Swedish Institute for Social Research (SOFI)

Stockholm University

WORKING PAPER 12/2007

WHICH WAGE DISPERSION MATTERS TO FIRMS' PERFORMANCE?

by

Per Lundborg

November 2007

Which Wage Dispersion Matters to Firms' Performance?*

by

Per Lundborg**

Swedish Institute for Social Research,
Stockholm University,

ABSTRACT

Research on wage dispersion and firm performance focuses on intra-firm and inter firm effects irrespective of workers' profession. We extend the analysis by considering dispersion within professions, within and across firms and within professions economy-wide. We find that the intra-firm dispersion of wages, which research so far has focused on, has limited effects on productivity compared to the economy-wide wage dispersion within the professions. As Swedish firms have differentiated wages among employees during the last 10-15 years also the economy-wide dispersion within professions has increased thus contributing considerably to the strong performance of the Swedish economy in the late1990.s.

*This paper was written while I was affiliated with Göteborg university. Comments from friends and colleagues at Göteborg university and other universities are acknowledged. In particular I want to thank Håkan Locking, Bertil Holmlund, Hans Sacklén and Juhana Vartiainen for comments and Anna Weigelt for data assistance.

**Professor Per Lundborg, Swedish Institute for Social Research, University of Stockholm, S-106 91 Stockholm, Sweden. Tel +46 8 162310, e-mail: per.lundborg@sofi.su.se.

Words: 4353

Introduction

Research on the relation between wage dispersion and productivity focuses on the distribution of wages within and between firms (or plants or industries) irrespective of the individuals' profession.[1] However, since firms employ a large number of workers of different professions, focusing on the wage distribution within or between firms only tests for effects of individuals' wage comparisons across non-peers, i.e. comparisons across different professions. Fairness arguments as well as so called "tournament" arguments for why dispersion matters to firms' performance should be expected to be more prominent among peers than among non-peers. A better understanding of "which" wage dispersion matters for the incentives to perform well would therefore be gained if peer and non-peer effects of wage dispersion are separated on a detailed level. Using employer-employee data on 114 individual professions we analyse the productivity effects of wage differentials within and between professions, within as well as across firms. Thus, the contribution is to add the profession dimension to the literature on intra-firm wage dispersion and firm performance.

Firms hire from other firms and workers may raise their salaries or wages by changing employers. Hence, outside options affect workers performance implying that the economy-wide dispersion within each profession may influence productivity. Therefore, we not only test if wage dispersion among peers within the firm affects productivity, but also if wage dispersion among peers in the whole labour market stimulates work effort. If wage dispersion increases among all employees of a given profession in an economy this may stimulate the individuals' effort since workers may signal their high productivity not only to the present employer but also to better paying external employers.

The Swedish labour market is an excellent case to study since major changes have taken place in the last decades. For many years, Sweden was characterised by centralised wage setting combined with a wage structure that in an international comparison was extremely compressed. This was the result of a wage policy of union solidarity that was a leading principle particularly

[1] For studies based on employer-employee data, see Heyman (2005), Lallemand et al (2004), Winter-Ebmer and Zweimüller (1999) and Eriksson (1999). Some of these separate white-collar from blue-collar workers and Heyman (200) and Eriksson (1999) also analyse managers. Levine (1993) analyse questionnaire results about how

among blue-collar workers' trade unions. Compression reached a peak in the first part of the 1980.s but since then, and particular during the last 10 to 15 years, Sweden has experienced major changes in wage setting practices and in wage structures. The employers' confederation, once the proponent of centralised wage setting,[2] initiated a decentralisation process in the early 1980.s. As employers' confederation rejected fully centralized wage bargaining, blue-collar workers' wage bargaining has since then taken place mainly at the industry level. Much more far-reaching changes characterize white collar workers as their unions gradually during the 1980.s and 1990.s accepted wage setting at the individual level. We show that this process of decentralisation has been followed by drastic increases in wage differences among white-collar workers, a development in sharp contrast to the one for blue-collar workers for which unions have maintained very narrow wage differences.

