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Wage Drift in Collective Bargaining at the Firm Level: Evidence from Spain

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ABSTRACT. – We present a simple model of the determinants and economic effects of formal firm-level bargaining in a collective bargaining system with mandatory extension of sectoral collective agreements. We model the effects on agents' incentives to engage in relation-specific investments, and test the main predictions of the model using Spanish data which combine information from collective bargaining statistics and from firms' balance sheets. We find that: (i) controlling for an endogeneity bias, firms' size appears to increase the ability of workers to increase wages, (ii) surplus per employee is lower in firms with formal firm-level bargaining; (iii) controlling for average surplus, the number of employees and other variables, total payments to workers are higher and less correlated with the surplus variable in firms with formal bargaining, and (iv) larger firms are more likely to develop formal firm-level bargaining.

Dérive salariale dans la négociation au niveau de l'entreprise : le cas espagnol

RÉSUMÉ. – Dans un système de négociation collective avec extension mandatoire des accords sectorielles, nous présentons un modèle simple sur les déterminants et les effets économiques d'une négociation formelle au niveau de la firme. Nous modélisons les effets sur les incitations que les agents ont pour s'engager dans des investissements spécifiques, et nous testons les prédictions principales du modèle sur des données espagnols qui combinent l'information provenant à la fois des statistiques sur les négociations collectives et des bilans des entreprises. Nous trouvons que : (i) après contrôle sur les biais d'endogénéité, la dimension des firmes augmente la capacité des travailleurs à augmenter les salaires, (ii) le surplus par employés est plus petit dans les entreprises avec négociation formelle au niveau de la firme, (iii) après contrôle sur le surplus moyen, le nombre d'employés et d'autres variables, les paiements totales aux travailleurs sont plus élevés et moins correlés avec le surplus dans les entreprises avec négociation formelle, (iv) les grandes entreprises développent des négociations formelles au niveau de la firme avec une plus haute probabilité.

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1 Introduction

Mass and persistent unemployment is, with very few exceptions, the most remarkable feature of the recent economic performance of Western European countries. According to most pundits, the main cause of persistent unemployment has to be found in the specific institutional characteristics of European labour markets, which, as a result, depart from frictionless/competitive labor markets. Among the labor market institutions that are common across Western European countries, collective bargaining is one of those with a most distinctive "European flavour".

Admittedly, both the coverage rate of collective bargaining and the legal rules under which collective bargaining is conducted vary widely across countries. However, there are some key characteristics shared by the collective bargaining system of some European countries which are not observed in countries with lower unemployment rates. For instance,

• The coverage rate of collective bargaining in most continental European countries (over 70% according to recent OECD figures [1]) is well above the coverage rate of collective bargaining in the US and in Japan (around 20%).

• Collective bargaining across (Continental) Europe is mostly organized under an "open-shop" rule so that agreements are extended to all workers within the scope of the agreement (sector), independently of their union status.

• Collective bargaining across (Continental) Europe is often structured around multiple levels of negotiation (national, sectoral, firm, establishment). Thus, several layers of working rules organize the determination of wage and employment conditions, and there are some legal rules to solve the overlapping effects of collective agreements at different levels. On the contrary, in the US and Japan only a single level of bargaining (firm-level bargaining) is operative.

• At the firm level, there are some European countries cases in which collective agreements are negotiated by work councils whose members may belong to several unions or even may not be affiliated to unions. Additionally, sectoral collective agreements are mostly negotiated by unions, and their effects may be extended to employers which do no sign the sectoral agreement. This extension can be *ex post*, under a legally regulated process, or mandatory (*ex ante).* In the later case, sectoral collective agreement reached by some employers and workers (somehow) representatives at the sectoral level apply to all employers and workers within the corresponding sector. This markedly contrasts with the US and the UK case, where, at least until recently, closed-shop provisions restrict the economic effects of collective bargaining to unionized workers.

1. *See* OECD (1994), chapter 5.

The economic analysis of collective bargaining has pursued two routes. First, from a macroeconomic point of view, most studies have focused on implications of the degree of centralization of collective bargaining [2]. Secondly, there are microeconometric studies of the effects on wages, employment and productivity of formal firm-level bargaining. In the Anglo-Saxon countries, given their institutional characteristics in this regard, these studies have been mostly directed to the estimation of the union wage–premium and to the comparison of the different performance of unionized and non-unionized firms. A survey of this sizeable literature can be found in LEWIS [1986], where studies that measure the union wage gap are compared and found to be systematically above 10%. The extent of the union wage gap under the Anglo-Saxon context has been found to depend crucially on the competitive nature of the market, varying from 9% for firms with market power to zero in firms without it (STEWART [1990]). In European countries, where collective bargaining takes place under an open-shop system and there are multiple levels of bargaining, microeconometric studies have been addressed at identifying the economic consequences of bargaining by work councils [3]. Recently a number studies have taken stock in the explanation of changes over time in the dispersion of wages [4]. In one of these papers, KRAMARZ *et. al.* [1994] find that the existence of formal bargaining at the firm level significantly increases average wages in French firms.

This paper is an attempt at identifying the determinants and the implications of *formal firm-level* bargaining under a institutional set-up like the Spanish one, which resembles the "European model" of collective bargaining. Formal firm-level bargaining may be a relevant determinant of economic performance since:

• It provides to workers with an instrument to extract firm-specific quasi-rents which cannot be the scope of national/sectoral negotiations,

• It makes possible the participation of employees in the firm's management and the distribution of surplus, which plausibly affects firms' long term performance, and

• It may have positive effects on firm's profitability by coordinating workers and improving the organization of labour and, hence, raising firms' productivity.

