Choice of union-firm bargaining agenda and social welfare

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Abstract

This paper shows that with a strong labour union, bargaining over piece rate generates higher social welfare than bargaining over fixed wage. Moreover, this social welfare exceeds the social welfare under efficient bargaining level, if the union is very strong.

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1 Introduction

Bargaining over labour contracts between a firm and its labour union is a widely observed phenomenon in the real world. Large number of studies have attempted to explain different aspects and consequences of collective bargaining. However, as far as wage is concerned, existing models of collective bargaining - 'right-to-manage bargaining' (henceforth, RTM) in which firms and unions negotiate over wages only (following Nickell and Andrews (1983)) or 'efficient bargaining' (henceforth, EB) in which both wages and employment are negotiated with unions (based on McDonald and Solow (1981))[1] - assume that time consistent fixed wage rate is the bargaining agenda, do not consider piece-rate wage.

Offering piece rates rather than fixed wages is a quite general practice in many modern firms (Shearer (2004), Haley (2003), Lazear (2000)) due to its positive impact on productivity. Hamilton et al. (2003) argues that group piece rate is more beneficial for the firm than individual piece rates, using data of garment factory operated in Napa, California. Given this empirical evidence, it is important to examine the impact of piece rate on social welfare and on firms' performance when workers are unionised and bargains over employment and/or piece rate. To the best of our knowledge, a model of collective bargaining which considers piece rate as a bargaining agenda is not yet available in the literature.

Instead of bargaining over fixed wages, the firm may adopt the following bargaining agenda. Each worker will get the reservation wage rate plus an amount which is in proportion to total output produced; and that proportionate factor, which we will call as piece rate, will be determined through bargaining. Then the questions are: Does bargaining over piece rate generates more profit compared to fixed wage bargaining? Which bargaining agenda, fixed wage vis-a-vis piece rate, is socially desirable? This paper attempts to answer these questions, assuming that, for the sake of simplicity, average productivity of labour remains same under alternative pay schemes: fixed wage, and piece rate.

First we consider RTM in which the firm-union pair bargains over the piece rate only.

[1]Recently Kraft (1998) has analysed 'co-determined bargaining' in which only employment level is the bargaining agenda, as is the case for co-determined firms in Germany.

It is found that the interests of the firm and the union are in conflict. The firm prefers to pay according to piece rate, but the union prefers fixed wage rate. From social welfare point of view fixed wage pay-scheme is preferred as long as the union is very weak. But, if the union is strong, bargaining over piece rate leads to higher social welfare.

Next, in the case of EB it turns out that bargaining outcomes are not sensitive to pay-scheme. Along with the firm's profit and the union's payoff, social welfare also remains unchanged under alternative bargaining agenda: fixed wage rate and employment level, and piece rate and employment level.

Finally, comparing social welfare under RTM in which piece rate is the bargaining agenda and EB we find that social welfare in case of RTM is greater than social welfare under EB, if the union is very strong. This finding is in sharp contrast to the widely known result that EB is always preferred to RTM from social welfare point of view, irrespective of the union's bargaining power.

2 The Model

Our model has two players: one firm and its labour union. The labour union is sufficiently large (having N member) to supply all the workers needed in the firm. The firm and its labour union bargain over the level of employment and/or wage. The bargaining power of the labour union is γ $(0 \leq \gamma \leq 1)$, and the bargaining power of the firm is $(1-\gamma)$. The firm is the monopoly producer and its production technology is assumed, for simplicity, to be CRS: $q = l$, where q is the amount of output and l is the level of employment. The market demand curve is assumed to be linear: $p = A - q$. The union's objective is to maximise the net wage bill $U = (w-r)l$ over and above the reservation wage bill rN, where w is the total wage per unit of labour. The firm's objective is to maximise the profit $\Pi = (p-w)l$.

2.1 Fixed wage

We begin with some benchmark calculations. First consider the standard RTM bargaining in which fixed wage rate is the sole object of bargaining. In this case the game goes through the following two stages. In stage 1 the union and the firm bargains over fixed wage rate w. In stage 2 the firm sets the level of employment. We solve the game by Backward Induction method. The bargained wage rate, employment level, payoffs of the union and the firm, and social welfare (measured as the sum of consumer surplus and producer surplus) will be as follows:

$$w_f^T = \gamma\frac{A-r}{2} + r,\ l_f^T = (2-\gamma)\frac{A-r}{4},\ U_f^T = \frac{\gamma(2-\gamma)}{8}(A-r)^2, \tag{1}$$

$$\Pi_f^T = \frac{(2-\gamma)^2}{16}(A-r)^2, \text{ and } SW_f^T = \frac{3(2-\gamma)^2}{32}(A-r)^2$$

The subscript f denotes that the bargaining agenda consists only the fixed wage rate, and superscript T denotes that the bargaining is RTM.

Next, consider the standard EB in which both the fixed wage rate and employment level are simultaneously determined through bargaining. In this case wage rate, level of employment, payoffs of the union and the firm, and social welfare will be as following.

$$w^E = \gamma\frac{A-r}{2} + r,\ l^E = \frac{A-r}{2},\ U^E = \frac{\gamma}{4}(A-r)^2, \tag{2}$$

$$\Pi^E = \frac{1-\gamma}{4}(A-r)^2, \text{ and } SW^E = \frac{3-2\gamma}{8}(A-r)^2$$

The superscript E denotes that the bargaining is EB.

