WAGE PREMIA, PRICE-COST MARGINS AND BARGAINING OVER EMPLOYMENT IN BELGIAN MANUFACTURING : AN ANALYSIS OF DISTINCT BEHAVIOR AMONG VARIOUS SKILLED WORKERS

Jacques BUGHIN

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Département des Sciences Economiques
Université Catholique de Louvain
3, Place Montesquieu, 1348 Louvain-la-Neuve (Belgique)

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Wage premia, price-cost margins and bargaining over employment in Belgian manufacturing: an analysis of distinct behavior among various skilled workers

J. BUGHIN *

I.R.E.S. ,

Place Montesquieu , 3 ,

Collège Dupriez

Université Catholique de Louvain ,

B-1348 Louvain-la-Neuve

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/ABSTRACT/

This model estimates an asymetric Nash efficient wage bargaining model for some Belgian manufacturing sectors at the firm level , under the premises that bargaining units are separate for 'R&D' people and other 'common' workers in order to account for 'wage rivalry' effects .

The importance of the R&D activity *as a strategic use for firm growth* is supported by a higher bargaining power for 'R&D' people than for common labor, while *'R&D' people tend also to attach less importance to employment* as compared to wages, possibly because of greater outside job opportunities.

In addition, the bargaining power of either union group depends on (the fluctuation of) output market power (*through the industry degree of utilization capacity and the level of industry concentration*) and on the firm financial structure (*through the level of debt*).

Further, skilled workers bargaining strength seems reduced by *under*investment in R&D activity in order for firms to reduce the revenues accruing from assets which are sunk at the time of negotiation.

Finally *some evidence of a 'wage-wage' spiral* is found for some sectors, indicating that there is room for separate bargaining units to coordinate somewhat their claims and collusively increase their power to extract oligopolistic profits.

1. INTRODUCTION

It is now common in the wage bargaining literature to oppose two models of unions behavior. The first model, known as ' *the right-to-manage model*', assumes that the employer restricts bargaining to wages alone, retaining its own right over the optimal level of employment (see Nickell and Andrews [1983]). The second model, known as '*the efficient bargaining model*' proposes an alternative perspective, where unions and management may find interesting to contract over employment as well (see Hall and Lilien [1979], or Mc Donald and Solow [1981]).

Both models have their own predictions, e.g. , as to how wage bargain is able to influence the 'ex post' labor share (see for instance Arnsperger and de la Croix [1990]); and concerning the impact of the bargained wage on price, employment and output (see Dowrick [1990] or Bughin [1991b]). Those divergences in prediction explain why some attempts have been recently made to test both models each against other (see MaCurdy and Pencavel [1986], Eberts and Stone [1986] , Brown and Ashenfelter [1986] , Card [1986] or Martinello [1989] for the U.S. ; - Dowrick [1990] for the U.K.).

Yet testing the labor demand model is relatively easy, testing for the alternative of efficiently bargained wage is not so straightforward since *bargaining over jobs is not only a question of (Pareto) efficiency, but also of power.*

Hence, cases exist where unions choose freely not to care about jobs (i.e., employment does not enter their utility function). But other cases also appear where unions are actually concerned about jobs, but are simply incapable of bargaining thereover (i.e., employment enters the union' s utility function, but bargaining strength is nil).

As Cowling [1990] admits, those two possibilities should happen frequently because the threat of job losses will serve to inhibit unions representing common workers from pressing for higher wages , while, in the same way, unions with strong workers will be less concerned about bargaining over jobs because logically, strong workers can easily pick up alternatives in the outside labor market.

Nevertheless, this does not imply that wages are set *automatically* on the labor demand, but rather that asymetry in rent distribution is likely to appear in favor of the firms. Besides the evidence from tests which evaluate the labor demand model against its alternative of efficient bargain[1], estimation of a labor contract curve remains a worthfull exercise in that it allows e.g. for:

- having the normative advantage of being a Pareto bargain (Mac Donald and Solow [1981]);
- being consistent within a broader range of conditions with the empirical findings that unions are capable to impact redistribution (Freeman [1983], Henley [1987] or Mac Pherson [1990]) ;
- encompassing the traditional labor demand curve model (see e.g. Brown and Ashenfelter [1986]) [2].

Further, an *implicit* contract viz employment is likely to occur between firms and workers, because work practices often prevent the firm to adjust its level of employment directly on its labor demand (Clark [1984]) [3].

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[1] Refer to Svejnar [1986], p. 1075: " *One cannot accept the traditional proposition that the bargaining solution lies on the marginal revenue product curve of labor..*". In Bean and Turnbull [1988], one may also read (p. 1101): ".. *runs counter to the prediction of the labour demand model and is in accord with the predictions of the efficient bargaining model*".

[2] That is, if one denotes **p**, **q** (**p**=>0 ; **q**=>0), the union power parameters in the negotiation over wages and employment respectively, an efficient bargain *à la Mac Donald-Solow* implies the equality: **p=q** , while a Right-to-Manage model *à la Nickell-Andrews* requires the a priori constraint : **q**=0.

[3] Note also that criticisms also exist against the efficient bargaininig model. Mentioning in passing, the common (interrelated) objections are twofold: the employer's incentive to cheat in the bargain and the case of asymetric information, respectively. Concerning the first objection, the argument states that as long as the contract specifies level of employment that is set up to the right of the labor demand curve, then the firm has some incentive to renege ex post on the negotiated wage-employment locus (see e.g. Holmund [1989]). Concerning now the second criticism, we note that the incentive to cheat is exacerbated when firms have better information on the shocks on employment, since in this case, firms may be enclined to lie about the causes of the shocks to move back to the labor demand curve (Farber [1986]). While conscious of those problems, we hold the efficient bargain as the working assumption along this paper, which amounts to assuming implictly that the degree of information and the power of the union are sufficient to prevent the firm from cheating. Those implicit assumptions are far for being heroïc, as e.g. the empirical results provided by Voos and Michel [1986] suggest an

This paper proposes a model of efficient bargaining along the original lines of Svejnar's [1986], and tests for the conjecture, amended from Cowling [1990] [4] that *high technical workers possess indeed greater bargaining power, but can be less risk-averse* .

The test we propose is clearly both an update and a generalization of Veugelers [1989], where the author's results on a cross-industry regression [that white collars have (surprisingly ? [5]) less bargaining strength] depends on her assumption that each workers group *is* risk-neutral. Furthermore, and in sharp contrast to that study, our investigation:

- is based on the distinction between 'technological workers' (i.e., people engaged in strategic R&D activities with some level of skills) and 'unskilled' workers;

- assumes sufficient complementary among skills to rationalize the existence of separate unions (see Horn and Wolinski [1988 a,b]) and account for 'wage rivalry' among different skilled workers (see also footnote 10) ;

- uses cross-sectional data *at the firm level;*

- aims at refining on an empirical way, the possible causal variables which determine the union workers' bargaining strength. Inter alia, 'wage envy' is incorporated through the influence of the other union wage on one union

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important role '*for employment-security provisions in enforcing efficient contracts..*' (p.80).