The fact that the initiative for wage decentralisation was taken by the employers' confederation suggests that individual wage setting would raise workers' productivity. Individual wage setting makes it possible for firms to differentiate wages, not least among workers of similar profession and education, so as to stimulate productivity. This notion finds theoretical support in "tournament" models[3] where wage inequality within a firm stimulates work effort as the most productive worker wins the "tournament prize". The tournament model has been interpreted relatively freely in the empirical literature as it has been applied to groups outside managerial positions. The general interpretation is that wage dispersion stimulates individuals' effort much irrespective of where in the firms' hierarchy the individual is placed. For an economy where workers move easily across firms, the notion that more wage dispersion stimulates productivity may be extended also to the economy-wide dispersion within the profession.

However, there are also alternative theories that stress fairness and cooperation among workers arguing that wage compression among workers fosters work effort.[4] Of course, both of these theories could be correct. More wage dispersion could benefit productivity if wages initially are

---

compensation executives set wages for carpenters, electricians, and programmers. See also Levine (1991), Akerlof and Yellen (1988).

[2] See Alexopoulos and Cohen (2004) who also give a detailed description of changes in the Swedish wage setting system.

[3] Lazear and Rosen (1981).

[4] Akerlof and Yellen (1990), Levine (1991).

very compressed, while more wage dispersion could be harmful to productivity if wages initially are much differentiated. Indeed, results in Winter-Ebmer and Zweimüller (1999) seem to corroborate the notion of such a hump-shaped relation.[5] Considering that wages initially were highly compressed in Sweden, we should expect to find that increasing wage dispersion among Swedish white-collar workers would raise productivity, i.e. that wage dispersion was below the productivity maximising point. Thus, we should expect "tournament" arguments to be more important than "fairness" arguments in this case.[6]

Other studies have mainly focussed on the effects of wage dispersion on firm profits. We focus on the productivity effects of wage setting, i.e. the dependent variable is labour productivity in the firm. Though profits may be the final variable that the firm aims at maximizing by its wage setting, labour productivity is the relevant variable that the firm may affect. Certainly, a higher productivity is expected to stimulate profits.[7]

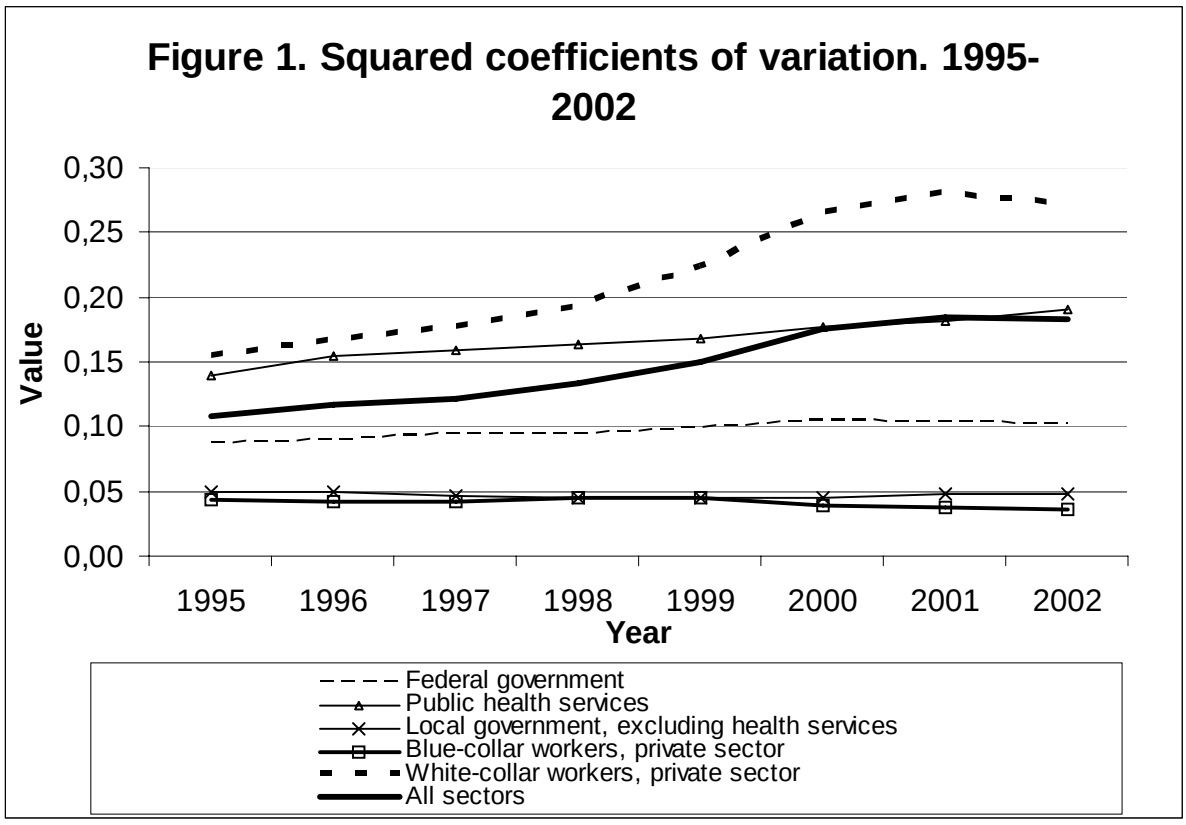
Using a large employer-employee data set, we find that firms' labour productivity is strongly affected if firms have a large number of workers in categories where economy-wide wage differences are large. The change in wage policy among white-collar workers in Sweden appears to have contributed significantly to raise firms' productivity suggesting that workers' effort is stimulated by the prospects of higher pay. However, only a minor effect comes via increased wage dispersion among workers in the same profession within the firm and across professions in the firm i.e. the effects that previous research has focused on. We find instead that the major effect on productivity comes via more wage dispersion across the whole labour market within each profession. This increased economy-wide wage dispersion within professions can be seen as a side-effect of the increased wage dispersion that took place within the firms.

