A THEORETICAL ANALYSIS OF TRADE-UNION MEMBERSHIP FEES, BARGAINING POWER, WAGE RATE AND UNEMPLOYMENT

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The positive effect of membership fees on trade-unions’ cohesion and commitment and the adverse effect these fees on trade unions’ density imply that the effects of membership fees on trade unions’ bargaining power, wage rate and unemployment can be depicted by inverted U-shaped curves whose upper bounds are reached when membership fees are set at half the ratio of the upper-bound on members’ level of satisfaction from the trade-union services to their disposable income rate. The implications of these effects for membership fees are analysed for a trade union that sets its membership fee as to minimise the loss stemming from missing wage rate and unemployment targets. (JEL classification: J50,J51)

I. INTRODUCTION

As reflected by a series of papers including Horn and Wolinsky (1988), Davidson (1988), Dowrick (1989, 1993), Blanchflower, Oswald and Garret (1990), Nickell and Kong (1992), Mumford and Dowrick (1994), Nickell, Vainiomaki and Wadhwani (1994) and Blanchflower and Oswald (1994), over the last ten years the popular approach to analysing wage outcomes has been based on the Nash-bargaining model developed by Binmore, Rubinstein and Wolinsky (1986). The final wage proposed by bargaining models has typically been dependent on the fallback wage and profits (i.e., the payoff each party expects to receive in a case of negotiation breakdown) and the bargaining power of workers and/or trade unions relative to employers, where the latter factor has been taken as given exogenously.

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The main objective of the present paper is to endogenise trade unions’ bargaining power. In particular, the paper argues that trade unions’ bargaining power may be linked to membership fees as the latter factor is likely to affect trade unions’ density and cohesion and their members’ commitment to unions’ objectives and strategies. In addition to ideological, political, institutional, cultural and social factors, the appeal of trade unions in the market-driven economies of the developed countries may depend on the relationship between their bargaining power and the membership fees they charge. The effect of membership fees on trade unions’ bargaining power is not straightforward. Like in the case of any other club, economic theory may suggest that membership fees affect workers’ decisions to join a trade union and reflect the marginal willingness to pay for the services provided by the trade union. On the one hand, trade unions’ density might be negatively associated with membership fees. On the other hand, members’ commitment may be positively associated with membership fees. That is, a rise in the membership fee is likely to reduce the breadth of solidarity within the relevant segment of the labour force as a larger number of workers is deterred by the higher fee. The departure of the less committed members, however, provides an alternative source of power to the trade union - it strengthens the commitment and improves the cohesion of the trade-unionist group and thereby facilitates reaching agreement on objectives and strategies.

By combining and incorporating the rival effects of trade union’s density and trade union’s commitment and cohesion, I propose that up to a critical membership fee, the final-fallback wage rate differential and unemployment level rise with membership fees as the positive effects of a greater union commitment and cohesion outweigh the adverse effect of declining union density on the union bargaining power. This proposition is consistent with the argument that a small army of volunteers can be more effective than a large army of conscripts. However, beyond the critical membership fee, the final-fallback wage rate differential and unemployment level decline with membership fees as the reduced density effect dominates the increased commitment and cohesion effects. The implications of this proposition for the efficient setting of trade union fees are analysed.

My theoretical analysis is innovative and refers to a trade union in a given profession, industry and location and, to simplify matters, ignores the possibility of employment adjustments through changing profession, industry or location and, thereby, competition or cooperation between the trade union under consideration and trade unions in other professions, industries or locations. The analysis is organised as follows. The relationships between trade-union density and overall level of cohesion and members’ commitment and membership fees are described in section II and section III. They are used in section IV to portray the relationship between the trade union's bargaining power
and membership fees. Section IV also presents the effect of trade union bargaining power on the wage rate and the effect of the latter factor on the unemployment level. These structural relationships are used in section V to construct the paper's main proposition on the full effects of membership fees on macroeconomic variables. It is proposed that the full effect of membership fee on wage rate and unemployment can be depicted by inverted U-shaped curves, and that the highest rates of wage and unemployment are achieved when the membership fee is equal to the ratio of half the upper-bound on members’ level of satisfaction from the trade union services to their disposable income rate. Membership fees can vary with the nature and objective of the union. The inverted U-shaped proposition is incorporated in section VI into the determination of the efficient membership fees by a trade union that sets its membership fee so as to minimise the quadratic loss stemming from not achieving wage rate and unemployment targets.

