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ORIGINAL ARTICLE

Performance pay, firm size and export market participation: Evidence from matched employer–employee data

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Abstract

The objective of this paper is to provide new evidence on the link between firm level characteristics (size and export) and the adoption of performance pay as part of worker remuneration. Our study exploits an employer–employee database with information on more than 200,000 workers at 26,055 Spanish firms. We find that the incidence of performance pay usually increases with firm size (at decreasing rates) and export status. However, we detect a wide variation among occupations, both in the prevalence of the two types of performance pay analysed and their relationship with size and export.

JEL CLASSIFICATION

C25, J33, M52

1 | INTRODUCTION

Pay for performance (PP) is a human resource management practice in which workers receive a part of their salary based on individual, team or firm performance. The two principal arguments for a firm to adopt a PP scheme are that it will induce workers to exert effort (*incentives*) and attract workers of higher ability (*sorting*) in contexts where imperfect and asymmetric information makes it difficult for firms to monitor worker behaviour and learn about their actual productivity (Cadsby et al., 2007; Holmström, 2017; Lazear, 2000, 2018; Prendergast, 1999). A third

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reason for adopting performance-related pay, even when effort is observable, is that it helps to share risk optimally.[1]

Hence, incentive schemes based on individual or collective performance help firms to attract, motivate and retain the most productive employees and induce optimal effort, which is ultimately what matters for firm performance and productivity. They are also expected to lower absenteeism and turnover rates, and to raise job satisfaction (Bryson et al., 2013) as well as to encourage cooperation and transparency (Blasi et al., 2016, 2018).

Nevertheless, empirical evidence shows that the use of PP widely differs across and within countries.[2] Bryson et al. (2013) find that the percentage of employees (with permanent contracts) in the private sector who receive any form of performance pay ranges from around 10 per cent in some European countries (Portugal and Greece) to over 30 per cent in Scandinavian countries and over 50 per cent in the United States. These authors also document a general increase of incentive schemes diffusion in the period 2000–05, even though it is moderate in some countries and higher in others. In the same line, Zwysen (2021) finds that the share of European workers receiving performance pay substantially increases from 2000 to 2015 (from 18 per cent to more than 30 per cent). As a result, the growing use of PP may be one source of the increase in wage inequality. Workers remunerated with performance pay tend to be concentrated at the upper end of the wage distribution (Lemieux et al., 2009), which is precisely where wage inequality has grown most dramatically (Autor et al., 2006). Yet other authors suggest that the use of some forms of collective PP, such as employee ownership or profit sharing, could be a tool for reducing inequality if they were spread more widely and meaningfully (Blasi et al., 2018).

The large heterogeneity observed in the use of performance pay leads to an interest in disentangling why some firms are more prone to introducing these pay schemes and which occupations and workers benefit most from the different types of incentive pay. Furthermore, identifying the determinants of performance pay may be helpful for the optimal design of policies aiming to promote the use of employee incentive systems and for the assessment of potential market interventions.[3]

The objective of this paper is to provide new evidence on the determinants of adopting PP as part of worker remuneration by focusing on two firm characteristics: firm size and export market participation. Empirical studies concur that large and exporter firms are more productive and innovative (e.g. Aw et al., 2011; Syverson, 2011). They also find that these firms pay higher wages for similar jobs in order to increase worker productivity, to retain the most efficient workers, or as compensation for unpleasant working conditions (e.g. Bernard & Jensen, 1997; Oi & Idson, 1999a).[4]

Since more productive firms need to attract workers with higher average ability (Helpman et al., 2010), it seems reasonable to expect large and exporting firms to use PP more intensively. This implies that workers of similar characteristics have a greater probability of being paid with PP when working in these firms. Nevertheless, few studies have explored how these firm characteristics are related to the variable component of worker remuneration.[5] This may be due to a lack of appropriate microdata incorporating an adequate disaggregation of worker earnings while also including information on worker and firm characteristics. Our paper contributes to filling this gap by furthering the knowledge on the importance of firm characteristics in adopting two types of performance pay with different payment frequency. Moreover, we present evidence of the heterogeneous incidence of PP among occupations and how its relation with export and size varies across them. In addition, we also examine the relevance of other worker and job characteristics.[6]

We address our research questions by estimating a bivariate probit econometric model and an auxiliary Mincer equation. We perform the analysis using matched employer–employee data drawn from a representative sample of Spanish establishments in the industry, construction, and service sectors, which provides information for a large sample of workers. We use the third wave of the Spanish Wage Structure Survey (2006), which contains detailed information about workers (level of education, tenure status, etc.), job position (occupation, responsibility, etc.) and firms (industry, size, export status, type of labour agreement).[7] This dataset has the additional advantage of allowing us to distinguish between two types of incentive payment schemes. The first type involves payments received regularly every pay period (i.e. every month, which we refer to as *regular* variable payments, RPP) typically tied to short-term performance goals; some examples are commissions and piece-rates. The second involves payments not received regularly each pay period (referred to as *irregular* variable payments, IPP, for which we know the total annual amount). This last type of performance pay includes quarterly and annual company bonuses and profit sharing.[8] In our data, 41 per cent of workers receive some sort of incentive payments: 29 per cent receive *regular* performance pay (RPP) and 20 per cent receive *irregular* performance pay (IPP). The distinction between these two types of PP allows us to identify differences in the role of the determinants under study, both in direction and intensity. To our knowledge, this is the first time these issues have been explored empirically in this manner. Moreover, this is the first paper analysing the two types of performance pay provided by the Spanish Wage Structure Survey.[9]

Summarizing our results, we can state that the use of both types of PP usually increases with firm size (at decreasing rates). In general, firm export status is also positively related with PP, although the magnitude declines with firm size.

However, these size and export links with PP are heterogeneous across occupations. On the one hand, for occupations in which worker performance is more difficult to measure on a short-term basis—as in the case of managers, for instance—we find a greater prevalence of IPP than RPP. On the other hand, regarding size, the likelihood of *irregular* variable payments is greater in large firms than in small firms for every occupation. The same cannot be said for *regular* variable payments given that the positive relationship with size disappears for white-collar workers, and is even negative for some occupations. Something similar happens with export status.

Regarding other determinants, we find that tenure plays a positive and significant role on both types of PP; whereas female workers receive PP less frequently than do males. By contrary, other characteristics—such as responsibility and education—play opposite roles in IPP and RPP.

The rest of the paper proceeds as follows. Section 2 reviews related literature, and Section 3 describes the data. Section 4 presents our empirical approach. Section 5 reports the estimated coefficients, and discusses our results. Section 6 concludes. In the Appendix, we include the descriptive statistics of the variables (Table A1) and two additional tables (Tables A2 and A3).

2 | RELATED LITERATURE AND EMPIRICAL IMPLICATIONS

Theoretical literature has investigated why some firms decide to offer performance pay schemes to some workers as part of their human resources practices. A first argument for the adoption of performance-related schemes is that they can be used to align worker and firm interests

(Lazear, 1986, 2000).[10] The existence of asymmetric information about worker effort leads firms to design compensation contracts that condition pay on some individual or aggregate measures of performance. The analytical framework most often used to analyse the design of such incentive contracts is the principal–agent model with hidden actions. The *informativeness* principle (Holmström, 1979) typically guides which performance measures to include. According to this principle, any measure of performance that provides information on whether the worker exerted the desired level of effort should be included in the optimal contract design.

Nevertheless, the monitoring of performance (or output) measures can in itself be costly; if that cost is high enough, then the firm will be less interested in using performance pay and workers will most likely be paid only a fixed salary. As it is reasonable to assume that the cost of monitoring effort increases with firm size faster than the cost of monitoring output, a greater use of PP should be expected in large firms. The existence of economies of scale in monitoring and the fact that it might be more difficult to observe effort in large organizations (Bryson et al., 2013) also support this hypothesis.

