

# Are workers less absent when wage dispersion is small?

Wage  
dispersion

Benoît Mahy

*Research Institute for Human Development and Organisations (humanOrg),  
Université de Mons, Mons, Belgium*

François Rycx

*Solvay Brussels School of Economics and Management (CEB and DULBEA),  
Université libre de Bruxelles, Brussels, Belgium, and*

Mélanie Volral

*Research Institute for Human Development and Organisations (humanOrg),  
Université de Mons, Mons, Belgium*

197

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## Abstract

**Purpose** – The purpose of this paper is to examine the impact of wage dispersion on sickness absenteeism observed in Belgian firms.

**Design/methodology/approach** – The authors use detailed linked employer-employee panel data for the period 1999-2006 that allow the authors to compute a conditional wage dispersion indicator following the Winter-Ebmer and Zweimüller (1999) methodology and to estimate the relationship between sickness absenteeism and wage dispersion while controlling for time-invariant workplace characteristics.

**Findings** – The authors find a positive and hump-shaped relationship between intra-firm wage dispersion and sickness absenteeism, the turning point of this relation being extremely high. In addition, the magnitude of the influence of wage dispersion on sickness absenteeism is found to be stronger in firms employing a larger share of blue-collar workers.

**Practical implications** – The results could therefore suggest that wage dispersion, suggestive of larger pay-for-performance mechanisms, decreases worker satisfaction and the workplace climate in general. Only a minority of workers, who are less sensitive to equity and cohesion considerations, would be less absent as pay-for-performance increases.

**Originality/value** – While numerous approaches analyse the link between wage dispersion and firm productivity, very few studies we are aware of are devoted to the relationship between wage dispersion and sickness absenteeism. Yet, the outcomes in terms of productivity and sickness absenteeism may be different. Furthermore, the influence of wage dispersion on sickness absenteeism does not seem unambiguous from a theoretical point of view. To the authors knowledge, it is the first time that this relation is analysed with Belgian data.

**Keywords** Belgium, Matched employer-employee data, Performance-related pay, Personnel economics, Sickness absenteeism, Wage dispersion

**Paper type** Research paper

## 1. Introduction

Absenteeism has become a major challenge for societies over time. Though great caution is required when comparing countries, given the different methodologies used, the average absence rates in the 27 member states of the European Union and in

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Norway are found to range from 3 to 6 per cent of working time. The main reasons for absenteeism are health problems, physical conditions, and work-related stress[1] (European Foundation for the Improvement of Living and Working Conditions, 2010). This results in a huge cost for societies: a report by the OECD (2009) indicates that, in 2005, OECD countries spent on average 0.8 per cent of their GDP on sickness benefits[2]. The overall cost of disability and sickness benefits is estimated to be almost 2.5 times that of unemployment benefits.

Absenteeism also generates substantive additional costs and organisational problems for firms. For instance, Securex (2013) estimates that the average cost of sickness absenteeism among Belgian firms with at least 200 workers is close to 1 million euros. This explains why employers are naturally interested in reducing absenteeism. Yet, it seems that “more workers are working longer hours and more frequently outside ‘normal’ hours; more jobs are involving high work intensity and complex tasks; while work contracts are less secure; and fewer workers report high work satisfaction – all of these indicators being correlated with stress and, in turn, inferior health” (OECD, 2009, p. 22).

At the firm-level, absenteeism is often considered as an indicator of worker satisfaction[3]. In order to improve job satisfaction and thereby to prevent absenteeism, firms can implement various human resource practices. Remuneration, for instance, is an important way to involve and motivate workers. As absenteeism is one of the key determinants of their productivity, firms often opt for performance-related pay systems when looking for the most adequate remuneration scheme to meet their productivity requirements. The incentive effect of these systems is, e.g. formalised in Lazear and Rosen’s (1981) “tournament” model, which suggests that firms have to award the largest prize (which can be a bonus or a promotion) to the most productive worker in order to stimulate workers’ effort[4]. This remuneration scheme, acting as a motivation incentive, could then reduce absenteeism.

A typical consequence of the introduction of performance-related pay systems is an increase in wage dispersion. Indeed, according to Belfield and Marsden (2003, p. 456), “there is a greater underlying variation in the individual endowments that determine worker performance (e.g. cognitive or physical ability, risk propensity, determination, etc.) than in those that determine input (e.g. ability to put in eight hours per day, etc.)”.