Trends in Swedish wage dispersion

After wage compression peaked in the early 1980s, there followed a period of wage

[5] See also Lallemand et al (2004).
[6] This seems consistent with findings in Hibbs and Locking (2000).
[7] For instance, Winter-Ebmer and Zweimüller (1999) use wage levels as a likely proxy for firm productivity, Lallemand et al (2004) use gross operating surplus per worker, Heyman (2005) profits per employee.

differentiation among white-collar workers but the increases in wage dispersion were modest.[8] This process accelerated, however, in the mid 1990.s and wage differences increased precipitously among white-collar workers. As seen in *Figure 1*, where wage dispersion is measured by the squared coefficients of variation, this tendency is particularly strong among white-collar workers in private sectors towards the end of the 1990.s.[9] We also see large increases in wage dispersion among white-collar workers in the public health sector. Notable is also that the coefficient has *not* increased and even decreased slightly among blue-collar workers in the private sector.[10] Workers in local government, outside the health sector, belonging to blue-collar workers' unions have also maintained a highly compressed wage structure.

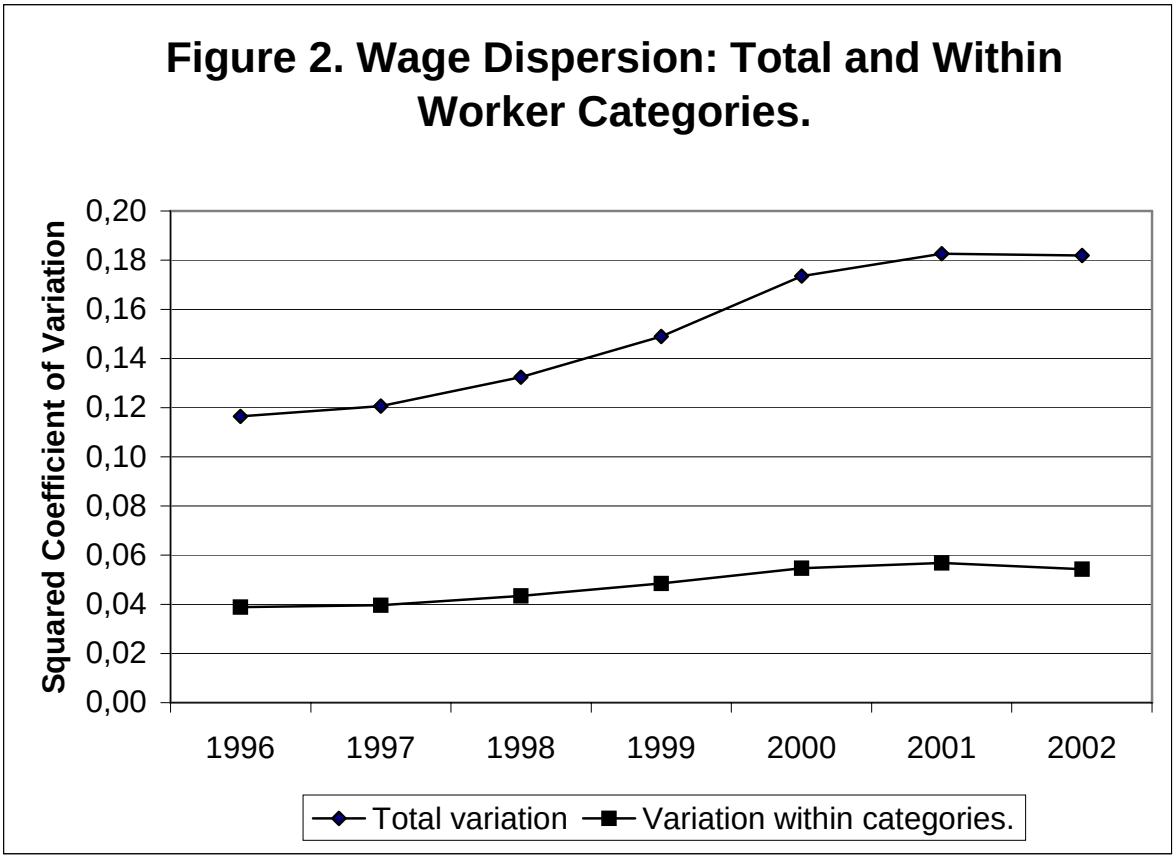


Source: Based on data from Statistics Sweden. See Appendix 1.

Finally, we note that the increasing wage differentials among white-collar workers have driven

[8] The small changes in wage differences since the mid 1980.s to the mid 1990.s are documented in OECD (1996).
[9] These are workers in categories covered by the two white-collar worker confederations TCO (The Swedish Confederation for Professional Employees) and SACO (The Swedish Confederation of Professional Associations).
[10] These are workers in categories that are covered by blue-collar workers' confederation, LO.

