Timing is Everything - The Labour Market Effects of Union Wage Bargaining

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This paper analyses the labour market effects of union wage bargaining for different sequences of the employment choice and the wage bargain. The result that collective bargaining decreases (firm-level) employment in a right-to-manage setting hinges on the assumption that employment is chosen by the firm after the wage bargain ("ex-ante" bargaining). Turning this sequence upside down ("ex-post" bargaining), the firm uses employment choice as a strategic variable for the wage bargain. Employment will be equal to the competitive case and wages will be higher. Although we strictly assume right-to-manage, the timing of the bargain ensures an efficient contract.

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1 Introduction

With union coverage rates of up to 95% (see CESifo DICE (2006)), the majority of employment contracts in Continental Europe are due to some form of collective bargaining. The importance of collective wage agreements has made wage bargaining models to become a workhorse of labour economics.[1]

[1]The database EconLit gives 1648 hits for the search combination "Unemployment and Unions or Wage Bargaining".

The standard model of collective bargaining, see Cahuc and Zylberberg (2004), analyses a situation in which the firm and a union (representing some exogenous membership) bargain the wage. Subsequently the firm unilaterally chooses employment. As a result, the wage will increase in case of wage bargaining and (firm-level) employment will decrease. This labour contract is characterised by two features.

First, the contract described by the standard model is inefficient, see Leontief (1946). If bargaining is over wages *and* employment, the collective agreement could result in a Pareto improvement. This argument, however, has been questioned since we hardly observe bargaining over employment, see Oswald (1993).[2]

Second, the standard view implies that employment can easily be adjusted which dictates the timing of "ex-ante" bargaining. In highly regulated labour markets with substantial firing costs employment cannot be adjusted that quickly. Thus, there is a case for reversed timing, i.e. the firm chooses employment *before* the bargain takes place ("ex-post" bargaining).

In an innovative paper, Stole and Zwiebel (1996) analyse a model in which individuals and the firm bargain the wage after the employment choice of the firm. With "ex-post" bargaining, there will be overemployment compared to the neoclassical wage taking case. Their argument is that the firm uses hiring as a strategic device to dampen the individually bargained wage. This finding questions the results derived from the standard model of collective bargaining.

In this paper we take up the Stole and Zwiebel (1996) argument and apply it to a collective bargaining environment.[3] We analyse the labour market effects of collective bargaining for different sequences of wage bargaining and employment decisions. With "ex-ante" bargaining the collective agreement gives rise to unemployment and inefficient work contracts. These inefficiencies can be circumvented by implementing "ex-post" bargaining. This offers the firm a strategic advantage since it can use its employment choice to decrease wage demands. The economy will realise an efficient contract in this

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[2]Oswald (1993) shows that as long as the union only cares for wage increases, bargained contracts which will be on the labour demand curve are efficient. The assumption that unions do not care for employment, however, seems to be at odds with the data, see Booth (1995).

[3]Another recent application of this framework is in Cahuc and Wasmer (2001) who analyse the effect of strategic employment choices in a search model of unemployment. Similar to Stole and Zwiebel (1996), they consider individual bargaining.

setting although we assume right-to-manage. Ex-post bargaining replicates the case of bargaining over wage *and* employment without dropping the assumption of unilateral employment choice of the firm.

These results suggest that the institutional setting of the bargain are important for the wage and the employment effects of collective bargaining. Results derived in the "ex-ante" bargaining environment may turn out wrong once the timing of the bargain is changed.

2 Framework

Firms in the economy produce homogenous output using labour L according to the following production function:

$$x = L^\alpha \quad 0 \le \alpha \le 1.$$

A union covers the exogenously given membership $\bar{L}$ and bargains the wage w with the firm such that the utility function

$$U = Lw + (\bar{L} - L)B$$

is maximised. B is the monetarised value of not working. It could be interpreted as some unemployment benefit or as the value of leisure. In any case, no worker would work for a wage which is smaller than B, thus in an equilibrium $w \ge B$ must always hold.[4]

To determine the bargained wage and the associated employment, we consider two different bargaining scenarios which only differ in the timing of the employment decision of the firm (which is always unilateral, since we only consider right-to-manage) and the wage bargain between union and firm.