If this incurred wage dispersion is too high, the aforementioned incentive effect predicted by the tournament theory might be offset by a lower cooperation among workers. In his “industrial politics and sabotage” model, Lazear (1989, 1995) indeed stresses that a compressed wage structure is more productive when the initial incentive effect of an output-based pay system on firm performance is offset by a lower level of work cohesion due to the sabotage behaviour of some workers (i.e. the “hawks”). Moreover, a set of theories, based on “fairness” considerations, emphasises that wage compression improves labour relations, stimulates the cohesiveness among workers (Akerlof and Yellen, 1988; Levine, 1991), and reduces personal rent-seeking activities (Milgrom and Roberts, 1990), which in turn is beneficial for firm performance. This better workplace climate could then retain more workers and lower absenteeism through a higher job satisfaction.

Empirical studies analysing the link between wage dispersion and firm productivity confirm the ambiguous results to be expected from previous theoretical considerations[5]. For instance, in their study on Belgium, Mahy *et al.* (2011) find a positive relationship between conditional intra-firm wage dispersion and average value added per hour worked, though this relationship turns out to be hump shaped. Their results thus suggest that the incentive effect of wage dispersion, predicted for instance by the “tournament” model,

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dominates “fairness” and/or “sabotage” considerations, though the latter become increasingly important as wage dispersion increases.

Studies devoted to the relationship between sickness absenteeism and wage dispersion are not as numerous as those analysing the link between firm performance and wage dispersion. Yet, the influence of wage dispersion on sickness absenteeism does not seem unambiguous from a theoretical point of view. On the one hand, the incentive effect of the tournament theory could imply that increasing performance-related pay and therefore wage dispersion could reduce sickness absenteeism. But the latter could also increase because of accelerated work pace, stress, and feelings of discouragement resulting from a race towards higher productivity. On the other hand, according to the theories based on “fairness” considerations, lower wage dispersion could lessen sickness absenteeism. But it might as well increase it if this higher wage homogeneity is perceived as unfair by more productive workers.

The influence of wage dispersion on sickness absenteeism could also depend on the characteristics of the workforce. Indeed, Prendergast (2002) suggests that it is more important to tie wages to firm performance for highly skilled workers as they are harder to monitor, in order to induce these workers to act in the optimal way. Moreover, Foss and Laursen (2005) postulate that managers can better apprehend tasks in industries that are low-knowledge intensive, which have on average a low-skilled workforce, and therefore have less need to use pay-for-performance mechanisms to increase productivity, as the asymmetrical information is reduced. Finally, according to Barth *et al.* (2008), highly skilled workers should also be more extensively paid according to performance because they can increase their productivity more easily than less-skilled workers. In sum, these arguments suggest that performance-related pay should be implemented more intensively for highly skilled workers than for their low-skilled counterparts, in order to increase firm productivity.

On the one hand, if we assume that wage dispersion increases sickness absenteeism, arguments proposed in the preceding paragraph might then suggest that this positive influence could be strengthened if the firm is largely composed of blue-collar workers for at least two reasons. First, these workers might be demotivated as they are not able to increase their level of output so easily than their white-collar colleagues. Second, blue-collar workers could also feel performance pay as a form of control in a more extensive way. On the other hand, if the relationship between wage dispersion and sickness absenteeism is found to be negative, preceding arguments can also suggest that this negative influence might be stronger in firms employing a larger share of white-collar workers.

Analysing the empirical literature devoted to the relation between wage dispersion and sickness absenteeism, authors generally find a negative relation between these variables. In this context, Nilsen (2011) tries to discriminate between the tournament theory and fairness considerations to explain the relationship between wage dispersion and absenteeism in Norway. On the basis of linked employer-employee panel data for the period 2001-2007, the author finds that wage dispersion significantly decreases sickness absenteeism and concludes that the results support the tournament model. Bingley and Eriksson's (2001) results are in the same line: they examine the influence of the dispersion and skewness of wages on firm productivity and workers' effort – measured as the inverse of sickness absence – in Denmark. Using linked longitudinal data of 6,501 firms for the years 1992-1995, they find a positive relationship between wage dispersion and workers' effort for white-collar workers, but no significant impact for blue-collar workers[6]. Analysing monthly personnel data of full-time white-collar workers from a large German company for the period 1999-2005, Pfeifer's (2010) results

indicate that relative wages – calculated as the deviation of the wage of the worker from the level's average wage of workers at the same hierarchy level – decrease the probability of being absent. When these deviations are split according to their signs, Pfeifer (2010) finds that receiving a wage above the reference level significantly decreases sickness absenteeism, though receiving a wage below the reference does not increase absenteeism significantly.