II. MEMBERSHIP FEE AND TRADE-UNION DENSITY

Trade-union density is defined as the ratio of the number of trade-union members \( M \) to the labour force in the profession, industry and location under consideration \( L \). My modelling of the possible adverse effect of the trade union membership fee on its density is based on the following microeconomic foundations.

Let \( S \) denote the periodical level of the service provided by the trade union to its members and suppose that this service is a public good available simultaneously and fully to all members (e.g., wage bargaining and job protection). Let the satisfaction of member \( i \) from \( S \) be given by the following utility function:

\[
    u_i = \theta_i u(S)
\]

where \( \theta_i \in (0,1) \) indicates the \( i \)-th member capacity to enjoy the periodical service provided by the trade union and \( u(S) \) is a positive scalar reflecting the upper-bound on members’ level of satisfaction from that service. Let \( m \) denote the periodical trade union membership fee, which is tax deductible, and \( t \) the tax rebate rate. Then, we expect individual \( i \) to be a member of the trade union as long as:

\[
    \theta_i u(S) \geq (1 - t)m. \tag{2}
\]
This membership rule implies that the minimum level of individual capacity of enjoying the trade-union service required for joining the trade union rises with the membership fee in accordance with the following linear equation:

$$\theta_{\text{min}} = \left[ \frac{1-t}{u(S)} \right]^{m}$$  \hfill (3)

where $u(S)$ is calibrated so that $0 \leq \theta_{\text{min}} \leq 1$. Consequently, the trade union density is given by:

$$\frac{M}{L} = \int \left[ \frac{1-t}{u(S)} \right]^{m} f(\theta_i) \, di$$  \hfill (4)

where $f(\theta_i)$ is the probability density function of the capacity to enjoy the trade union services within the relevant labour force. To simplify the analysis I assume that this probability density function is uniform. Hence, the trade union density can be expressed as:

$$\frac{M}{L} = \left[ 1 - \left( \frac{1-t}{u(S)} \right)^{m} \right]$$  \hfill (5)

and the positive scalar $(1-t)/u(S)$ can be interpreted as the overall inclination of the labour force in the profession, industry and location under consideration to withdraw the trade-union membership as the membership-fee rises. This membership withdrawal inclination is moderated by the tax-rebate rate and the upper-bound on the members’ satisfaction level from the service provided by the trade union.

### III. Membership Fee and Trade-Union Degrees of Commitment and Cohesion

While the previous section demonstrates that a rise in the trade union membership fee reduces the trade union density, which in view of McDonald's and Suen's (1992) empirical findings can be translated to a loss of trade-union bargaining power, this section proposes that the departure of workers for whom the membership fee is higher than their willingness for the trade-union service provides an alternative source of power
for the trade union if their departure improve the distribution of the degree of commitment within the group of trade-union members.

Commitment is a term describing a human propensity that is not commonly used by economists. I used this concept in explaining the organisational transformations of a cooperative. (Romm and Levy, 1990) Commitment is linguistically defined as “an engagement or obligation that restrict freedom of action” (Hughes, Michell and Ramson, 1992, p. 219). It is used in this paper to describe the intensity of members’ obligation to adhere to the trade-union objectives and the intensity of their engagement with the trade-union actions. In what follows I assume that the distribution of commitment within the group of the trade union members is improved by the membership fees. The underlying rationale is that it is likely that members’ commitment is positively correlated with their capacity to enjoy the service provided by the trade union. Yet the existence of intervening factors, such as ideological (e.g., socialist) indoctrination and sentiments, implies that the distribution of commitment within the group of the trade-union members does not coincide with, and does not necessarily resemble, the distribution of the members’ capacity to enjoy the service provided by the trade union.