A second argument for the adoption of performance payments is that they make it easier for the firm to attract workers of higher ability. Lazear (1986) remarks: 'The best workers select firms where performance has a payoff. The worst ones go to firms where ability has no effect on salary' (p. 413). Large and exporter firms require a comparatively greater number of highly skilled workers, consequently they may choose to offer PP schemes as a strategy to attract the most talented (Gabaix & Landier, 2008; Helpman et al., 2010; Lazear, 2000; Schmidt & Zimmermann, 1991; Terviö, 2008). In this line of inquiry, Oi and Idson (1999b) suggest that jobs at large firms must be matched with more productive workers; Card et al. (2018) show that more productive firms hire more productive workers; and Molina-Domene (2018) finds that individuals with specific talents (rather than generalist talents) tend to work for large firms. Similarly, exporter firms face greater market competition, so they require a higher focus on productivity and therefore a higher incidence of performance-related pay may be expected in these companies. Evidence along this line is found in Barth et al. (2008) for a sample of Norwegian firms.

The above arguments suggest that more productive firms (large and exporter firms) will use PP to a greater extent and that PP will prevail among higher ability workers.[11] In this paper, we explore whether these statements hold for the two types of PP distinguished in our data.

Another relevant point is the great heterogeneity appearing in the use of performance-related pay among occupations and firms. Some firms do not use PP at all; others use it only for some workers or use different types of variable payments for different kinds of workers. To this regard, greater uncertainty about what the agent should be doing makes delegation and performance pay based on output more likely (Prendergast, 2002). If the environment is more certain, in contrast, then principals assign tasks to agents and directly monitor them; hence there is less need for performance pay. This distinction could help explain why performance pay is relatively more prevalent in some occupations and sectors. In addition, the type of performance pay applied depends on the nature of the job and the availability of measures that reflect the effort chosen by the worker. It is commonly observed that some workers (e.g. sales employees) are mainly rewarded with contracts that relate pay to individual measures of performance, whereas the pay of other workers is usually based on more aggregate measures (Prendergast, 1999).[12] This difference could reflect difficulties in measuring the individual effort exerted by different types of workers,[13] but this may also be due to the optimal design of PP schemes depending on the way work is organized.[14] In this line, Dohmen and Falk (2011) analyse why firms use different incentive schemes even when operating in similar environments. They point out that firms have different

requirements regarding the composition of their workforce and may therefore offer different contracts to induce workers to self-select optimally. On this basis, *aggregate* or *collective* performance measures are more appropriate when teamwork and cooperation among workers are required. This could be the case for managers and for workers with team responsibilities.

Thus, we expect a greater prevalence of *irregular* PP in occupations characterized by (i) a high degree of autonomy, (ii) high costs of monitoring effort, and (iii) workers' individual contributions that are difficult to measure on a short-term basis. These characteristics are more typical of management activities and, in general, white-collar occupations. On the contrary, we expect a greater prevalence of *regular* PP in occupations characterized by standardized tasks, low levels of autonomy, and individual performance that is relatively easy to measure. We also expect the differences in the use of both types of PP to influence the relevance of firm size and export status.

The following sections describe the data and estimate an econometric model to test and discuss these hypotheses.

3 | DATA AND DESCRIPTIVES

The data are drawn from the third wave of the Spanish Wage Structure Survey (2006) carried out by the National Institute of Statistics.[15] This survey contains matched employer–employee data based on a random sample of workers selected via a two-stage procedure. First, firms are randomly selected from the records of the General Register of Payments of the country's Social Security system. Second, samples of workers from the selected firms are randomly drawn. The survey gives detailed information on worker, firm and job characteristics, as well as on wages and their components. Occupations are disaggregated according the 1994 National Occupational Classification.

Table 1 shows the number of workers and firms in our database. It contains a total of 212,854 workers (5965 managers) at 26,055 firms in the industry, construction, and service sectors.[16] About 40 per cent of the employees in the sample work in small firms (fewer than 50 employees), and 29 per cent and 31 per cent of them work in, respectively, medium-size (50–199 employees) and large firms (at least 200 employees); and 16 per cent of the total employees work for exporting firms. We consider the firm as an exporter when its main market is the European Union or the World Market.[17]

One of the main advantages of this database is that firms provide detailed information about their workers' annual and monthly compensation schemes. The Commission Regulation (EC) N° 1738/2005 (amending Regulation [EC] N° 1916/2000 as regards the definition and transmission of information on the structure of earnings) determines what has to be included in earnings variables in the Structure of Earning Surveys conducted in all Member States.[18] The information of the Spanish 2006 Survey is disaggregated in a way that allows us to distinguish between two types of performance pay according to their regularity or periodicity:

- Annual salary information includes the total amount received by the worker in the year and the annual amount of non-periodic performance-related payments, which include bonuses and commissions related to results of the firm or the worker (production objectives, sales, profits, etc.) that are not paid in each pay period (each month). We refer to them as IPP.[19]
- Monthly salary information (referred to October) includes the fixed base salary plus payments for overtime hours and other additional payments (complements). The survey contains separate information on the amount of these monthly paid complements that are linked to productivity. We refer to them as RPP.[20]

The survey provides no separate information on individual and collective PP, but frequently paid PP will generally be used when performance is easier to measure in the short term (such as sales commissions or piece rates) whereas less frequently paid PP includes payments tied to firm performance and/or employee achievement of certain objectives (such as performance-based bonuses and profit sharing). Unfortunately, after 2006 the disaggregation of the salary information (both annually and monthly) permitting the identification of variable payments is no longer available. For this reason, and because the database for 2002 excludes firms with fewer than 10 workers, we only use the 2006 survey.

In our data (see the last two columns of Table 1), 41 per cent of workers receive some sort of incentive payment (20 per cent receive IPP, 29 per cent receive RPP). These percentages are higher in large and exporting firms. In the following sections we delve further into this relationship by controlling for worker and job characteristics.[21]

For the workers receiving incentive payments, the average of this salary component (as a percentage of total wages) is far from insignificant: 9 per cent in the case of IPP, and 20 per cent in the case of RPP. These numbers hide some heterogeneity between managers and the rest of workers. In this regard, Table 2 highlights several interesting facts. First, IPP is much more prevalent for managers than for other occupations, and it is more frequent in large firms. In these firms, 61.4 per cent of managers receive IPP; in small firms, only 32.4 per cent receive this type of payment. The corresponding figures for non-managers are 28.5 per cent and 12.0 per cent in large and small firms, respectively. Second, for workers receiving this type of PP, the average size (as a percentage of total annual wage) ranges from 11.8 per cent to 13.5 per cent for managers, depending on the size of the firm. For other workers, the corresponding percentage ranges from 7.5 per cent to 10.6 per cent.[22] Thus, not only do Managers receive IPP with higher probability, but also the proportion of their wages corresponding to variable payments is (on average) greater than that of the rest of the workers.

When we focus on the RPP, we observe that it is less prevalent for managers—this is just the opposite of what we found for IPP. Only 17.8 per cent of managers in large firms receive this variable compensation, wheras almost a third of other workers receive it. This evidence could reflect that the output of managers is more difficult to measure on a monthly basis because their work consists in making multiple decisions and taking actions that have a long-term effect on the firm

TABLE 1 Coverage of the sample and proportion of workers with PP

	Firms		Number of workers		% of workers	
Firm type	**Number**	**%**	**Total**	**Managers**	**IPP**	**RPP**
By size						
Small firms (1–49 workers)	18,106	69.49	86,363	1758	12.4	25.0
Medium firms (50–199 workers)	5071	19.46	61,216	1763	20.6	32.6
Large firms (more than 199 workers)	2878	11.05	65,275	2444	29.8	31.8
By export status						
Non-exporter firms	23,427	89.91	178,872	4631	18.5	28.2
Exporter firms	2628	10.09	33,982	1334	28.5	34.8
Total sample	26,055	100.00	212,854	5965	20.1	29.3

outcomes. For other workers, by contrast, results are easier to observe and to measure monthly; it follows that appropriate incentives are best delivered by regular performance-related pay.[23]

Regarding the average size of RPP (as a percentage of total monthly wage), it ranges between 4.3 per cent and 6.5 per cent. Yet when we restrict the sample to workers with this variable payment, the average weight of this component increases (it ranges between 28.0 per cent and 18.5 per cent) and presents a negative relation with firm size. On average, one out of four (five) Euro of the salary of managers (other workers) receiving RPP corresponds to this variable payment; this is far from an insignificant amount.

