Higher and higher? Performance pay and wage inequality in Germany

K. Sommerfeld
Department of Applied Econometrics, University of Freiburg, D-79085 Freiburg, Germany
E-mail: katrin.sommerfeld@vwl.uni-freiburg.de

December 2012

Performance pay is of growing importance to the wage structure as it applies to a rising share of employees. At the same time wage dispersion is growing continuously. This leads to the question of how the growing use of performance pay schemes is 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 in turn led to an upward shift of the wage distribution by about one log point. However, it did not contribute to the growth in wage inequality. Even though wage inequality grew within the group of employees who receive performance pay, it grew even more so within the group who do not. Still, the wage difference between both wage schemes remained flat over the distribution. 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

Acknowledgements: I am grateful to Juan J. Dolado, Bernd Fitzenberger and Marie Paul for fruitful discussions. For comments and suggestions I thank seminar participants at the University Carlos III de Madrid and Freiburg University as well as at the XV. Encuentro de Economía Aplicada en A Coruña and the 10th International German Socio-Economic Panel User Conference. Further, I thank the scientific committee of the SOEP User Conference for choosing this paper for the Joachim R. Frick Memorial Prize 2012 for the best paper presented at the conference. This research was started when the author was visiting Universidad Carlos III de Madrid. Financial support from the University of Freiburg and the German Academic Exchange Service (DAAD) is gratefully acknowledged. All errors remain my own responsibility. An additional online appendix to this article is available at https://www.empiwifo.uni-freiburg.de/discussion-papers-1.
I. Introduction

Performance pay is of growing importance to the wage structure as it applies to a rising share of employees. This trend has been observed in several industrialized countries over the past decades (Lemieux et al. 2009). A parallel trend has been that of growing wage inequality (Autor et al. 2008). This prompts the following research question: How is the rise in wage inequality related to the growing use of performance pay schemes?

Performance pay has been found to contribute strongly to growing wage inequality in the US mainly in the top of the wage distribution (Lemieux et al. 2009; Heywood and Parent 2009). Lemieux et al. (2009) quantify this effect to amount to 21% of the growth in wage dispersion between the late 1970s and the early 1990s, based on the reweighting method of DiNardo et al. (1996). I will extend their analysis by adding a term for the incidence of performance pay jobs in a sequential decomposition. Above all, the contribution of this paper is to study in depth the case of Germany.¹

The case of Germany is interesting because its wage structure follows the international trends in growing wage dispersion (Dustmann et al. 2009) and the increasing use of performance pay schemes (Pannenberg and Spiess 2009).² At the same time, the labor market has experienced dramatic shifts from strong rigidity to more flexibility (Fitzenberger et al. 2011). These shifts rendered possible “Germany’s jobs miracle” (Krugman Nov 12, 2009), which took place on the German labor market during the Great Recession (Möller 2010). Still, the dramatic growth in wage inequality in Germany remains in parts unresolved. Several explanations are possible, one of which is skill-biased technological change (Katz and Autor 1999; Autor et al. 2003). However, Antonczyk et al. (2009) find that changes in the tasks cannot explain the growing wage dispersion in Germany. Deunionization can explain only a small part of it (Antonczyk et al. 2010) while differences between industries and establishments play a large role (ibid., Card et al. 2012). Can performance pay provide the missing explanation for rising wage inequality?

¹The longest panel study on performance pay for Germany is provided by Pannenberg and Spiess (2009) for the period from 1991 to 2000. However, they do not model the contribution of the growing use of performance pay to growing wage dispersion.

²Performance pay plays a special role in Germany given the background of the strong German system of industrial relations (Jirjahn 2002, p. 158). Compared to collectively negotiated wages, performance pay is more flexible. Therefore it was seen as a way to increase the competitiveness of German firms and thus to reduce unemployment (Jirjahn 2002, p. 163).
The key research question of this study is the following: How would the wage distribution have developed, had the incidence of pay for performance not increased? In order to answer this question, this study will employ a sequential decomposition method in a quantile regression framework following Machado and Mata (2005) and Chernozhukov et al. (2008). This sequential decomposition method is capable of separating the distributional effects of the growing incidence of performance pay jobs from changes in the composition of the workforce, and from changes in the returns to these characteristics.

