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Wage bargaining and monopsony

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Abstract

This paper integrates models of monopsony and wage bargaining. A novel result is that for a range of the relative bargaining power of the firm and the union, the wage and employment is constant and equal to the 'competitive' solution.

Keywords: Monopsony; Unions; Wage bargaining

JEL classification: J3; J5

1. Introduction

The idea that firms may have some wage-setting power has recently obtained wide appeal both from an empirical and theoretical point of view, see Boal and Ransom (1997) and Manning (2003) for comprehensive discussions. In this paper we integrate models of monopsony and collective bargaining. Conventional wage bargaining models assume that without union bargaining power, the outcome occurs at the 'competitive' solution where demand and supply of labor is equalized. Our approach assumes that the relevant reference point is the monopsony solution and formalizes the idea that the bargaining solution can be either on the supply or demand schedule.

The model identifies three possible results of changes in relative bargaining power; a tradeoff between wage and employment as in the conventional demand constrained 'union model'; movement along the upward sloping supply curve as discussed by Manning (2003); and a third regime without any effects. The

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last case is a novel result of our model for which the bargaining outcome equals the ‘competitive’ solution for a range of the relative bargaining powers of the bargaining parties.

2. The model

We specify a simple partial equilibrium model of wage bargaining in which the firm is faced with a less than perfectly elastic labor supply curve due to worker heterogeneity and the firm bargains with a union consisting of heterogeneous members.

2.1. Preferences

When the labor supply curve to the firm is upward sloping, workers must be heterogeneous in some respect. Our specification of the labor supply function is based on heterogeneity in workers' alternative income in line with the assumptions of Bulkley and Myles (2001). We assume that utility from alternative employment differs across workers. Variation in utility level in alternative employment may be due to differences in mobility costs, differences in the connections to the firms, differences in the propensity to be unemployed, or different information level across workers. As Bulkley and Myles (2001) we assume for simplicity that productivity is known and equal for all workers.

The workers are risk neutral and the alternative income of potential workers in a particular firm is uniformly distributed on support $[A^{\mathrm{L}},A^{\mathrm{H}}]$ with density $\frac{1}{A^{\mathrm{H}}-A^{\mathrm{L}}}$. The labor supply function faced by the firm is given by the cumulative distribution of the alternative income times the number of potential workers L, $N^{\mathrm{S}}=\phi(W-A^{\mathrm{L}})$ where $\phi=\frac{L}{A^{\mathrm{H}}-A^{\mathrm{L}}}$.

We take the utilitarian approach that has been common in the literature on trade unions, following the seminal work by McDonald and Solow (1981). Assume that union membership is equal to L and in the case of excess supply, the workers employed in the firm is a random draw of the workers who want to work in the firm.[1] The expected utility level of a randomly chosen worker i is

$$U_i=\frac{N}{L}W+\frac{N^{\mathrm{S}}-N}{L}\frac{W+A^{\mathrm{L}}}{2}+\frac{L-N^{\mathrm{S}}}{L}\frac{A^{\mathrm{H}}+W}{2}=\frac{N}{L}\frac{W-A^{\mathrm{L}}}{2}+\frac{A^{\mathrm{L}}+A^{\mathrm{H}}}{2} \tag{1}$$

where N is employment. The first term on the right hand side of the first equality is the probability of being employed in the firm times the utility level in that case. The second term is the probability of not being employed even though the worker wants to be employed (there is excess supply) times the expected utility level. The third term is the probability that the worker does not want to be employed in the firm times expected utility. The last equality in Eq. (1) shows that expected utility of a random worker is equal to the expected utility gain for the workers in the firm plus the expected outside utility level for the union members.

[1] One may think of L as (i) a large number, (ii) the number of workers in the firm when supply equals demand as in Bulkley and Myles (2001), or (iii) as the supply of labor faced for the given wage. It turns out that the interpretation of L is not important for the results because L does not enter equation (2). The important simplifying assumption is that all workers in the firm are members of the union.

Assuming that a dispute in the wage bargaining implies $N=0$ and the union members get their alternative income, the net union utility in utilitarian terms is

$$U-U^0 = \sum_{i=1}^{L}\left(\frac{N}{L}\frac{W-A^{L}}{2}+\frac{A^{L}+A^{H}}{2}\right)-\sum_{i=1}^{L}\frac{A^{L}+A^{H}}{2} = N\frac{W-A^{L}}{2} \tag{2}$$

This utility function is qualitatively equal to the traditional rent maximizing formulation. The union maximizes total rent in expectation terms.

Turning to the firm, we assume that employment is the only input and $R(N)$, $R'(N)>0, R''(N)<0$, is the revenue function. Profit is $\Pi=R(N)-WN$, and the labor demand function is given by $R'(N^D)=W$, where upper letter D indicates that the outcome is on the demand curve.