All these figures motivate the interest to analyse the determinants of variable payments.[24]

4 | EMPIRICAL APPROACH

This section presents our econometric model. Taking into account that the probabilities of receiving RPP and IPP are likely to be correlated (jointly distributed), we estimate a joint model with two binary dependent variables, IPP_i and RPP_i, that take the value 1 if employee i perceives a positive amount of the corresponding type of PP (IPP or RPP, respectively). Then, the model can be written as.

$$IPP_i^* = X_i\alpha^I + \varepsilon_i^I; \qquad RPP_i^* = X_i\alpha^R + \varepsilon_i^R;$$

$$IPP_i = \begin{cases} 1 & \text{if } IPP_i^* > 0 \\ 0 & \text{otherwise} \end{cases}; \qquad RPP_i = \begin{cases} 1 & \text{if } RPP_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$E\left[\varepsilon_i^I\right] = E\left[\varepsilon_i^R\right] = 0;\ Var\left[\varepsilon_i^I\right] = Var\left[\varepsilon_i^R\right] = 1; \text{ and } Cov\left[\varepsilon_i^I, \varepsilon_i^R\right] = \rho,$$

where X is the vector of explanatory variables; α^I and α^R are the vectors of coefficients that include our parameters of interest and ε_i^I, ε_i^R are normally distributed error terms. The covariance between both error terms is ρ. This model, commonly referred to as bivariate probit model, is estimated jointly by maximum likelihood.[25]

Our specification includes as explanatory variables three dummies that indicate the size of the firm—S_1 (small), S_2 (medium), and S_3 (large)—as well as their interactions with a dummy variable that is set to 1 when the firm is an exporter (Exp) and is otherwise set to 0. The interactions enable us to explore whether export status relates to PP differently depending on firm size. We also include a vector Z_i that captures controls for worker, contract and job characteristics. That is,

$$X_i\alpha^j = \beta_0^j + \beta_2^j S_2 + \beta_3^j S_3 + \gamma_1^j(\text{Exp} \times S_1) + \gamma_2^j(\text{Exp} \times S_2) + \gamma_3^j(\text{Exp} \times S_3) + \delta'^j Z_i + \lambda^j u_i \qquad (1)$$

where j refers to I (irregular) and R (regular) performance pay, respectively.

Regarding worker characteristics, Z_i incorporates gender, age, nationality, tenure (measured as the number of years working in the firm), and level of education. With respect to contract and job characteristics, Z_i contains one variable that identifies whether (or not) the contract is indefinite, another indicating whether (or not) it is part-time, and a dummy variable that takes the value one when the job involves supervising responsibilities. It also includes a set of dummies indicating the level of collective bargaining agreement (firm, sectoral or regional level), and another set indicating the type of occupation.[26] We also control for sector and region

TABLE 2 Incidence of regular and irregular performance pay

		Managers			Other workers		
	All	Small	Medium	Large	Small	Medium	Large
Irregular PP							
Share of workers receiving IPP (per cent)	20.1	32.4	50.0	61.4	12.0	19.7	28.5
Average IPP over total wage in per cent (all workers)	1.8	4.4	5.9	7.7	1.3	1.8	2.2
Average IPP over total wage in per cent (workers with IPP)	9.0	13.5	11.8	12.6	10.6	8.9	7.5
Regular PP							
Share of workers receiving RPP (per cent)	29.3	21.8	24.2	17.8	25.1	32.8	32.4
Average RPP over total wage in per cent (all workers)	5.7	6.1	6.0	4.3	5.1	6.5	6.0
Average RPP over total wage in per cent (workers with RPP)	19.6	28.0	24.8	23.9	20.2	19.7	18.5

fixed effects.[27] Finally, we include u_i, the residual of a Mincer (fixed) wage equation, as a proxy of unobserved worker ability. Although this residual may be influenced for other factors (in particular, unobservable firm effects), it is sensible to assume that it is positively correlated with valuable unobserved worker skills linked to intrinsic worker ability (Lemieux, 2006) perceived by the firm but unobserved by the researcher. Notice that the fixed wage is usually set at the beginning of the year and does not depend on the effort actually exerted by the worker.

Thus, we estimate an extended Mincer equation for the log of fixed wage, that is, the following equation:

$$\log\left(W_i^F\right) = w_i^F = \theta' Y_i + u_i$$

where w_i^F is the log of the fixed wage (in €/h)[28]; Y_i is a vector of firm and worker characteristics in line with Card and de la Rica (2006); θ is a vector of returns to these observable characteristics, and u_i represents the residual.

Our estimation strategy consists of (i) estimating the fixed wage equation[29]; (ii) computing the predicted value of the residual, $\widehat{u}_i$ (which we refer to as predicted residual wage); and (iii) introducing $\widehat{u}_i$ as an additional explanatory variable in Equation (1). We expect the parameter associated to this variable to be positive.

5 | RESULTS

5.1 | Estimation results

Table 3 presents the estimated coefficients and the standard errors (clustered by firms) of the bivariate probit regression. The first two columns show the estimated parameters for IPP and

TABLE 3 Probability of receiving variable payments

	IPP (1a)	RPP (1b)	IPP (2a)	RPP (2b)
Constant	−1.18 (0.01)***	−0.68 (0.01)***	−1.59 (0.05)***	−0.62 (0.05)***
Size (base = 1–49 workers)				
50–199 workers	0.32 (0.02)***	0.21 (0.02)***	0.29 (0.02)***	0.26 (0.02)***
>199 workers	0.61 (0.03)***	0.16 (0.02)***	0.44 (0.03)***	0.29 (0.03)***
Exporter firm × size				
1–49 workers	0.25 (0.04)***	0.09 (0.04)**	0.18 (0.04)***	0.09 (0.04)**
50–199 workers	0.20 (0.04)***	0.09 (0.04)**	0.11 (0.04)***	0.00 (0.04)
>199 workers	0.15 (0.05)***	0.19 (0.04)***	0.09 (0.05)*	0.02 (0.04)
Predicted wage premium			0.17 (0.02)***	0.44 (0.02)***
Female			−0.07 (0.01)***	−0.16 (0.01)***
Immigrant			0.03 (0.03)	−0.00 (0.02)
Tenure (in logs)			0.08 (0.01)***	0.03 (0.00)***
Responsibility			0.04 (0.01)***	−0.04 (0.01)***
Level of education (base = primary or less)				
Low			0.18 (0.02)***	0.00 (0.02)
Medium			0.19 (0.02)***	−0.06 (0.02)***
High			0.22 (0.02)***	−0.18 (0.02)***
Age (base = 20–29 years)				
30–39			0.00 (0.01)	−0.01 (0.01)
40–49			−0.02 (0.01)	−0.03 (0.01)***
50–59			−0.04 (0.02)**	−0.05 (0.01)***
>59			−0.18 (0.03)***	−0.16 (0.02)***
Labour agreement (base = sectoral)				
Province, interprov., local			−0.07 (0.02)***	0.05 (0.02)**
Company			0.12 (0.03)***	0.10 (0.03)***
Work centre			0.28 (0.07)***	0.06 (0.08)
Others			0.22 (0.21)	−0.31 (0.18)*
Indefinite contract			0.03 (0.02)*	−0.00 (0.02)
Part-time contract			−0.09 (0.02)***	−0.06 (0.02)***
Occupation dummies			Yes	Yes
Sector dummies			Yes	Yes
Regional dummies			Yes	Yes
Number of observations	212,854		212,854	
Log pseudo-likelihood	−229,277.06		−210,814.45	
ρ	0.23 (0.01)***		0.29 (0.01)***	