The empirical analysis uses data from the German Socio-Economic Panel study (SOEP). This long and large panel data set provides information on performance pay. The period of analysis is from 1984 to 2009.

The results confirm the strong increase of performance pay in Germany. Its incidence has more than doubled over the observation period from 1984 to 2009. Wage inequality has grown strongly over the observation period. The growing incidence of performance pay schemes led to an upward shift of the wage distribution by about one log point. However, it did not contribute to the growth in wage inequality. The stark growth in wage inequality was instead driven by changes in the remuneration scheme (i.e. the coefficients in the decomposition) as well as by the composition of the workforce. Even though wage inequality grew within the group of employees who receive performance pay, it grew even more so within the group who do not. Although the wage difference between both wage schemes grew over time, it remained flat over the distribution.

This paper proceeds as follows: The next section describes the existing literature. Section III. explains the data and provides descriptive statistics. Section IV. outlines the sequential decomposition method and presents the results. The final section concludes.

II. Literature Review

Rising wage inequality has been the major empirical trend in labor economics in recent decades (OECD 2008; 2011; Doerrenberg and Peichl 2012). The strong increase in wage dispersion in the US and the UK since the 1980s has affected the entire distribution (Katz and Autor 1999; Autor et al. 2008). In contrast, wage
inequality in West Germany began to rise first at the top of the distribution in the 1980s, and has only started to grow at the bottom since the 1990s (Fitzenberger 1999; Kohn 2006; Gernandt and Pfeiffer 2007; Dustmann et al. 2009; Antonczyk et al. 2009). Recently, the growth in wage dispersion has been dramatic with an increase of 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 which makes it an important component in the debate on poverty and the low wage sector (ibid.).

Parallel to the trend of growing wage inequality, the incidence of pay for performance has increased in many countries (Booth and Frank 1999; Lemieux et al. 2009; Pannenberg and Spiess 2009). Still, Brown and Heywood (2002) conclude that there is no general trend towards more performance pay. Nevertheless, the end of the last century has been a time for large experiments (ibid.), which makes it interesting to study the growing use of performance pay schemes. Why should the incidence increase at all? Generally speaking, there is a growing heterogeneity of firms which goes hand in hand with a growing need for flexibility on the firm level (Fitzenberger et al. 2011; Card et al. 2012). This trend could for example be driven by trade globalization or skill-biased technological change (SBTC). Moreover SBTC, which changes the relative demand for skilled labor, translates into changed relative returns to skills (Katz and Murphy 1992; Juhn et al. 1993; Katz and Autor 1999). Lemieux et al. (2009) argue that pay for performance could serve as the channel by which changed returns to skills are converted into actual wage changes and therefore be growing (also see Heywood and Parent 2009).

How does the growing incidence of pay for performance affect wages? Above all, it is expected to induce higher effort which would in turn generate higher wages (Booth and Frank 1999; Lazear 2000; Dohmen and Falk 2011). At the same time, performance pay leads to sorting of workers: As employees learn about their own productivity and about their willingness to provide effort, they sort into the preferred pay scheme (Lazear 1986; 2000; Dohmen and Falk 2011). Moreover, wage insecurity is higher in variable pay schemes, which could be compensated by higher wages (Seiler 1984; Amuedo-Dorantes and Mach 2003).

Furthermore, starting from a standard Cobb-Douglas production function, classical 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 asymmetric information, search frictions, delayed compensation, collective bargaining, etc. (see, e.g., De la Rica et al. 2010). Against this background, pay for performance can be seen as a mechanism to more closely align wages with productivity. Empirical support for this mechanism is given in the studies by Lemieux et al. (2009) and De la Rica et al. (2010). They show that in a fixed wage regime, wages are tied closer to job and firm characteristics whereas in a variable pay scheme, wages are more closely related to the individual worker’s characteristics.

In addition to the level effect, performance pay is expected to go along with rising wage inequality. By definition, wages vary more on the individual level in a variable pay scheme than in a fixed wage scheme, because productivity or performance vary more than the determinants of a fixed wage, such as education and tenure (Seiler 1984). Additional variation could be caused by outside factors – cooperating partners, product demand, etc. – or by the measurement mechanism itself (Lazear 1986, p. 421). Hence, wage variability is expected to grow as performance pay schemes become more prevalent over time.