[4] We quote: " *thus, certain groups of workers (the managerial and the technological hierarchy) will find it possible to extract a share of the growing surplus accrueing as result of a monopolisting tendency, whereas other groups (direct productions workers) will generally find it difficult.*"

[5] A question mark seems of rigor for one may consider that Veugelers' results are the consequence of say: - aggregation bias; - measurement-errors; - the fact that white collars actually extract less rent; - and variables omission (for instance, the fact that white collars use to receive hidden renumeration in the form of fringe benefits is excluded from the model). Further, an important caveat of Veugelers' estimation strategy (which is discussed later on in the main text) is that the *endogeneity* of the industry price-cost margin is not taken into account, yet observed price-cost margins are eroded by wage rents within a Pareto bargain (see Dowrick [1989] and Bughin [1991b]).

bargaining strength in order to test the Keynesian idea of fairness among workers (Bhaskar [1990]). Further, the possibility of strategic inefficiency by the firm is investigated, under the premise of unbinding contracts (Grout [1984]; Manning [1987]);

- last, but not least, accounts for the simultaneous causality between wages and price-cost margins (see footnote 5) .

We expect those differences in scope to generate relatively distinct results for several reasons:

- *first*, the importance of technological change for the firm growth is now well-established (see Griliches [1986] or Geroski [1989]). To the extent that people engaged in R&D activities generate the most part of profits, it is logically expected that their bargaining power is increased in wage negotiations. On the other hand, however, employees may find it optimal to *under*invest in assets that are both specific and sunk as is the case for R&D, with the consequence that the bargaining power of R&D workers is reduced [6], [7].

-*Second*, interdependence across wage claims should be of some empirical presence in that one would expect that wage increase for one group reduces the surplus available to the other union. Further, one would also replicate the 'wage envy' effect as in Risager [1990] that wage increases for skilled workers trigger claims from the other workers . This 'wage-wage' spiral could be especially present *at the firm level* because of say: - less asymetric information about wage distribution *inside* a firm than *across* firms; - and firm-specific human resources policies which aim at facilitating adhesion to corporate strategy, by closer notion of *fairness in wage attribution* (see e.g. , Porter [1980]).

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[6] The reason for underinvestment in sunk assets comes from the fact that some part of the quasi-rents generated by such investments accrue to unions in collective bargaining. For evidence of this underinvestment in R&D, see Connolly, Hirsch and Hirschey [1986] .

[7] R&D revenues may also accrue to common workers, but we will see in the empirical analysis that the effect of strategic underinvestment is not apparent for those workers, possibly because the effect already works through the channel of the 'wage envy' effect.

- *Thirdly*, allowing for risk-aversion provides more flexibility for the support of the efficient bargaining model in that one may question *why unions should be qualified only as rent-maximizers especially when an industry is not competitive* [8] . The fact is that when an industry is non competitive, level skills are no longer 'general' (Becker [1975]), but become more specific, and the more concentrated the industry (see Heywood [1986]). From this, one would infer that: - risk aversion possibly increases with industry concentration; - ceteris paribus, higher skilled labor becomes more risk-averse when their skill specificity entails greater search costs to find outside position in the industry.

To anticipate, our data reveal that sectors under study behave quite heterogenously, with the possibility of wage being bargained *off* the labor demand curve . Asymetric power in redistribution is also present as the consequence of either low bargaining strength by 'common' (or 'unskilled') workers, or poor preferences towards jobs by 'higher-quality' employees. Also, because two separate unions bargain twice over the firm revenue, possibility arises that union power *as a whole* increases, precisely as a justification of bargaining separately.

The paper reads as follows: section 2 presents the analytical model, while section 3 deals with the econometric issues. Section 4 states the main conclusions .

2. AN EFFICIENT WAGE BARGAINING MODEL

A. General background:

Our bargaining model considers a (short-term efficient) bargaining over both wage and employment, given the level of capital , R&D and physical equipment alike. Levels of R&D and physical capital are assumed decided unilaterally by the firm, *but before* negotiations takes place concerning both wages and employment, in order to reflect the stylised fact that capital is generally less flexible than wages (and employment).

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8 For evidence of oligopolistic conduct in some of the industries considered in the empirical part of this study, see Bughin [1991b].

At this point, it is important to note that we do not explicitly model the first stage of the game which relates to the investment decisions, but we keep in mind from other works (see e.g. Grout [1984]) that unbinding contracts may lead to strategic inefficiency by the firm. In this context, a correlation may be distinguishable between the bargaining power of the union and the *'ex post'* investment level, since with underinvestment, a higher investment level stands ceteris paribus for a lower power by the union in extracting sunk revenues. This correlation between union power and investment levels will be considered latter in the econometric study of Section 3.

Further, bargaining is assumed at the firm level, but wage reaction is also possible to represent interaction among bargaining units [9]. Also, we assume skills heterogeneity of the two groups of workers to be large enough so that each group is used in a *sufficiently* complementary way for the firm i production, Yi [10].

B. The principle of separate unions:

Consistent with the Horn and Wolinski [1988] principle which states that *it is strategically relevant for (sufficiently) non-substituable workers to form distinct unions*, we will assume two unions, UNic [for common workers] and UNit [for technological workers], which bargain *each distinctly with the employer , i.* Being separate , unions acts non cooperatively, so that wage interdependence appears already under the form of a 'wage rivalry' effect.

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[9] The approach with bargaining unit at the firm level is more general than one which directly postulates an industry-wide union. Indeed, consider the conjectural variation parameter ϖ viz wages. Only a value of ϖ=1 for all firms implies that firm wages move together, that is, one faces the case of a centralized union which negociates an uniform wage at the industry level (see Dowrick [1989]).

[10] We might justify that assumption, based namely on the works by Charos and Simos [1988] that Human Capital and Labor are found poorly (and not significantly) substitutes in a translog profit equation for the whole US economy. Experiments we performed with a translog function based on Belgian manufacturing firms tend a priori to confirm those results.Further, our results (see section 3) *suggest that separate unions at the skill level may well increase the bargaining power of workers above what they could get by merging into only one union.*

C. The surplus to be shared in the bargain:

Note that whatever the wage bargaining model it is postulated, this should predict that wage premium depends on the *interaction of labor union strength and profits*, since workers are only able to push up their wages without bankrupting the firm when the firm earns some surplus. Assume thus that the firm sets output, Yi, or price Pi, such that the firm price-cost margin (gross of capital costs) , PCMi, is expressed as follows, given input prices:

$$PCMi = F([X]i, Yi) \quad (1)$$

where: - the vector [X]i captures structural and behavioral conditions in the product market, such as market share, product differentiation, inter-firm collusion and the elasticity of product demand [11];- and Yi enters as an argument to combine technological (R&D) and scale effects (see Dowrick [1990]). This price-cost margin may also fluctuate along the business cycle as suggested by Sneessens [1987], or by Domowitz et alii [1987]).