up the economy wide variation of wages, which, as measured by the squared coefficient of variation, has increased from less than .12 in 1995 to more than .18 in 2002. It is of interest to see how much of this increase has taken place *within* the professions and how much *across* the professions. In *Figure 2* we show total wage dispersion and wage dispersion within the professions 1996-2002, the difference between these two curves is the variation of wages across the 114 professions. Wage dispersion has increased both within the professions as well as across the professions. The large increases took place in the late 1990.s while wage dispersion was fairly stable in the early 2000.s.



Source: Based on data from Statistics Sweden. See Appendix 1.

Productivity and the prospects of better pay

This development of wage dispersion raises interesting questions. The transition to individual wage setting at the firm level, strongly pushed for by employers, raises the scope for firms to

stimulate the individual workers' effort. But, as noted, wage dispersion within each profession economy-wide, has also increased. While we have no information about the individuals' productivity, our employer-employee data allows us to illuminate the effects of wage differentials within professions economy-wide on firms' productivity. In this section we first test the hypothesis that *firms having employed many workers in categories where economy-wide wage differences are large enjoy higher productivity than firms having employed few workers in these categories*. A flat wage distribution in the economy yields weak incentives to work hard since relatively little is to be gained by the individual of being productive. A steep economy-wide wage distribution yields strong incentives for good performance as workers are mobile across firms.