The paper is organized as follows. Section 2 describes the most relevant institutional characteristics of the Spanish system of collective bargaining.

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2. *See* CALMFORS [1994] for a recent survey of this literature.

3. ROGERS and STREEK [1994] provide a survey of different forms of labor participation in firms through work councils in a sample of European countries, comparing them with the organization of labour relations in the US. They conclude that the work council is an efficiency enhancing institution because it helps to reduce transaction costs by improving communication and intermediation (ROGERS and STREEK [1994] p.148). Among European countries it is posibly the case of German work councils that have been more throughly studied. ADDISON and WAGNER [1994] survey studies on German work councils concluding that the evidence on the economic implications of work councils is partial and inconclusive: (*"[...]it is not clear in particular how German institutions might be better poised to circumnavigate the problems of incomplete contracts and opportunistic behavior"*-ADDISON and WAGNER [1994], p. 10).

4. *See* for instance DAVIS and HALTIWANGER [1994].

Section 3 contains an illustrative theoretical model on the determinants and effects of formal firm-level bargaining. The main hypothesis delivered by this model are then tested in Section 4, using data obtained by matching the registry of collective agreements of the Spanish Ministry of Labour and the Bank of Spain' survey on firms' balance sheet. These two data sources are described in some detail in the first part of section 4, and then the results of our empirical exercise are reported. Finally, concluding remarks and proposals for further research are in section 5.

2 Collective Bargaining in Spain: Some Institutional Aspects [5]

Generally speaking, the Spanish system of collective bargaining concurs with the sketch of the European model of collective bargaining made in the introduction. Union density in Spain is rather low (somewhere between 10-15%) but the coverage of collective bargaining is a much higher 70%. Thus, Spain is the country (excluding France) with the largest difference between the unionization rate and the coverage rate of collective bargaining. The organization of bargaining around the "open shop" principle, and the ex-ante mandatory extension of sectoral collective agreements explain the huge difference between these two rates.

In Spain there are multiple levels of bargaining, which have resulted in over 5000 collective agreements being in effect in recent years. Most of these agreements are at the firm-level. However, the incidence of formal firm-level bargaining is lower than the incidence of sectoral agreements: only about 15% of employees are covered by firm-level collective bargaining (JIMENO [1992]). Regarding the regulation of collective bargaining, the most relevant legal provisions are:

• Collective bargaining is a worker's right recognized by the Constitutional Law and the Workers' Charter, in effect since 1980. This right is exercised by the election of representatives, which may or may not belong to unions. Elections take place every four years on a regional and a sectoral basis in a process which is mostly organized and run by the major unions (UGT, socialist, and CC.OO, formerly communist). It turns out that a large proportion of the elected workers' representatives are affiliated to either UGT or CC.OO.

• Workers' representatives constitute work councils (*comités de empresa*) which are entitled to bargain wages and employment conditions at the firm level. Work councils may call strikes in support of their demands. The facts

5. This section draws from JIMENO and TOHARIA [1994], chapter 3. *See*, also, METCALF and MILNER [1994].

that Spanish work councils can produce a wage drift relative to sectorial agreements, and that they can call strikes, are distinctive features of the Spanish system of collective bargaining (*see* ROGER and STREEK [1994]).

• Unions collecting more than 10% of the vote within the geographical and sectoral scope of sectoral agreements are entitled to bargain the corresponding sectoral agreements. Collective agreements are legally enforceable and apply to all workers, regardless of their union status. Sectoral agreements establish the wage and employment conditions of all workers within the corresponding sector (*i.e.*, extension is *ex-ante* and mandatory).

• Collective agreements may be at multiple levels: national, sectoral and firm-level. Firm-level agreements cannot contradict the terms of sectoral agreements. Thus, *de facto*, sectoral agreements establish a second layer of minimum wages (above the national statutory minimum) which can only be revised downwards by firm-level agreements under very special circumstances. There were national agreements between the government, the major employers' association and some unions in the 1978-86 period (with the exception of 1984). After 1986, no national agreement has been struck.

• The structure of collective bargaining (levels of negotiation and number of agreements at each level) is mostly decided by the unions and the employers' associations engaged in sectoral bargaining. Since the two dominant unions enjoy some political and institutional recognition, they plausibly exploit a higher bargaining power at the national and sectoral level than at the firm level. According to most pundits (and, even, union officials), firm-level bargaining is mostly devoted to large firms which supposedly have rents and capacity to pay higher wages.

• Bargaining at the sectoral level is mostly about wages and working hours. Firm-level bargaining is over more issues (absenteeism, productivity, manning ratios, etc.). However, explicit bargaining over employment is rarely observed (*see* JIMENO [1992]).

Thus, it seems that the main motivation of formal firm-level bargaining in Spain is to distribute firm-specific quasi-rents. Insofar as work councils have certain information and co-determination rights [6], work councils conceivably act taking balance of *ex-ante incentives* and *ex-post opportunism*. If workers and employers can exert effort or make investments that are relevant for the long term performance of the firm, and if labour contracts are incomplete, it is well known that effort is not provided optimally (GROUT [1984]). The extent of the distortion is in general inversely related to agents' bargaining power. In particular, formal firm-level bargaining will imply an increase in workers' bargaining power with some plausible negative effects in the employer's propensity to invest.