Empirical studies have confirmed the positive correlation between pay for performance and wage inequality (for early studies see Seiler 1984; Lazear 2000). This has been attributed to unobserved worker heterogeneity (Parent 1999; Booth and Frank 1999; Pannenberg and Spiess 2009; Barth et al. 2012). Also within-firm wage variation is higher when performance pay prevails (Barth et al. 2012; Lazear 2000). Two recent studies by Lemieux et al. (2009) and Heywood and Parent (2009) reconfirm that performance pay tends to be associated with higher wage inequality particularly at the top of the distribution. Both studies analyze the US using data from the Panel Study of Income Dynamics (PSID) for the period of 1976 to 1998. By means of the reweighting method of DiNardo et al. (1996), Lemieux et al. (2009) quantify the contribution of performance pay to growing wage inequality in the US to 21%. They also show that wage inequality has grown within and between variable and fixed wage schemes. The present paper uses a similar empirical strategy, but for the case of Germany. For Germany, Pannenberg and Spiess (2009) analyze the variance of wages by also using the SOEP data, but their study is limited to the time period from 1991 to 2000. From a general equilibrium (GEE) model they find that unobserved heterogeneity in the wage and performance pay equation are significantly positively correlated. They do not model the contribution of the growing use of performance pay to wage inequality as will be analyzed in the following.
III. Data and Descriptive Statistics

The following empirical analyses are based on data from the German Socio-Economic Panel (SOEP), a large household survey for the years 1984 to 2009 (Socio-economic Panel (SOEP) 2011; for a description see Haisken-DeNew and Frick 2005). This data set is comparable to the PSID in the US and the British Household Panel Survey (BHPS) in the UK, but larger in size. The empirical analyses are limited to full-time employees in West Germany aged 25 to 65, excluding self-employed and public-sector employees, as for these groups the meaning of pay for performance is not evident. This leaves a sample size of nearly 13,000 employees in more than 20,000 job matches. All procedures use sampling weights provided by the SOEP data in order to obtain representative results. 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 corresponding gross amount. I will refer to this pay component as “performance pay” in the present study. More precisely, in this study, “pay for performance” is defined as profit-sharing, premia and bonuses excluding piece rates, comissions, overtime premia, Christmas and vacation pay.

Given that this variable pay component depends on performance, some eligible 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 (following Lemieux et al. 2009 and Heywood and Parent 2009). This category captures all job matches with a variable pay scheme, regardless of whether a bonus was paid in the specific 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 et al. (2009) and Heywood and Parent (2009) as here only bonus payments in the past or present define a PP job – not those in the future. This definition allows observing in the data the new introduction of pay for performance in a given job match.

This definition would however distort the observed share of employees in performance pay jobs at the beginning of the observation period. In order to present descriptive statistics that are comparable over time, an end-point correction is applied following Lemieux et al. (2009), which is described in the online appendix to

---

3The most recent available wave at the time of writing is from 2010, which refers to pay components in the year 2009.
How has the incidence of performance pay in Germany developed over the past 25 years? Table 1 and Fig. 1 show the answer using the aforementioned definition and correcting for the end-point problem. The share of employees working in PP jobs has been increasing continuously from 15.4% in 1984 to 39.6% in 2009. The steepest increase is observed in the late 1990s. This is followed by a period of 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 again in 2009 (see Fig. 1).

Overall, the general trend has pointed towards a steady increase. This is in line with Pannenberg and Spiess (2009) who document the same trend for Germany over the 1990s. In absolute terms, the volume of performance pay is not negligible as it amounts to 1700 Euro per year at the median, that is one half monthly salary (see web appendix). The volume of performance pay increases over the wage distribution.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></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>

The goal of this study is to analyze wage changes over time, such that the observation period should be as long as possible. To avoid misclassification of PP jobs at the start of the observation period, the starting year of the comparison will not be 1984, but 1986. Moreover, several years have to be pooled to achieve reasonable case numbers at the start of the observation period, i.e. 1986-1989. Correspondingly, the time frame for the end period will be the pooled observations from 2006 to 2009.

4See https://www.empiwifo.uni-freiburg.de/discussion-papers-1.
5Qualitatively similar results are obtained from different subsamples of the data (available upon request).
6Another question in the SOEP data explicitly asks for performance evaluations by the supervisor in the years 2004 and 2008. 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. On the firm level, Berger et al. (2011) report that 37% of all firms use performance-related pay.
Employees in PP jobs are better educated, have longer tenure, and work in larger firms, as compared to non-PP jobbers (see table 2 in the web appendix). The same result has, for example, been found by De la Rica et al. (2010) for Spain and Cornelissen et al. (2011) for Germany. This points towards a 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%).