Moreover, Dale-Olsen (2012) aims to jointly analyse the impacts of performance pay and teams on sickness absenteeism. On the basis of Norwegian panel data for the period 1996-2005, his results suggest a negative influence of performance pay on sickness absenteeism. In Italy, Battisti and Vallanti (2013) examine whether wage flexibility and temporary jobs influence workers' effort, measured by absenteeism, and firm productivity. On the basis of a sample of 2,098 firms observed during the years 2008-2009 and various econometric specifications, they find that performance-related pay significantly decreases absenteeism, this result being driven by white-collar workers.

But other empirical studies do not necessarily support this negative relationship between wage dispersion and absenteeism. A related strand of the literature addresses the link between performance-related pay and job satisfaction and provides mixed results. For instance, McCausland *et al.* (2005) find that pay-for-performance decreases job satisfaction, except for high-paid British workers. Green and Heywood (2008) also consider British evidence during a more recent period, but they find a positive influence of performance-related pay on several dimensions of job satisfaction such as overall job satisfaction, satisfaction with pay, satisfaction with hours worked, satisfaction with job security, and satisfaction with the work itself. Other authors still examine the influence of a set of human resource practices, among which performance-related pay, on sickness absenteeism directly. For instance, Böckerman *et al.* (2011) analyse the effect of self-managed teams, information sharing, employer-provided training, and incentive pay on absenteeism using Finnish data. Their preferred estimation does not show any significant effect of these practices on absenteeism.

In this context of ambiguous relationship from both theoretical and empirical points of views, the aim of this paper is to analyse the impact of wage dispersion on sickness absenteeism in the Belgian private sector. We also examine whether this relationship depends on the workforce qualification. In order to achieve these objectives, we use a large and detailed matched employer-employee panel data set of 20,611 firm-year-observations from 9,255 firms observed during the period 1999-2006, and compute a conditional wage dispersion indicator, as suggested by Winter-Ebmer and Zweimüller (1999). This means that wage dispersion is measured between workers with similar observable characteristics, which is more appropriate if we aim to examine the practical implications of theories such as "tournaments" or "fairness", as they refer to wage differentials between similar workers. Our panel data also allow us to control for firm-level time-invariant heterogeneity.

## 2. Methodology

We estimate the impact of wage dispersion on sickness absenteeism on the basis of the Winter-Ebmer and Zweimüller's (1999) methodology, which allows us to compute a conditional wage dispersion indicator. This rests upon a two-step estimation procedure: in the first step, we estimate by OLS the following wage equation for each firm and each year separately:

$$\ln w_{ijt} = \alpha_0 + \mathbf{y}_{ijt}\boldsymbol{\alpha}_1 + \varepsilon_{ijt} \quad (1)$$

where  $w_{ijt}$  is the gross hourly wage (including bonuses) of worker  $i$  in firm  $j$  at year  $t$ ;  $\mathbf{y}_{ijt}$  a vector of individual characteristics including age (two dummies), sex, education (two dummies), and occupation (one dummy);  $\varepsilon_{ijt}$  the error term.

The standard deviations of the residuals of these regressions run firm by firm and year by year,  $\sigma_{jt}$ , are then used as a conditional measure of wage dispersion in the second step, which consists in estimating the following firm-level absenteeism equation:

$$\text{abs}_{jt} = \beta_0 + \beta_1 \sigma_{jt} (+ \beta'_1 \sigma_{jt}^2) + \mathbf{x}_{jt} \boldsymbol{\beta}_2 + \mathbf{z}_{jt} \boldsymbol{\beta}_3 + \gamma_t + \nu_{jt} \quad (2)$$