TABLE 3 (Continued)

	IPP (2a)	RPP (2b)
Occupation (base = unskilled workers)		
Managers	0.50 (0.03)***	−0.09 (0.03)***
Professions related to 5-year (or longer) university degrees	0.34 (0.04)***	−0.20 (0.04)***
Professions related to 3-year university degrees	0.20 (0.04)***	−0.20 (0.03)***
Support professionals and technicians	0.27 (0.03)***	−0.01 (0.03)
Administrative employees	0.11 (0.03)***	0.01 (0.02)
Service-sector workers and shop assistants	0.19 (0.03)***	0.10 (0.03)***
Skilled production workers	0.12 (0.03)***	0.17 (0.02)***
Machine operators and assemblers	0.09 (0.03)***	0.17 (0.02)***
Sector (base = traditional industries[a])		
Financial intermediation	0.85 (0.05)***	−0.41 (0.05)***
Travel agencies; postal activities and telecomm.	0.50 (0.07)***	−0.26 (0.08)***
Energy and water	0.35 (0.07)***	−0.16 (0.06)***
Retail trade	0.31 (0.05)***	−0.09 (0.04)**
Motor vehicles trade and wholesale trade	0.27 (0.05)***	0.01 (0.05)
Coke refined petroleum prod., chemic., rubber and plastic	0.26 (0.05)***	−0.12 (0.05)**
Printing and reproduction of recorded media	0.23 (0.07)***	−0.16 (0.06)**
Mining and extractive industries	0.22 (0.09)**	0.48 (0.07)***
Computer, electrical, electronic, and optical products	0.17 (0.06)***	0.04 (0.06)
Non-metallic mineral products	0.16 (0.06)***	0.35 (0.05)***
Real estate and rental activities; professional services	0.09 (0.04)**	−0.29 (0.04)***
Transport	0.08 (0.07)	0.06 (0.05)
Wood and paper	0.02 (0.08)	−0.06 (0.05)
Machinery and equipment	0.02 (0.06)	0.10 (0.06)*
Metal products	0.02 (0.06)	0.19 (0.05)***
Construction	0.02 (0.05)	0.19 (0.04)***
Accommodation and food service activities	−0.04 (0.06)	−0.44 (0.05)***
Transport equipment; furniture and other manufacturing	−0.04 (0.06)	0.07 (0.05)
Other social activities	−0.13 (0.05)***	−0.37 (0.05)***
Health	−0.30 (0.07)***	−0.34 (0.06)***
Education	−0.73 (0.07)***	−0.71 (0.07)***

Note: *, **, and *** indicate statistical significance at, respectively, the 10%, 5%, and 1% level.
[a]Food, beverages, and tobacco; textile and clothing; leather and footwear.

RPP when the specification includes only size and export variables. The last two columns report the estimated coefficients when controls are included. In this last case, we calculate the standard errors by bootstrapping (with 200 replications) to correct for the bias associated with our inclusion of an estimated variable as a regressor.

In this subsection, we analyse the sign and significance of the coefficients; in the next, we compute the marginal effects of our main variables of interest and discuss our results. First, the estimated coefficients reveal that firm size is clearly and positively related with the probability of receiving performance pay of either the *irregular* or *regular* type. Notice that in the baseline estimations without controls all size and export dummies are significant. As expected, most of the parameters go down when dummies of occupation, sector, region, worker and firm characteristics are included.

Second, we find that export status is especially relevant in the case of IPP for which the estimated coefficients are always significant, although they decrease with firm size. However, for RPP, when controls are included, export status is significant only at small firms.

Third, concerning worker characteristics, we find that the female indicator has a negative and significant coefficient—an outcome reflecting women are less likely to receive performance pay than are men with the same characteristics.[30] The immigrant indicator is not significant, whereas tenure has a positive and significant effect both in IPP and RPP. As for the level of education and the assumption of responsibility, they are both positively (resp. negatively) associated with the likelihood of receiving *irregular* (resp. *regular*) variable payments. The reason may be that, the higher the level of education and/or the greater number of responsibilities assigned, the more likely it is that the worker will perform tasks that are difficult to evaluate in the short term (i.e. less mechanized tasks whose results are less directly observable); in this case, IPP is better suited than RPP for aligning worker–firm incentives. We also find that age is negatively related to receiving variable payments.

In addition, the coefficient of the predicted residual wage is significant and has the expected sign. This suggests that workers with (fixed) salaries higher than what corresponds to their observable characteristics are more likely to be paid using PP.

Fourth, workers subject to decentralized wage-setting agreements (at the firm or plant level) are more likely to receive IPP than are those whose wages are set at a more centralized (sectoral or regional) bargaining level where the role of unions is greater. The same can be said with respect to the workers affected by agreements at the firm level in the case of RPP.[31]

The contract features also play a role: part-time contracts (as opposed to full-time) are less frequently remunerated by way of variable payments of any type; indefinite contracts (in comparison with fixed-term contracts) present higher probability of IPP, but this type of contract makes no difference to the probability of RPP.

Finally, occupation dummies reveal heterogeneities to be discussed in more detail in Subsection 5.3, and industry dummies show significant differences too. Workers at manufacturing and construction firms are the most likely to receive RPP, whereas workers at firms in some service sectors are the most likely to receive IPP. So even though *Financial intermediation* is the sector with the highest incidence (by far) of IPP, it also has nearly the lowest incidence of RPP. Perhaps this is because many decisions in this sector are taken within the context of uncertainty and risk, which makes it particularly difficult to observe (and evaluate) worker performance.

5.2 | Predicted probability and its relationship with size and export

In order to deeply analyse the relevance of size and export status, we use the estimated parameters to compute, for each worker *i*, the predicted probability of PP for each possible combination of these two firm characteristics. Formally, for IPP,

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 0, S_1 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(0,1) = \Phi\left(\widehat{\varphi}_i^I\right),$$

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 0, S_2 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(0,2) = \Phi\left(\widehat{\beta}_2^I + \widehat{\varphi}_i^I\right),$$

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 0, S_3 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(0,3) = \Phi\left(\widehat{\beta}_3^I + \widehat{\varphi}_i^I\right),$$

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 1, S_1 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(1,1) = \Phi\left(\widehat{\gamma}_1^I + \widehat{\varphi}_i^I\right),$$

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 1, S_2 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(1,2) = \Phi\left(\widehat{\beta}_2^I + \widehat{\gamma}_2^I + \widehat{\varphi}_i^I\right),$$

$$\widehat{\Pr}\left(\text{IPP}_i = 1 \mid \text{Exp} = 1, S_3 = 1, \widehat{\varphi}_i^I\right) = \widehat{\Pr}_i^I(1,3) = \Phi\left(\widehat{\beta}_3^I + \widehat{\gamma}_3^I + \widehat{\varphi}_i^I\right);$$

where $\widehat{\Pr}$ denotes the *predicted* probability, Φ stands for the normal cumulative distribution function and $\widehat{\varphi}_i^I = \widehat{\beta}_0^I + \widehat{\delta}^I Z_i + \widehat{\lambda}^I \widehat{u}_i$. Similar expressions determine the corresponding predicted probabilities of RPP.