For this purpose, we specify the following explanatory variable:

$$wwd_k = \sum_{j=1} \frac{a_{jk}}{\sum_j a_{jk}} CofV_j \qquad (1)$$

where wwd_k is the weighted wage difference among the professions that are represented in each firm *k*. a_{jk} is the number of workers of category *j* in firm *k* and Σa_{jk} is the total number of workers in firm *k*.[11] With coefficients of variation for our professions $CofV_j$ (*j*=1…114) we can define for each firm a coefficient of variation weighted by the number of workers in each category. A firm with a large number of professions where wages differ a lot will get a high value of wwd_k, while a firm with a large number of professions where wages do not differ much will get a low value of wwd_k. If incentives to work hard and be more productive are higher in the first group, we should expect a firm with a large number of such professions to be more productive. We assume that the higher is wwd_k in firm *k* the higher will be the level of productivity in that firm.

In testing this hypothesis, we start with a constant returns production function for a single firm with inputs of high skilled labour in efficiency units, eL_h, low skilled labour in efficiency units, eL_ℓ, and capital, *K*. To these inputs we add a firm specific factor *f* to get[12]

[11] Assume, for instance, a firm having 100 employees of which 75 are metal workers and 25 are civil engineers. The *wwd* would then be .75 times metal workers' coefficient of variation plus .25 times civil engineers' coefficient of variation.

[12] Cf. Levine (1992).

$$Q = (eL_h)^{d_1} (eL_\ell)^{d_2} K^{1-d_1-d_2} f\varepsilon * \qquad (2)$$

where ε* is an error term uncorrelated with the inputs. To simplify, we have deleted the firm index. To obtain labour productivity, *P*, we divide both sides by the total number of workers, $L(= L_h + L_\ell)$:

$$P = Q / L = (eL_h)^{d_1} (eL_\ell)^{d_2} K^{1-d_1-d_2} L^{-1} f\varepsilon \quad . \qquad (3)$$

Effort, *e*, is assumed to be a function of the relative wage, wwd_k , which is specified as $e= wwd_k^{\alpha}$. In the empirical specification we differentiate labour into high skilled and low skilled to get the estimable function:

$$\ln \mathrm{P}_{kt} = \alpha_0 + \gamma \ln wwd_{kt} + \beta Z_{ks} + \delta \ln L_{hkt} + \tau \ln L_{lkt} + \kappa \ln K_{kt} - \eta \ln L_{kt} + \varepsilon_t \qquad (4)$$

where $\gamma = \alpha(d_1 + d_2)$ and *k* is an index of firms and *t* represents time. Z_{ks} is a dummy variable of firm *k* aimed at capturing specific properties of the sector to which firm *k* belongs. This captures the major differences between for instance firms in service sectors and firms in different manufacturing sectors. The capital stock, K_k, is measured as the value of machinery and equipment, in firm *k*. Both these variables are included to control for the major determinants of productivity differences across firms, namely the factor supplies. Productivity is measured as the firm's value added, divided by the total number of workers in the firm.

In *Table 1* we present six different specifications. *Model 1* shows the results of an OLS regression with all variables measured in the same year, 2002. The estimated elasticity of the weighted wage difference variable is .23 and is highly significant suggesting that wage differences in a profession raise productivity significantly in a firm using workers in that category. Also the estimates of the parameters of the two factor supply variables come out highly significant.

We need to discuss possible caveats with the formulation of equation (4). First, is it possible that

our variable wwd_{kt} captures skill-biased technological change (SBTC) which then, in turn, affects productivity? Note that the variable as specified in (1) weighs and add the economy-wide wage distribution *within* the individual professions that are represented in the firm.[13] SBTC should raise average wage of skilled workers compared to the average wage of unskilled workers but leave the wage distribution within the individual professions unaltered.[14] Thus, SBTC leaves the variable *wwd* unchanged. SBTC is instead captured by the inclusion of the changes in factors of production demanded by the firm.

Could wage differences within a given profession be affected by firms' productivity? If this is the case, wwd_k would be affected by P_k and hence not be truly exogenous and our estimates would be biased. This would occur only if a productivity increase raises the *dispersion* of productivity that in turn would affect wage dispersion. However, since we estimate the *level* of firms' productivity as a function of the profession weighted wage distribution, such an effect is very unlikely. Yet, should a problem in this respect exist, a remedy for such a source of estimation bias could be to estimate (4) using $wwd_{k,t-1}$ rather than $wwd_{k,t}$. It could also be the case that the productivity effect emerges with a lag of one year. The results when the firms' productivity of the year 2002 is estimated as a function of weighted wage differences in 2001 are presented as *Model 2*. The estimated parameter comes out somewhat lower than for $wwd_{k,t}$, (.14), but is again highly significant and supports the general conclusion that the increased wage dispersion affects productivity favourably.