Another plausible factor in the efficiency effects of work councils will be the nature of workers' effort: whether effort is a collective [7] or an individual

6. *See* ROGERS and STREEK [1994], p. 129.
7. As for instance in FLANAGAN *et al.* [1993], p. 106

decision. If effort is individual then formal firm-level bargaining implies a separation between workers' pay and performance. Indeed, in this case, wage increases are the result of a collective action that benefits all workers whereas effort is internalized only by the individual that exerts it [8]. Then, if the free rider problem is pervasive, any loss of employer's incentives will not be matched by enhancement in workers' incentives and the introduction of a works council would imply inefficient investment levels.

Thus, the institutional characteristics of Spanish collective bargaining suggest the existence of interesting hypothesis to be tested:

1. Formal firm-level collective bargaining should take place more often in firms with higher ability to pay and enjoying monopoly power yielding firm-specific quasi-rents,

2. Formal firm-level bargaining is about the distribution of rents, so that wages will be higher in firms with formal firm-level bargaining.

3. Formal firm-level bargaining is about lump-sum increments in wages, not about incentives' schemes, so that if effort by employers and workers are individual and not verifiable, the introduction of collective bargaining should negatively affect firm's performance.

We now turn to formalize these hypothesis by providing a theoretical model where they can be derived.

3 A Model of Firm-Level Bargaining

Consider a firm affected by the ex ante mandatory extension of a sectoral collective agreement. This means that the firm is obliged to pay a minimum wage, q, established by the sectoral agreement. A fraction of the firms in the sector developed formal firm-level bargaining. In firms with formal bargaining the firm's surplus is split between owners and employees. Without loss of generality, assume that the surplus split is determined by the Nash solution with workers' bargaining power given by α (in firms with formal firm-level bargaining $\alpha > 0$ and in the rest of the firms which apply the sectoral agreement $\alpha = 0$).

The timing is as follows. Initially ($t = 1$) the L employees in the firm decide cooperatively whether to push for formal firm-level bargaining. This cooperation to push for a collective agreement within the firm has a linear cost: $K_0 + K_1 L$. At $t = 2$, workers (indexed by l) decide individually the level of effort to be exerted, e_l, and the employer decides the level of firm-specific investment, i. The cost of effort is $\frac{1}{2}(e_l - 1)^2$ for employees

8. This will be the case unless the scope of bargaining are incentives schemes based on measures of individual performance or based on a "budget-breaking" principle (HOLMSTRÖM [1984]).

and the cost of investment is normalized to be $\frac{1}{2}(i-1)^2$ for the employer. Finally (at $t=3$) bargaining between the employer and the employees (as a group) takes place [9].

The surplus to be divided at $t=3$ (R) [10] is a function of workers' effort levels (e_l) and the employer's investment decision (i), and is given by $R=\beta_0\overline{e}L+\beta_1 iL$; where $\overline{e}$ is average effort $(\overline{e}=\frac{1}{L}\sum_{l=1}^{L}e_l)$. Workers are entitled to get the sector's minimum wage q, guaranteed by the sectoral agreement. The outside opportunity of the employer, $\widetilde{R}$, is such that she cannot realize gains from workers' effort, $\overline{e}$, nor his own effort, i, beyond unity: $\widetilde{R}=\beta_0 L+\beta_1 L-qL$ [11].

Thus, following the previous assumptions, the resulting wages (per employee) and profits are:

$$(1)\quad w(\overline{e},i)=q+\frac{\alpha}{L}\Big(R-\widetilde{R}\Big)=q+\frac{\alpha}{L}(\beta_0(\overline{e}-1)L+\beta_1(i-1)L)$$

$$(2)\quad \begin{aligned}\pi(\overline{e},i)&=\alpha\widetilde{R}+(1-\alpha)R-qL\\&=\beta_0\overline{e}L+\beta_1 iL-\alpha(\beta_0(\overline{e}-1)L+\beta_1(i-1)L)\end{aligned}$$

At $t=2$ agents determine their levels of effort maximizing (1) net of effort cost, that is:

$$(3)\quad \max_{e_l} w(\overline{e},i)-\frac{1}{2}(e_l-1)^2\Rightarrow \widehat{e}_l=1+\frac{\alpha\beta_0}{L}=\widehat{\overline{e}},\quad (l=1,...,L)$$

$$\max_{i}\pi(\overline{e},i)-\frac{1}{2}i^2\Rightarrow\widehat{i}=1+(1-\alpha)\beta_1 L$$

From equation (3) it is clear that the existence of formal firm-level bargaining implies distortions in the employer's investment and in workers' level of effort with respect to the corresponding first-best levels [12]. Since there may be free-riding in productivity enhancing investments, the extent of the distortion in the employer's investment increases with the number of employees. In particular, an increase in labour bargaining power reduces employer's effort $(\frac{di}{d\alpha}=-\beta_1 L<0)$ but, if L is high enough, this does not translate into an increase in employees' effort because of moral hazard,

9. R -defined below- is the pie over which agents bargain. It is often argued that under perfect competition payoffs are exogenous -there are no quasi-rents to distribute. We will also relate positive wage drift to the existence of quasi-rents, that we will measure by firms' value-added per employee in deviations with respect to sectoral level.
10. R is defined as the sum of the total wage bill (including social security contributions by the firm) plus profits after debt interests and tax payments. The implicit assumption is that items like reserves or depreciation allowances are not affected by the nature of the bargaining regime in the firm.
11. The employer is obliged contractually to pay the minimum sectoral wage, q to employers.
12. First best levels are given by: $\overline{e}^*=e_l^*=1+\beta_0>\widehat{e}_l$; $i^*=1+\beta_1 L>\widehat{i}$.