Figure 1 reports the average of these predicted probabilities for IPP (top) and RPP (bottom), and Tables 4 and 5 gives the average marginal effects obtained from them.

Our main results are as follows. First, the link between firm size and IPP is always positive and significant. This result holds regardless of firm export status. When considering firms as non-exporters, the average probability of IPP ranges from 14.1 per cent at small firms to 24.8 per cent at large firms. So, the average increase in the probability of IPP associated to firm size changing from small to large is 10.7 percentage points (p.p.). When considering that firms participate in foreign markets, the corresponding probabilities range from 17.9 per cent to 27.6 per cent; this is, on average, the equivalent of 9.6 additional p.p. Besides, Table 4 shows that the increase of the likelihood when moving from a small to a medium-size firm is greater than that of moving from a medium-size firm to a large one. Second, in the case of RPP, size is significant only when we compare small firms with both medium and large firms. That is, regardless of the export status, no difference arises in the probability of RPP when the worker is employed by a medium-size firm rather than by a large one.

These results may help to explain the evidence that PP is less common in countries with a high proportion of small firms (Bryson et al., 2013), and the *firm size-wage premium* that usually appears in the empirical literature on wages.[32]

Third, Table 5 shows that the relevance of exporting is greater in smaller firms. Working at an exporter firm increases the IPP probability by 3.9 p.p. when the firm is small and by 2.9 or 2.7 p.p. when the firm is, respectively, medium-size or large. In the case of RPP, export status is significant only at small firms, accounting for 2.7 additional p.p.

Thus, on the one hand, our results suggest that workers are more likely to be remunerated with PP when working in large and exporting firms. This may be explained by the underlying mechanism discussed in Helpman et al. (2010), which points out that more productive firms (in particular, larger and exporter firms) screen workers more intensively than do less productive firms in order to have workforces of higher average ability. In this line, Lazear (2000) and Dohmen and Falk (2011) find that productive workers are more likely to self-select into variable

payment schemes when the alternative is a fixed salary. To sum up, being aware that the most-able workers are more prone to self-select performance pay schemes, more productive firms may not only use incentive pay schemes for their positive influence on worker effort, but also consider the sorting effects.

On the other hand, we find that the positive link between exporting and PP decreases with firm size. This may be because firms have to incur in sunk fixed costs (that do not rise with firm size, Roberts & Tybout, 1997) to be able to sell in international markets; i.e., they must surpass a productivity threshold to compete effectively (Melitz, 2003). Máñez-Castillejo et al. (2010) give evidence that supports this argument using a representative sample of Spanish firms. They find that pre-entry productivity is higher in large firms and that the exporting threshold is binding

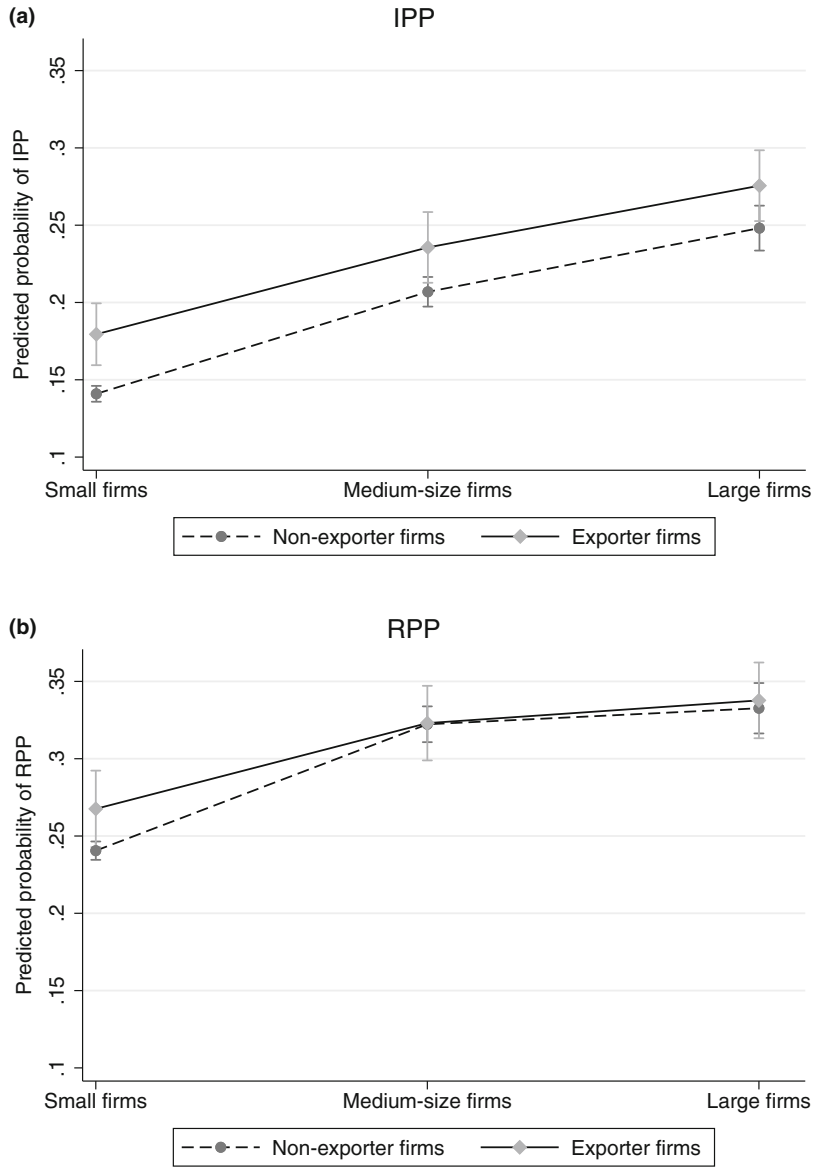

FIGURE 1 Predicted probability of performance pay. Confidence intervals at the 95% level

TABLE 4 Average marginal effects of firm size

	IPP	RPP
If firms were non-exporters		
Small to medium: $\widehat{P}(0,2)-\widehat{P}(0,1)$	6.6***	8.2***
Medium to large: $\widehat{P}(0,3)-\widehat{P}(0,2)$	4.1***	1.0
Small to large: $\widehat{P}(0,3)-\widehat{P}(0,1)$	10.7***	9.2***
If firms were exporters		
Small to medium: $\widehat{P}(1,2)-\widehat{P}(1,1)$	5.6***	5.5***
Medium to large: $\widehat{P}(1,3)-\widehat{P}(1,2)$	4.0***	1.5
Small to large: $\widehat{P}(1,3)-\widehat{P}(1,1)$	9.6***	7.0***

Note: *, **, and *** indicate statistical significance at, respectively, the 10%, 5%, and 1% level.
For the first column: $\widehat{P}(x,y)=\frac{1}{N}\sum_{i=1}^{N}\widehat{\Pr}\left(IPP_i=1\,|\,Exp=x,S_y=1,\hat{\varphi}_i\right),x=\{0,1\},y=\{1,2,3\}$.
For the second column: $\widehat{P}(x,y)=\frac{1}{N}\sum_{i=1}^{N}\widehat{\Pr}\left(RPP_i=1\,|\,Exp=x,S_y=1,\hat{\varphi}_i\right),x=\{0,1\},y=\{1,2,3\}$.