where  $\text{abs}_{jt}$  is the sickness absenteeism rate of firm  $j$  at year  $t$ , measured by the firm average ratio between the number of hours and minutes of paid sick leave and the total of paid hours and minutes in the reference period,  $\sigma_{jt}$  is the conditional wage dispersion indicator, estimated by Equation (1),  $\sigma_{jt}^2$  is the squared conditional wage dispersion indicator introduced in order to test for a potential hump-shaped relationship between wage dispersion and absenteeism,  $\mathbf{x}_{jt}$  is a vector containing aggregated characteristics of workers, i.e. the share of the workforce that: has at most a degree of lower secondary education; has at least ten years of tenure; and is younger than 25 and older than 49 years, respectively, the share of women and the share of blue-collar workers,  $\mathbf{z}_{jt}$  includes firm characteristics, i.e. sectoral affiliation (eight dummies), the size of the firm (number of workers)[7] and the level of wage bargaining (one dummy),  $\gamma_t$  is a set of year dummies (seven dummies), and  $\nu_{jt}$  is the error term.

From an econometric point of view, we initially estimate Equation (2) by standard OLS. Yet, in order to control for firm fixed-effects, we reformulate Equation (2) as follows:

$$\text{abs}_{jt} = \beta_0 + \xi_1 \sigma_{jt} (+ \xi'_1 \sigma_{jt}^2) + \mathbf{x}_{jt} \boldsymbol{\xi}_2 + \mathbf{z}_{jt} \boldsymbol{\xi}_3 + \gamma_t + \delta_j + \mu_{jt} \quad (3)$$

where  $\delta_j$  are firm fixed-effects controlling for time-invariant workplace characteristics.

Finally, we also investigate whether the relationship between wage dispersion and sickness absenteeism depends on the qualification of the workforce. We therefore estimate the following variant of Equation (3):

$$\begin{aligned} \text{abs}_{jt} = & \beta_0 + \partial_1 \sigma_{jt} + \partial_2 [\sigma \times \text{Blue\_Collar}]_{jt} \\ & \left( + \partial'_1 \sigma_{jt}^2 + \partial'_2 [\sigma^2 \times \text{Blue\_Collar}]_{jt} \right) \\ & + \partial_3 \text{Blue\_Collar}_{jt} + x_{jt} \partial_4 + z_{jt} \partial_5 + \gamma_t + \delta_j + \omega_{jt} \end{aligned} \quad (4)$$

where “Blue\_Collar” is a dummy variable that is equal to one if the workforce of the firm is largely composed of blue-collar workers, i.e. if the firm has a proportion of blue-collar workers larger than the median in the whole sample.

### 3. Data

Our empirical analysis is based on a combination of two large data sets, the “structure of earnings survey” and the “structure of business survey”, covering the years 1999-2006[8]. The first contains a wealth of information provided by the management of firms, both on the characteristics of these firms (e.g. sector of activity, number of workers, level of collective wage bargaining) and on the individuals working there (e.g. age, education, tenure, gross earnings, paid hours, sex, occupation). The second provides information on financial variables, such as firm-level value added. These data

sets have been merged by Statistics Belgium using the firms' social security number as identifier. They thus provide linked employer-employee data for a representative sample of firms operating in Belgium, employing at least ten workers and whose activities fall into sections C to K of the NACE Rev. 1 nomenclature (i.e. the private sector)[9].

Gross hourly wages are calculated by dividing gross earnings (including overtime payments, premiums for shift, night and/or weekend work, and other bonuses) in the reference period by the corresponding number of total paid hours (including overtime).

We apply the following restrictions to our initial data set. First, as the computation of our conditional wage dispersion indicator requires a sufficient number of individual observations per firm, we eliminate firms with less than ten observations in a given year. We then exclude workers earning less than the minimum hourly wage, firms with negative value added, and workers and/or firms for which data are missing. Moreover, we also eliminate firms belonging to the public sector. Our final sample is an unbalanced panel of 20,611 firm-year-observations from 9,255 firms observed during the period 1999-2006.

Table I presents descriptive statistics of the main variables. It indicates that the sampled firms employ on average 128 workers with a mean gross hourly wage (including bonuses) of 15.98 euros and a conditional hourly wage dispersion of 0.15 euro. The intra-firm sickness absenteeism rate is 2.1 per cent on average. We also observe that the average value added per hour worked amounts to 55.17 euros, and that around 26 per cent of the workers are women, 57 per cent are blue collars, and 38 per cent have a low level of education (i.e. lower secondary school at most). Firms are essentially concentrated in the following sectors: manufacturing (46 per cent), wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (17 per cent), construction (13 per cent), and in real estate, renting and business activities (12 per cent).

