

The Effects of Human Resource Management on Small Firms' Productivity and Employees' Wages.

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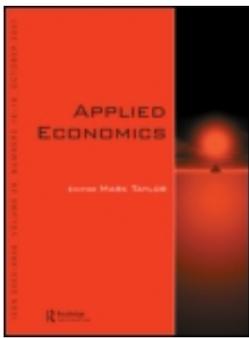
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The effects of human resource management on small firms' productivity and employees' wages

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This paper analyses whether employees and firms differently benefit from particular human resource (HR) practices. The focus is on small firms that may be badly informed on the impact of HR practices on firm performance. In this study on Dutch pharmacies, it is found that firms do not reward employees' skills according to their contribution to firms' productivity, as (1) employees are over-rewarded for their sector-specific skills and under-rewarded for the productivity enhancing effect of their computer skills and (2) employees' work experience positively affects their wages but does not have real productivity effects. Moreover, it is found that training employees in case of vacancy problems seems to be an adequate HR practice, since it increases productivity without affecting the average wage level. The opposite holds for offering higher wages to newly recruited employees. Furthermore, we find that only the employees benefit from performance evaluation interviews, whereas employing many employees by temporary contracts appears to have a negative effect on productivity, without affecting the wage level.

I. Introduction

In a simple neoclassical view of the labour market the wage level can be taken as a direct measure of productivity. However, if the labour market is characterized by imperfect competition, bargaining and rent-sharing may occur (Stevens, 1994; Acemoglu and Pischke, 1999). The linked employer–employee data we use enable us to analyse the effect of human resource (HR) practices on administrative data on workers' wages as well as on firm productivity. This allows us to analyse whether employees and firms differently benefit from particular HR practices. We focus on a branch that is dominated by small firms. Small firms may be badly informed on the

possible impact of HR practices, since they do not have professional HR staff (cf. De Kok and Uhlaner, 2001) and might be unaware whether or not particular HR practices stimulate a convergence of employee and firm interests.

We will analyse the effects of the more basic practices in the field of recruitment, human resource development and performance pay, which we found to be characteristic for the HR practices in the pharmacies.¹ Opposite to the large literature on the effects of HR practices in large firms, we do not focus on the impact of a 'High Performance Workplace' that is characteristic for a more advanced HR system in large firms (Wood, 1999; Osterman, 2000; Ichniowski and Shaw, 2003),

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¹Our approach can be characterized as an 'insider-econometric analysis' (Ichniowski and Shaw, 2003).

but not relevant for most small firms (Heneman *et al.*, 2000).

The paper focuses on the ‘core workers’ in the pharmacies: the pharmacist’s assistants who represent 80% of the total workforce in the pharmacies.² The advantage of this ‘jobs-based approach’ (Lazear, 1995) is that a category of workers can be analysed that is homogeneous with respect to their occupation as well as their educational background.³

Linked employer–employee data is used, relating the data of an employers survey we conducted among pharmacies in the Netherlands to administrative data on the workforce and the productivity of the firms. The administrative data enable us to use a physical measure of productivity related to the pharmacies sector⁴: the number of prescription-lines delivered to customers. These prescription-lines directly measure a pharmacy’s production, as there are only minor differences in the workload between delivering different medicines.

This study contributes to the literature on the effects of HRM in several ways. First, this study is the first to systematically analyse linked employer–employee data to determine whether the effects of various HR practices on firm performance differ from the effects on the remuneration of the workforce. Second, the focus is on small firms, whereas almost all studies on the effectiveness of HR practices deal with the effects of more advanced HR systems in large firms. Therefore, this analysis contributes to the understanding of the thresholds in the diffusion of less traditional HR practices among smaller firms. Third, we take account of the actual ‘stock’ of skills (i.e. employees’ scores on the various relevant competencies) by which the human capital embedded in a firm’s workforce may contribute to firm performance and employees’ wages, whereas other studies of the effects of HR practices merely focus on employees’ participation in formal training. Finally, we test whether traditional proxies of employees’ skills acquired on the job, such as employees’ age and job

tenure, really affect employees’ productivity or merely reflect institutionalized practices in salary scales.