TABLE 5 Average marginal effects of exporting

	IPP	RPP
If firms were small: $\widehat{P}(1,1)-\widehat{P}(0,1)$	3.9***	2.7**
If firms were medium: $\widehat{P}(1,2)-\widehat{P}(0,2)$	2.9**	0.0
If firms were large: $\widehat{P}(1,3)-\widehat{P}(0,3)$	2.7**	0.5

Note: *, **, and *** indicate statistical significance at, respectively, the 10%, 5%, and 1% level.
For the first column: $\widehat{P}(x,y)=\frac{1}{N}\sum_{i=1}^{N}\widehat{\Pr}\left(\mathrm{IPP}_i=1\,|\,\mathrm{Exp}=x,S_y=1,\hat{\varphi}_i\right),x=\{0,1\},y=\{1,2,3\}$.
For the second column: $\widehat{P}(x,y)=\frac{1}{N}\sum_{i=1}^{N}\widehat{\Pr}\left(\mathrm{RPP}_i=1\,|\,\mathrm{Exp}=x,S_y=1,\hat{\varphi}_i\right),x=\{0,1\},y=\{1,2,3\}$.

for small firms but not for large firms. Thus, exporting is more demanding for small firms than for large ones. In addition, smaller export-oriented firms are likely to be more affected by sales volatility and competition in international markets, and PP might be used as a risk-sharing tool. These reasons could explain why we find that small firms selling in international markets use both types of PP more intensively than domestic small firms, and why the export status has no per se relation with the RPP likelihood in medium and large firms.

5.3 | Performance pay by occupation

Firms that decide to implement incentive schemes must choose the most appropriate type for each worker. Given that occupations differ in terms of the characteristics that call for applying (or avoiding) a particular type of performance pay—for instance, the observability of worker performance, workers' autonomy over the tasks they perform, information asymmetries or monitoring costs—we expect that the type of PP will vary in function of such characteristics. We are also interested in analysing whether the relationship between the PP probabilities, size and export hold regardless of the occupation.

To test these hypotheses, we augment the specification of our econometric model to include interactions between worker occupations, firm size and export status.[33] Using the estimated parameters from this augmented specification, we obtain the predicted probabilities and

TABLE 6 Average marginal effects of size by occupation: Irregular performance pay

Occupation	Predicted IPP	Predicted probability		Average marginal effects			
		If small firms	If non-exporter firms	Medium vs. small	Large vs. medium	Large vs. small	Exporter vs. non-exporter
Managers	49.4	37.9	47.2	13.4***	4.6**	18.0***	9.3***
Professions related to 5-year (or longer) university degrees	25.9	19.0	24.3	5.0***	8.2***	13.2***	7.4***
Professions related to 3-year university degrees	17.9	12.9	16.9	3.3***	8.5***	11.8***	6.4***
Support professionals and technicians	30.2	24.6	29.1	5.7***	5.4***	11.2***	5.6***
Administrative employees	22.7	14.9	22.1	8.6***	6.8***	15.4***	3.7***
Service-sector workers and shop assistants	16.8	11.2	16.9	6.5***	4.3***	10.8***	−0.4
Skilled production workers	16.1	11.1	16.2	8.0***	4.4***	12.4***	1.5
Machine operators and assemblers	17.0	12.4	16.5	6.3***	3.2*	9.4***	1.9
Unskilled workers	11.6	10.0	11.3	2.9***	−0.9	2.1**	2.5*
All workers	20.1	14.8	19.6	6.4***	4.2***	10.6***	3.1***

Note: All predicted probabilities in the first three columns are statistically significant at the 1% level. *, **, and *** indicate statistical significance at, respectively, the 10%, 5%, and 1% level.

marginal effects reported in Tables 6 and 7 for, respectively, IPP and RPP. The figures in each row of these tables are calculated for the subsample of workers in the corresponding occupation. Thus, the first data column reports the average predicted probabilities for each subsample of workers; the second and third columns give the average predicted probabilities if all the firms were small and if all firms were non-exporters, respectively. The next three columns of each table report the average increase in the predicted probabilities when firm size changes from small to medium (fourth column), from medium to large (fifth column), and from small to large (sixth column). Finally, the last column shows the average variation in the probability of PP associated to firms changing from non-exporters to exporters.

Several conclusions can be drawn from Table 6. First, the prevalence of IPP is heterogeneous across occupations as it ranges from nearly 50 per cent (*Managers*) to 12 per cent (*Unskilled workers*). These results indicate that white-collar occupations are associated with the highest use of IPP contracts whereas blue-collar occupations are the ones with the lowest incidence of IPP. Second, the relationship of size with IPP is positive and significant in all

TABLE 7 Average marginal effects of size by occupation: Regular performance pay

Occupation	Predicted RPP	Predicted probability		Average marginal effects			
		If small firms	If non-exporter firms	Medium vs. small	Large vs. medium	Large vs. small	Exporter vs. non-exporter
Managers	21.5	20.5	23.0	4.2**	−4.5**	−0.3	−6.1***
Professions related to 5-year (or longer) university degrees	13.0	14.3	13.9	−1.2	−1.6	−2.8*	−5.0***
Professions related to 3-year university degrees	15.4	14.7	15.8	0.6	1.3	2.0	−1.2
Support professionals and technicians	24.7	24.2	25.2	3.3***	−4.1***	−0.8	−2.0
Administrative employees	24.4	19.4	24.2	7.5***	1.9	9.4***	1.6
Service-sector workers and shop assistants	23.9	18.3	23.3	8.7***	1.0	9.7***	8.0***
Skilled production workers	40.4	32.7	40.2	12.1***	6.7***	18.8***	1.8
Machine operators and assemblers	39.4	31.3	39.2	11.8***	5.6***	17.4***	0.8
Unskilled workers	25.6	22.0	25.2	5.8***	0.1	6.0***	4.6***
All workers	29.3	24.6	29.2	7.6***	1.8**	9.5***	1.5*

Note: All predicted probabilities in the first three columns are statistically significant at the 1% level. *, **, and *** indicate statistical significance at, respectively, the 10%, 5%, and 1% level.

occupations, although it varies across them.[34] In the case of *Managers*, e.g., the prevalence of IPP increases by 13.4 p.p. when firms change from small to medium-size and by 4.7 p.p. when they change from medium-size to large. Thus, for *Managers* the increase is 18.1 p.p. when firms shift from small to large, which is significantly greater than the average increase for the entire sample (10.5 p.p., as shown in the last row of Table 4). Third, the increase of probability when firms shift from small to medium is greater than that of shifting from medium to large for all occupations except for *Professions related to university degrees*.

As regards firm export status, it is worth noting that this firm characteristic is significant in six of the nine occupations considered—namely, the five with the greatest predicted prevalence of IPP plus *Unskilled workers*. In the case of *Managers*, the likelihood of working under an IPP contract is 9.3 p.p. greater when the firm is an exporter. Hence, we find wide variation among occupations in their adoption of IPP and also significant differences concerning the relevance of size and export, which is higher in those occupations where IPP is more prevalent.

As expected, results are radically different when we analyse RPP. We find that *Skilled production workers* and *Machine operators* are the occupations most likely to receive RPP. This result could reflect that these occupations are staffed by workers (i) who have considerable influence on firm productivity, but (ii) whose output is easy to measure on a monthly basis. We also find that the greatest positive tie to size appears in these two occupations: 18.9 additional p.p. for *Skilled production workers* and 17.5 additional p.p. for *Machine operators* in response to firm size changing from small to large. By contrast, *Managers* and employees in *Professions related to university degrees* have the lowest RPP probabilities. This may be related to the higher prevalence of IPP in these occupations, which seems to confirm our hypothesis that IPP (rather than RPP) is the type of performance pay that best suits them.

For RPP we also find that firms moving from small to medium size increase the probability more than firms moving from medium to large. In fact, in this latter case the change in the RPP probability is even negative for *Managers* and *Support professionals and technicians*, occupations for which RPP is lower than the average and IPP is higher than the average.

Relevant differences between RPP versus IPP additionally appear concerning their association with export status. Firm export status is positively related with the adoption of a RPP scheme for only two occupations—*Unskilled workers* and *Service-sector workers and shop assistants*. Meanwhile the association is both negative and significant for *Managers*, *Professions related to university degrees* and *Support professionals and technicians*. This may also be related to the fact that IPP is more appropriate than RPP for these occupations.