#### 4. Results

We first estimate Equation (2) by OLS. The results presented in the first column of Table II point towards the existence of a positive and significant impact of wage dispersion on sickness absenteeism. Davidson and MacKinnon's (1989, 1993) version of the Hausman (1978) test indicates that wage dispersion is not endogenously determined. Furthermore, in order to test for a potential hump-shaped relationship between our variables, we add the wage dispersion indicator in quadratic form to Equation (2). The findings reported in column 2 of Table II show that the coefficient of wage dispersion in level is again positive and significant and that the wage dispersion indicator in quadratic form presents a significant negative coefficient. Thus, evidence appears in favour of a hump-shaped relationship between wage dispersion and sickness absenteeism: when wage dispersion is low, increasing it should increase sickness absenteeism. But, when a high level of wage dispersion is reached, increasing wage dispersion would then lower sickness absenteeism.

We then run a Breusch and Pagan Lagrangian multiplier test to examine the presence of firm-level time-invariant heterogeneity. The conclusion of this test indicates that we cannot then proceed with a standard OLS regression ( $\chi^2$  statistic of 413.8 and  $p$ -value of 0.0000). Next, we perform a Hausman test to examine whether we should apply a fixed or a random effects model. With a  $p$ -value of 0.0025 ( $\chi^2$  statistic of 46.6), we can reject the null hypothesis that a random effects specification should be preferred (Greene, 2008). The results from our fixed-effects model[10] (reported in columns 3 and

Variables	Mean	SD
Hourly value added (€ <sup>a</sup> )	55.17	500.8
Gross hourly wage (€ <sup>a</sup> )	15.98	5.76
Gross monthly wage (€ <sup>a</sup> )	2,476.89	929.41
Hourly conditional wage dispersion <sup>b</sup> (€ <sup>a</sup> )	0.15	0.09
Average sickness absenteeism rate	0.021	0.026
Size of the firm (number of workers)	127.62	362.17
Age (%)		
Less than 25 years	9.12	10.31
Between 25 and 49 years	75.22	13.71
50 years and more	15.66	12.89
Women (%)	26.16	24.29
Education (%)		
No degree, primary/lower secondary	37.96	34.65
General upper secondary, technical/artistic/prof. upper secondary	39.67	30.51
Higher non-university, university and post graduate	22.37	26.55
Blue-collar workers <sup>c</sup> (%)	57.15	35.12
Firm-level collective agreement (%)	16.91	37.48
Sector (%)		
Mining and quarrying (C)	0.37	
Manufacturing (D)	45.57	
Electricity, gas and water supply (E)	0.07	
Construction (F)	13.18	
Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (G)	17.03	
Hotels and restaurants (H)	2.77	
Transport, storage and communication (I)	7.89	
Financial intermediation (J)	1.04	
Real estate, renting and business activities (K)	12.08	
Number of observations	20,611	
Number of firms	9,255	

**Notes:** <sup>a</sup>At 2006 constant prices; <sup>b</sup>hourly residual wage dispersion after controlling for human capital variables and workers' characteristics in the wage equation following the Winter-Ebmer and Zweimüller's (1999) methodology (i.e. standard deviations of residuals of wage regressions run for each firm and each year separately); <sup>c</sup>the distinction between blue- and white-collar workers is based on the International Standard Classification of Occupations (ISCO-88). Workers belonging to groups 1-5 are considered to be white-collar workers (1: legislators, senior officials and managers; 2: professionals; 3: technicians and associate professionals; 4: clerks; 5: service workers and shop and market sales workers) and those from groups 7 to 9 are considered to be blue-collar workers (7: craft and related trades workers; 8: plant and machine operators and assemblers; 9: elementary occupations)

**Table I.**  
Descriptive statistics  
of selected variables

4 of Table II) confirm the previously found positive and hump-shaped relationship between wage dispersion and sickness absenteeism and allow us to estimate that the turning point is high (0.44 euros), nearly three times higher than our sample mean of 0.15 euros.

Our results might therefore suggest that broader wage dispersion, suggestive of larger pay-for-performance mechanisms, could be harmful to job satisfaction and could increase sickness absenteeism. Indeed, from a tournament perspective, performance-related pay could induce a faster work pace, more stress and feelings of discouragement. In addition, according to fairness considerations, wage dispersion can damage the workplace climate.

