<tr>
<td>Firm size</td>
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<td>887</td>
<td>1760</td>
<td>1562</td>
<td>993</td>
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<td>Occupation:</td>
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<td></td>
<td></td>
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<tr>
<td>Untrained worker</td>
<td>0.01</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.04</td>
<td>0.04</td>
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<td>Semi-trained worker</td>
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<td>0.09</td>
<td>0.21</td>
<td>0.17</td>
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<tr>
<td>Trained worker</td>
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<td>0.15</td>
<td>0.13</td>
<td>0.25</td>
<td>0.21</td>
</tr>
<tr>
<td>Foreman</td>
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<td>0.07</td>
<td>0.10</td>
<td>0.07</td>
<td>0.08</td>
<td>0.06</td>
</tr>
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<td>Simple tasks</td>
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<td>0.04</td>
<td>0.03</td>
<td>0.06</td>
<td>0.12</td>
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<tr>
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<td>0.31</td>
<td>0.29</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>Highly qualified professional</td>
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<td>0.13</td>
<td>0.26</td>
<td>0.34</td>
<td>0.11</td>
<td>0.14</td>
</tr>
<tr>
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<td>0.01</td>
<td>0.05</td>
<td>0.03</td>
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<td>18.91</td>
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<td>56,671</td>
<td>1,251</td>
<td>4,537</td>
<td>7,587</td>
<td>8,677</td>
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Figure 10: Sensitivity check: Permutation of the order of decomposition

Previous: $\beta$, PP-job, X  

$\beta$, X, PP-job

PP-job, X, $\beta$  

X, PP-job, $\beta$

Figure 11: Sensitivity check: Deterministic prediction of PP job status