6 | SUMMARY AND CONCLUSIONS

This paper aims to help understand why some workers receive part of their compensation tied to performance whereas others do not. We focus on the role of two firm characteristics: size and export status. Our empirical approach consists of estimating a bivariate probit model using a matched employer–employee data that allows us to distinguish between two types of performance pay, which have a non-negligible presence in salaries in Spain.

The main results of our study can be summarized as follows. First, the adoption of either IPP or RPP usually increases with firm size (at decreasing rates). Second, working at an exporter firm also increases the probability of IPP, but for RPP this increase is positive and significant only in small firms.

Third, the prevalence of PP is heterogeneous among occupations. IPP occurs more frequently in occupations characterized as having high costs of monitoring effort and individual performance that is difficult to measure on a monthly basis—a description that fits white-collar workers—whereas RPP is more often observed in occupations in which individual short-term performance is easier to measure. Fourth, we confirm the positive link between firm size and the adoption of IPP in all occupations; for RPP, however, this relation holds only for manual workers. Finally, firm participation in international markets shows a positive relationship with the IPP prevalence for white-collar workers, whereas the relation is negative in the case of RPP.

Our results confirm that some firms offer PP schemes to their employees (whereas others do not) for reasons beyond heterogeneity in worker characteristics. Differences across firms in PP costs and benefits, and in ability to set up these payment schemes can explain why otherwise similar workers have a higher likelihood of receiving PP in large and exporter firms. In general, more productive firms may have more capacity to pay costly bonuses and are therefore in a better position to further increase their productivity. Thus, our results suggest that policies to

encourage the use of PP schemes should place greater emphasis on less productive firms (mainly SMEs) to help them to overcome PP costs. Promoting PP in smaller companies can be one way to boost their productivity.

More research on both types of performance pay is needed. Unfortunately, the questions relative to variable payments were dropped from the Spanish Wage Structure Survey after 2006. Reinstating this information would be useful for researchers and policy makers to further investigate the evolution of this wage component. Note that the European Company Survey (a representative sample survey of business establishments with at least 10 employees in European countries, which always includes the EU Member States) reveals a clear upward trend in the use of variable payments. In particular, this survey uncovers that 55 per cent of Spanish firms did not have or barely had variable pay schemes in 2013 (Eurofound, 2015, p. 77), whereas this percentage dropped to 29 per cent in 2019 (Eurofound and Cedefop, 2020, p. 80).

A future line of research could be to identify the conditions under which IPP and RPP substitute or complement each other. This may help explain why, in some occupations, firm size and export status have the expected connection with IPP but not with RPP. This particularly happens in some occupations for which IPP probability is higher than the average whereas RPP probability is lower than the average.

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ENDNOTES

[1] Traditional principal–agent models assume that the agent is risk averse while the principal is risk neutral. When this assumption holds and effort is observable, optimal contracts are based exclusively on fixed payments. Yet even when effort is observable, a compensation scheme with some level of variable pay would be the choice of a principal that is also risk averse.

[2] Bloom and Van Reenen (2010) show that management practices (among them, remuneration incentives) present a large variation across firms and countries.

[3] One reason for the implementation of this type of policies is that PP may contribute to enhancing not only the productivity of workers who receive incentives, but also that of the rest of the workers in the firm (see Franceschelli et al., 2010), which would positively impact the economy as a whole.

[4] Some papers have focused on the role of firm size (e.g. Green et al., 2021; Lallemand et al., 2005, 2007; Oi & Idson, 1999a) and others on the firm export status (e.g. Amiti & Davis, 2011; Bernard & Jensen, 1997; Bernard et al., 2007; Schank et al., 2007).

[5] The literature analysing the effect of firm characteristics on performance pay schemes has largely focused on top executives (e.g. Baker & Hall, 2004; Edmans et al., 2017).

[6] Other determinants of PP to which the empirical literature has paid attention are, e.g., institutional factors (Marsden & Belfield, 2010), foreign ownership of firms (Heywood & Jirjahn, 2013), union bargaining (Barth et al., 2012) and gender (Geddes & Heywood, 2003; Kangasniemi & Kauhanen, 2013; Xiu & Gunderson, 2013).

[7] The Structure of Earnings Survey is conducted every 4 years in EU Member States as well as EU candidate countries and European Free Trade Association countries. The Spanish Survey (*Encuesta de Estructura Salarial*, Wage Structure Survey) provides no information regarding PP in the subsequent waves of the survey.

[8] Spanish law establishes no specific regulatory restrictions on PP schemes. It only states that the contract will determine the salary structure, which must include the base salary and, when so agreed, 'salary supplements

set according to circumstances related to the worker's personal conditions, the work performed or the situation and results of the company, which will be calculated according to the criteria agreed upon for this purpose' (article 26.3 of the Spanish Workers' Statute [Estatuto de los Trabajadores, R.D. 2/2015 https://www.boe.es/eli/es/rdlg/2015/10/23/2/con], Accessed 30th May 2022).

[9] A few papers deal with the question of why some Spanish workers receive PP while others do not. De la Rica et al. (2015) use a sample extracted from the same data source as ours to analyse the gender gap in the PP component of wages, but they only consider information on irregular performance pay. Bayo-Moriones et al. (2013) use data at the plant level gathered through personal interviews with managers to analyse differences in the incidence of performance pay across occupations. Although these papers include some firm characteristics as controls, they focus on other determinants (gender and occupation, respectively).

[10] Although this may be relevant for most occupations, an extensive literature has focused on the use of different schemes of PP on executive compensation (see the literature review in Murphy, 1999, and Boeri et al., 2013).

[11] Reverse causality cannot be excluded from this relationship. Firms with better management practices tend to become larger and more productive (Bloom & Van Reenen, 2010) and are more likely to enter foreign markets (Bloom et al., 2021). Unfortunately, the cross-section nature of our data does not allow us to deal with this problem. Thus, our results need to be interpreted with caution and we can only refer to them as associations.

[12] Bayo-Moriones et al. (2013) analyse three types of performance pay: PP linked to individual performance, to group performance, and to plant or firm performance. They find that the use of PP linked to individual performance is more frequent for sales workers, whereas the compensation of top executives is more likely to incorporate a PP linked to firm or plant performance.

[13] If the available measures of output are based on the inputs of many individuals working together (team production), individual performance may be difficult to measure.

[14] Drago and Garvey (1998) show that agents are less likely to help their co-workers when they are compensated via individual performance pay schemes. Gómez-Mejia and Balkin (1989) find that, in the case of R&D workers, individual-based rewards are perceived as being less effective than aggregate incentive schemes.

[15] Microdata files are available at the National Statistics Institute (INE) web. See https://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736177025&menu=resultados&idp=1254735976596#!tabs-1254736195110 (Accessed 30th May 2022).

[16] We exclude workers at public firms (7.7% of the initial sample) and workers below 20 years old (1.1% of private firm employees). We also exclude observations of workers in companies of unknown size as well as some atypical observations (extremely low numbers of hours worked or of hourly wages); these additional exclusions amount to 0.8% of the private firm sample.

[17] The survey asks firms about their main geographical market. The possible answers are: (1) Local or regional market, (2) National Market, (3) European Union, (4) World Market. We consider them exporter firms when they select option 3 or 4 in response to this question.

[18] The gross earnings for the reference month have to include 'bonuses and allowances paid regularly in each pay period, even if the amount varies monthly' and exclude 'periodic bonuses and gratuities not paid regularly at each pay date'. The annual earnings have to cover 'all "non-standard payments", i.e., payments not occurring each pay period', in particular, 'quarterly or annual company bonuses', 'productivity bonuses depending on pre-set targets, employee recognition awards and recruitment incentives'.