- Scenario 1: Union and firm first bargain the wage. After the wage agreement, the firm chooses employment such as to maximise profits. This is the standard scenario applied in the literature on the effects of union wage bargaining.

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[4]Since we only consider the partial equilibrium effects of ex-ante and ex-post bargaining, we do not attempt to endogenise this monetarised value in order to analyse the aggregate effects. We are well aware of the fact that our results do not necessarily hold for the aggregate equilibrium, see Layard and Nickell (1990).

- Scenario 2: The firm chooses employment. After this choice, the union and the firm bargain the wage. However, the firm is able to lay-off all workers in case the bargain fails. This is a novel framework, first analysed by Stole and Zwiebel (1996). Here, it is applied to union wage bargaining.

The scenarios reflect different economic environments in which wage bargaining takes place. They differ by the degree of the bindingness of the employment choice and the bargained wage, respectively. Scenario 1 stands for a situation in which the economy is characterised by binding wage agreements, but an otherwise flexible labour market in which the firm can adjust the stock of employment instantaneously. If however adjusting employment is very costly (for example due to some form of employment protection legislation), Scenario 2 will be a better description of this economy. Note that in this case wage (re)negotiations take place after the employment choice of the firm which is binding[5], at least when an agreement is reached.

Note that if in Scenario 2 the firm was able to (partially) adjust its labour force (for example due to a less strict employment protection legislation) after a wage agreement was reached, Scenario 2 would collaps to Scenario 1. In this case there would be no difference in the strategic environment between the two bargaining games. With the possibility of employment readjustment, the firm would not be able to use the employment choice as a strategic device for the bargaining game.[6]

3   Equilibrium

3.1   Scenario 1

At the last stage the firm chooses employment given any bargained wage. By standard profit maximisation, labour demand reads:

$$w = \alpha L^{\alpha-1}, \tag{3.1}$$

where we assume x to be the numéraire. At the first stage of the game, the wage is bargained. During the bargain both parties anticipate the results

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[5]In this case, as in Stole and Zwiebel (1996), the wage is non-binding and is possible subject to renegotiation.

[6]I am grateful to the referee for this point.

of the last stage of the game (i.e. labour demand). The bargained wage is found by applying the Nash bargaining solution. The Nash product reads:

$$\Omega_1 = (L(w)w + (\bar{L} - L(w))B - \bar{L}B)^\beta (\Pi(L(w), w) - \Pi(0))^{1-\beta},$$

where the outside option of the union is the value of unemployment times the exogenous membership. That of the firm is the profit when no worker is employed (which implies $\Pi(0) = 0$). The first-order condition for the bargained wage reads:

$$w = B + \left(-\frac{1-\beta}{\beta}\frac{d\Pi}{dw}\frac{1}{\Pi} - \frac{dL}{dw}\frac{1}{L}\right)^{-1}.$$

Applying the envelope theorem to the profit function and using the labour demand function, the bargained wage will be:

$$w = \left(1 - \frac{1-\alpha}{1+\alpha\frac{1-\beta}{\beta}}\right)^{-1} B, \tag{3.2}$$

which says that the wage will be a mark-up over the unemployment value B. Using equations (3.1) and (3.2), we can solve for the equilibrium wage and equilibrium employment. The union wage bargaining results in higher wages and lower employment compared to the perfectly competitive situation in which $w = B$ holds. This is the standard result from the union bargaining literature.

Denote the equilibrium wage of this scenario by w_1, the (equilibrium) profit of the firm is given by:

$$\Pi_1 = (\alpha^{-1} - 1)w_1 \left(\frac{w_1}{\alpha}\right)^{\frac{1}{\alpha-1}}. \tag{3.3}$$

3.2   Scenario 2

Again the equilibrium is found by backward induction. However, in this scenario, the wage bargain takes place at the last stage. The Nash product reads:

$$\Omega_2 = (Lw + (\bar{L} - L)B - \bar{L}B)^\beta (\Pi(L, w) - \Pi(0))^{1-\beta}. \tag{3.4}$$

