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Abstract: Using panel data from German establishments, this study finds that performance pay is associated with increased productivity only when it is coupled with a high-wage policy. This holds for individual-based performance pay, group-based performance pay and profit sharing.

JEL Classification: D20, J33, M52.

Keywords: Performance pay, high-wage policy, productivity, fixed effects regressions.

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1. Introduction

Since the emergence of the economics of personnel, explorations on the outcomes of individual and collective performance pay have been increasingly common (e.g., Black and Lynch 2004, Heywood et al. 2011, Knez and Simester 2001, Lazear 2000, Lucifora and Origo 2015, Paarsch and Shearer 2000). The basic hypothesis is that employers can provide incentives by tying workers' pay to their output. However, the consequences of performance pay remain a matter of debate. Performance pay can entail disincentives if it undermines intrinsic motivation or violates norms of fairness (Benabou and Tirole 2003, Bewley 1995, Gneezy et al. 2011). Thus, the effects of performance pay may depend on circumstances and type of firm.

This study uses establishment data from Germany to test the hypothesis that incentive schemes are more effective in raising productivity when coupled with a high-wage policy. Higher rewards do not just provide stronger incentives. Sufficiently high rewards may be necessary to compensate the loss of intrinsic motivation entailed by monetary incentive schemes (Gneezy and Rustichini 2000). Moreover, workers may be more likely to perceive performance pay as fair if the employer is willing to share a substantial amount of the rents generated by their efforts. Perceived fairness in turn increases workers' willingness to respond to performance pay by increasing their efforts.

2. Data and Variables

The study uses the Hanover Panel, a four-wave panel with representative data from manufacturing establishments in the federal state of Lower Saxony (Gerlach et al. 2003). Interviews were conducted by Infratest Sozialforschung, a professional survey and opinion research institute. The data were collected on the basis of a questionnaire in

personal interviews with the owner or top manager. The Volkswagen Foundation provided financial support.

The important advantage of the data set is that it provides the necessary information on the remuneration policy of the establishments. This information is available from wave 1 (1994) and wave 3 (1996) of the survey. Thus, our fixed effects regressions are based on a balanced panel with two waves of observations. The analysis uses data from establishments with more than 50 employees.

Table 1 shows the definitions of variables. The dependent variable is the logarithm of productivity, with productivity being defined as value added (sales minus material costs) per employee. Each wave of interviews provides retrospective information on productivity in the previous year. Hence, data on productivity in the years 1994 and 1996 are available from waves 2 and 4.

The key explanatory variables are three dummies for the use of individual-based performance pay, group-based performance pay and profit sharing. A high-wage policy is captured by a dummy equal to 1 if management regards it as important or very important to motivate workers by paying wages above the level specified in collective agreements. Note that this information is available for both establishments covered and establishments not covered by collective agreements. In Germany, even uncovered establishments typically use collective agreements as a reference point when deciding about their remuneration policy.

We also control for the coverage by a collective agreement. Collective agreements define minimum standards. Thus, employers are free to pay wages above the level specified by the agreements. Collective agreements are usually negotiated on a broad

industrial level between employers' associations and unions. Employers are covered if they are members of an employers' association. Furthermore, the presence of a works council is taken into account. Works councils provide a highly developed mechanism for establishment-level codetermination. Their creation depends on the initiative of the establishment's workforce. A participatory HRM policy is captured by a variable indicating whether or not management regards it as important to motivate workers by giving them greater scope for decisions. Moreover, variables for establishment size, capital intensity, shift work, weekly hours, single-establishments, subsidiaries, owner-managers and the structure of the workforce are included.

3. Results

Column (1) of Table 2 shows the initial fixed effects regression without interaction variables. The variables for capital intensity, shift work, owner-management and works council incidence emerge with significantly positive coefficients. Establishment size, collective bargaining coverage, single establishment status, the share of women and the share of apprentices are significantly negative determinants of productivity. Most importantly in our context, the variable for a high-wage policy and the variables for the various types of performance pay do not emerge with significant coefficients. However, the pattern of influences may remain obscured until interaction effects have been considered.

Regression (2) additionally includes variables for the interaction of a high-wage policy with performance pay. While a high-wage policy and performance pay, taken in isolation, still have no significant influence on productivity, a combination of both is a significantly positive determinant. This holds for all of the three types of performance

pay, i.e. individual-based performance pay, group-based performance pay and profit sharing. The effect is strongest for group-based performance pay. All in all, the regression provides a clear pattern of results. Performance pay is associated with increased productivity only when it is coupled with a high-wage policy.

4. Conclusions

This study finds no evidence that performance pay per se or a high-wage policy per se has an influence on productivity. However, combining performance pay with a high wage policy significantly raises productivity. The findings support the view that performance pay needs to be combined with a high-wage policy in order to involve positive incentive effects. Sufficiently high rewards may be required to foster perceptions of fairness and to offset the loss of intrinsic motivation so that workers positively respond to performance pay. In this sense, our real world investigation using establishment data complements experimental evidence provided by Gneezy and Rustichini (2000). Importantly, our study shows that the same pattern of results holds for different types of performance pay, namely individual-based performance pay, group-based performance pay and profit sharing.