as usual in teams' problems. Thus, substituting (3) into (1), equilibrium wages and surplus are given by:

$$(4) \qquad \begin{aligned} w\left(\widehat{e},\widehat{i}\right) &= q + \frac{\alpha^2}{L}\beta_0^2 + \frac{\alpha}{L}(1-\alpha)\beta_1^2 L^2 \\ R\left(\widehat{e},\widehat{i}\right) &= \beta_0 L + \alpha\beta_0^2 + \beta_1 L + \beta_1^2(1-\alpha)L^2 \end{aligned}$$

From (4) it follows that, for L large enough, the effect of an increase in labour bargaining power reduces total surplus, since the gains from the effects on workers' incentives do not compensate the losses arising from negative effect on the employer's incentives. An approximation to wages in firms with no formal bargaining can be obtained by a first-order expansion of (4) around $\alpha = 0$, that is:

$$(5) \qquad w(\alpha) \simeq q + \frac{\partial w(\alpha = 0)}{\partial \alpha}\alpha = q + \beta_1^2 L$$

which implies that the wage drift is positive and increasing in the number of employees and in the productivity parameter β_1.

Finally consider the $t = 1$ stage [13]. Workers decide collectively whether to have formal bargaining at the firm level if and only if the wage bill under bargaining net of total effort cost and coordination is greater than the wage bill without bargaining, that is, if:

$$(6) \qquad \psi(.) \equiv (\alpha\beta_0)^2 + \alpha(1-\alpha)\beta_1^2 L^2 - \frac{1}{2}\frac{(\alpha\beta_0)^2}{L} - K_0 - K_1 L > 0$$

$$(7) \qquad \psi(.) \simeq \psi_0 + \psi_\alpha \alpha + \psi_L L + \psi_\beta \beta + \psi_K K$$

Equation (6) implies that the probability of observing firm level bargaining conditioned on L, K, α and β in a firm is proportional to ψ. Using the linear approximation in (6) then we have that for $\alpha < 0.5$ and $L > 1$ [14]: $\psi_\alpha > 0$: if workers' bargaining power is small, it is not worthwhile to develop firm level bargaining; $\psi_L > 0$, $(\psi_\beta > 0)$: larger size (productivity of labor) implies a larger investment by the employer and therefore a higher return from bargaining over wages; $\psi_K < 0$: bargaining costs decrease the occurrence probability of firm level bargaining. Thus, this model yields some predictions on the determinants and economic effects of formal firm level bargaining when sectoral collective agreement are ex-ante mandatorily extended. WE now turn to test these predictions using Spanish data.

13. Timing assumptions are justified because effort is an individual decision and it is not verifiable by a court, whereas the existence of a works council and equilibrium surplus and wages are assumed to be verifiable.

14. These restrictions are justified on empirical grounds: α has been estimated as 0.1 in Spanish firms and L is in all firms in the sample greater than 50.

4 Empirical Evidence on the Effects of Formal Firm-Level Bargaining

4.1. The Data

To provide empirical evidence on main predictions of the model, we collect data on the existence of formal firm-level bargaining in Spanish firms. In Spain, unlike other countries, there are no surveys on firms regarding industrial relations. Thus, a comprehensive statistical source on industrial relations and firms' characteristics is not available. The main statistical source on Spanish collective bargaining is the *Collective Agreement Statistics* (*Estadística de Convenios Colectivos*), elaborated from the register of collective agreements kept by the Spanish Ministry of Employment [15]. Data from this source provide information on the number of firms with formal bargaining and the number of workers affected by them, since 1981. However, they do not provide information on relevant economic variables (like wages, productivity, surplus, etc.) of firms with formal bargaining. Thus, data from the *Collective Agreement Statistics* has to be supplemented by a data set with firm-level economic characteristics, that comprises firms under both regimes (with and without formal bargaining).

The supplementary data source that we use is the *Bank of Spain's Survey on Firm's Balance Sheets (Central de Balances del Banco de España).* This is a survey conducted by the Bank of Spain since 1982, that has information on relevant economic variables (like employment, production, labour costs, profits, etc.) [16]. Matching these two data sources we have a sample of firms under the two regimes, formal bargaining and no formal bargaining. We perform the matching using the information for 1990. Hence, in our sample, a firm with formal bargaining is a firm which has a collective agreement registered in 1990 and was covered by the *Bank of Spain's Survey on Firm's Balance Sheets* [17]. A firm with no formal bargaining is a firm without a collective agreement registered in 1990, and covered by the *Bank of Spain's Survey on Firm's Balance Sheets* [18].

15. Collective agreements must be registered in the Ministry of Employment in order to be legally enforceable.

16. BENTOLILA and DOLADO [1994] use this database to estimate a insider-outsider model of wage determination in Spanish firms.

17. A complete description about sampling methodology, variables definition, and variables descriptive statistics of variables for each year can be found in the publication by Banco de España: *"Central de Balances: resultados anuales de las empresas no financieras"*, 1982 to 1994.

18. The matching is performed by identifying firms in both registries according to their names and using instructions in SAS to match alphabetic strings. As could be expected the coorespondence between both data sets is not one-to-one, resulting from coding errors in firms names. This implies that about 40% of the firms in the balance sheets registry has to be dropped. In principle, though, it seems plausible that these errors are purely random.

Admittedly our sample is somehow biased, since, although the register of collective agreements is in principle universal, small firms are under-represented in the *Bank of Spain's Survey on Firm's Balance Sheets*. Thus, a selection bias is very likely. Moreover, our sample covers the 1982-92 period while only the existence of formal firm-level bargaining in 1990 is observed. Thus, transitions between the two regimes, formal bargaining and no bargaining, are not observed. However, this is not an important problem since the existence of formal bargaining tends to be very rather persistent through time.