2.2. Wage bargaining outcome

We follow the tradition by using a 'right to manage' model where employment is determined after the wage bargaining. To illustrate the range of possible outcomes of the model it is instructive to use Fig. 1 where Π^j and U^j, $j=1, 2, 3$, denotes isoprofit curves and union indifference curves, respectively. The monopsony solution is at the tangency of an isoprofit curve and the labor supply curve (point A), and the monopoly union solution is at the tangency of a union indifference curve and labor demand (point B). Point C illustrates the competitive solution with $W=W^*$ and $N=N^*$.

We assume that the bargain maximizes the Nash product $\{\Pi^{\gamma}(U-U^0)^{(1-\gamma)}\}$, where γ and $(1-\gamma)$ are the relative bargaining powers of the firm and the union, respectively. The model can be solved by maximizing the log of the Nash product with respect to both wage and employment, given that the employment is either constrained by demand or by supply, or both, i.e., $W \le R'(N^D)$ and $N^s \le \phi(W-A^L)$,

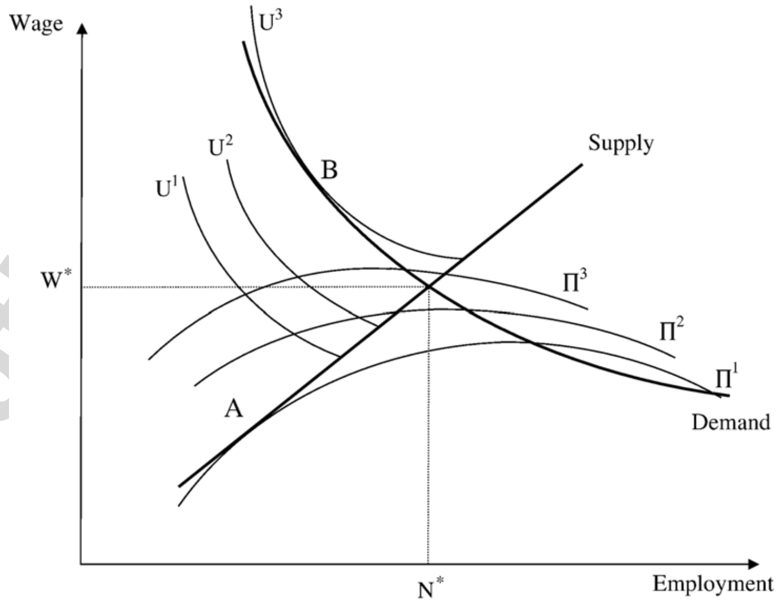

Fig. 1. Isoprofit and indifference curves.

where the Lagrange multipliers are denoted λ and μ, respectively. The first order conditions and the Kuhn Tucker conditions are

$$-\gamma\frac{N}{\Pi}+(1-\gamma)\frac{N}{N(W-A^L)}-\lambda+\mu\phi=0 \tag{3}$$

$$\gamma\frac{R'(N)-W}{\Pi}+(1-\gamma)\frac{W-A^L}{N(W-A^L)}+\lambda R''(N)-\mu=0 \tag{4}$$

$$\lambda\geq 0 \text{ and } \lambda(W-R'(N))=0 \tag{5}$$

$$\mu\geq \text{ and } \mu(N-\phi(W-A^L))=0 \tag{6}$$

Initially, two regimes may be identified. First, in the traditional union model (demand constrained case), $\mu=0$ and $W>W^*$. The outcome moves toward point B in Fig. 1 as γ approaches zero. When $\mu=0$, the wage follows from (3)–(5) as

$$W^D=A^L\left(1+\frac{(1-\gamma)(1-\kappa)\varepsilon}{\gamma\kappa\varepsilon-(1-\gamma)(1-\kappa)(1+\varepsilon)}\right) \tag{7}$$

where $\kappa=R'(N)\frac{N}{R(N)}$, $\kappa\in\langle 0,1\rangle$, and $\varepsilon=R''(N)\frac{N}{R'(N)}$, $\varepsilon\in\langle -1,0\rangle$. The wage is a mark-up over the alternative wage of the worker with the lowest alternative wage, A^{L}. Utilizing that $W^*=R'(N^*)$, it follows from (7) that the assumption $\mu=0$, as in the traditional models, only holds for $\gamma<\hat{\gamma}$, where

$$\hat{\gamma}=\frac{(1-\kappa)(\mathrm{A^L}-(1+\varepsilon)\mathrm{W}^*)}{(1-\kappa)(\mathrm{A^L}-(1-\varepsilon)\mathrm{W}^*)-\kappa\varepsilon(\mathrm{W}^*-\mathrm{A^L})} \tag{8}$$