How has wage inequality grown? Table 2 and Fig. 2 display the difference between the two unconditional wage distributions from 1986 - 1989 and 2006 - 2009. Wages have on average increased by 7.7 log points over the 20 years. However, notable real wage losses at the bottom of the wage distribution (-4.3 log points at the 10th percentile) are accompanied by strong wage increases at the top of the distribution (+17.5 log points at the 90th percentile). Thus, the 90-10 differential has widened by 21.6 log points over the observation period of 20 years. The trend of rising wage dispersion in West Germany has also been documented by Fitzenberger (1999); Dustmann et al. (2009), Antonczyk et al. (2010) and Pannenberg and Spiess (2009).

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

7Wages are defined as real log hourly wages.
Table 2: Increase in wage inequality (comparing 1986-1989 to 2006-2009)

<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 2: Increase in wage inequality (comparing 1986-1989 to 2006-2009)

IV. Decomposition Results

The following analysis will decompose changes in the wage structure over time. The following subsection will explain in more detail the sequential decomposition method. Then, the results will be presented and explained. Afterwards, some further decomposition results will address additional research questions. Sensitivity checks to scrutinize the key result can be found in the online appendix mentioned above.

Sequential decomposition method

To analyze the effect of pay for performance on the entire wage distribution, the classical decomposition approach of Oaxaca (1973) and Blinder (1973) is not sufficient as it refers only to the mean. Their method has been extended to capture the entire wage distribution mainly by DiNardo et al. (1996) and by Machado and Mata (2005). Previous decomposition analyses on the relation between performance
pay and the wage structure have used the reweighting method of DiNardo et al. (1996) (see Lemieux et al. 2009 and Heywood and Parent 2009). That method has the advantage of being easy to implement and thanks to its semiparametric nature imposes few restrictions on the functional form. For exactly this reason, the method of DiNardo et al. (1996) cannot capture a coefficient effect (as there are no coefficients), but only a residual effect. In contrast, the extension by Machado and Mata (2005) identifies a coefficient effect from specifying a linear quantile regression model (Machado and Mata 2005, p. 451). While this parametric modelling is naturally more restrictive, identifying separate effects from coefficients and characteristics may be important for the topic of growing performance pay use. That is because the growing incidence of performance pay jobs may not only change the composition of the employees working in such jobs (characteristics effect) but also the remuneration may respond to this development (coefficients effect). For this reason, the method of Machado and Mata will be used. For the estimation, the procedure from Chernozhukov et al. (2008) is employed.

Specify the \( \tau \)th quantile of log hourly wages \( w \) conditional on the set of covariates \( X \) 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.\(^8\) The linear quantile regression models are specified as extended Mincer-type log wage equations and include the following covariates: individual-specific characteristics (educational degree, gender, age and age squared), job match specific covariates (tenure and tenure squared, occupational category, and an indicator for temporary contracts) and firm characteristics (firm size in categories, industry branch, and federal state).

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 to 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 over time it is not sufficient to measure the contribution of the

\(^8\)In the following the notation will abbreviate these time periods, mentioning only the starting year.
characteristics and the coefficients, but a PP job-term will be added. Therefore, the decomposition follows this equation:

\[
\frac{q(X_{06}, PP_{06}, \beta_{06}) - q(X_{86}, PP_{86}, \beta_{86})}{\text{Overall wage change}} = \frac{q(X_{06}, PP_{06}, \beta_{06}) - q(X_{06}, PP_{86}, \beta_{86})}{\text{Coefficients effect}} + \frac{q(X_{06}, PP_{06}, \beta_{86}) - q(X_{06}, PP_{86}, \beta_{86})}{\text{PP-jobs effect}} + \frac{q(X_{06}, PP_{86}, \beta_{86}) - q(X_{86}, PP_{86}, \beta_{86})}{\text{Characteristics effect}}
\]

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 first step involves simulation of the wage structure if individuals from 2006 were paid as 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 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 \(q(X_{06}, PP_{86}, \beta_{86})\). The resulting PP jobs effect quantifies the contribution of the growing incidence of performance pay, holding the composition of the workforce and the wage structure constant. It is a lower bound because it does not consider the response of the remuneration scheme.