4.2. **Empirical Implementation**

In section 2 we modeled firm level bargaining as a transfer of bargaining power from the employer to employees, and explored its implications in a context of incomplete contracts. We now use those results to measure the effects of formal firm level bargaining on wages and productivity. To do this, take a linear approximation to $w(.)$ and $R(.)$ in (4) around values $\overline{\mathbf{x}} = (\overline{\alpha}, \overline{\beta}, \overline{L})$ [19], where $\overline{\alpha} < 0.5$ and $\overline{L} > 1$. This linear approximation, after dividing the surplus equation by L, yields:

$$(8) \qquad w(\mathbf{x}) \simeq w(\overline{\mathbf{x}}) + \overline{w}_{\alpha}(\alpha - \overline{\alpha}) + \overline{w}_{L}\big(L - \overline{L}\big) + \overline{w}_{\beta}\big(\beta - \overline{\beta}\big)$$

$$(9) \qquad \frac{R(\mathbf{x})}{L} \simeq \frac{R(\overline{\mathbf{x}})}{L} + \frac{\overline{R}_{\alpha}}{L}(\alpha - \overline{\alpha}) + \frac{\overline{R}_{L}}{L}\big(L - \overline{L}\big) + \frac{\overline{R}_{\beta}}{L}\big(\beta - \overline{\beta}\big)$$

where $\overline{w}_z = \frac{\partial w(x=\overline{x})}{\partial z}$ and where $\overline{R}_z$ is defined similarly. Given assumptions on $\overline{\mathbf{x}}$ it is easy to show that:

• $\overline{w}_{\alpha} > 0$: the wage drift is positive (since all firms have $L \geq 1$). Since bargaining is efficient ex post and it is inefficient to exert threats on strikes or lock outs, the inequality follows immediately.

• $\overline{w}_{L} > 0$: it follows from the fact that bargaining power by employees varies between zero for firms without formal bargaining, and α positive, but small, for firms with formal bargaining. With α small, higher levels of employment imply higher employer's investment, which increases the pie that agents bargain over.

• $\overline{w}_{\beta} > 0$: *Caeteris paribus*, the higher quasi-rents are, the higher the wage premium from firm level bargaining.

• $\overline{R}_{\alpha} < 0$: As long as $L > 1$, the transfer of bargaining power from the employer to workers reduces the size of the pie. This is because the loss in the fraction of the marginal profit that the employer internalizes from her investment is not compensated with a similar gain to employees, since they are a team and free ride on each other.

• $\overline{R}_{L} > 0$: Given the distribution of bargaining power, and since inputs are assumed to be complementary, the higher L is, the higher the surplus $R(.)$ is.

19. We are taking $\beta = \beta_0 = \beta_1$, as a simplification with respect to (4).

• $\overline{R}_\beta > 0$: Higher productivity of labour raises benefits to invest, and increases surplus in equilibrium.

• The Wage Equation

We are interested in capturing the long term effects of firm level bargaining on wages and efficiency, rather than its effects on short term fluctuations of these variables. The following transformations are done in order to capture long term wage premia from work council bargaining. From (8), and taking into account that observations are classified according to firm (i), sector (j) and year (t):

$$w_{ijt} = \overline{w}_{jt} + \overline{w}_\alpha(\alpha_{ijt} - \alpha_{jt}) + (z_{ijt} - z_{jt}) + \varepsilon_{ijt} \tag{10}$$

where $\beta_{ijt} = (z_{ijt}, \widetilde{\beta}_{ijt})$ has been decomposed into an observed component, z_{ijt}, and an unobserved component, $\widetilde{\beta}_{ijt}$, and $\varepsilon_{ijt} = \overline{w}_\beta \widetilde{\beta}_{ijt}$ [20]. w_{ijt} is (the log of) the average wage in firm i, sector j, and time t, L is (the log of) the total number of employees, and z is a vector of firm characteristics, such as total capital stock, proportion of temporary workers, and ownership characteristics [21]. Taking sectoral averages, we get that

$$w^m_{jt} = \overline{w}_{jt} + \overline{w}_\alpha(\alpha^m_{jt} - \alpha_{jt}) + \overline{w}_L(L^m_{jt} - L_{jt}) + \overline{w}_\beta(z^m_{it} - z_{jt}) + \varepsilon^m_{jt}$$

where $w^m_{jt} \equiv \frac{1}{I_j}\sum_{i \in J} w_{ijt}$. Unobserved sectoral fixed effects disappear by taking differences with respect to the sectoral mean, so that

$$\begin{aligned}(w_{ijt} - w^m_{jt}) = \overline{w}_\alpha(\alpha_{ij} - \alpha^m_j) + \overline{w}_L(L_{ijt} - L^m_{jt}) \\ + \overline{w}_\beta(z_{ijt} - z^m_{jt}) + (\varepsilon_{ijt} - \varepsilon^m_{jt})\end{aligned} \tag{11}$$

If the wage drift in firms with formal bargaining is positive and persistent through time, this should arise as a positive difference between the time-average of wages and average sectoral wages. Thus, by taking time averages we derive the equation that will be estimated:

$$\widetilde{w}_{ij} = \overline{w}_\alpha d^\alpha_{ij} + \overline{w}_L \tag{12}$$

where $\widetilde{w}_{ij} = \frac{1}{T}\sum_t(w_{ijt} - w^m_{jt})$, $\widetilde{L}_{ij} = \frac{1}{T}\sum_t(L_{ijt} - L^m_{jt})$, $\mathbf{Z}_{ij} = \frac{1}{T}\sum_t(z_{ijt} - z^m_{jt})$ and $e_{ij} = \frac{1}{T}\sum_t(\varepsilon_{ijt} - \varepsilon^m_{jt})$. Since α is not observed, we proxy the effects of formal firm bargaining by a *dummy* variable, d^α_{ij}.