II. Prior Research

In the literature on the effects of HR practices at the firm level, two avenues of research exist. First, the human capital literature focuses on the effects of training and experience at the firm level. Although empirical human capital research traditionally focuses on the earnings function of the individual worker, a stream of research is emerging that analyses the effects of human resource development at the firm level. Several studies found considerable returns on employees’ participation in training (Lynch, 1994). However, after controlling for selectivity, Goux and Maurin (2000) found that training has no real effect on employees’ wages. Studies on the effects of training on wages could, however, underestimate the effect of training on productivity when the labour market is characterized by imperfect competition (Stevens, 1994; Acemoglu and Pischke, 1999). Dearden *et al.* (2000), meanwhile, found that the effects of training on wages are about half the size of the effects on industrial productivity.⁵ However, they did not focus on the productivity of individual firms, but on the productivity of the sector of industry.⁶ More recent is the literature on the effects of employees’ skills on their wage level. Most of these studies focus on skills for which there is a growing demand, such as computer skills (Borghans and Ter Weel, 2004), and problem-solving and communication skills (Dickerson and Green, 2004). As far as we know, there are no studies that analyse the effects of employees’ skills on firm performance.

Empirical studies generally show that employees’ experience contributes to their productivity, in as far as this is indicated by the wages they earn (Mincer, 1974). However, employees’ life-cycle earnings growth might reflect institutional arrangements in

² See Arthur (1992), Osterman (1994, 2000) and Batt (2002) for a similar approach. Osterman defines these ‘core workers’ as the largest group of non-supervisory, non-managerial workers at the establishment of a firm who are directly involved in making the product or providing the service.

³ In the Netherlands a person is only allowed to work as a pharmacist’s assistant if he or she is a graduate from a pharmacist’s assistants school.

⁴ Arthur (1994), MacDuffie (1995) and Ichniowski *et al.* (1997) also use physical measures of productivity related to the branch they analyse. These kind of sector specific performance measures can be considered as relatively ‘hard’ data on the performance of a firm (Ichniowski *et al.*, 1996).

⁵ Other studies that analyse the effects of training on the productivity of the firm are Ballot *et al.* (2001), Black and Lynch (2001) and Molina and Ortega (2003), whereas Kazamaki Ottersten *et al.* (1999) analyse the effects of training on firms’ total costs.

⁶ They combine Labour Force Survey data on individual workers with data on the value added per sector of industry in manufacturing.

salary-scales rather than productivity gains (Medoff and Abraham, 1991).

The second line of research has developed from the HRM or personnel economics literature (see Wood, 1999 and Ichniowski and Shaw, 2003 for an overview of these studies). In this literature, several arguments can be found for the expected positive relation between HR practices and firm level productivity (Wolf and Zwick, 2002). First, as has been discussed above, investments in the human capital of the workforce may increase the productivity of employees (Bartel, 1994). Second, HR practices may increase employees' motivation and commitment to their tasks (Ichniowski *et al.*, 1997). Finally, HR practices that increase job satisfaction will reduce quit rates, which, in turn, decreases recruitment and selection costs, and increases the benefits of investments in firm-specific skills (Batt, 2002). There is, however, hardly any literature on the effects of HR practices in small and medium-sized enterprises (SMEs). Moreover, some of these studies focus on medium-size firms (Hayton, 2003) Hornsby and Kurato (1990) show that small firms have less formal HR practices, whereas Heneman *et al.* (2000) conclude from their literature survey that 'the lack of information about human resources in SMEs is problematic for theory, research and practice'.

Only a few HRM studies analyse to what extent employees benefit from HR practices. Forth and Millward (2004) found that 'high-involvement management' is associated with higher pay. Handel and Gitterman (2004) did not find any consistent wage effects of a 'high performance workplaces'.

III. Data

Measure of productivity

In this study we will use a physical measure of productivity, following the research of other studies that focus on a particular industry (Arthur, 1994; MacDuffie, 1995; Ichniowski *et al.*, 1997). We measure the productivity of pharmacies by the number of prescription lines delivered to customers.

Each prescription line refers to a particular medicine delivered to a customer. Family doctors write these prescription lines, this being the only way in which registered medicines can be obtained in the Netherlands. The average number of prescription lines per assistant (in full-time equivalents) is a good indicator of the productivity of a pharmacy, since it determines the quantity of medicines delivered to customers.⁷ Moreover, the pharmacies are paid a fixed amount of money for each prescription line (€5.08) by the health insurance companies.⁸ In this way our measure of physical productivity is directly related to the value added of the firm.