Moreover, the study provides evidence that, conversely, a high wage policy needs to be coupled with performance pay in order to increase establishment performance. Just paying high wages without setting clear performance standards and tying workers' pay to their performance does not appear to provide appropriate incentives.

Future research could fruitfully examine the consequences for profits. As the combination of performance pay with a high-wage policy also raises labor costs, it is an open question whether or not such combination is profitable to employers.

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Table 1: Variable Definitions and Descriptive Statistics (*N* = 438)

Variable	Definition	Mean
Ln(productivity)	Log of value added (in German marks) per employee.	11.723
Ln(capital intensity)	Log of gross fixed capital stock per employee in thousand German marks. For each year, official German statistics are matched to 32 detailed industrial sectors within manufacturing.	5.470
Ln(size)	Log of number of employees.	5.091
Women	Share of female employees.	0.260
Blue-collar workers	Share of blue-collar workers.	0.639
Part-time workers	Share of part-time workers.	0.056
Apprentices	Share of apprentices.	0.044
Old workers	Dummy equals 1 if management regards the average age of employees as too high.	0.146
Shift work	Dummy equals 1 if the establishment uses shift work.	0.651
Weekly hours >= 40	Dummy equals 1 if blue-collar worker have a standard work week of 40 or more hours.	0.107
Weekly hours]35, 40[	Dummy equals 1 if blue-collar workers have a standard work week with more than 35 but less than 40 hours.	0.751
Single establishment	Dummy equals 1 if the establishment has no subsidiaries and is not itself a subsidiary.	0.422
Subsidiary	Dummy equals 1 if the establishment is a subsidiary.	0.164
Owner-manager	Dummy equals 1 if the establishment is managed by its owner.	0.323
Participatory HRM policy	Ordered variable indicating if management regards it as important to motivate workers by giving them greater scope for decisions. The variable ranges from 1 “not important” to 4 “very important”.	3.146
Codetermination	Dummy equals 1 if the establishment has a works council.	0.852
Collective bargaining	Dummy equals 1 if the establishment is covered by a collective agreement.	0.769
High wages	Dummy equals 1 if it is important or very important for management to motivate workers by paying wages above the level specified in collective agreements.	0.616
Individual performance pay	Dummy equals 1 if the establishment uses individual performance pay as an incentive scheme.	0.313
Group performance pay	Dummy equals 1 if the establishment uses group performance pay as an incentive scheme.	0.105
Profit sharing	Dummy equals 1 if the establishment provides profit sharing for employees.	0.221

Table 2: Determinants of Productivity, Fixed Effects Within Estimations

	(1)	(2)
Constant	10.1348 (1.9489)***	10.5216 (1.9611)***
Ln(capital intensity)	0.7704 (0.3231)***	0.6895 (0.3265)***
Ln(size)	-0.5083 (0.1198)***	-0.4813 (0.1268)***
Women	-0.6064 (0.2830)**	-0.4256 (0.2333)*
Blue-collar workers	-0.1391 (0.2480)	-0.1945 (0.2357)
Part-time workers	0.3691 (0.4460)	0.4378 (0.3944)
Apprentices	-1.3829 (0.7247)*	-1.0475 (0.7541)
Old workers	-0.0354 (0.0580)	-0.0372 (0.0559)
Shift work	0.2220 (0.0917)**	0.2356 (0.0946)**
Weekly hours >= 40	-0.0918 (0.1037)	-0.1298 (0.1026)
Weekly hours]35, 40[	-0.0341 (0.0479)	-0.0395 (0.0466)
Single establishment	-0.1590 (0.0731)**	-0.1850 (0.0623)***
Subsidiary	-0.0309 (0.0893)	-0.0993 (0.0713)
Owner-manager	0.1069 (0.0622)*	0.0951 (0.0650)
Codetermination	0.2063 (0.0961)**	0.2081 (0.0844)**
Collective bargaining	-0.1586 (0.0936)*	-0.1471 (0.0967)
Participatory HRM policy	0.0272 (0.0301)	0.0179 (0.0285)
High wages	0.0335 (0.0400)	-0.0876 (0.0562)
Individual performance pay	-0.0453 (0.0729)	-0.1032 (0.0829)
Group performance pay	0.0631 (0.0724)	-0.1481 (0.0953)
Profit sharing	0.0362 (0.0491)	-0.0681 (0.0523)
High wages x individual performance pay	----	0.1232 (0.0738)*
High wages x group performance pay	----	0.3609 (0.1194)***
High wages x profit sharing	----	0.1875 (0.0769)**
R-squared (within)	0.2764	0.3407

Dependent variable: Ln(productivity). Number of observations = 438. Number of establishments = 219. Standard errors in parentheses are clustered at the establishment level. *** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level.