Table II.  
Results

Dependent variable	OLS			Fixed-effects		Fixed-effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(6)
Intercept	0.007 (0.001)***	0.003 (0.001)*	0.004 (0.004)	0.001 (0.004)	0.007 (0.004)*	0.005 (0.004)	0.005 (0.004)
Conditional wage dispersion <sup>b</sup>	0.015 (0.003)***	0.072 (0.007)***	0.029 (0.005)***	0.061 (0.011)***	0.017 (0.006)***	0.04 (0.01)***	0.04 (0.01)***
Squared conditional wage dispersion		-0.131 (0.016)***		-0.069 (0.021)***		-0.044 (0.025)*	-0.044 (0.025)*
Conditional wage dispersion×Blue_Collar <sup>c</sup>						0.028 (0.022)	0.028 (0.022)
Squared conditional wage dispersion×Blue_Collar <sup>c</sup>						-0.012 (0.055)	-0.012 (0.055)
Worker characteristics <sup>d</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics <sup>e</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies (7)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.02	0.03					
R <sup>2</sup> within			0.01	0.01	0.012	0.012	0.012
Sig. model (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hausman statistic	1.56		1.38		1.41		
p-value	0.12		0.17		0.16		
Number of observations	20,611	20,611	20,611	2,611	20,611	20,611	20,611
Number of firms	9,255	9,255	9,255	9,255	9,255	9,255	9,255

**Notes:** Robust standard errors between parenthesis. <sup>a</sup>Firm average ratio of the number of hours and minutes of paid sick leave over the total of paid hours and minutes in the reference period; <sup>b</sup>hourly residual wage dispersion after controlling for human capital variables and workers' characteristics in the wage equation following the Winter-Ebmer and Zweimüller's (1999) methodology (i.e. standard deviations of residuals of wage regressions run for each firm and each year separately); <sup>c</sup>Blue\_Collar<sup>c</sup> is a dummy variable that is equal to one if the workforce of the firm is largely composed of blue-collar workers (i.e. if the firm has a proportion of blue-collar workers larger than the median in the whole sample (0.69)); <sup>d</sup>share of the workforce that: has at most a degree of lower secondary education; has at least ten years of tenure; and is younger than 25 and older than 49 years, respectively. The share of women and the share of blue-collar workers are also included; <sup>e</sup>sectoral affiliation (eight dummies), number of workers and level of wage bargaining (one dummy). \*, \*\*, \*\*\*Significant at 10, 5 and 1 per cent level, respectively



The explanation of the hump-shaped relationship is less intuitive. It could be that, as wage dispersion is growing, workers who are downhearted by these remuneration schemes would be more absent and would end up leaving the firm. In the end, there would be only a group of (more) homogeneous workers remaining, those less sensible to fairness considerations. Then, the more these workers' remuneration depends on their performance, the more their absenteeism would decrease. In this scenario, the tournament would then lead to a selection, a phenomenon often put forward in the literature. Indeed, the introduction of performance-related pay generally goes together with a shift in the workforce, where less productive workers leave the firm: "economic theories of piece rates – where pay is entirely a function of output – predict that piece-rate workers will earn more than fixed rate workers because of two mechanisms. First, higher-ability workers – whose unobserved characteristics are such that they would earn more regardless of payment method – self-select into piece-rate contracts (the selection effect). Second, piece rates induce higher levels of effort (the incentive effect)" (Pekkarinen and Riddell, 2008, p. 315).

Though this paper focuses on short-run effects, it could be worth to estimate in future research whether the slope-inversion point of the relationship shifts over time: to the right; or to the left, which would imply to observe firms over a longer period. Validating the first case would then suggest that "intrinsic" motivations of workers make them increasingly refuse pay for performance incentives over time, while supporting the second case would merely indicate that "extrinsic" motivations of workers make them perceive more and more (the environment of) performance-pay systems as natural, fair, and incentivising.

We then examine whether the qualification of the workforce influences the relationship between wage dispersion and sickness absenteeism, by adding an interaction term between wage dispersion and a dummy which is equal to one if the workforce of the firm is largely composed of blue-collar workers (Equation (4)). Results are presented in column 5 of Table II. They again reveal the existence of a positive and significant impact of wage dispersion on sickness absenteeism. Moreover, the magnitude of this impact is found to be bigger in firms employing a larger fraction of blue-collar workers[11]. This result is rather in line with those obtained by McCausland *et al.* (2005), following which pay-for-performance systems decrease job-satisfaction except for high-paid workers.