The profit function , given exogenous costs is written:

$$\Pi i = PCMi \cdot Ri - Fi \quad (2)$$

with: - Fi are fixed costs associated with production; - and Ri stands for firm revenue, that we can write alternatively under the form:

$$Ri = Pi \cdot f(Lic, Lit) \quad (3)$$

where: - firm i faces a short-term production technology of the form f ; and Li = Lit + Lic is the total level of employment with Lic being the level of common workers employment, and Lit, the employment level of technological workers .

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[11] As an example, consider a homogenous oligopoly facing an inverse demand function with absolute price-elasticity of $1/\eta$. Then firms expected to play a static Nash quantity-setting game get an economic surplus which is the product of a common industry parameter, η, and a firm-specific market position, $[Yi/Y]$ (for all i) , where Y is aggregate industry supply.

D. Agents' utility functions:

In what follows, we assume the firm to be risk-neutral, so that its utility level, Vi, matches its profit function, Πi.

On the other hand, each union's utility is assumed of the general form:

$$Uij = Uij\,(Wij,\ Lij/Uaj) \qquad (4)$$

with j= c,t and where Uaj is a measure of the best alternative wage bill opportunities.

(4) is simplified to the utilitarian objective (see e.g. Svejnar [1986]) [12] :

$$Uij = Lij.\ [Wij^{\delta j} - Waj^{\delta j}]^{\frac{1}{\delta j}} \qquad (5)$$

where δj is a parameter reflecting attitude towards risk, that is, the relative importance workers attach to employment *versus* wages.

E. *Nash as the bargaining concept:*

As a bargaining solution, we adopt a generalized Nash bargaining equilibrium in which the players (that is, each union taken separately and the firm) act *as if* they maximize a geometric mean of their own maximand utility, the weights being given by their respective bargaining strength in the negotiation. The outcome gij* [*with j is either c or t*] is written:

$$gij^* = \underset{Wij,Lij}{\arg\max}\ [Uij-\underline{U}ij]^{(\beta ij)} \cdot [Vij-\underline{V}ij]^{(1-\beta ij)} \qquad (6)$$

where: - $0 < \beta ij < 1$ and $(1-\beta ij)$ represent the 'bargaining power' of the union UNij and of the firm respectively; - Uij is the union utility given by (5) ;

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12 This commonly used utility function has the advantage of analytical tractability over some more complicated forms (see Bean and Turnbull [1988]).

- Vij is the firm surplus over which the union j will bargain, *given* the rent extraction by the other union; - and $\underline{U}ij$, $\underline{V}ij$ represent the respective 'statu quo' positions.

Based e.g. on the work by Binmore et alii [1986], the 'statu-quo' points in the asymetric Nash bargaining solution (6) should be distinguished from the 'threat point' , that is , the outside option that appears to each party if the bargain breaks down. Rather, the 'statu-quo' should be identified as the income streams accruing to each player as a consequence of *not reaching an immediate agreement*.

However, if we assume that there exists a point in time from which it becomes credible for the parties to stop any negotiation for bargaining agreement, it seems wiser to match more closely the outside option with the 'statu-quo' points (see Barth [1989]).

Assuming thus for simplicity that no strike payment are available during a strike and unemployment benefits are negligible, we may interpret the level of utility $\underline{U}ij$ as each party outside option, an interpretation which implies that $\underline{U}ij$ is set to zero in (6).

Turning now to the meaning of $\underline{V}ij$, we will assume that because of sufficient complementary between the two groups of workers, the firm cannot produce with one union workers when it reaches no immediate agreeement with the other group, but it is always able to lay off the workers for the other union all the time of the dispute [or , altenatively, and more plausibly, the firm is able to rent the services of its other skilled workers to outside firms for the same wage bill]. Those assumptions lead to a definition of the firm fall-back utility which is the same for either union, and stands for minus the cost of the fixed capital; hence, we find back the idea that with sequential bargaining, the firm and the union bargain over the *gross* margin only.

We thus have:

$$\underline{U}ij = 0 \text{ for } j = c, t \text{ (and for all i)}$$

$$\underline{V}ij = Vi = -Fi \qquad \text{(for all i)} \tag{7}$$

Given the equations (2), (5), and (7), (6) becomes written :

$$gij^* = \arg\max \left[Lij. \left[\frac{Wij - Waj}{(\delta j)}\right]^{(\delta j)} \right]^{(\beta ij)} . \left[Ri - Wij. Lij - Wik^*. Lik^* \right]^{(1-\beta ij)} \quad (8)$$

$k = c$ when $j = t$, *and* vice versa;

with the peculiarity that [Wik*. Lik *] is the *bargained* wage bill obtained by the other union. *Wage interdependence* (see Gylfason and Lindbeck [1984]) appears here because the solution of one bargain is influenced by the other bargain with the employer [13]. Other forms of wage interdependence will be discussed later on.

F. Nash solution with risk-neutrality:

To highlight the main aspects of the bargaining solution, we assume now that δj's (j =c, t) are unity, that is, workers are risk-neutral and act as pure rent maximizers (Abowd [1985]). [This assumption will be relaxed later on].

With risk-neutrality, each labor contract curve is vertical and the outside option matches the marginal revenue product of labor (see Svejnar [1986], Bughin [1991b]). Focusing on the bargained wage for the union representing the common workers, first-order conditions for the wages is (with the firm subscript omitted for convenience):

$$\delta \text{ Ln } gc/ \delta \text{ LnWc} = \beta c. [1/ Wc\text{-}Wac] - (1-\beta c) [Lc^* / (PCM^*. R^*)] = 0 \quad (9)$$

or:

$$Wc^* = Wac + (\beta c/1-\beta c) . [(PCM^*.R^*) / Lc^*] \quad (10)$$

with: - PCM*, L*, W* are defined following the resolution of the bargaining between the firm and the separate unions; - and the level of employment is

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13 Note that **Ri** intervenes in the maximand whatever the union involved in the bargain. That is, firms have clearly to bargain twice over the goods market surplus, when negotiating with two separate unions (see Horn and Wolinski [1988b]).

the result of the cost minimization of labor, given input prices (and specifically, the outside option representing the wage).

What (10) essentially tells, thus, is that, depending on the bargaining power by the union, *the negotiated wage may be greater than the wage Wac which should appear should the firm have the ' right to manage' unilaterally the level of employment* [14].