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20. The variables $\overline{w}_{jt}, \alpha_{jt}, L_{jt}$ and z_{jt} are sector specific levels around which the linear approximation in (8) is taken.

21. The term $\overline{w}_{jt}$ depends only on time and industry without loss of generality. Firm fixed effects might be present in the term ε_{ijt}.

We first estimate equation (12) by OLS. Table 1 shows means and variances of the principal variables considered in this empirical exercise. Variables are defined according to transformations in (11) and (12) [22]. The results from OLS estimation are in Table 2(a). Notice that the error term is the unobservable component of labour productivity. Since effort and employment decisions are dependent on labour productivity, OLS estimates in Table 2(a) are most likely subject to a simultaneity bias. Therefore, we proceed to estimate (12) by a two-stage-least-squares procedure (*see*

TABLE 1

Descriptive Statistics: Transformed Variables.

VARIABLE	Mean	Stand. Deviat.
wages ($\widetilde{w}$)	-0.025	0.2201
number of employees ($\widetilde{L}$)	-0.804	1.3982
surplus per employee ($\widetilde{r}$)	-0.278	1.1573
capital (Z_1)	-0.209	0.8289
% owned by private domestic firms (Z_2)	11.684	23.7317
fraction of temporary employees (Z_3)	-0.030	0.1366
% owned by foreign firms (Z_4)	15.041	55.556
% owned by public sector (Z_5)	5.010	14.5283
Bank debt (Z_6)	0.902	0.2971

TABLE 2(a)

OLS Estimation of Equation (12). Dependent Variable: ln (Firm Wage) - ln (Sectoral Wage).

VARIABLE	Coeff.	std. dev	t-Stat	p-value
constant	0.117	0.027	4.266	0.0000
firm-level bargaining	0.016	0.015	1.054	0.2925
surplus per employee	0.044	0.008	5.512	0.0000
number of employees	0.051	0.006	9.170	0.0000
% of fixed-term employees	-0.313	0.093	-3.375	0.0008
bank debt	0.015	0.049	0.311	0.7562
Capital	0.079	0.010	7.855	0.0000
% owned by foreign firm	0.0003	0.0003	1.161	0.2459
% owned by other domest firm	0.001	0.0003	3.918	0.0001
% **not**-owned by public sector	-0.101	0.026	-3.948	0.0001

R squared: 0.3081 Adjusted R squared: 0.2988

F test of joint significance: $F(9, 666) = 32.9551$.

22. For details on untransformed data ($w_{ijt}, R_{ijt}, L_{ijt}, ...$) *see* Banco de España [1995].

appendix for instruments definition). The results of this second estimation procedure are in Table 2(b) [23].

TABLE 2(b)

2SLS Estimation of Equation (12) [24]. Dependent Variable: ln (Firm Wage) - ln (Sectoral Wage)

VARIABLE	Coeff.	std. dev	t-Stat	p-value
constant	0.148	0.034	4.365	0.0000
firm-level bargaining	0.050	0.026	1.905	0.0572
surplus per employee	0.102	0.031	3.313	0.0010
number of employees	0.052	0.008	6.515	0.0000
% of fixed-term employees	-0.320	0.091	-3.513	0.0005
bank debt	0.084	0.065	1.300	0.1940
Capital	0.048	0.023	2.084	0.0375
% owned by foreign firm*	0.0002	0.0002	1.022	0.3070
% owned by other domest firm*	0.001	0.0003	3.670	0.0002
% **not**-owned by public sector*	-0.140	0.032	-4.400	0.0000

R squared: 0.221 Adjusted R squared: 0.210
F test of joint significance: $F(9, 666) = 20.965$.
HAUSMAN TEST STATISTIC:
CHI-SQ(8) = 9.367 , PROB = 0.312

From table 2(b), the wage drift produced by firm level bargaining is found to be positive and significant, what is consistent with (8). Thus, controlling for the endogeneity bias it appears that workers at firms with formal bargaining are able to obtain a 5% average wage premium relatively to sectoral agreements, persistently over time. The effect of size (in terms of total number of employees in deviation with sector average) is found to be positive and strongly significant [25].

We proxy quasi-rents by the deviation of value added per employee with respect to sectoral averages The higher quasi-rents are, the higher wages are, being this effect significant, which is consistent with $\overline{w}$ in (12) being positive. The coefficient on capital is estimated to be positive and significant, which is not surprising since the capital stock should be positive correlated with a higher productivity of labour and, plausibly, also with firm's market power. Several other firm characteristics appear to have explanatory power

23. Standard errors are robust to heteroskedasticy throughout.

24. *See* the appendix for instrument definition. Variable with an asterix have not been intrumented for.

25. This coefficient measures simultaneously $\overline{w}_L$ and $\overline{w}_\beta$ since firm's size is plausibly an indication of market power, and, therefore, of the existence of quasi-rents.

over the wage drift. Ownership characteristics are systematically significant: for instance, firms participated by the public sector tend to yield relatively high wage premia for their sector. This can be interpreted in terms of "soft budget constraints" in public firms. However, the proportion of temporary employees is not found to affect wage determination, what might be at odds with the idea that temporary workers have lower bargaining power than permanent employees. A potential explanation could be that wage increases at firm level bargaining operate in an "open shop" regime: they are extended automatically to all workers (conditioned on category) in the firm [26].