In this scenario employment is *not* a function of the wage since it is predetermined at the first stage. The firm calls in workers at the first stage, employs

them and bargains the wage after this employment contract. If there is an agreement over the wage, the firm employs all the workers that have been called in at the first stage. Thus, the employment contract is binding in the sense that the firm cannot unilaterally deviate from this contract when a wage agreement has been reached. However, when there is no wage agreement, the firm can lay off all its employed workers.[7] This gives rise to what Stole and Zwiebel (1996) call a labour hold-up. As is the case in Grout (1984) who analyses the capital hold-up case, the hold-up situation in our model has interesting implications for wages and employment in the unionised economy. The bargained wage in this situation reads:

$$w = \beta L^{\alpha-1} + (1-\beta)B. \tag{3.5}$$

The wage is a weighted average of the *average* product of a worker and the unemployment value B. The weights are the bargaining power of the union and of the firm, respectively. The important difference between the bargained wage in scenario 1 and 2 is that it is a function of employment in the latter case which is due to the assumed timing structure. Note, however that if the bargaining power of the union was zero ($\beta = 0$), the wage would again equal the outside option which is obviously true independent of the timing assumption.

The dependence of the wage on employment has an important implication for the behaviour of the firm. The employment choice at the first stage affects the bargained wage at the second stage. By choosing employment, the firm has to take this strategic effect into account. The profit function, hence reads:

$$\Pi = L^{\alpha} - w(L)L$$

and labour demand is given by:

$$w = (\alpha + (1-\alpha)\beta)L^{\alpha-1}. \tag{3.6}$$

The marginal gain of employing labour is not only marginal production, but also the marginal effect on the bargained wage. As such, the marginal revenue of labour is larger in this case compared to that in scenario 1. Equilibrium employment in this "ex-post" bargaining case is hence given

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[7]If this assumption did not hold the firm could be totally exploited by the union implying a bargained wage which leaves the firm with zero profits. It does not seem reasonable to assume that the firm is not able to lay off workers in case of a dispute.

by $L = \left(\frac{\alpha}{B}\right)^{1/(1-\alpha)}$. Employment is identical to the perfectly competitive case. Moreover, equilibrium wage is given by $w = \left(1 + \frac{1-\alpha}{\alpha}\beta\right)B$. The wage exceeds that of the competitive situation. This contrasts results found in Stole and Zwiebel (1996). They argue that there will be overemployment and the bargained wage will be bid down to the outside option (=unemployment value B), see Result 5 in their paper. The difference in our model stems from the fact that the firm faces collective bargaining with a union once employment has been set. Thus, the threat points in our framework are different from that in Stole and Zwiebel (1996). This restricts the labour hold-up, implying a higher wage (and lower employment).

Denoting the equilibrium wage (determined by (3.5) and (3.6)) by w_2 yields profits in this scenario:

$$\Pi_2 = ((\alpha + (1-\alpha)\beta)^{-1} - 1)w_2 \left(\frac{w_2}{\alpha + (1-\alpha)\beta}\right)^{\frac{1}{\alpha-1}}. \qquad (3.7)$$

Using equations (3.3) and (3.7) reveals that the scenario 1 profit always exceeds the scenario 2 profit. Although the scenario 2 firm can use the employment choice strategically to decrease the wage it cannot profit from this strategic advantage. This is obviously due to the fact that the firm has to bind itself to use this advantage which increases the hold-up potential of the union. This basically resembles the overemployment result in Stole and Zwiebel (1996). Note, however that although profits decrease welfare increases.