Alternatively said: with *efficient bargains that allow for unions objectives that trade off employment and wages* , the 'ex post' price-cost margin PCM* is typically lower than that which could occur if costs are predetermined *on* the labor demand [as assumed for the definition of the PCM given by (1)] . Reason for labor costs entering *directly* the *'ex post'* surplus is the manifestation of extraction by workers in enforcing employment contracts, the idea being simply that firms are forced not to set a too high price in order to respect the employment contract with their union workers.

Because 'ex post' price-cost margin PCM* is *endogenous* to the wage , one could also write (10) in other equivalent ways. Remembering that Wac matches the marginal revenue product of labor, one may write:

$$Wc^* = Wac + (\beta c/1-\beta c) \,.\, [(R^* - Wac.Lc^* - Wt^*.\, Lt^*) \,/\, Lc^*] + (\beta c/1-\beta c) \,.\, [Wc^* - Wac^*] \qquad (11)$$

or:

$$Wc^* = Wac + (\beta c) \,.\, [(R^* - Wac.Lc^* - Wt^*.\, Lt^*) \,/\, Lc^*] \qquad (12)$$

or:

$$Wc^* = (1-\beta c).\, Wac + (\beta c) \,.\, [(R^* - Wac.Lc^* - Wt^*.\, Lt^*) \,/\, Lc^*] \qquad (13)$$

that is, bargained wage for one union is a convex set of its outside option and the firm revenue (with respect to union employment) *but from which the bargained wage bill from the other union is already extracted.* Hence, wage interdependence is found back in the sense that the higher the claim by one union, the lower the surplus for the other, and the more likely the firm be aggressive in its negotiation.

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14 This feature of the efficient bargain is that which is used by Mc Curdy and Pencavel [1986] to test efficiency against the alternative of the traditional labor demand curve.

Performing the same analysis for the derivation of Wt, one finds of course:

$$Wt^* = (1-\beta t).\, Wat + (\beta t)\,.\,[(R^* - Wc^*.\, Lc^*)\,/\,Lt^*] \qquad (14)$$

and combining the two wage equations, one finds the 'reduced-form' bargained wages, Wc* and Wt*:

$$Wc^* = [(1-\beta c)/(1-\beta c.\beta t)]\,.Wac + [(\beta c - \beta c.\beta t)/(1-\beta c.\beta t)]\,.\,[R^*\,/\,Lc^*] + [(\beta c.\beta t - \beta c)/(1-\beta c.\beta t)]\,.\,Wat.\,[Lt^*/Lc^*] \qquad (15)$$

$$Wt^* = [(1-\beta t)/(1-\beta c.\beta t)]\,.Wat + [(\beta t - \beta c.\beta t)/(1-\beta c.\beta t)]\,.\,[R^*\,/\,Lt^*] + [(\beta c.\beta t - \beta t)/(1-\beta c.\beta t)]\,.\,Wat.\,[Lc^*/Lt^*] \qquad (16)$$

which are dependent not only on the outside option and the ratio of revenue to (specific) employment as this is the case for one union bargaining with one firm , *but also on the relative union employment as the manifestation of the wage interdependence* [15].

G. A more general solution:

The solution (10) and the other equivalent forms just discussed above postulate risk-neutrality for the firm and the workers. Relaxation of risk-neutrality is discussed now to match closely to the utility function expressed by (5).

With δ not restricted to unity, the bargained wage Wij* is such that it verifies:

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[15] Note that the last term in (15) and (16) is negative, hence revealing the rivalry effect among unions. Also , as expected, the last term is greater (in absolute value), the greater the outside option , the bargaining power and the employment of the other union.

$$\frac{W_{ij}^{\delta_j} - W_{aj}^{\delta_j}}{W_{ij}^{(\delta_j-1)}} = \frac{(\beta_{ij}.\,\delta_j)}{(1-\beta_{ij})} \cdot \frac{[R^* - W_{ij}.L_{ij}^* - W_{ik}^* - L_{ik}^*]}{L_{ij}^*} \qquad (17)$$

$k = c$ when $j = t$, *and* vice versa;

which, in term of level of employment, L_{ij}^*, being the left-hand side variable, becomes:

$$1/\,L_{ij}^* = [W_{ij}^*/\,(R^* - W_{ik}^*.\,L_{ik}^*)] + [(1-\beta_{ij})/\,(\beta_{ij}.\,\delta_j)] \cdot \frac{[W_{ij}^* - W_{ij}^*.\,(W_{aj}/W_{ij})^{\delta_j}]}{R^* - W_{ik}^*.\,L_{ik}^*} \qquad (18)$$

$k = c$ when $j = t$, *and* vice versa;

while, the bargained level of employment equation is precisely given by (13)-(14) when expressed with the wage as the left-hand side variable, and with the further implicit assumption that Wa's match the respective marginal revenue product of labor.

Hence, it follows that the simultaneous system of wage and employment equations provided by (18) and (13)-(14) provides the clues for comparing the bargaining power and risk-aversion of the two unions groups. The bargaining power measuring the maximal rent available to each group *along* its contract curve, the *shape* of this being determined by the coefficient of risk-aversion .

The model estimation is now being discussed:

3. ESTIMATION

A. The basic econometric model:

The econometric model is composed of four structural equations (the subscript i omitted for convenience):

$$1/\,Lc = [Wc/\,(R\text{-}Wt.\,Lt)]^{\delta c} + [(1-\beta c)/\,(\beta c.\,\delta c)]\,.\,\frac{[Wc - Wc.\,(Wac/Wc)]}{R\text{-}Wt.\,Lt} \qquad (19)$$

$$1/\,Lt = [Wt/\,(R\text{-}Wc.\,Lc)]^{\delta t} + [(1-\beta t)/\,(\beta t.\,\delta t)]\,.\,\frac{[Wt - Wt.\,(Wat/Wt)]}{R\text{-}Wc.\,Lc} \qquad (20)$$

$$Wc = (1-\beta t).\,Wac + (\beta t)\,.\,[(R - Wt.\,Lt)\,/\,Lc] \qquad (21)$$

$$Wt = (1-\beta t).\,Wat + (\beta t)\,.\,[(R - Wc.\,Lc)\,/\,Lt] \qquad (22);$$

with alternatively, (21)-(22) estimated by (13)-(14).

Before estimation, we discuss: - the definition of the alternative wages (that is, Wac and Wat); - the possible response of the bargaining power β parameter to exogenous changes in the bargaining environment : - and the status of the variables included in the model. Before these points, however, we discuss the data set available for estimation.

B. The data:

The model is estimated on Belgian data from the S.P.P.S., on a pooled cross section-time series (balanced) data of 176 manufacturing firms in four years (1979, 1981, 1983, 1985) at the three-digit-NACE-code level [16].

Data on financial measures such as the total wage bill, revenue, added value or the debt ratio are available *at the firm* level, while employment (disaggregated into R&D workers and common workers) is available *at the plant* level as are data on R&D which are split among operating expenses (namely, wages) and investment expenses. To obtain the employment of each group, we aggregate the employment data at the plant level , while wage bill for R&D people is assumed the aggregation of R&D operating

16 The NACE coding is a general systematic industry classification. The classification is also used in Veugelers' [1989].

expenses at the plant level, and wage bill for other workers is simply the balance of the aggregate wage bill minus the wage bill for R&D workers.