An alternative specification involves the use of instrumental variables. Wage dispersion is, however, a variable not easily instrumented and the only possible instrument for wwd_k is $wwd_{k,t-1}$. The correlation between these two variables is .75. In *Model 3*, we present the results of this IV-estimation. We see that the estimated parameter now is somewhat higher: .34. The estimate is again highly significant, supporting the hypothesis that the increased wage differences within many professions have affected productivity in a favourable way. Thus, the results in *Model 2* and *3*, strongly support the fact that we have no reason to believe that our wage dispersion variable should not be truly exogenous.

[13] Note also that there are as many as 114 professions in the data implying that workers skill levels are homogenous within each category.
[14] Note that we have as many as 114 professions represented in data.

	Model 1	Model 2	Model 3 (IV)	Model 4	Model 5	Model 6
Constant	5.9734 (23.17)	6.2971 (61.47)	7.8788 (61.29)	6.5212 (60.55)	6.0150 (22.32)	6.4459 (61.67)
$\mathbf{wwd_{kt}}$	.2294 (9.82)		.3417 (7.29)	.2077 (8.26)	.1828 (6.20)	.1472 (5.84)
$\mathbf{wwd_{kt-1}}$		.1422 (6.96)				
$\mathbf{wwdf_{kt}}$				.0303 (3.77)		.0147 (1.69)
$\mathbf{wd_{kt}}$					.0484 (3.07)	.0587 (4.60)
LS	.0792 (3.35)	.0447 (1.55)	.0844 (2.94)	.0664 (2.44)	.0750 (2.93)	.0573 (2.09)
HS	.0818 (7.38)	.0942 (7.15)	.0688 (5.10)	.0778 (6.66)	.0805 (7.06)	.0764 (6.57)
K	.1384 (17.34)	.1423 (15.69)	.1433 (15.90)	.1338 (15.61)	.1371 (16.48)	.1317 (15.32)
L	-.2616 (-8.75)	-.2616 (-7.02)	-.2629 (-7.20)	-.2577 (-7.71)	-.2737 (-8.71)	-.2561 (-7.64)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
No of obs.	3882	2901	2901	3348	3647	3348
$\mathbf{R^2}$	.3538	.3839	.3836	.3717	.3676	.3759

Table 1. Estimates of the effects of wage dispersion within professions on firms' productivity. Estimated on double logarithmic form. Robust estimates. 52 sector dummy variables have been used. The correlation between $wwd_{k,t}$ and $wwd_{k,t-1}$ is .75.

How large is this estimated effect of wage dispersion on productivity? The estimations based on $wwd_{k,t}$ yielded an elasticity of .23. Labour productivity, measured as an average in all sectors, increased by approximately 2.28 % per year between 1996 and 2002 which is considerably higher than the average for the Euro area (.84) and higher than the OECD average (1.61).[15] Average wage dispersion within categories increased by approximately 5.4 % per year. Our result in *Model 1* Table 1 would then suggest that 1.24 out of the 2.28 percent, i.e. around half of the productivity gains should be ascribed increasing wage differences. However, some caution should be taken in interpreting the results for such large changes in the wage dispersion.

[15] OECD Economic Outlook (2006).

Our main purpose is to evaluate which wage dispersion that matters most. To test how other dispersion variables affect productivity of the firm and to see if our weighted wage distribution within professions yields a robust estimate, we include in Table 1 also the results from estimating three other models. We may first ask if the dispersion of wages for a profession *within the firm* matters to the firm's productivity. Is the fact that the wage dispersion within the profession affects productivity because it reflects the dispersion of wages for the profession within the firm? Instead of defining wage differences for the professions economy-wide we thus do it for the professions within each firm by calculating:

$$wwdf_k = \sum_{j=1} \frac{a_{jk}}{\sum_j a_{jk}} CofV_{jk} \qquad (5)$$

which differs from equation (1) only in that the coefficient of variation now has an index *k* indicating that it is the wage distribution of the profession in firm *k* that matters. The coefficient of variation for a profession within a firm can only be calculated for some minimum number of workers in that category and we restrict this number to five.

