E C O N O M I C S   B U L L E T I N

Trade unions, efficiency wages and employment

Jean−Christophe Pereau
O.E.P., Université de Marne−la−Vallée

Nicolas Sanz
ECONOMIX, Université Paris X−Nanterre

Abstract

This short paper combines three of the main theories of the labour market (the shirking, turnover cost and union−firm bargaining models) in an integrated framework to highlight the consequences of their interactions for the determination of the wage and the firm's labour demand. We show that bargaining and both efficiency wage theories are mutually reinforcing, leading to higher wages. Like Weiss (1990), Fehr (1991) and Garino and Martin (2000), we find a "backward bending" labour demand curve along which the employment level increases with the wage for some range. However, the aim of this note is to show that the negotiated wage is always located on the downward sloping portion of the labour demand curve, whatever the source of the efficiency wage effects involved.

Citation: Pereau, Jean−Christophe and Nicolas Sanz, (2006) "Trade unions, efficiency wages and employment." *Economics Bulletin*, Vol. 10, No. 4 pp. 1−8
Submitted: April 2, 2006. **Accepted:** April 4, 2006.
URL: http://www.economicsbulletin.com/2006/volume10/EB−06J20002A.pdf

1 Introduction

In recent years, the existence of a positive relationship between employment and wages has been studied in several directions, especially in imperfect competition frameworks. Indeed, Chatterjee and Cooper (1989) and Manning (1990) have respectively shown that greater competition in booms or some increasing returns-to-scale in the production technology can both lead to situations in which the aggregate demand for labour increases with the aggregate real wage. When such a labour demand curve is combined with a standard decreasing labour supply curve, the prospect of multiple equilibria opens up at the macroeconomic level. The existence of multiple equilibria deeply modifies the conclusions that can be drawn concerning the right economic policy to be driven against unemployment.

Such a positive relationship between employment and wages has also been emphasized at the firm level, in the wage efficiency literature. Weiss (1990), Fehr (1991) and Garino and Martin (2000) all find "backward bending" labour demand curves, along which employment increases with the wage for some range. The shape of the labour demand curve comes from the fact that firms pay efficiency wages to their workers, which increases their productivity, or decreases the turn-over costs born by firms. In such a case, it can be profitable for firms to simultaneously increase their level of employment and wages, as long as the gain due to the rise in workers' productivity or the fall in turn-over costs is higher than the loss induced by the increase in wage costs. This statement makes Fehr (1991) argue that "*if unions, ..., do not constitute the only deviation from a perfectly competitive labor market, i.e., if for example the market is characterized by the payment of efficiency wages, ... , any increase in the real wage will unambiguously induce firms to employ more workers*". But in his pure turnover cost model, Fehr does not explicitly model the bargain between the firm and the union and its impact on the determination of the wage in the presence of efficiency wages.

The aim of this note is to see whether a positive relationship between employment and wages is sustainable at the firm level. To achieve this, we combine in an integrated framework three of the main theories of the labour market: the shirking, the turnover cost and the union-firm bargaining models. Our main purpose is to highlight the consequences of their mutual interactions for the determination of the wage and the firm's labour demand. We show that bargaining and both efficiency wage theories do interact in the same direction, leading to higher wages. Like Weiss (1990), Fehr (1991) and Garino and Martin (2000), we find a "backward bending" labour demand curve along which the employment level increases with the wage for some range. But contrary to Fehr, we show that the negotiated wage is always located on the downward sloping portion of the labour demand curve, whatever the source of the efficiency wage effects involved.

2 The labour demand curve

We assume that wages are determined by a negotiation between a firm and a union. The firm then chooses employment, output and price. The production function of the firm is given by $Y = (EN)^{\alpha}$, $0 < \alpha < 1$, where Y stands for output, N for employment and E for effort per worker. According to Summers (1988), we use the effort supply function which depends on the difference between the wage paid by the firm W and the exogenous reservation wage W_R: $E = \left[(W - W_R)/W_R\right]^{\beta}$, $0 < \beta < 1$. We also assume that the firm bears some turnover costs that we model in the spirit of Martin (1997). At each period, a proportion q of the workforce quits, where the quit rate is a decreasing function of the relative wage $q = q\,(W - W_R)$, and the firm hires h new workers, each of whom must be trained at a cost τ_1. In order to hire, the firm expends search effort s, where $\theta = h/s$ is the number of hires per unit of search ("search effectiveness") which is an increasing function of the relative wage, $\theta = \theta\,(W - W_R)$. The unit cost of search is denoted by σ_1. Thus, in steady state ($h = qN = \theta s$) the average cost of labour is equal to $\gamma = W\left[1 + q\left(\tau + \sigma/\theta\right)\right]$ where $\tau = \tau_1/W$ and $\sigma = \sigma_1/W$ (see Martin, 1997). The demand for the firm's output is $Y = P^{-\varphi}$, where P stands for the output price and $\varphi > 1$ for the constant elasticity of demand. Thus, the firm's profit can be written as:

$$\Pi = (EN)^{\frac{\alpha}{m}} - \gamma N \qquad (1)$$

where $m = \varphi/\left(\varphi - 1\right) > 1$ stands for the mark-up of price over marginal cost. Assuming the firm chooses the level of employment taking the wage as given, we obtain the firm's optimal demand for labour:

$$N = \left(\frac{m}{\alpha}\right)^{\frac{-m}{m-\alpha}} E^{\frac{\alpha}{m-\alpha}} \gamma^{\frac{-m}{m-\alpha}} \qquad (2)$$

The elasticity of the labour demand with respect to the wage is equal to:

$$\varepsilon_W^N = \frac{\partial N}{\partial W}\frac{N}{W} = \frac{1}{m-\alpha}\left(\alpha\varepsilon_W^E - m\varepsilon_W^{\gamma}\right) \qquad (3)$$

which has the same sign as $\alpha\varepsilon_W^E - m\varepsilon_W^{\gamma}$, where ε_W^E and ε_W^{γ} are respectively the wage-elasticities of effort supply and labour average cost. According to the selected effort function, we get:

$$\varepsilon_W^E = \beta \frac{W}{W - W_R} \tag{4}$$

Following Martin (1997), we parameterize the wage-elasticity of the average cost of labour ε_W^γ directly as:

$$\varepsilon_W^\gamma = 1 - \theta \frac{W}{W - W_R} \tag{5}$$

Substituting (4) and (5) in (3), we show that the labour demand curve is decreasing (increasing) if:

$$W > (<) \frac{m}{m(1-\theta) - \alpha\beta} W_R \tag{6}$$

Thus our model yields a "backward-bending" labour demand curve as in Weiss (1990), Fehr (1991) and Garino and Martin (2000). Indeed, the labour demand curve of the firm becomes vertical where $W = \{m/[m(1-\theta) - \alpha\beta]\} W_R$. As Fehr (1991) has pointed out, this curve can even be increasing for some low values of the wage. To see whether the outcome of the negotiation between the firm and a union can be located on the increasing portion of the labour demand curve, i.e. whether a rise in the negotiated wage[1] can lead to an increase in employment, let's turn to the wage determination.

3 The negotiated wage

The union has the utility function $U = (W - W_R) N$. The bargaining process is formalized by the Generalized Nash Criterion according to which the wage is chosen to maximize $U^\lambda \Pi^{1-\lambda}$, where $0 < \lambda < 1$ represents the union's relative bargaining strength. The solution satisfies:

$$\frac{W}{W - W_R} + \varepsilon_W^N + \frac{1-\lambda}{\lambda} \varepsilon_W^\Pi = 0 \tag{7}$$

where ε_W^Π and ε_W^N are respectively the wage-elasticities of profit and employment which, from (1) and (2), are equal to:

$$\varepsilon_W^\Pi = \alpha \frac{\varepsilon_W^E - \varepsilon_W^\gamma}{m - \alpha} \tag{8}$$

[1]This rise may be related to an increase in the bargaining power of the union.

$$\varepsilon_W^N = \frac{\alpha\varepsilon_W^E - m\varepsilon_W^\gamma}{m-\alpha} \tag{9}$$

Substitution of (4) and (5) into (8) and (9) and then, (8) and (9) into (7) leads to the value of the negotiated wage:

$$W = \frac{\lambda\,(m-\alpha)+\alpha}{\alpha(1-\beta)-\theta\,[\lambda\,(m-\alpha)+\alpha]}W_R \tag{10}$$

which is equal to the reservation wage times a mark-up. Our integrated mark-up allows us to unify two of the main efficiency wage theories with the union-firm bargaining wage theory. Indeed, we can see that if $\lambda = 0$ we get $W = W_R/\,(1-\beta-\theta)$, which is the composite efficiency wage obtained in Martin (1997). If $\theta = 0$, the wage becomes $W = \{[\lambda\,(m-\alpha)+\alpha]\,/\alpha\,(1-\beta)\}\,W_R$, which is the same wage as in Garino and Martin (2000) where shirking and bargaining effects are combined. We can now draw the following results from our model.

Firstly, let us stress that the mark-up in equation (10) is greater than the mark-up found by Martin (1997) and Garino and Martin (2000) (see Appendix 1). Thus, as these authors have pointed out, efficiency wage and bargaining theories seem to be mutually reinforcing mechanisms. Here, we show that this is the case whatever the source of the efficiency wage effects involved: shirking or turnover cost.