Data building depends thus on the assumption that R&D operating expenses is mainly composed of labor bill for R&D workers, so that results which follow should be interpreted accordingly, that is, *under the caveat that the unit wage variables suffer from measurement errors.*

Finally, concerning industry variables (see infra) , the data are from IRES , while the variable proxying the average degree of capacity utilization rate is from the N.B.B. [17].

C. The alternative wage measures:

Before discussing how the alternative wage is measured, recall that equations (21)- (22) [or (13)-(14)] follow from the implicit assumption that the alternative wage matches the concept of marginal revenue product of labor - *an assumption which is only valid when one imposes union members risk neutrality.* Replacing the alternative wage by the concept of marginal revenue product of labor in (21)- (22) corrects the whole system, while the benefit to this correction has to be balanced by the cost of specifying the adequate production technology.

Here we have preferred to adopt the short-cut of specifying (21)- (22) with the alternative wages, Wa's, and results hereafter are to be interpreted under this potential caveat [18].

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17 Data on concentration measures have been made available by J. de Maegd at IRES.

18 It is worth noting that our strategy amounts to *reinforcing* the assumption that union power in wage and employment fixation is the same (refer to footnote 2 supra). To see this, assume one union which is rent maximiser, that is, its utility function is utilitarian of the form :

$$U = (W - Wa).L.$$

Note τ the union's power in wage negotiations, and η its power in employment bargaining. Then bargained wage is given by :

$$W = Wa + \tau. R/L ,$$

while negotiated employment level is such that:

$$W = R'(L) + \eta. R/L.$$

Turning now to the measure of the alternative wage concept , we proxy it by the *industry wage* outside the firm should negotiations fail to coordinate the workers and firm desired sharing of surplus.

Evidently, the *attractiveness* of the outside option will depend of a number of factors; one may quote: the level of the industry wages, the probability of employment, the distance to other firms , the organizational climate, and so on. For, of course, the identification of such factors requires additional theoretical analysis which is beyond the scope of this paper, we rather assume that the alternative wage for a union dealing with an industry firm is a linear function of the industry r to which the firms belongs, that is:

$$Wajr = \alpha jr \, . \, W\hat{} \, r \qquad (23)$$

where: - Waj, α j , W^ are each function of the industry r to which the firms belong [19] ; - α j is function of the workers skills j with the 'a priori ' that : α j <=1. [20]; - and W^ is (average) industry wage.

It is easy to check that within this more general model *à la Manning* [1987] , **Wa** is related to **R'(L)** by:

$$\mathbf{Wa} = \mathbf{c}.\mathbf{R'(L)} + (1-\mathbf{c}).(\mathbf{W}),$$

where $\mathbf{c} = \tau/\eta$.

Since , say, in the case where **c** <1 , which implies greater relative power in employment, we find that **Wa** > **R'(L)**, it follows that using **Wa** instead of **R'(L)** in the employment equation, makes the 'correction' towards the equality of τ and η, that is, towards the *imposed structure of a pure efficient bargaining model*. Of course, by such a procedure, we bias towards the *acceptance* of the efficient bargaining model as compared to a more general model where union power is different according to the variable under negotiation. This however is not our purpose in this paper as we *do not test* for the efficient bargaining model as in Alogoskoufis and Manning [1991], but we rather impose it as the underlying model of negotiation.

[19] Because of available data at the business line , we face the possibility of firms diversified at the three digits Nace level. As a rule of allocating firms to specific industries, we adopt the strategy that a firm belongs to the industry of the business line with the highest turnover.

[20] The a priori constraint may be rationalized by considering that the attractiveness of the sector depends mainly on the probability of employment. Since this probability is always lower than 1, we expect of course that $\alpha j <= 1$.

Adopting such a specification for the alternative wage is not only common in the bargaining literature. It also creates some linkage (or interdependence) between decentralized and industry-wide bargaining (see footnote 9), a typical feature indeed of the Belgian labor market, where bargaining is strongly organized by sector (see Veugelers [1989]) [21].

Further, because Waj's appear in the employment equations [19] and [20], one may provide evidence as to the rejection of the labor demand bargaining model since a significant impact of the alternative wage in the employment equation is sufficient to reject the traditional (static) labor demand model [22].

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21 Remind that the characterization of high degree of industry-level bargaining for the Belgian economy does not mean that specifying a model at the firm level is inappropriate. Rather, and as explained in footnote 4 above, our strategy allows to more general conjectural variations as to how firm wages react to each other, which the a priori reasoning in this case that the conjectural variation is close to unity. Besides flexibility in the estimation, one reason why we may expect the average firm conjectural variation to be different from unity is that employment, *which is one interdependent object of bargain in the efficient model*, is rarely negociated at the industry level, but rather depends on the firm characteristics, and work practices.

22 Strictly speaking, the absence of the alternative wage in the employment equation is sufficient to reject the right-to-manage model of bargaining either when no adjustment costs appear to the optimal employment level, or when adjustment costs prevail if the wage and employment paths are negotiated forever at the time of bargaining (see Clark [1986]). In the case of adjustment costs with no commitment,however, the alternative wage may enter in the dynamic labor demand equation as stressed by Lockwood and Manning [1989].

D. The determinants of bargaining power:

Instead of estimating each βj as a parameter, we may expect it to vary according to the economic bargaining environment. As no theoretical consensus exists in the literature as to the actual functional form and the variables influencing the bargaining power βj, we postulate a simple linear relationship with the following variables [23]:

$$\beta c = \beta c0 + \beta c1.\,[\,CPI^{*}B] + \beta c2.\,IDUC + \beta c3\,.\,[R\&D/\,PR] + \beta c4.\,Wt + \beta c5.\,DR + \beta c6.\,H + uc \qquad (24)$$

and:

$$\beta t = \beta t0 + \beta t1.[\,CPI^{*}B] + \beta t2.\,IDUC + \beta t3.[\,R\&D/PR] + \beta t4.\,Wc + bt5.\,DR + \beta t6.\,H + ut \qquad (25);$$

where: - CPI is the consumer price index; - IDUC is the industry capacity utilization rate (measured at the 2-digits level); - DR is the firm debt ratio; - R&D/ PR is the ratio of nominal level of R&D *investment* expenses to the nominal revenues from patents; - H is the industry Herfindhal index (measured at the 3-digits level) ; -and B is a dummy variable which takes one before 1983 and attempts to account for the prices control which occurred in Belgium after the 1982 Belgian Franc currency devaluation.