Model 4 shows the results when the variable specified in (5) is added and we see that the estimated parameter of the profession wage dispersion remains stable and is only slightly reduced from a value of .23 (*Model 1*) to .21. The added variable *wwdf* comes out with the expected positive sign and is significant. The effect of this variable is, however, much smaller than the effect of increased wage dispersion within the professions economy-wide, *wwd*.

Does the distribution of wages *across all professions within the firm* matter? Such non-peer effects are what much previous research has focused on. In *Model 5* we have included a variable of the wage distribution in the firm, wd_k , measuring the coefficient of variation across all employees in the firm. In line with Akerlof and Yellen one could argue that a wider distribution of wages in the firm would have a negative impact on productivity. However, as noted above, this is less likely to apply to firms in an egalitarian economy while "tournament" effects are more likely. One could also argue that some workers at the lower end would feel unfairly treated and lower effort while those at the other end would be stimulated to raise effort. The overall qualitative effect is therefore ambiguous.

As seen in Table 1, *Model 5*, this variable yields a positive but low parameter estimate. We also see that our variable in focus, wwd_k , is robust also with respect to the inclusion of the distribution of all wages in the firm. The estimated parameter is now .18.

Finally, in *Model 6*, we include both the variable as specified in (5) and a variable on firms' internal wage dispersion. We see that our estimated parameter of the variable representing the wage distribution across professions is slightly lower (.15) while the estimated parameter of wd_k is slightly higher. However, the variable $wwdf_{kt}$, measuring the effects of the distribution of wages within the professions in firms, yields an estimate that is still significant but now only on the 10 percent level.

Clearly, the variables that the firm may affect as wage setting is decentralised to the individual level for the white-collar workers, are the distribution within professions within the firms ($wwdf_{kt}$) and the internal wage distribution across professions (wd_k). Changes in wage dispersion in these two dimensions appear to affect firms' productivity but the major effect derives from the fact that the economy-wide dispersion within professions (wwd_k) also increases as firms differentiate internal wages.

Concluding remarks

Wage dispersion can be analysed in different dimensions. Earlier research has analysed the effects on firms' performance of the wage structure across all workers or across some broad groups of workers within the firm or across the firms. We have used worker-firm linked data covering 114 different professions of the Swedish workforce and we have analysed the effects of wage dispersion 1) within the professions economy-wide, 2) within the professions within the firms, and 3) across the professions within the firms. This allows us to investigate which dimension of wage dispersion that matters the most to firms' performance.

The changes in Swedish wage setting among white-collar workers make this economy an ideal one for such an evaluation. Decentralization implied that local firms could affect the wage of the

individual employee and thus increase the scope for efficiency wage setting in a way previously not experienced. Many of the changes towards decentralised wage setting were motivated by employers' need for wage differences that should encourage the individual employee to invest in skills, to take own initiatives and raise effort. The individualization of wage setting among white-collar workers was followed by increases in wage dispersion within and across white collar professions.

We find that the dominating effect of increased wage dispersion on firms' productivity is not related to the firm itself, but to the dispersion of wages among workers of the same category across the whole economy. Thus, when Swedish employers demanded wages to be set at the individual level a minor productivity enhancing effect occurred as firms differentiated wages, while the major effect occurred when wage dispersion increased economy-wide, a factor which was outside the control of any individual firm. This result suggests that workers' performance responds to possible outside options.

The fact that the economy-wide wage dispersion within the professions matters the most highlights the importance of trade unions' wage policies and in particular their attitudes to wage compression. Our results derive from changes in wage dispersion among white-collar workers and the results indicate that their unions' attitude towards wage dispersion is of great importance to firms' performance. However, it is not obvious that the results carry over to blue-collar workers, as their effort could be of less importance to the firm. It could be that the dispersion of inherent productivity among white-collar workers is higher implying that the scope for enhancing effort is greater among these workers than among blue-collar workers. It also appears crucial that the incentives to perform well is particularly strong among managerial workers and other white-collar workers on central positions in firms and less so among blue collar workers that to a greater extent may perform more routine-like tasks.