[19] The exact wording of the question in the survey is: 'Extraordinary payments related to the situation or results of the company or the worker paid in 2006. These are non-periodic payments (not received every month) whose amount, unknown and/or variable, is determined based on production objectives, quality, sales volume, profits...' (question 12.1.3).

[20] The exact wording of the question in the survey is: 'Variable salary supplements: supplements that are received every month and do not have a fixed amount. From the amount noted in 11.4, indicate the complements of quantity or quality of work and the ones linked to the results of the company (supplements for production bonuses—productivity—attendance, punctuality, quality awards, profit sharing, bonuses, payments for achieving objectives, commissions, incentives...) paid in October 2006' (question 11.4.2).

[21] Table A2 reports, by occupations, the proportion of employees receiving only one type of PP and the proportion of those receiving both of them (which accounts for 8% of all workers).

[22] It is worth noting that the annual total wage and the fixed component of wages is greater for workers with IPP than it is for workers not receiving this variable payment. The average wage is 11.3 €/h for workers without IPP, while it reaches 17.3 €/h for workers with IPP for whom the average fixed wage is 15.5 €/h.

[23] Table A2 shows that, as expected, *Managers* have the highest incidence of IPP while *Skilled production workers* have the highest incidence of RPP.

[24] However, this information was eliminated from the survey because the INE considered that the weight of this salary component was not very high (when taking into account workers with and without performance pay). See survey methodology (INE, 2020, pp. 15–16).

[25] Alternatively, we also estimate a multinomial probit model considering that firms and workers choose among four different types of contracts: no PP, only RPP, only IPP, and both forms of PP. The relationship of our main variables with the use of regular and irregular PP is almost identical to that obtained using the bivariate probit model; so the main conclusions of the paper remain the same. The results of the multinomial model are available upon request.

[26] We distinguish among nine occupations: Managers; Professions related to 5-year (or longer) university degrees; Professions related to 3-year university degrees; Support professionals and technicians; Administrative employees; Service-sector workers and shop assistants; Skilled production workers; Machine operators and assemblers; Unskilled workers.

[27] We include in Z_i a set of 21 sector dummies and another set of 6 regional dummies. We have performed several robustness checks to test for the sensitivity of the main estimated coefficients concerning the inclusion of interactions among different sets of dummies (sector × occupation dummies, sector × region dummies, occupation × region dummies). Our main parameters of interest barely change and our results remain robust to all of these specifications.

[28] This variable is built as the total annual salary information minus all variable payments, divided by the total number of hours worked in the year.

[29] Table A3 gives the estimated parameters for this regression.

[30] De la Rica et al. (2015) reach the same conclusion, although they only analyse IPP; whereas Geddes and Heywood (2003) point out that the effect varies attending to the type of PP. Using a sample of young workers, they find that women are less likely to be paid commissions and bonuses, but are more likely to be paid piece rates.

[31] This result is consistent with the one obtained by Barth et al. (2012), which reveals that even though PP contributes to greater within-firm wage dispersion, it is unlikely to become a major contributor to increased wage inequality in highly unionized labor markets.

[32] The probability of receiving PP increases with the firm size and the wage distribution of workers with PP is skewed towards higher wage levels than the corresponding to workers without PP.

[33] This specification barely modifies the estimated coefficients for the rest of the variables presented in Table 3, and the conclusions remain unchanged.

[34] The only exception is for unskilled workers moving from medium to large firms.

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APPENDIX A

TABLE A1 Descriptive statistics

Number of observations = 212,854	Mean	St. dev	Min	Max
Irregular performance pay (IPP)	0.20	0.40	0	1
Regular performance pay (RPP)	0.29	0.46	0	1
Size				
1–49 workers	0.41	0.49	0	1
50–199 workers	0.29	0.45	0	1
>199 workers	0.31	0.46	0	1
Exporter firm × size				
1–49 workers	0.03	0.16	0	1
50–199 workers	0.05	0.22	0	1
>199 workers	0.08	0.28	0	1
Predicted residual wage	0.00	0.32	−1.94	2.86
Female	0.37	0.48	0	1
Immigrant	0.07	0.25	0	1
Tenure (number of years working in the firm, in logs)	1.21	1.49	−2.48	4.04
Responsibility (job involving supervising responsibilities)	0.19	0.39	0	1
Level of education				
Primary or less	0.53	0.50	0	1
Low	0.18	0.38	0	1
Medium	0.18	0.38	0	1
High	0.12	0.32	0	1
Age				
20–29	0.24	0.43	0	1
30–39	0.33	0.47	0	1
40–49	0.25	0.43	0	1
50–59	0.15	0.36	0	1
>59	0.03	0.18	0	1

TABLE A1 (Continued)

Number of observations = 212,854	Mean	St. dev	Min	Max
Labour agreement				
Sectoral	0.38	0.49	0	1
Province, interprov., local	0.44	0.50	0	1
Firm	0.16	0.37	0	1
Work centre	0.02	0.13	0	1
Others	0.002	0.05	0	1
Indefinite contract	0.75	0.43	0	1
Part-time contract	0.15	0.35	0	1
Occupation				
Managers	0.03	0.17	0	1
Professions related to 5-year (or longer) university degrees	0.05	0.21	0	1
Professions related to 3-year university degrees	0.03	0.18	0	1
Support professionals and technicians	0.15	0.36	0	1
Administrative employees	0.13	0.33	0	1
Service-sector workers and shop assistants	0.11	0.31	0	1
Skilled production workers	0.19	0.39	0	1
Machine operators and assemblers	0.17	0.38	0	1
Unskilled workers	0.15	0.35	0	1

TABLE A2 Types of PP by occupations (in per cent)

	No PP	Only IPP	Only RPP	Both	IPP	RPP
Managers	40.0	39.1	10.5	10.4	49.6	20.9
Professions related to 5-year (or longer) univ. degrees	65.9	21.4	8.1	4.6	26.0	12.7
Professions related to 3-year university degrees	71.4	13.1	10.4	5.0	18.1	15.5
Support professionals and technicians	54.5	20.9	15.3	9.3	30.2	24.6
Administrative employees	61.2	14.5	16.2	8.1	22.7	24.3
Service-sector workers and shop assistants	67.7	8.2	15.3	8.8	17.0	24.1
Skilled production workers	53.0	6.6	30.8	9.6	16.2	40.5
Machine operators and assemblers	53.3	7.2	29.8	9.7	16.9	39.5
Unskilled workers	68.3	6.1	20.1	5.5	11.6	25.6
All workers	59.0	11.7	20.9	8.4	20.1	29.3

TABLE A3 Mincer equation for fixed pay (auxiliary regression)

	w_i^F
Constant	1.696 (0.015)***
Female	−0.174 (0.003)***
Immigrant	−0.006 (0.004)
Tenure (in logs)	0.067 (0.001)***
Responsibility	0.145 (0.003)***
Indefinite contract	−0.004 (0.004)
Part-time contract	−0.001 (0.005)
Age (base = 20–29 years)	
30–39	0.054 (0.002)***
40–49	0.111 (0.003)***
50–59	0.151 (0.003)***
>59	0.161 (0.007)***
Level of education (base = primary or less)	
Low	0.067 (0.003)***
Medium	0.101 (0.004)***
High	0.193 (0.005)***
Labour agreement (base = sectoral)	
Province, interprov., local	0.008 (0.004)**
Company	0.120 (0.006)***
Work centre	0.094 (0.014)***
Others	−0.025 (0.050)
Size (base = 1–49 workers)	
50–199 workers	0.097 (0.004)***
>199 workers	0.146 (0.005)***
Export × size	
1–49 workers	0.095 (0.009)***
50–199 workers	0.052 (0.008)***
>199 workers	0.068 (0.008)***
Occupation dummies × sector dummies	Yes
Regional dummies	Yes
Number of observations	212,854
R^2	0.56