Linked employer–employee data

We conducted an employers survey among pharmacies in the Netherlands in November 2001.⁹ A written questionnaire was mailed to 1319 pharmacists of whom 549 responded. The response appeared to be unbiased with respect to region and pharmacy size. We were able to link the survey data with the available administrative data on the number of prescription lines worked up in the various pharmacies and with administrative data on employees' wages and other employee characteristics.¹⁰ The latter data source was used to calculate the assistants' average gross wages per month,¹¹ as well as employees' average age and tenure for each pharmacy.

Table 1 shows the means and standard deviations of the variables in the data set used. The average gross wage per month for pharmacist's assistants is €1770. On average, an assistant in a pharmacy handles 13 630 prescription lines per year.

The HR practices included in the analyses can be classified as recruitment practices, human resource development and incentive pay. With respect to the firm's recruitment policy we included the percentage of assistants with temporary contracts and a variable that indicates whether or not the firm offers a higher wage to new assistants in case of vacancies that are difficult to fulfil.

For human resource development we included variables that measure the extent to which a pharmacy employs high-performance assistants.¹² For this

⁷ It should be noted that in the Netherlands non-registered medicines are almost always bought in commercial drugstores and hardly contribute to the sales of the pharmacies.

⁸ Although pharmacies in the Netherlands have to deal with all kinds of government regulations, they are truly independent, for-profit firms.

⁹ In the tradition of 'insider econometrics', we based this survey on extensive fieldwork to get a detailed understanding of the production process in Dutch pharmacies.

¹⁰ All pharmacist's assistants are registered at the pension fund (*Pensioenfonds Medewerkers Apotheken*).

¹¹ The gross wages per month are based on full-time jobs (36 hours per week).

¹² The skills of the assistants employed can be interpreted as the firm's stock of human capital. As all assistants attended the same government required education program, their skills will, to a large extent indicate the stock of training investments during their working career (Lynch, 1998).

Table 1. Description of the variables*

Variable	Mean	Standard deviation
<i>Wages and productivity</i>		
• Assistants' average gross wages per month in euros ($\times 1000$)	1.77	0.11
• Number of prescription lines per assistant per year ($\times 1000$)	13.63	4.89
<i>Recruitment policy</i>		
• Assistants with temporary contracts (%)	12.60	16.58
• Offering higher wages to new assistants in case of vacancies (yes/no)	0.13	0.34
<i>Human resource development</i>		
• Assistants' average score on general skills higher than 7.5 (yes/no)	0.63	0.48
• Assistants' average score on specific skills higher than 7.5 (yes/no)	0.28	0.45
• Assistants' average score on computer skills higher than 7.5 (yes/no)	0.34	0.48
• Training of employees in case of vacancies (yes/no)	0.10	0.30
• Worker performance evaluation interview (yes/no)	0.75	0.43
• Assistants' average age in years	36.61	4.39
• Assistants' average job tenure in years	6.89	2.73
<i>Incentive pay</i>		
• Performance pay (yes/no)	0.16	0.36
<i>Technological and organizational innovations</i>		
• New computer system (yes/no)	0.17	0.37
• Organizational changes (yes/no)	0.56	0.50
<i>Other staff</i>		
• Share of second pharmacists in total number of employees	0.05	0.08
• Share of other employees in total number of employees	0.15	0.11
<i>Firm characteristics</i>		
• Type of pharmacy		
– Independent (yes/no)	0.70	0.46
– Chain of less than 5 pharmacies (yes/no)	0.18	0.38
– Chain of 5 or more pharmacies (yes/no)	0.13	0.33
• More than 10 employees (yes/no)	0.53	0.50

Note: * $n = 549$.

purpose we asked the pharmacists to score the average level of their workforce for ten different skills. The skill scores refer to the score scales from 1 to 10 common in Dutch education, in which a score of 6 is a passing grade. In order to indicate whether a pharmacy employs high-performance employees, we distinguished between the pharmacies with average skill scores below and above 7.5.¹³ We here distinguished between three clusters of skills: general skills, sector-specific skills and computer skills (Heijke *et al.*, 2003). Moreover, we included employee performance evaluation interviews that may increase the quality of human resource development, and we included a variable that indicates whether or not a firm retrain its employees when there are vacancies that are difficult to fulfil. In addition to these more direct human resource development variables, we included the traditional proxies of employees' experience: average age and job tenure.