The inclusion of the variable CPI is evident , as it attempts to check whether unions are more able to extract rents in periods of high inflation; this variable is also used in Svejnar [1986] . IDUC attempts to control for the effect of the business cycle on each βj; we expect the effect to be positive as a low IDUC means a lower price-cost margin (see e.g. Sneessens [1987]), and hence, a lower surplus which makes the firm more aggressive in negotiation [24].

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[23] Based on the works by Binmore et alii [1986] , Jackman et alii [1991] stress that in a time-preference model of bargaining, the relative power of the union as compared to the firm depends on the relative discount rate of the future by the firm and the union. The question remains as to how characterize the factors influencing those discount rates, while further, the time preference model of bargaining is only one explanation of the Nash bargaining outcome.

[24] The 'threat point' for the firm is the point where it makes non-positive long-run profit, since at this point the firm is no longer rentable. The threat point being greater than the 'statu-quo' point,

The DR variable is included following the idea that firms have interest to increase the probability of bankruptcy in order to diminish the quasi-rents accruing to the bargainers. One then expects that the higher the debt ratio, the lower the union bargaining power as the debt ratio creates a constraint on the maximal rent to be extracted by the union.

The justification concerning the inclusion of the ratio of R&D expenses to patents revenues is to be found in the theoretical presumption that strategic investment deterrence may be optimal *because* wages rise more with the R&D capital stock. With *ex post* data on R&D, the correlation between wages and R&D should reflect the combined effect that wages increase with R&D and that optimal R&D is deterred by wage rent seeking. Without proper instrumentation of the R&D variable, the sign is a priori ambiguous because of simultaneity bias, but what we may infer from the estimate is that the correlation is biased downwards when the deterrence effect is present in the data [25], [26]. Hence, as an analysis of the deterrence effect, we will e.g. compare the correlation between R&D and wages with- and without -instrumentation, with the idea that a more positive correlation with- than without instrumentation reflects the possibility of union deterrence on investment.

The Herfindhal index attempts on its hand to control for the stylized fact in industrial economics (Schmalensee [1989], 'stylised fact 4.11') that the more concentrated the industry, the more powerful are the industry competitors .

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possibility arises that it becomes binding (see Scaramozzino [1991]) so that it should influence negatively the βj's as being expressed as the share coefficient *between the original surplus and the statu- quo point*.

25 Specifically, the ratio of R&D expenses to patents revenues is used because patents protection reduces firm vulnerability to union sharing. Indeed, the markets for patents allow transfers of R&D assets at optimal (non-union) value (see Connolly et alii [1986]). Another reason of using that ratio is the consequent reduction of collinearity between R&D and the Herfindhal index.

26 Based on the argument that unions deter investment, one should also incorporate a measure of the physical capital as a measure influencing the union bargaining power. This is not done here due to lack of adequate data for measuring the stock of physical capital. Further, the theoretical presumption that union deter investment because wages rise more with the physical capital stock does not seem supported by the empirical evidence (see e.g. Wadhwani and Wall [1989]).

We thus expect that a higher Herfindhal should lead to a lower bargaining power for the union due 'ceteris paribus' to lower firm monopoly rents.

Finally, the other union wage on one union bargaining strength is included in order to test for another wage interdependence under the form of a 'wage envy ' effect. With the model above which postulates separate unions, we have assumed away any form of coordination because of the non-cooperative nature of the game. Further, as explained in Horn and Wolinski [1988a], positing that one union bases its threat on the other union wage is suspect *theoretically* because the union threat is not credible. However, as far as some form of (weak) substitution is present among skills and dynamics is taken into account , the *empirical* model should attempt to integrate some possible collusive benchmark among unions which prevent them to wage wars and smooth the pure rivalry effect. We thus expect : $(\beta c4, \beta t4) => (0,0)$ [and $\beta t4 <= \beta c4$ to get a stable solution [27]].

E. The variables status:

One important aspect of estimation is how we qualify the status of the R.H.S. variables in the model.

Contrary to Svejnar [1986] and Veugelers [1989], we have assumed that in addition to wage and employment , price-cost margin in the model version with equations (13)-(14)) [say, revenue in the model version with equations (21)- (22)] *is endogenous* to the model. Reason for endogenizing price-cost margin has been already discussed; reasons for endogenizing revenue seem also immediate: - first , as long as effort is introduced in a standard bargaining framework, one may infer that the greater the union power, the lower the effort by workers, and hence, the labor productivity (Haskel [1990]) ; - second, as far as a short-term oligopolistic structure is postulated on the goods market , higher contract employment may change the output market price, depending on the conjectural reactions of competitors, and the cost and output demand functions (see Dowrick [1989]).

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[27] This condition is consistent with the common empirical fact that wage increase runs from skilled to unskilled labor. For a theoretical rationale, but in a different context, refer also to Myles and Naylor [1990].

For least squares estimation of equations (24) and (25) [28], Hausman tests of exogeneity have allowed us to qualify the utilization capacity, consumer price and Herfindhal index variables as exogenous. Some endogeneity is found for the R&D/PR ratio, suggesting already (but see hereafter) some evidence of R&D being influenced by the union power in wage and employment bargaining.

As instruments for the endogenous (R.H.S.) variables of each model , we have systematically used their own two- lagged value [29], and all the exogenous .

F. Estimation results:

Results are presented per industry sector, for there is a lot of evidence that wages determinants differ between industries (see e.g. Krueger and Summers [1987]).

Industries considered in the study are :

- chemicals (NACE codes 14-18-25 [except pharmaceuticals 257]);
- food products (NACE codes 41-42);
- rubber products(NACE code 48);
- electrical, mechanical and instruments engineering (NACE code 34);
- metal products (NACE codes 20-21);
- textiles, leather and clothing (NACE codes 43-44-45).

Aggregation is based on preliminary results and heavily depends on available degrees of freedom for estimation convergence. For deeper discussion, see Bughin [1991a].

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[28] Equation [24]-[25] are estimated by least suares under the premise that the left-hand side variables βj's for each firm are derived from (26), replacing **Waj** by (23) where αj is the 3SLS estimate of the complete model under the assumption that bargaining power β are parametric across firms and time.

[29] Values at two lags were considered because of first-order correlation in the residuals.

Industry estimates by Non linear Three Stage Least Squares (NL3SLS) of the four simultaneous model given by (19) to (22) are reported in Table 1 for each union group.

Comparing column 1 and 3, the pattern emerges that bargaining power is greater for 'R&D workers' than for 'common workers'. The only exception being for metal products, but one will notice that the βt estimate is not significant at traditional risk level.

Such a pattern is slightly at odds with Veugelers ' study [1989] on 1978 Belgian industry manufacturing data, which concludes on the opposite proposition that blue-collars extract more rents than white-collars. Beyond some divergences between that study and ours (as explained in the introduction) , one possible reason for such a divergence comes from the non imposition of risk neutrality in this study. Clearly, risk-neutrality is rejected by the data for both 'R&D' and 'common' workers, with the peculiarity that 'R&D' workers are on average less risk-averse , possibly because of better outside jobs opportunities [30].