4 Discussion

In the previous section, we have analysed two wage bargaining scenarios which have two common features. The wage is bargained between a union and a firm and the firm has the right-to-manage in the sense that it can unilaterally decide on how much labour to employ. The only difference is the timing of the wage and employment decision. This small twist, however, yields very different labour market outcomes in terms of bargained wages and employment. Figure 1 replicates the equilibria in the first two scenarios. The grey curves are the labour demand and the wage setting relation which determine the equilibrium in the economy with a standard timing assumption. Employment will be L_1 and is lower than in the competitive case. The reason for this employment decrease is the inefficiency caused by the *timing*
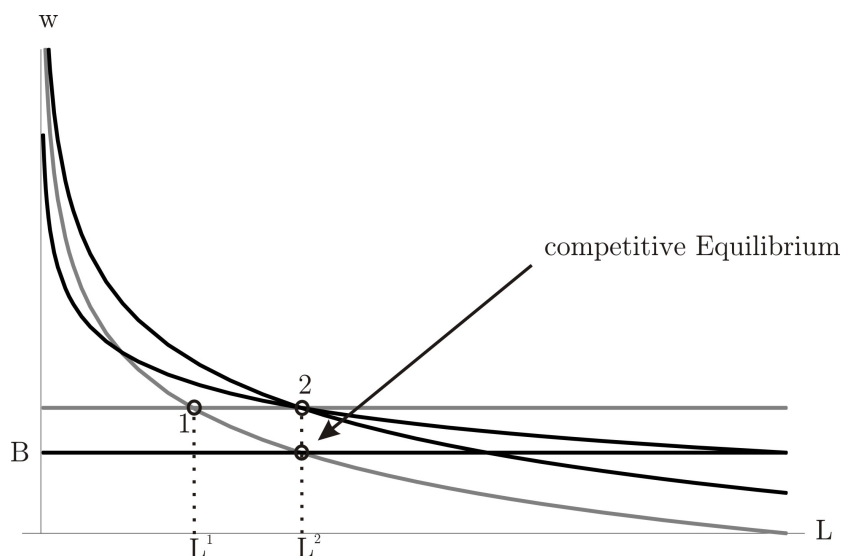
Figure 1: Labour Market Equilibria

of the wage bargain. If we reverse the timing of employment choice and wage bargaining, the economy will reach a point like 2. Employment will be equal to that of the competitive situation, but the wage will be larger than B. So by changing the timing of the wage bargain, the economy experiences an efficiency gain (compared to scenario 1). Where does this gain come from? Leontief (1946) has shown that contracts such as the one in scenario 1 are inefficient. Both parties, firm and union could gain by bargaining wages and employment, realising an efficient contract. Ex-post bargaining replicates this bargaining over wages and employment, although we consider a right-to manage setting. The firm uses its strategic advantage and chooses employment such as to maximise the size of the "pie". The bargain at the last stage only determines how the "pie" is split. This is where the efficiency gain comes from. With the standard timing assumption, the firm chooses employment such that only *its* piece of the "pie" is maximised. Both strategies have different labour market outcomes. The ex-post bargaining situation will be on a contract curve (implying efficiency) whereas the ex-ante bargaining economy will be on a neoclassical labour demand curve.

In the previous section, we have discussed that distinguishing between ex-post and ex-ante bargaining is especially important in a situation in which

employment protection legislation is very strong or in general firing costs are very high. Thus, if the economy is characterised by a high-level of firing frictions, switching from ex-ante to ex-post bargaining would imply an efficiency gain. This is a second best argument: if the labour market was already distorted by union wage bargaining, an additional distortion (for example a strict employment protection) combined with a clever institutional arrangement could increase welfare. So care should be taken (especially in a Continental European context) when reforming the labour market. Small and gradual reforms may even worsen the situation in the economy.

In the Stole and Zwiebel (1996) framework it is shown that the firm will want to overemploy compared to the neoclassical case. This is not true in our setting. This is due to the fact that the bargaining setting is different. First, the firm can only (re)negotiate with all its workers. Thus, every worker will get a fraction of the *average* product. This limits the employee hold-up. Second, the threat point of the union is much better than that of an individual worker. This again limits the hold-up. Nevertheless, we observe overemployment compared to the ex-ante bargaining situation.

5   Concluding Comments

In this paper we show that the wage and employment effects of collective bargaining depend on the assumption concerning the timing of the wage bargain relative to the employment choice. Our model suggests that unionisation does not necessarily result in lower (firm level) employment. Moreover, it offers a very straightforward way to resolve a puzzle concerning labour relations. Real world labour contracts are usually characterised by right-to-manage, although we know that bargaining over employment *and* wages is more efficient, see for example Oswald (1993) or McDonald and Solow (1981). Right-to-manage situations can result in efficient contracts as long as we have ex-post bargaining, i.e. the firm uses the employment choice to influence the bargained wage.

All results that have been derived only apply to a partial equilibrium situation. Consequences for aggregate unemployment can not be drawn directly from these results since they do not necessarily transform to the general equilibrium which is, for example characterised by endogenous alternative incomes, see Layard and Nickell (1990). Nevertheless, we think it is a worthwhile research program to analyse the general equilibrium consequences of

different timing assumptions and to investigate the robustness of policy conclusions usually drawn from the standard right-to-manage wage bargaining model. We leave these questions for further research.

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