Wage dispersion would thus be even more harmful to sickness absenteeism if the firm is largely composed of low-skilled workers, for at least two reasons. On the one hand, these workers could perceive performance pay as even more unfair as they are not able to increase their level of output as easily as their highly skilled counterparts, their output being less sensitive to their effort as pointed out by Barth *et al.* (2008). Wage dispersion therefore demotivates them and they are increasingly more absent as wage dispersion increases. On the other hand, while white-collar workers could see performance-related pay as a mechanism increasing their autonomy, blue-collar workers could experience it as a form of control, and therefore have a negative perception of wage dispersion.

Testing for a non-linear relationship between wage dispersion and sickness absenteeism in interaction with the qualification of the workforce, we still find a hump-shaped nexus between our variables of interest (column 6 of Table II). However, though estimates associated to a higher incidence of blue-collars in firms suggest a strengthening of the relationship, they turn out to be non-significant.

Finally, Mahy *et al.* (2011) previously found that intra-firm wage dispersion is beneficial for firm productivity in the Belgian private sector (provided that wage dispersion is not too high). It is first worth to mention that this positive relationship between wage dispersion and firm productivity is coherent by definition with the positive influence of wage dispersion on sickness absenteeism[12]. Next, the

above-mentioned selection effect could enable to document the main result of this paper, namely, the fact that wage dispersion increases sickness absenteeism in Belgium and that firms end up with more productive workers. However, we have to qualify this selection effect as sickness absenteeism is still increasing when the level of wage dispersion is (very) high, the estimated turning point of the relationship being an extreme value of the distribution. It is therefore not just a question of selection: in the group of the workers who stay in the firm, some are not satisfied with the system and are absent from work. Others can have more difficulties keeping up the pace. And the social climate could worsen increasingly. Our data enable us to observe a short-term process (firms are observed on a period of 2.2 years on average). Frustrated workers will then probably end up leaving the firm (in a longer term).

## 5. Conclusion

This paper aims to examine the influence of wage dispersion on sickness absenteeism in the Belgian private sector. While numerous approaches analyse the link between wage dispersion and firm productivity, few studies are devoted to the relationship between wage dispersion and sickness absenteeism. Yet, the outcomes in terms of productivity and sickness absenteeism may be different. Furthermore, the influence of wage dispersion on sickness absenteeism does not seem unambiguous from a theoretical point of view. On the one hand, the incentive effect of the tournament theory could imply that increasing performance-related pay and therefore wage dispersion could reduce sickness absenteeism. But the latter could also increase due to adverse outcomes resulting from a race for higher productivity, in terms of accelerated work pace, stress, and feelings of discouragement. On the other hand, according to the theories based on “fairness” considerations, lower wage dispersion could lessen sickness absenteeism. But it could also increase it if this higher wage homogeneity is perceived as unfair by more-productive workers.

Our empirical analysis is based on detailed matched employer-employee panel data constituted of 20,611 firm-year-observations from 9,255 firms observed during the period 1999-2006. This panel is representative of all firms employing at least ten workers within sections C to K of the NACE Rev. 1 nomenclature, with the exception of the electricity, gas, and water supply sector (NACE E) and large parts of the financial sector (NACE J). The panel data allow us to compute a conditional wage dispersion indicator following the Winter-Ebmer and Zweimüller’s (1999) methodology, which is more appropriate in a context of tournament and fairness, and to control for firm-level time-invariant heterogeneity.

Our OLS and fixed-effects results all emphasise a significant and positive impact of conditional intra-firm wage dispersion on sickness absenteeism. They therefore contrast with the results of other studies that examine the link between wage dispersion and sickness absenteeism and that often conclude to a negative relationship between these variables (Nilsen, 2011; Bingley and Eriksson, 2001; Pfeifer 2010). Our results are rather more in line with the study of McCausland *et al.* (2005), who find that, for the UK, performance-related pay lowers job satisfaction, excepted among higher-wage workers.

In addition, we find that the magnitude of the influence of wage dispersion on sickness absenteeism is bigger in firms with a higher incidence of blue-collar workers. These workers could indeed perceive performance-related pay as even more unfair than white-collar workers as: they are not able to increase their level of output as easily, given that their output is less sensitive to effort (Barth *et al.*, 2008); and they could feel performance pay as a form of control in a more extensive way (while white-collar workers might see performance-related pay as a mechanism increasing their autonomy).