Further, separate bargaining by skill levels tends to lead to greater whole surplus extraction by the unions, providing ex post rationale for the fact that bargaining unit is decentralized (even implictly) at the skill level (see Risager [1990]). To confirm this, one will note that in reliance upon (13)-(14), rent extraction for one specific union j , is given by:

$$[Wij^* - Waj].\ Lij^* = [\beta j/(1-\beta j)]\ .\ \Pi i^* \qquad (26),$$

so that *observed* profit is linked to 'ex ante' profit, by:

$$\Pi i^* = \Pi i - [\beta c/(1-\beta c)]\ .\ \Pi i^* - [\beta t/(1-\beta j)]\ .\ \Pi i^* \qquad (27)$$

Accordingly, and taking for example the chemicals industry, one may easily check that (provided risk-neutrality) about 50% of surplus is appropriated by

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30 An estimation problem even arises in the case of the engineering industry for the relative risk-aversion parameter implies significant risk-loving. Within the context of a constant risk-aversion, this also implies that the utility function is no longer concave, so that the second-order for optimization must be investigated further as to check for a maximum.

the combined actions of union groups, a proportion which is greater than that found in other wage bargaining studies for Belgian manufacturing (refer again to Veugelers [1989]; and Bughin [1991b] [31]).

However, even if decentralized bargaining may seem to increase union power, results remain that in general the output rent is not divided equally between the firm and the union. Rather, firms accaparate the greater portion of rents, confirming the relevance of applying a generalized Nash-Zeuthen-Harsanyi asymetric bargain model for the Belgian manufacturing wage process.

ABOUT HERE:

Table 1:

Estimates of the bargaining power

and the relative risk aversion parameters

A final note concerns the disparities of estimates among industries, pointing to the need for examining the assertion that bargaining strength varies indeed with shocks.

The Table 2 addresses this issue by estimating least squares versions of (24) and (25) and by considering the ratio R&D/PR as *endogenous* in the model [32]. Estimation is corrected for heteroscedasticity .

From that table, key results are:

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[31] But is in light with Svejnar's study [1986] where the mean of estimated values for the β's at the firm level is 0.46.

[32] For obvious reasons, results do not appear for rubber products.

ABOUT HERE

Table 2:

Determinants of union bargaining power

- (when significant) a positive impact of inflation on the bargaining power. This positive correlation indicates that unions succeed in raising their share in inflationary period, a result also found by Svejnar for the U.S. One possible could be institutional, but one could also think that in the presence of adjustment costs, the speed of prices to their equilibrium values is reduced with oligopoly power (see e.g. Ginsburgh and Michel [1987]);

- a positive impact of IDUC on bargaining strength, implying that firms are less aggressive in periods of booms than in periods of recession. One reason for such a fact is that unanticipated recession increases capital obsolescence and reduces monopoly profits (Bresnahan and Suslow [1987]), leading the firm to being more aggressive in wage negotiations (see Scaramozzino [1991]). Unfortunately, the variable is rarely significant at the firm level, due - one conjectures- to its measure at the industry level.

- a kind of 'wage-wage' spiral effect is found in the estimates, with the skilled wage pushing the unskilled wage. The 'wage envy' effect is however small and poorly significant, for the convergence of wage differential among skilled may be already tackled by the outside industry wage in the complete model;

- when instrumented, the ratio of R&D investment expenses to patents revenues is rarely significant, although generally positive when it impacts in a significant way the level of wages. It is interesting to see that the effect of the R&D ratio on the 'common workers' wage is never significant, suggesting that the *direct* effect that wages rise more with R&D stock only prevails for 'R&D workers'. *In*direct effects may arise however , say, through the 'wage envy' effect ;

- a depressive effect of the debt ratio on union power . This is consistent with Nickell and Wadhwani [1988], and reflects the threat of bankruptcy on the bargaining set.

- the effect of concentration measure on bargaining power suggests a negative impact , yet the results are mostly insignificant. This is consistent with Schmalensee [1989], and the empirical findings by Bughin [1991a] that concentration may increase *ex post* profits (that is, unions are less able to accaparate part of the ex ante surplus), while is at odds with Veugelers [1989]).

Concerning finally the evidence of union deterrence on R&D, we have also run the 'R&D workers' bargaining power equation (25) by treating the ratio of R&D to patents revenues as (wrongly) exogenous. Systematic lower coefficients for the R&D variable in the wage equation was found, providing *indirect* evidence of the 'deterrence effect' [33].

Rather, as *direct* evidence, Table 3 hereafter presents some estimation results originating from a two-equations model composed of [25] and a structural equation which relates R&D/PR to some variables by the form:

$$R\&D/PR = Fc\,(\,IDUC, IR\&D\,, H, LVA, ES, \beta) \qquad (28)$$

where: - IR&D is the average industry R&D to which the firm belongs , and is included as a measure of research opportunities; - LVA is (the logarithm of) value added as a measure of the Schumpeter size effect; -ES is a measure of the firm export share to control for different market returns in the home and foreign activities; - and Fc has been assumed linear [34].

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[33] On average, the estimated coefficient for the R&D variable has reduced by one-third, in the 'R&D workers' equation for the industries where a positive and significant correlation has been found with proper R&D variable instrumentation.

[34] The included variables are traditional of the empirical literature on the firm R&D determinants (see Bughin [1991a] and the references therein).

ABOUT HERE

Table 3:

The effect of union power on R&D activity

While fairly standard, the equation [28] now includes the potential effect of the bargaining power β on R&D. While poorly fitted, the equation reveals that, when significant , *β indeed reduces R&D*, providing some clues for the argument that powerful unions may inhibit R&D activities . This remains in light with other empirical findings (see Connolly et alii [1986]; or , *mutatis mutandis* , Entorf and Pohlmeier [1990]), and stresses for the need in further studies on the R&D determinants to control for this 'deterrence effect' [35] .

Of course, the results given in this latter table are only illustrative as the R&D equation remains to be better specified. However, an important aspect of the results are their consistency with the 'union deterrence hypothesis': one generally finds that this is *because* wages increase with the R&D stock - e.g., a significant positive correlation is found between the left-hand side wage variable and R&D in Table 2- that union power significantly reduces R&D activity by the firm [36].

4. CONCLUSIONS

Using firm data, this paper has analysed wage differentials across skills within an asymetric Nash bargaining model. Based on the principle of separate union group for 'R&D' workers and 'common' workers, the paper has formulated a structural model of efficient bargain, which accounts for 'wage rivalry 'effect, and allows for general risk aversion. 'Wage envy' on its hand has been introduced from the definition of the outside alternative

[35] Recall from early equations in the model that β may be correlated with some of the common R.H.S. variables influencing R&D decisions, so that the omission of β may lead to improper inference concerning the impact of those traditional variables on R&D, if the correlation with β is important.