Third, the final step in this sequential decomposition consists of changing the characteristics from 1986 to 2006 levels. This characteristics effect captures changes in the composition of the workforce such as educational upskilling or changes in the composition and incidence of PP jobs. As an intermediate step, they simulate a wage distribution in the absence of performance pay jobs. This step is avoided here, because instead the changes in the wage distribution over time are modelled. As an intermediate step, the share of PP jobs is held constant at 1986 levels – not at zero as in DiNardo et al. (1996).

How the coefficients in the PP job and in the non-PP job scheme evolved will be considered in the additional decomposition results later in this section.
industry structure.\textsuperscript{12}

The key 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 (DiNardo \textit{et al.} 1996; Chernozhukov \textit{et al.} 2008; Fortin \textit{et al.} 2010). In this application it means that changes in the covariates \( X \) 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 by definition assumes away any general equilibrium effects.

The crucial step in the simulation process concerns the second component, i.e. the PP jobs effect. The correlations between the covariates and the PP job status is accounted for by estimating a propensity score. This score is used to weigh the hypothetical observations with and without a PP job in 1986 in the estimation of the counterfactual wage distribution \((X_{06}, PP_{86}, \beta_{86})\).\textsuperscript{13}

\textit{Sequential decomposition results}

The results of the decomposition analysis can be found in Table 3 and in Fig. 3. To keep the figures readable, only the confidence band that corresponds to the PP jobs effect of interest is displayed in Fig. 3.\textsuperscript{14}

The total difference recapitulates the growing wage inequality over time and is about to be explained by the decomposition.\textsuperscript{15}

The coefficients are the largest contributor to this increase in wage inequality. More precisely, changes in the remuneration scheme have contributed to rising wage inequality at the bottom of the wage distribution, but less so at the top. Still, the top half of the wage distribution has seen strong wage level increases due to changing returns. What could be the explanation for these strong changes in the returns to characteristics? Antonczyk \textit{et al.} (2010) find very large effects due to changed

\textsuperscript{12}Alternative orders of decomposition will be considered in the sensitivity checks in the web appendix.

\textsuperscript{13}An alternative matching procedure will be explained as a sensitivity check in the web appendix.

\textsuperscript{14}Inference is based on 100 bootstrap replications, applying a block bootstrap where individuals are resampled and using all observations over time for the resampled individuals.

\textsuperscript{15}Here, following Chernozhukov \textit{et al.} (2008), the predicted wages from the quantile regressions form the basis. Because this smoothes out the error term, the total difference is not as erratic as in Fig. 2. This does not change the results (available upon request)
Table 3: 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>
</thead>
<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>

Percent explained by PP jobs incidence

16.7  20.0  11.4  8.9  8.0

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

Figure 3: Result of sequential decomposition
returns to sector affiliation for Germany, i.e. increasing between-industry differentials. Very recent research by Card et al. (2012) points to the growing importance of firm- and individual-specific heterogeneity as well as growing assortative matching between employees and employers. Several other explanations are possible, among them the prominent hypothesis of skill-biased technological change (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, which should reflect in the coefficients effect. If skilled labor is found mainly at the top of the wage distribution, then it is not surprising to find the largest coefficient effect in this part, too, which is in line with the results presented here. The negative coefficients effect found for the very bottom of the wage distribution suggests wage losses in this part of the wage distribution, which, however, would stand in contrast to the task-based approach to SBTC (Autor et al. 2003). Alternative explanations, such as trade globalization (Blinder 2006) require further research.

The characteristics effect affects wage inequality steadily over the entire distribution. It is very pronounced in the top half of the wage distribution where the coefficients effect is rather flat. Thus, the changing composition of characteristics (such as educational upgrading and industry changes) raises wages in the top of the wage distribution, while the bottom sees real wage losses. One possible explanation could stem from employees with bad labor market characteristics who newly enter full-time work in the private sector in West Germany, e.g. due to labor market reforms in the early 2000s. Moreover, deunionization could affect the characteristics effect if collective bargaining coverage is correlated with the observed characteristics.16 As Antonczyk et al. (2010) show in their characteristics effect, declining collective bargaining coverage contributes significantly to growing wage inequality, but the effect is small in magnitude.