For incentive pay we only have data on whether or not a pharmacy works with some kind of performance pay.

We do not have data on the physical capital used in the pharmacies. However, as the production process in the various pharmacies is rather similar, the capital stock invested in the firm will be strongly related to the size of the workforce. Moreover, we included variables that take into account the technological (TI) and organizational innovations (OI) that may have taken place in the pharmacy. Both technological and organizational innovations have been found to contribute to higher levels of firm productivity (Bresnahan *et al.*, 2002), and may also result in an increase in employees' wages (Bauer and Bender, 2001). Finally, we included some controls for the employment shares of the remaining staff employed in the pharmacy: the 'second pharmacists'¹⁴ and 'other employees' (usually cleaning personnel and

¹³ A score of 7.5 is in between 'ample sufficient' (7) and 'good' (8).

¹⁴ Second pharmacists are pharmacists employed by the managing pharmacist who usually owns the firm.

Table 2. Results of Zellner's seemingly unrelated regression analysis

Variable	Average wage level (ln)		Prescription lines (ln)	
	B	t-value	B	t-value
Constant	0.279***	10.86	2.782***	17.05
<i>Recruitment practices</i>				
• Assistants with temporary contracts (%)	-0.000	-0.22	-0.004**	-3.74
• Offering higher wages to new assistants in case of vacancies (yes/no)	0.015*	1.81	0.036	0.74
<i>Human Resource Development</i>				
• Assistants' score on general skills > 7.5 (yes/no)	0.001	0.10	0.010	0.28
• Assistants' score on specific skills > 7.5 (yes/no)	0.011*	1.71	-0.049	-1.29
• Assistants' score computer skills > 7.5 (yes/no)	-0.005	-0.91	0.084**	2.38
• Training of employees in case of vacancies (yes/no)	0.004	0.50	0.110**	2.10
• Worker performance evaluation interview (yes/no)	0.012**	2.06	-0.020	-0.55
• Assistants' average age in years	0.006***	8.89	-0.002	-0.39
• Assistants' average job tenure in years	0.004***	4.03	-0.002	0.26
<i>Incentives</i>				
• Performance pay (yes/no)	0.001	0.13	0.064	1.43
<i>Technological and organizational innovations</i>				
• New computer system (yes/no)	0.004	0.53	-0.029	-0.67
• Organizational changes (yes/no)	0.011*	1.95	0.019	0.60
<i>Other staff</i>				
• Employment ratio of second pharmacists (ln)	-	-	0.021**	3.16
• Employment ratio of other employees (ln)	-	-	0.023**	2.66
<i>Firm characteristics</i>				
• Type of pharmacy				
- Independent (yes/no)	-0.002	-0.20	0.083*	1.74
- Chain of less than 5 pharmacies (yes/no)	0.019*	1.93	-0.006	-0.10
- Chain of 5 or more pharmacies (ref.)	-	-	-	-
More than 10 employees (yes/no)	0.0123**	2.26	-0.116**	-3.45
Adjusted R ²		0.363		0.163
n	379		379	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

administrative staff) and some controls for firm characteristics.

IV. Econometric Model

To analyse the effects of the various HR practices on employees' wages and the productivity of the firm, we estimate the effects of the various practices in a wage equation as well as a production function. We estimate these two equations as a set of 'seemingly unrelated regression equations' (Zellner, 1962). By using EGLS estimators we are able to use the information on the explanatory variables that are only included in the second equation when estimating the first equation and allow for correlation between the two error terms:

$$\ln(W/L)_i = \alpha_1 + \beta'_1 H_i + \delta_1 OI_i + \gamma_1 TI_i + \mu'_1 X_i + \varepsilon_{1i} \quad (1)$$

$$\ln(P/L)_i = \alpha_2 + \beta'_2 H_i + \delta_2 OI_i + \gamma_2 TI_i + \mu'_2 X_i + \phi'_2 \ln(Z/L)_i + \varepsilon_{2i} \quad (2)$$

W_i =total wages of pharmacist's assistants in firm i ; L_i =number of full-time assistants in firm i ; P_i =number of prescription lines delivered in firm i ; H_i =use of various HR-practices in firm i ; OI_i =organizational innovations in firm i ; TI_i =technological innovations in firm i ; X_i =control variables; Z_i =additional staff; α , β' , δ , γ , μ' , ϕ' =(vectors of) coefficients; ε_{1i} , ε_{2i} =error terms.