[36] An exception is the food industry where β influences negatively the R&D ratio in Table 3, while β is not caused by R&D in Table 2.

wage and through the dependence of one union bargaining strength on the other union wage.

The empirical findings on a pooled cross section-time series balanced data for some Belgian manufacturing industries reveals the importance of the R&D activity as a strategic use for firm growth, as bargaining union power is significantly higher for 'R&D' people than for 'common' workers. Also, 'R&D' workers tend to be less risk- averse, while risk-neutrality has to be rejected for all sectors, casting some doubt on empirical models (Veugelers [1989], Bughin[1991b]) which a priori impose unions to be pure rent maximizers.

Data seem to confirm that the modelling strategy of separate unions is not restrictive as separate unions are more able on a whole to extract oligopoly profits , yet unions gain less than the 'split the difference' outcome of the symetric Nash model.

Investigating further on the determinants of the bargaining strength, one finds some reasons that the bargaining power of either union group depends on (the fluctuation of) output market power and on the firm financial structure, positing urgent need to general equilibrium models which incorporate not only in their analysis the labor and the goods markets(Dowrick [1989]), but also the financial sphere.

Finally, the fact that skilled workers bargaining power tend to be reduced by underinvestment in R&D activity leads to the need of building more of strategic intertemporal models, and of thinking back to problems of efficiency in presence of any agent power in an economy.

Clearly, other investigations are needed so as to understand more deeply the effect of unions in a non competitive economy, but one result which emerges here and rejoins other studies (Svejnar [1986] or Bean and Turnbull [1988]) is that *efficient* bargaining seems a more appealing assumption to be made than to restrict labor to be negotiated in every period on the marginal revenue product curve of labor.

Accordingly, and with reference to footnotes 2 and 18 in the paper, it should be worth investigating what are the consequences *of imposing identical bargaining power in both wages and employment negotiation*, especially to analyse more deeply what are the variables which actually influence the union power. This , we hope to report, in subsequent research.

Table 1:

Estimates of the bargaining power and the relative risk aversion parameters

	R&D workers:		common workers:	
	βt	δt	βc	δc
chemicals:	0.35*	0.92*	0.14*	-2.16*
	(2.46)	(3.12)	(2.16)	(2.03)
food products	0.19*	-4.13*	0.12*	-2.79*
	(2.55)	(3.04)	(1.99)	(2.61)
rubber products	- [1]	-	-	-
engineering	0.22	3.01	0.14	1.17
	(1.46)	(1.52)	(1.71)	(0.66)
metal products	0.12	-2.92*	0.15*	-6.73*
	(1.66)	(2.14)	(2.03)	(4.01)
textiles	0.18*	1.03*	0.09*	-3.97*
	(3.12)	(2.89)	(2.18)	(1.99)

Notes:
- * = significant at the 5% risk level;
- in parentheses are (absolute) t-Student values.
- [1]: the algorithm did not converge. Estimates adjusted for first-order correlation

Table 2:

Determinants of union bargaining power

	Chemicals		Food products		Engineering	
	R&D-	common workers	R&D -	common workers	R&D-	common workers
CPI*B	0.002*	0.003*	0.000	0.004*	0.003*	0.007*
	(2.21)	(2.46)	(1.41)	(1.98)	(2.36)	(4.01)
IDUC	0.06	0.05	0.08*	0.09	0.13	0.10
	(1.01)	(1.42)	(2.06)	(1.60)	(1.02)	(1.55)
Wt	-	0.09*	-	-0.02*	-	0.004
		(2.06)		(3.01)		(1.54)
Wc	-0.01	-	0.000	-	0.01*	-
	(0.54)		(0.65)		(2.21)	
R&D	0.34*	0.02	0.12	0.08	0.66*	-0.12
	(2.12)	(1.02)	(1.04)	(1.2)	(1.69)	(0.42)
DR	-0.60*	0.02	-0.87*	-0.54*	-0.41	-0.14
	(1.98)	(0.71)	(2.67)	(1.94)	(1.06)	(1.37)
H	-0.04	- 0.02	-0.06*	-0.05*	-0.02	0.01
	(1, 53)	(1.66)	(3.05)	(3.68)	(1.77)	(0.88)
R-squ.	0.22	0.31	0.22	0.25	0.35	0.33
D-W.	1.79	2.12	1.84	1.72	2.32	2.21

Table 2 (Continued):

Determinants of union bargaining power

	Metal products		Textile	
	R&D- common workers		R&D - common workers	
CPI*B	-0.002*	0.000	0.006*	0.004*
	(2.01)	(1.17)	(2.69)	(1.97)
IDUC	0.12	0.20*	0.17	0.15*
	(1.24)	(2.61)	(1.03)	(4.21)
Wt	-	-0.01	-	0.12*
		(0.46)		(3.16)
Wc	-0.004	-	0.02*	-
	(0.98)		(2.04)	
R&D	0.28	-0.15	0.13*	0.04
	(1.12)	(0.32)	(2.94)	(0.76)
DR	-0.41*	-0.46	-1.43*	-0.98
	(1.98)	(0.71)	(2.87)	(1.64)
H	-0.04	0.00	-0.12*	-0.05*
	(1, 33)	(1.06)	(2.05)	(3.01)
R-squ.	0.19	0.24	0.24	0.20
D-W.	2.14	2.06	1.82	1.96

Notes:
- * = significant at the 5% risk level;
- in parentheses are the (absolute) t-Student values.;
- standard errors corrected for heteroscedasctity.

Table 3

The effect of union power on R&D activity

	Chemicals	Food products	Engineering
IDUC	0.0034 (1.69)	0.002 (0.64)	0.008 (1.34)
IRD	0.028* (2.64)	0.031* (2.47)	0.05* (1.94)
H	-0.019 (1.23)	0.018 (1.04)	-0.01 (1.41)
LVA	0.0015 (1.26)	0.002 (1.66)	0.001 (1.37)
ES	-0.008 (1.52)	0.003* (1.97)	-0.002 (1.08)
β	-0.001 (0.54)	-0.006* (1.94)	-0.001* (2.02)

	Metal products	Textile
IDUC	-0.0012 (0.69)	0.001* (2.12)
IRD	0.028* (2.64)	0.034* (3.02)
H	0.0198 (1.23)	0.008* (1.92)
LVA	0.0023 (1.26)	0.001 (1.12)
ES	-0.000 (1.26)	-0.002* (1.98)
β	0.002 (0.58)	-0.004** (1.69)

Notes:
- * (**) = significant at the 5% (10%) level;
- (absolute) T-statistics in parentheses ;
- T-statistics corrected for the fact that β is an *estimated* parameter (see e.g. Mc Curdy and Perncavel [1986] for the methodology);
- standard errors corrected for heteroscedascticity.

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