Results from OLS estimation (Table 2(a)) are similar, but the wage drift virtually disappears. We regard these estimates as inconsistent estimates of partial derivatives (because of the endogeneity bias). Yet, surprisingly the Hausman test for endogeneity (at the end of table 2(b)) accepts the hypothesis of absence of endogeneity. It is plausible that our set of instruments fail to perfectly qualify.

• Efficiency Effects

We follow a similar procedure to estimate persistent effects of firm level bargaining on efficiency. Starting from $R(.)$ in (8), we take deviations with respect to sectoral means in each of the years to get to the equivalent of (10):

$$(r_{ijt} - r^m_{jt}) = \overline{r}_\alpha(\alpha_{ij} - \alpha^m_j) + \overline{r}_L(L_{ijt} - L^m_{jt}) + \overline{r}_\beta(z_{ijt} - z^m_{jt}) + (\eta_{ijt} - \eta^m_{jt})$$

where $r = R/L$. Taking time averages, the second equation to be estimated is:

$$\widetilde{r}_{ij} = \overline{r}_\alpha d^\alpha_{ij} + \overline{r}_L \widetilde{L}_{ij} + \overline{r}_\beta \mathbf{Z}_{ij} + u_{ij} \tag{13}$$

where $\widetilde{r}_{ij} = \frac{1}{T}\sum_t (r_{ijt} - r^m_{jt})$, and $u_{ij} = \frac{1}{T}\sum_t (\eta_{ijt} - \eta^m_{jt})$ and $\widetilde{L}$ and $\mathbf{Z}$ are as in (12). The results of estimating (13) by OLS and 2SLS are shown in Tables 3(a) and 3(b) respectively.

The main result derived here is the significance (at the 10% level) of the firm level bargaining dummy, as predicted by (8), thus giving some support to the theory that transferring bargaining power from employer to employees distorts employees' incentives of the former without enhancing productivity.

Other effects found are sensible. Capital increases labour productivity, as it should be expected.. Firms with a lower degree of participation by the public sector seem more efficient on average. Positive participation by foreign corporations has a positive effect on labour productivity. On the other hand, neither the total number of employees nor the fraction of temporary workers correlate with surplus per employee.

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26. For more on the effects of temporary workers on wage determination, *see* JIMENO and TOHARIA [1993], and BENTOLILA and DOLADO [1994].

TABLE 3(a)

OLS Estimation of Equation (13). Dependent Variable: ln (Surplus per Employee) -ln (Surplus per Employee in Sector).

VARIABLE	Coeff.	std. dev	t-Stat	p-value
constant	-1.247	0.378	-3.295	0.0010
firm-level bargaining	-0.189	0.083	-2.272	0.0234
number of Employees	0.036	0.024	1.486	0.1378
% Fixed-term Employees	0.327	0.220	1.483	0.1385
bank debt	-0.825	0.298	-2.771	0.0057
% owned by other domest. firm	0.003	0.002	1.730	0.0842
% owned by foreign firm	0.001	0.0004	2.045	0.0412
% **not**-owned by public sector	1.221	0.373	3.278	0.0011
Capital	0.221	0.035	6.378	0.0000

R squared: 0.153 Adjusted R squared: 0.143

F test of joint significance: $F(8, 667) = 15.036$.

TABLE 3(b)

2SLS Estimation of Equation (13) [27]***. Dependent Variable: ln (Surplus per Employee) -ln (Surplus per Employee)***

VARIABLE	Coeff.	std. dev	t-Stat	p-value
constant	-0.890	0.299	-2.976	0.0030
firm-level bargaining	-0.249	0.146	-1.714	0.0870
number of employees	0.0001	0.034	0.002	0.9985
% fixed-term employees	0.313	0.234	1.335	0.1823
bank debt	-0.986	0.296	-3.336	0.0009
% owned by other domest. firm*	0.002	0.001	1.244	0.2140
% owned by foreign firm*	0.001	0.0005	1.882	0.0603
% **not**-owned by public sector*	0.867	0.274	3.168	0.0016
Capital	0.332	0.087	3.801	0.0002

R squared: 0.137 Adjusted R squared: 0.127

F test of joint significance: $F(8, 667) = 15.036$.

• The Determinants of Formal Firm-Level Bargaining: Probit estimates

The model in section 3 has implications on the occurrence of firm level bargaining. The probability of observing local bargaining in firm ij, $p(d_{ij}^{\alpha} = 1 \mid L, \alpha, \beta, K)$ can be approximated by (6).

A simple tests of these predictions boils down to the estimation of a probit regression, as presented in Table 4. However, it is clear that decisions on number of employees and investment will depend on the existence of

27. *See* the appendix for instrument definition. Variable with an asterix have not been intrumented for.

firm level bargaining, so that results in Table 4 are descriptive rather than structural estimates of the model in section 4.

TABLE 4

Probit Estimates. Endogenous Discrete Variable: Firm Level Bargaining.