The controls we included differ between the two equations, since in the production function (Equation 2) we have to add additional controls for the other categories of employees in the pharmacies (Black and Lynch, 2001), i.e. the ratio between other staff employed and pharmacist's assistants. In order to impose constant returns to scale, we take the log transformation of the latter term.

V. Estimation Results

The estimation results show that there are some remarkable differences between the determinants of the wage level, and the determinants of productivity.

With respect to the human-resource development variables, we find that pharmacies that employ assistants with high scores on computer skills have a higher productivity, whereas these computer skills do not affect the wage level. The latter reflects the findings of Borland *et al.* (2004) that the effect of computer skills on workers' wages is substantially reduced when detailed occupational controls are included in the regressions.¹⁵

Conversely, high scores on sector-specific skills have a positive effect on the wage level, whereas these skills do not have a similar effect on productivity. This indicates that these occupational skills, which are strongly related to pharmacists' own field of expertise, are highly valued by the pharmacists, even though this is not reflected in the productivity of the firm. Moreover, we find that training employees in the case of vacancies seems to be an adequate HR practice, since it increases the productivity of the pharmacy.

Another remarkable finding is that performance evaluation interviews are more favourable for employees than for the firm. This indicates that these interviews give the employees a floor for bargaining without having any effect on firm performance. With respect to pharmacies recruitment policy, we find that pharmacies that offer a higher wage to newly recruited assistants, in order to cope with their vacancy problems, also have a higher average wage level, although this recruitment policy does not have a positive effect on productivity. Employing many assistants by temporary contracts appears to have a negative effect on productivity, whereas there is no effect on the wage level. The latter could be expected because for employees with temporary contracts, the limited duration of their contract is already a negative aspect of their contract (Golden, 1996). The estimation results do not show a significant effect of performance pay on the productivity of the firm, nor on the average wage level of the pharmacist's assistants.

The estimation results also show that wages are strongly related to the age and job tenure of employees; a result that is usually interpreted as the productivity effect of general and job or firm-specific experience or 'on-the-job training'.¹⁶ However, our

estimation results show that age and tenure of the workforce do not have a positive effect on the productivity of the firm. These results indicate that the effects of age and experience on earnings merely reflect institutionalized salary-scale effects¹⁷ rather than real productivity effects.

Finally, the estimation results show that technological developments neither affect wages nor productivity in the pharmacies, whereas organizational innovations have a positive effect on employees' wages, although they do not affect the productivity of the firm.

VI. Conclusions

In this study, we analysed the effects of HR practices in Dutch pharmacies. We focused on the question whether the effects of HR practices on employees' wages and firm productivity are similar or different. Considerable differences were found between the determinants of the level of pharmacist's assistants' wages, and the determinants of the productivity of the pharmacies. Wages seem to be mainly based on institutionalized salary-scales, and individual bargaining in annual performance evaluation interviews, instead of rewarding employees productivity. This shows that pharmacies could gain from aligning their wage policies with employees' contribution to firm performance.

These findings indicate that the employers are not well informed regarding the impact of the various HR practices on firm performance. This probably holds for SMEs in general.

However, since the data we used are cross-sectional, our estimation results may suffer from a selectivity effect for which we could not control. As shown by Wolf and Zwick (2002), a negative selectivity effect may occur in measuring the effects of HR practices on firm performance, because less productive firms have an incentive to introduce more productive HR practices. Moreover, sector studies on the effects of HR practices cannot be conclusive regarding the extent to which the results found can be generalized to other sectors in the economy. This raises the need for more empirical research on

¹⁵ Moreover, it should be noted that we here control for many more skills than in studies that focus on the wage effects of computer skills. In these studies part of the returns to computer skills probably represent the returns to other unobserved skills (DiNardo and Pischke, 1997; Borghans and Ter Weel, 2004; Borland *et al.*, 2004).

¹⁶ The job-matching theory gives an alternative explanation: long tenures reveal good worker-employer matches (Hotchkiss, 1998).

¹⁷ These salary scales are defined in the *Collectieve Arbeidsovereenkomst Apotheken 2001* (Collective Bargaining Agreement Pharmacies, 2001).

the effects of HR practices in SMEs, where the majority of the working population in the Western world is employed. These studies may also contribute to our understanding of the thresholds in the diffusion of more advanced HR systems among these firms.

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