We finally find a hump-shaped relationship between wage dispersion and sickness absenteeism, the turning point of this relation being however encountered at a very high level. Hence, broader wage dispersion, suggestive of larger pay-for-performance mechanisms, could be harmful to job satisfaction and could increase sickness absenteeism. Indeed, from a tournament perspective, performance-related pay could induce a higher pace of work, stress, and feelings of discouragement. In addition, according to fairness considerations, wage dispersion can damage the workplace climate. Only a minority of workers, who are less sensitive to equity and cohesion considerations, would be increasingly less absent the more their remuneration depends on their performance.

### Notes

1. For Belgium, the study conducted by the European Foundation for the Improvement of Living and Working Conditions (2010) mentions that stress is reported as partly causing absence in about one-third of cases.
2. In an attempt to include the indirect costs of absence (e.g. effects on productivity, administration, quality of service, overtime, social security contributions, the hiring of replacement of workers), which is not the case in the OECD's (2009) report, the European Foundation for the Improvement of Living and Working Conditions (2010) even estimates that the average cost of absenteeism for a nation amounts to 2.15 per cent of its GDP.
3. The inverse relationship between job satisfaction and sickness absenteeism can be documented by two reference models. On the one hand, in the "demand-control model" (Karasek, 1979), jobs with high demands in terms of productivity but low decision latitude (i.e. low control) are associated with mental strain. On the other hand, Siegrist's (1996) "effort-reward imbalance model" indicates that high-cost/low-gain conditions appear when a worker spends high effort (due to extrinsic (i.e. the demands on the job) or intrinsic (i.e. the motivations of the worker) factors) which is not compensated by high societal rewards (i.e. money, esteem, or status control). This lack of reciprocity between costs and gains in turn leads to emotional distress.
4. Note that performance-related pay can be based on absolute or relative criteria. According to Lazear (1995), the relative position of a worker may be more easily assessed than his absolute performance. Another point is that relative comparisons are not affected by common productivity shocks. However, relative comparisons create a negative externality of individual effort on the wages of co-workers. Bandiera *et al.* (2005) show that if workers internalise this externality, piece rates may lead to a higher average productivity than relative compensation schemes. Whether performance-related pay should be based on absolute or relative criteria is likely to depend on the firm's working environment. Moreover, both schemes are not mutually exclusive and may be combined in order to optimise workers' productivity (e.g. Schöttner and Thiele, 2010 examine the optimal combination of linear individual performance pay and promotion tournaments).
5. For an overview of the empirical literature dedicated to the influence of wage dispersion on firm productivity (see Mahy *et al.*, 2011).
6. Bingley and Eriksson (2001) also report a hump-shaped relationship between wage dispersion and firm productivity when the analysis is restricted to white-collar workers.
7. We have information on whether a firm employs either between 10 and 19 workers, between 20 and 49 workers, between 50 and 99 workers, between 100 and 199 workers, between 200 and 499 workers, or more than 500 workers.
8. Nominal variables have been deflated using 2006 sectorial value-added prices.

9. Note that only some parts from the financial sector (NACE J) are included, namely, other financial intermediation (NACE 652) and activities auxiliary to financial intermediation (NACE 67). For the year 2006, the data set also contains firms from the public sector, which we thus eliminate.
10. The Hausman (1978) test still indicates that the hypothesis of exogeneity of wage dispersion cannot be rejected.
11. The Hausman (1978) test still leads to the conclusion of exogeneity of wage dispersion.
12. More precisely, as productivity is defined as the value-added (VA) divided by the total of hours worked (HW) and sickness absenteeism as the number of hours of paid sick leave (HS) divided by the total of paid hours in the reference period (HP), the following relation holds:

$$\begin{aligned}\text{Productivity} &= \text{VA}/\text{HW} = \text{VA}/(\text{HP} - \text{HS}) = \text{VA}/\text{HP}(1 - \text{HS}/\text{HP}) \\ &= \text{VA}/\text{HP}(1 - \text{absenteeism})\end{aligned}$$

So an increasing wage dispersion, fostering absenteeism, reduces the denominator and consequently increases the productivity.

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### Corresponding author

Mélanie Volral can be contacted at: [melanie.volral@umons.ac.be](mailto:melanie.volral@umons.ac.be)

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