VARIABLE	Coeff.	std. dev	t-Stat	p-value
Constant	3.315	1.494	2.22	0.026
Sect 1	-0.947	0.267	-3.54	0.00
Sect 2	-0.468	0.248	-1.88	0.060
Sect 3	-0.786	0.258	-3.04	0.002
Sect 4	-0.771	0.318	-2.42	0.015
Sect 5	-0.696	0.292	-2.38	0.017
Sect 6	-0.398	0.372	-1.07	0.284
Number of employees (in ln)	0.164	0.046	3.56	0.000
% fixed-term workers	-1.248	0.688	-1.81	0.070
Bank Debt	-0.793	0.388	-2.04	0.041
Cost of Debt	-0.143	0.426	-0.33	0.738
Liquidity	-0.013	0.028	-0.48	0.631
Quoted in the stock market	0.623	0.230	2.70	0.007
Bank Group	0.030	0.008	3.53	0.000
% owned by other domest firms	0.002	0.002	1.04	0.299
% owned by other foreign. firms	0.003	0.002	1.27	0.206
% **not**-owned by public sector	-0.156	0.197	-0.79	0.428
Participat. in (sector) union elec.	0.036	0.017	-2.04	0.041
Capital	-0.055	0.079	-0.68	0.498
Subsidies to capital	-0.250	0.580	-0.43	0.667
Subsidies to Sales	-0.106	-0.106	-1.16	0.245
Sales	-0.085	0.108	-0.79	0.432
Surplus	-0.097	0.056	-1.72	0.085

Likelihood Ratio $\chi^2(22)$: 117.058.
Log likelihood for full model: -391.875
Percent correctly predicted: 69.675
McFadden's pseudo R-square:0.130

From Table 4, there is a clear positive correlation between number of employees and firm bargaining. It is in large firms where work council bargaining takes place. This is consistent with the model in section 3. It is plausible that size is capturing firm's market power and therefore quasi-rents. On the other hand our measure of quasi-rents (surplus per employee in firm relative to sector, *surplus* in Table 4) appears with a negative and significative coefficient, what must be the composition of a positive structural coefficient and a negative endogeneity bias.

Interestingly, the coefficient of *% of fixed term employees* is negative. Fixed term employees are hired for a maximum of three years after which the firm either hires them under a permanent contract or terminates the relationship without compensation. These workers therefore cannot be thought of as insider employees. We interpret the variable as a measure of insiders bargaining power: a larger fraction of outsider workers reduces insiders bargaining power. Then the estimate in Table 4 is consistent with

predictions: $\psi_\alpha > 0$, since *% of fixed term employees* is negatively related to α.

The coefficient on *participation in sectoral union elections* is negative and significant. A possible interpretation is that this variable is a proxy for the quality of the sectoral agreement between union and firm representatives. If the sectorial agreement is good for workers and mandatory extension is effectively binding then it is not worth it to pay the set up cost for local bargaining and its likelihood diminishes as in Table 4.

5 Concluding remarks

The majority of studies that look at union wage effects have focused on the Anglo-Saxon institutional framework, the specificities of which are hard to generalize to Continental European countries. In this paper, we have addressed the issue with the latter case in mind. In particular we have presented a theoretical model of the determinants and the effects of formal firm level bargaining under a collective bargaining system with mandatory (ex ante) extension of sectoral collective agreements. We have modeled the costs and benefits (to workers) of establishing work councils in firms, when the introduction of firm local bargaining is interpreted as a transfer of power from the employer to employees, all agents are engaged in relationship-specific investments, and commitment to contracts on future wages is not possible. As it is the case in Spanish labour relations, work councils are supposed to bargain over wages, and entitled to call strikes, if necessary. Moreover, wage increases resulting from firm level bargaining are not for the only benefit of unionized workers, but affect all workers. We have shown that this open shop system might exacerbate the problem of underinvestment in moral hazard in teams.

We have tested the predictions of the model using data from Spanish firms. Our main results show that bargaining by work councils yields an average positive wage drift of around five per cent. We also find that wages are positively related to firms' quasi-rents, strongly affected by the total number of employees, and negatively affected by the proportion of temporary workers. Regarding efficiency effects, we find that work council bargaining significantly reduces labour productivity, what may be explained by the distortions in the choices of effort and investment levels that our model derives. Thus, these results suggest that firm level wage bargaining is not only a matter of quasi-rents distribution, but also of incentive schemes.

A number of avenues for future work remain open. For instance, it is plausible that there are asymmetries in the wage effects of work council bargaining, so that there is wage rigidity after negative shocks. In addition, it is plausible that in firms without formal bargaining, employers and work councils do also bargain, although in some informal fashion. At least, it is conceivable that in these firms a given subset of the employees bargain individually for their wage. A model with both collective and individual

bargaining would plausibly have other implications for firm growth and factor composition. We are undertaking some of these hypothesis in on-going work.

APPENDIX

Variables and Instruments definition:

Variables:

Instruments for 2SLS estimation of (12), (Table 2(b)) and (13), (Table 3(b)).

Equations (12) and (13) have been estimated considering all regressors $\left(d, \widetilde{L}, \widetilde{\mathbf{Z}}\right)$ potentially correlated with error terms e and u. Instruments used in both cases are:

w_{ijt}^{1} -w_{ijt}^{8}: 8 sectoral dummies at 1 digit NACE level:

w_{ijt}^{9}: subsidies to the capital received by firm ij in year t.

w_{ijt}^{10}: subsidies to gross profits of firm ij in year t.

w_{ijt}^{11}: (dummy) =1 if firm equity trades in the stock market ij in year t.

w_{ijt}^{12}: direct participation of public sector in firm (% of firm stock owned by public sector) ij in year t.

w_{ijt}^{13}: indirect [28] participation of public sector in firm ij in year t.

w_{ijt}^{14}: direct participation of financial institution in firm ij in year t.

w_{ijt}^{15} indirect participation of financial institution in firm ij in year t.

w_{ijt}^{16}: direct participation of private domestic firm in firm ij in year t.

w_{ijt}^{17}: indirect participation of private domestic firm in firm ij in year t.

w_{ijt}^{18}: direct participation of foreign domestic firm in firm ij in year t.

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28. indirect participation in firm ij by firm k means there is a third company partially owned by k that owns equity of ij.

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