Second, outcome on the labor supply curve (the supply constrained case), occurs when $\lambda=0$ and $W<W^*$. The employment moves toward point A in Fig. 1 as γ approaches unity. In this case the wage follows from (3), (4) and (6) as

$$W^S=\frac{1}{2}\gamma A^L+\frac{R(N)}{N}\left((1-\gamma)+\frac{1}{2}\gamma\kappa\right)=\gamma W^M+(1-\gamma)\frac{R(N)}{N} \tag{9}$$

where $W^M=\frac{1}{2}(R'(N)+A^L)$ is the monopsony wage, and $R(N)/N\geq W$ in order for $\Pi\geq 0$. The wage is an average of the monopsony wage and the zero-profit wage, weighted by the bargaining powers. It follows that the assumption $\lambda=0$, for which $W^{\mathrm{S}}<W^*$, only holds for $\gamma>\tilde{\gamma}$, where

$$\tilde{\gamma}=\frac{(1-\kappa)W^*}{(1-\kappa)W^*+\frac{1}{2}\kappa(W^*-A^L)} \tag{10}$$

The following proposition compares the two critical values of the relative bargaining power of the firm.

Proposition 1:

(i) $\hat{\gamma} > \tilde{\gamma}$

(ii) For $\hat{\gamma} \geq \gamma \geq \tilde{\gamma}, \frac{\partial W}{\partial \gamma} = \frac{\partial N}{\partial \gamma} = 0.$

Proof. Part (i) of the proposition follows directly from comparison of (8) and (10). Regarding part (ii), it follows from (3)–(6) that for $\lambda > 0$, the supply constraint binds for $\gamma > \hat{\gamma}$. In addition, for $\mu > 0$, the demand constraint binds for $\gamma < \tilde{\gamma}$. Thus, for $\hat{\gamma} > \gamma > \tilde{\gamma}$, we have that both the demand and supply constraints are binding because both $\lambda > 0$ and $\mu > 0$. This is the competitive solution $W = W^*$ and $N = N^*$. The bargaining outcome does not change when the bargaining power changes within the interval $\hat{\gamma} \geq \gamma \geq \tilde{\gamma}$. □[2]

To help on the intuition, consider a gradual increase in the bargaining power of the firm. As γ increases from 0 to 1 the indifference curves of the objective function transform smoothly from those of the union ($\gamma = 0$) to those of the firm ($\gamma = 1$). Looking at Fig. 1 the solution of the optimisation problem begins at B, travels down the demand curve until the intersection of supply and demand and then travels down the supply curve. The constraint set of the optimisation is defined by the minimum of demand and supply for any wage and therefore has a kink at the intersection of supply and demand. For $W > W^*$ the union must accept a lower wage, but gain higher employment. For $W < W^*$ the union loses both in terms of wage and employment as γ increases. Thus, for a range of values of γ the solution will remain at the kink. This is why there is a region of constancy.

How relevant is the case where changes in the bargaining power have no effect? Within the present setup, the factors influencing the relevance of this case are the union objectives and the competitiveness of the labor and product markets. Proposition 1 holds as long as the union has preferences over employment. It is the preferences over employment that generates the kink in the marginal utility of the union at the competitive solution. Falch and Strøm (2004) present some simple numerical illustrations indicating that the regime may apply to a quite wide range of the relative bargaining power.

3. Conclusion

In this paper we have developed a simple model of wage bargaining in a firm facing an upward sloping labor supply curve to analyze how changes in bargaining power alter the bargaining outcome. The model predicts a nonlinear relationship between bargaining power and employment. As the relative bargaining power of the firm increases from zero to unity, the employment firstly increases, then stays constant, and finally decreases. Bargaining power in the hands of trade unions may give an efficient outcome because 'medium' powerful unions generate an outcome equal to the 'competitive' solution. Our results show that efficiency occurs for a range of different bargaining powers.

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[2] Details on the computations can be obtained from the authors on request.

References

Boal, W.M., Ransom, M.R., 1997. Monopsony in the labor market. Journal of Economic Literature 35, 86–112.

Bulkley, G., Myles, G.D., 2001. Individually-rational union membership. European Journal of Political Economy 17, 117–137.

Falch, T., Strøm, B., 2004. Wage bargaining and monopsony. Working Paper, vol. 8/2004. Department of Economics, Norwegian University of Science and Technology.

Manning, A., 2003. Monopsony in Motion: Imperfect Competition in Labor Markets. Princeton University Press.

McDonald, I.M., Solow, R.M., 1981. Wage bargaining and employment. American Economic Review 71, 896–908.