Finally, the key result is given by the PP jobs effect. The results show that this effect remains completely flat over the distribution. The change of the wage distribution that can be attributed to the rising incidence of pay for performance is an upward shift on the order of one log point. Although the magnitude of the effect seems small at first sight, 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 point out of 8.8 log points, see last row of Table 3). However, while the growing

16Collective bargaining coverage cannot be identified from the data and therefore cannot be investigated further in this study.
incidence of PP jobs contributed to the wage level, it 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. They reach their conclusion by analyzing wage changes within the group of performance pay jobs. This is what we will turn to next.

### Additional decomposition results

Another way to think about growing wage inequality 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, such that the composition of the characteristics of this group has changed? 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 leads to the question of how wage inequality has changed over time within performance pay jobs. The corresponding decomposition is simpler than the one considered so far, as the PP jobs effect drops out. The results are found in Table 4 and in figure 4 where results are displayed without (left) and with confidence bands (right side).

<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>0.039</td>
<td>0.070</td>
<td>0.102</td>
<td>0.116</td>
<td>0.117</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.022)</td>
<td>(0.016)</td>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Coefficients Effect</td>
<td>0.028</td>
<td>0.061</td>
<td>0.090</td>
<td>0.084</td>
<td>0.085</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.029)</td>
<td>(0.016)</td>
<td>(0.014)</td>
<td>(0.015)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Characteristics Effect</td>
<td>0.011</td>
<td>0.009</td>
<td>0.012</td>
<td>0.032</td>
<td>0.032</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.021)</td>
<td>(0.013)</td>
<td>(0.014)</td>
<td>(0.015)</td>
<td>(0.015)</td>
</tr>
</tbody>
</table>

17 This result is very robust to variations in the estimation procedure, see the web appendix.
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 and remains stable above that point. This means that within the group of PP jobbers, wage inequality has increased in the bottom half of the wage distribution, driven almost completely by changes in the remuneration scheme. In contrast, characteristics have contributed only slightly to an improvement of wages. This falsifies the hypothesis that the increased incidence of PP jobs worsens the selection of employees into this wage regime.

The same questions apply to those employees who work under a fixed wage: Did the selection of this group worsen as more employees switch into a performance pay scheme? Table 5 and Fig. 5 show that the growth in wage inequality has been much more pronounced for non-PP jobbers.¹⁸ For them, over 20 years wage inequality, as measured by the 90-10 differential, has increased by 12.7 log points. Again, a large part of the wage increase over time is driven by changes in the coefficients. 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 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, meaning that it contributes strongly to the growing wage inequality within this group of non-PP jobbers.

¹⁸Pannenberg and Spiess (2009) also find that over the period from 1991 to 2000, wage inequality as measured by the coefficient of variation increased within both pay regimes. However, they do not differentiate between the coefficients and characteristics effect.
Comparison of the coefficients effect shows that it is larger for PP jobbers than for non-PP jobbers. This means that the returns to observable characteristics have increased more strongly within PP jobs. This resembles the result found by Lemieux et al. (2009) who explain this by SBTC. Thus, while the underlying cause for the increasing importance of coefficients remains unresolved, this analysis gives a clue by showing that it affects PP jobs more strongly than non-PP jobs.

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, consequently, in wages? In order to analyze this, the wage difference between PP and non-PP jobs is decomposed as follows:\(^\text{19}\)

\(^{19}\)The decomposition for the years 1986-1989 follows analogously.

---

### Table 5: Decomposition results within non-PP jobs

<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>-0.052 (0.013)</td>
<td>-0.019 (0.009)</td>
<td>0.023 (0.009)</td>
<td>0.055 (0.009)</td>
<td>0.075 (0.013)</td>
</tr>
<tr>
<td>Coefficients Effect</td>
<td>-0.007 (0.013)</td>
<td>0.021 (0.009)</td>
<td>0.049 (0.009)</td>
<td>0.062 (0.009)</td>
<td>0.064 (0.012)</td>
</tr>
<tr>
<td>Characteristics Effect</td>
<td>-0.045 (0.009)</td>
<td>-0.040 (0.006)</td>
<td>-0.026 (0.006)</td>
<td>-0.008 (0.007)</td>
<td>0.011 (0.009)</td>
</tr>
</tbody>
</table>