It is straight forward to see that $SW^E > SW_f^T$, $\forall\ \gamma \in [0,1]$. That is, *with fixed wage, EB is preferred to RTM bargaining from the social welfare point of view, irrespective of the union's bargaining power.*

2.2 Piece rate

Suppose that the firm offers the following pay scheme to its workers.

$$w = r + \beta q, \tag{3}$$

where w is the total wage per unit of labour. Each worker receives the reservation wage rate (r) plus an amount proportional to the total output produced (βq). The proportionate factor β is the piece rate. Clearly, under the pay scheme given by (3) the workers' participation constraint is always satisfied.

First consider RTM in which in stage 1 the union-firm pair bargains over piece rate β, and in stage 2 the firm chooses employment level. In this case the firm might adjust total wage rate in its favour by choosing employment level accordingly in stage 2, since wage is directly related to the output level and hence on the level of employment. This type of adjustment in wages is not possible in case of fixed wage bargaining. We solve the game by Backward Induction Method.

In stage 2 the problem of the firm is to

$$Maximise_l\ \Pi = pq - wl = (A - l)l - (r + \beta l)l$$

Solving the above problem we get $l = \frac{A-r}{2(1+\beta)}$.

In stage 1 the union and the firm determines the piece rate (β) by solving the following bargaining problem.

$$Max_\beta\ B = U^\gamma \Pi^{(1-\gamma)} = \{\beta l^2\}^\gamma \{(A - l)l - (r + \beta l)l\}^{(1-\gamma)}$$

subject to the constraint

$$l = \frac{A-r}{2(1+\beta)}.$$

Solving the above problem we get $\beta = \gamma$, that is the equilibrium piece rate is exactly equal to the bargaining power of the union. The equilibrium wage rate, level of employment, payoffs of the union and the firm, and social welfare will be as follows:

$$w_p^T = \frac{\gamma}{1+\gamma}\frac{A-r}{2} + r,\ l_p^T = \frac{A-r}{2(1+\gamma)},\ U_p^T = \frac{\gamma}{4(1+\gamma)^2}(A - r)^2, \tag{4}$$

$$\Pi_p^T = \frac{(A-r)^2}{4(1+\gamma)}, \text{ and } SW_p^T = \frac{3+2\gamma}{8(1+\gamma)^2}(A-r)^2$$

The subscript p denotes that the bargaining agenda is piece rate, and superscript T denotes that the bargaining is RTM.

From (1) and (4) we find that $w_p^T < w_f^T$, $l_p^T < l_f^T$, $U_p^T < U_f^T$, $\Pi_p^T > \Pi_f^T$, $\forall \gamma \in [0,1]$; and $SW_p^T > SW_f^T$ if $\gamma > 0.37$. Clearly, interests of the firm and the union are in conflict. The firm is better off by paying its workers according to piece rate, but the union prefers to get fixed wage rate. There is no obvious way to resolve this conflict. The union-firm bargaining over the menu of bargaining agenda is a possible way out. Legal and institutional rules might also play a role to resolve this conflict. Surprisingly, from social welfare point of view, it is better to deprive the labour union by making bargaining over piece rate mandatory, if the union is strong.

Proposition 1. *Bargaining over a piece rate leads to higher social welfare as compared to bargaining over a fixed wage rate, if the labour union is strong. The firm always prefers to bargain over piece rate, but the union prefers to bargain over fixed wage rate.*

Next, we extend the analysis to EB in which the union-firm pair bargains over the piece rate and employment simultaneously. In this case the bargaining problem can be written as:

$$Max_{\beta,l}\ B = \{\beta l^2\}^{\gamma}\{(A-l)l - (r+\beta l)l\}^{(1-\gamma)}$$

Solving the above problem we get $\beta = \gamma$ and $l = \frac{A-r}{2}$. Hence, outcomes of efficient bargaining are not sensitive to bargaining agenda regarding wages. This implies that *payoffs of the union and the firm, and social welfare will be same as in (2).*

Comparing social welfare under RTM in which the union-firm pair bargains over piece rate with EB we find the following:

Proposition 2. *Social welfare under bargaining over piece rate is greater than social welfare under efficient bargaining, if the labour union's bargaining power is very high (greater than 0.78).*

Generally, it is argued that social welfare under EB is greater than RTM irrespective of relative bargaining strength of the union. Proposition 2 is in sharp contrast to this common knowledge. EB does not necessarily lead to higher social welfare always. It depends on the bargaining agenda about wages and on the union's bargaining power.

3 Conclusion

We have compared outcomes of two alternative bargaining agenda about wages, piece rate and fixed wage rate, under right-to-manage bargaining (RTM) and efficient bargaining (EB). Under RTM social welfare is greater in case of bargaining over pice rate, if the union is strong. Moreover, if the union is very strong, social welfare is greater under bargaining over pice rate only than EB. This is a novel finding of this paper.

Outcomes of EB are not sensitive to the bargaining agenda about wages. Under RTM the firm prefers to bargain over piece rate, but the union prefers to bargain over fixed wages. There is no obvious way to resolve this conflict. From social welfare point of view it is better to go for piece rate than fixed wage, if the labour union is strong.

Productivity of labour may vary across pay schemes: fixed wage vis-a-vis piece rate. In this paper we have ignored this issue. Intuitively we can say that if productivity improves on an average under piece rate, it will be more advantageous for the firm to bargain over piece rate and that will increase social welfare as well.

It might be interesting to extend this analysis by relaxing the assumption of monopoly firm. Adopting piece rate as the bargaining agenda might be strategically advantageous to firms under oligopoly. Analysis of union-firm bargaining over piece rate vis-a-vis fixed wage under incomplete information regarding intrinsic motivation of workers and/or market demand seems to be useful also. We think these are beyond the scope of this paper, but we hope to pursue in future.

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