Secondly, our setting allows us to analyze the consequences of a third possible situation in the labour market for the wage determination: the case of a bargain when turnover costs are born by the firm. Indeed, when $\beta = 0$, the negotiated wage reduces to $W = \langle[\lambda\,(m-\alpha)+\alpha]\,/\,\{\alpha-\theta\,[\lambda\,(m-\alpha)+\alpha]\}\rangle\,W_R$. We can easily check that this wage is greater than the wage which emerges when bargaining is the only source of rigidity in the labour market (in this case, it reduces to $W = \{[\lambda\,(m-\alpha)+\alpha]\,/\alpha\}\,W_R$) and than the wage associated with the pure turnover cost wage model (which is equal to $W = W_R/\,(1-\theta)$). Moreover, one can also put forward that:

$$\frac{\partial^2 W}{\partial\lambda\partial\theta} = \frac{2\alpha\,(m-\alpha)\,[(\lambda\,(m-\alpha)+\alpha)]}{\{\alpha-\theta\,[\lambda\,(m-\alpha)+\alpha]\}^3}W_R > 0 \tag{11}$$

According to equation (11), an increase in wages coming from an increase in the union's bargaining power is greater when turnover is more sensitive to the wage. Thus, the turnover cost version of the efficiency wage theory and the bargaining wage theory seem to be complementary and lead to a higher wage. In this sense, we confirm the first result obtained in Fehr (1991).

Lastly, we can compare the negotiated wage obtained in (10) with the wage for which the labour demand curve becomes vertical (6). For the sake of realism, we only consider positive wages[2]. We then show that (see Appendix 2):

$$\frac{\lambda\,(m-\alpha)+\alpha}{\alpha(1-\beta)-\theta\,[\lambda\,(m-\alpha)+\alpha]} > \frac{m}{m\,(1-\theta)-\alpha\beta} \tag{12}$$

This equation means that the negotiated wage is always located on the decreasing portion of the firm's labour demand curve. Thus in our model, contrary to the conjecture of Fehr (1991), a rise in the negotiated wage always leads to a decrease in employment, whatever the reasons for which the firm pays efficiency wages. This suggests that labour market real rigidities are not sufficient on their own to make employment increase with wages at the firm level.

[2]This requires that the denominator on the left side of (12) is positive, i.e. $\alpha(1-\beta)-\theta\,[\lambda\,(m-\alpha)+\alpha]>0$.

References

Chatterjee, S. and R. Cooper, 1989, Multiplicity of equilibria and fluctuations in dynamic imperfectly competitive economies, American Economic Review 79, 353-357.

Fehr E., 1991, Wages and labor demand: a note, Journal of Institutional and Theoretical Economics 147, 539-546.

Garino G. and C. Martin, 2000, Efficiency wages and union-firm bargaining, Economics Letters 69, 181-185.

Manning A., 1990, Imperfect Competition, Multiple Equilibria and Unemployment Policy, Economic Journal 100, 151-162.

Martin C., 1997, Efficiency wages: combining the shirking and the turnover cost models, Economics Letters 57, 327-330.

Summers L.H., 1988, Relative wages, efficiency wages and Keynesian unemployment, American Economic Review 78, 383-388.

Weiss L., 1990, Efficiency Wages: Models of Unemployment, Layoffs and Wage Dispersion (Clarendon Press, Oxford).

Appendix

- Appendix 1: the mark-up found in Martin (1997) is equal to $1/\left(1-\beta-\theta\right)$. Comparing it with (10), one finds:

  $$\frac{\lambda\left(m-\alpha\right)+\alpha}{\alpha(1-\beta)-\theta\left[\lambda\left(m-\alpha\right)+\alpha\right]}>\frac{1}{1-\beta-\theta}$$

  which is true since $m>\alpha$.

  Garino and Martin's (2000) mark-up is equal to $\left[\lambda\left(m-\alpha\right)+\alpha\right]/\left[\alpha(1-\beta)\right]$. Thus, one can check that:

  $$\frac{\lambda\left(m-\alpha\right)+\alpha}{\alpha(1-\beta)-\theta\left[\lambda\left(m-\alpha\right)+\alpha\right]}>\frac{\lambda\left(m-\alpha\right)+\alpha}{\alpha(1-\beta)}$$

  since $-\theta\left[\lambda\left(m-\alpha\right)+\alpha\right]<0$ (assuming a positive wage, i.e. $\alpha(1-\beta)-\theta\left[\lambda\left(m-\alpha\right)+\alpha\right]>0$).

- Appendix 2: simplifying the inequality (12) leads to the following condition:

  $$\left(m-\alpha\right)\left[\lambda m+\alpha\beta\left(1-\lambda\right)\right]>0 \qquad \text{(A1)}$$

  which is always true for the values of the parameters defined in the model.