REFERENCES

Alexopoulos, M. and J. Cohen (2004); "Lessons from the Past: What can we learn from the History of Centralized Wage Bargaining" *Penning- och Valutapolitik*, 1, 62-92.

Akerlof, G., A. Rose and J. Yellen (1988); "Job Switching and Job Satisfaction in the US Labour Market", *Brookings Papers on Economic Activity*, vol. 2, 495-594.

Akerlof, G., A. Rose and J. Yellen (1990);"The Fair-Wage Effort Hypothesis and Unemployment", *Quartely Journal of Economics,* 105: 255-283.

Eriksson, T (1999);"Executive Compensation and Tournament Theory: Empirical Tests of Danish Data," *Journal of Labor Economics*, 17(2), 262-280.

Heyman, F. (2005);"Pay Inequality and Firm Performance: Evidence from Matched Employer-Employee Data," *Applied Economics*, 37, 1313-1327.

Lallemand, T., R. Plasman, and F. Rycx (2004); "Intra-Firm Wage Dispersion and Firm Performance: Evidence from Linked Employer-Employee Data," *Kyklos*, 57, 4, 533-558.

Lazear and Rosen (1981); "Rank-order Tournaments as Optimum Labor Contracts, *Journal of Political Economy*, 89, 841-64.

Levine D. I. (1991),"Cohesiveness, Productivity, and Wage Dispersion." Journal of Economic Behavior and Organization, 15(2), March, 237-55.

Levine, D. I. (1992) Can Wage Increases Pay for Themselves? Tests with a Production Function, *The Economic Journal*, 102, September, 1102-1115.

Levine, D. I. (1993) Fairness, Markets, and Ability to Pay," *American Economic Review*, Dec93, Vol. 83 Issue 5, 1241-1260.

OECD (1996), Employment Outlook, July, Paris.

OECD Economic Outlook (2006), 1/79, Paris.

Winter-Ebmer and Zweimüller (1999); Intra-firm Wage Dispersion and Firm Performance, *Kyklos* (52) 4, 555-572.

APPENDIX

All data are taken from Statistics Sweden's data sets. To Statistics Sweden's annual wage investigations has been added wage data from "Kommunförbundet" and "Landstingsförbundet" (together making up The Swedish Association of Local Authorities and Regions) and "Svenskt Näringsliv" (Confederation of Swedish Enterprise).

Wages cover the period 1995-2002 and include a basic fixed wage (salary), any extra wage income like bonuses, any compensation for inconvenient work hours or compensation while "on duty", the value of fringe benefits, compensations in cash etc. All wages are expressed in full time month equivalents.

Seniority is measured as number of years with the present employer. This variable is limited back in time to 1995, i.e. has a maximum value of 6. The government sector is treated as one employer since no information is available about the number of years with the individual employers in the sector.

Education is divided into 6 groups with elementary education normalised. The other education levels are two years of high school, three years of high school, university less than three years, university at least three years (but not doctoral degree), and Ph.D.

Profession rests on ILO's international classification of professions, ISCO-88, and is reported on a three digit level (SSYK-3).

Capital stock is measured as total value of machinery and inventories in the firm.

Share of highly educated is the number of employees with at least two years of college education as a share of all employees.

The total number of individuals is 2 261 514 and covers employees on permanent as well as temporary positions and includes entrepreneurs with employment conditions according to agreements. The number of positions is larger, 2 305 534, since some individuals have income from several jobs.

Some means and min and max values:

Variable	Mean	Min	Max
% women	44		
Year of birth	1959	1937	1984
Share elementary school <9 years	8.4 %		
Share high school	48.0 %		
Share university <2 years	5.4 %		
Share university>=2 years	31.5 %		
Share Ph.D.	1.4 %		
Monthly wage in SKR	22053	9646	1137890
Average # of employments	1.06	1	7