---

**Figure 5: Decomposition results within non-PP jobs**

Without confidence bands

With confidence bands
\[
\begin{align*}
q(X_{06}^{PP}, \beta_{06}^{PP}) - q(X_{06}^{PP}, \beta_{06}^{no}) &= q(X_{06}^{PP}, \beta_{06}^{PP}) - q(X_{06}^{PP}, \beta_{06}^{no}) + q(X_{06}^{PP}, \beta_{06}^{no}) - q(X_{06}^{no}, \beta_{06}^{no}) \\
&= \text{Overall wage change} + \text{Coefficients effect} + \text{Characteristics effect}
\end{align*}
\]

Table 6: Wage difference PP jobs versus non-PP jobs

<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>0.251</td>
<td>0.243</td>
<td>0.259</td>
<td>0.296</td>
<td>0.318</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.016)</td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.016)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Coefficients Effect</td>
<td>0.065</td>
<td>0.056</td>
<td>0.069</td>
<td>0.086</td>
<td>0.109</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.014)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Characteristics Effect</td>
<td>0.186</td>
<td>0.188</td>
<td>0.190</td>
<td>0.219</td>
<td>0.209</td>
</tr>
<tr>
<td>(Standard error)</td>
<td>(0.012)</td>
<td>(0.010)</td>
<td>(0.009)</td>
<td>(0.012)</td>
<td>(0.013)</td>
</tr>
</tbody>
</table>

Early (1986-1989)

| Total Difference | 0.343 | 0.332 | 0.338 | 0.358 | 0.361 |
| (Standard error)   | (0.020) | (0.014) | (0.012) | (0.013) | (0.016) |
| Coefficients Effect | 0.063 | 0.082 | 0.108 | 0.126 | 0.126 |
| (Standard error)   | (0.017) | (0.012) | (0.010) | (0.012) | (0.016) |
| Characteristics Effect | 0.280 | 0.251 | 0.230 | 0.232 | 0.235 |
| (Standard error)   | (0.012) | (0.010) | (0.010) | (0.010) | (0.012) |

Late (2006-2009)

Table 6 and Fig. 6 display the decomposition results of the wage difference between PP and non-PP jobs for the early and the late period. The results show that the wage difference between the two types of jobs is rather flat within both time periods. Over time, the level of the wage difference between PP and non-PP jobs has shifted upwards by about eight log points. Characteristics explain a very large
share of the wage difference, particularly at the bottom of the wage distribution. 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 (least not full-time). Apparently, these individuals, who on average have less valued labor market characteristics, mostly work in non-PP jobs. In addition, the contribution of coefficients to the wage difference is growing only slightly over time, meaning that the remuneration scheme hardly responded to the changed selection of individuals. In sum, wage inequality within and between both job types has grown over time in Germany, similarly to that in the US (Lemieux et al. 2009).

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.

V. 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, more than doubling over the observation period from 1984 to 2009. The steepest increase took place in the late 1990s. Employees in performance pay jobs are positively selected.

One of the most important trends in empirical labor economics over the past few decades has been growing wage inequality. Several factors contribute to this trend such as globalization, skill-biased technological change and deunionization. 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 (DiNardo et al. 1996; Chernozhukov et al. 2008; Fortin et al. 2010). This article contributes to the literature by analyzing the contribution of the growing incidence of performance pay jobs to the increasing wage inequality for the case of Germany.

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 upward shift in the wage distribution due to the growing use of performance pay. The magnitude of this shift is around 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). 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 wage difference between both types of jobs grew over time but remained flat.

The cause for growing wage inequality in Germany is not the growing use of variable pay schemes, as the present analysis has shown. Nevertheless, the empirical evidence presented here points to a growing importance of returns to characteristics that affects employees in performance pay jobs more strongly than in non-performance pay jobs, which Lemieux et al. (2009) would attribute to skill-biased technological change. The underlying cause for this trend needs further investigation. It is likely related to recent findings of growing firm heterogeneity and assortiveness between employees and employers (Card et al. 2012). So long, a coherent explanation for the
underlying cause of the steep growth in wage inequality seems still to be missing – at least for Germany. It appears that the main driving factor for growing wage dispersion is not pay for performance and also changes in the job tasks or deunionization cannot explain a lot. So the search continues.

References