In particular, I assume that the distribution of members’ commitment ($c$) to the trade union’s objectives and strategies shifts rightward and becomes more concentrated as the membership fee rises. For simplicity, I assume that the degree of commitment is normally distributed among the trade union members and, hence, it is sufficient to consider its first two moments. While the mean of $c$ reflects the organised workers’ overall degree of commitment to their trade union’s objectives and strategies, the standard deviation of $c$ reveals their lack of group cohesion. Consistent with the above assumption, it is taken that the mean of the degree of commitment within the group of the trade union members ($E(c)$) rises with the membership fee and that the standard deviation of the degree of commitment within this group ($S.D.(c)$) diminishes with the membership fee but in diminishing rate as described by the following concave forms:

$$E(c) = \mu_0 m^{\gamma}$$  \hspace{1cm} (6)

and

$$S.D.(c) = \sigma_0 m^{-\eta}$$  \hspace{1cm} (7)

where $\mu_0$ and $\sigma_0$ are positive scalars and the powers $\gamma$ and $\eta$ are positive and smaller than one. Note that if membership fee is restricted to be at least one dollar then by substituting $m=1$ in the above equations we obtain that $\mu_0$ and $\sigma_0$ can be interpreted as the labour force’s intrinsic levels of aggregate commitment and lack of cohesion, i.e.,
the aggregate levels of commitment and lack of cohesion of the labour force prior to unionisation, respectively.

IV. BARGAINING POWER, WAGE AND UNEMPLOYMENT

Following McDonald's and Suen's (1992) empirical findings with Australian data, it is assumed that the trade-union’s bargaining power ($BP$) rises with the ratio of the trade union density ($M/L$) to the unemployment rate ($U/L$), where $U$ indicates the number of unemployed. The novelty of the present analysis is in the incorporation of the assumption described in the previous section that the adverse effect of a rise in the trade-union membership fee on the trade-union bargaining power through lowering the trade-union density is moderated by the rise in the overall commitment level of members and group cohesion. In formal terms this assumption is incorporated by multiplying the ratio of the trade-union density to unemployment rate by the ratio of $E(c)$ to $S.D.(c)$, and in recalling equations 6 and 7 the trade-union bargaining power is expressed as:

$$BP = \left( \frac{\mu_0 m^\gamma}{\sigma_0 m^{-\eta}} \right) \left( \frac{M}{U} \right).$$

Equation 9 suggests that, in addition to the intrinsic ratio of the commitment mean to the commitment standard deviation, the trade-union’s bargaining power rises with the ratio of its budget ($mM$) to the unemployment level ($U$). The underlying rationale is that the larger the trade-union’s membership and budget and the lower the unemployment level, the higher the potential costs of negotiations’ break down for employers and the lower they are for employees. Moreover, the trade union may decide to support financially the unemployed members of the labour force. The larger the trade-union budget and the smaller the number of unemployed members the larger the expected average financial support in a case of dismissal and therefore, ceteris paribus, the greater the inclination of members to campaign vigorously for better working conditions.
The substitution of equation 5 into 9 for $M$ suggests that the bargaining power of a trade union can be depicted as:

$$BP = \frac{\mu_0 m(1 - \delta m)L}{\sigma_0 U} \tag{10}$$

where $\delta$ denotes the trade-union membership withdrawal coefficient and defined as:

$$\delta = \frac{(1 - t) / u(S)}{\mu_0}. \tag{11}$$

The level of unemployment might be affected indirectly by the trade union bargaining power through the determination of the wage rate. Consistent with the Nash-bargaining model I assume that the difference between the final wage rate obtained through bargaining and the fallback wage rate ($W$) rises with the trade union bargaining power, that the demand for labour is downward sloping and hence an increase in the wage rate raises the unemployment level, and that, for convenience, these relationships are linear. That is, the final-fallback wage rate differential is given by:

$$W = \alpha BP \tag{12}$$

and the corresponding level of unemployment is:

$$U = \beta W \tag{13}$$

where $\alpha$ and $\beta$ are positive scalars indicating, respectively, the average effect of the trade union on final-fallback wage rate differential and the trade-off between unemployment and wage. In terms of a Nash-bargaining model $\alpha$ can be interpreted as the per worker firm’s profit differential between reaching an agreement with the trade union and negotiation breakdown (e.g., Webster and Summers, 1998). Note also that in order to simplify the following algebraic presentation the unemployment equation 13 does not include an intercept. That is, it is assumed for convenience that full employment prevails when the final wage rate is equal to the fallback wage rate.

Although the simplifying features and the mathematically convenient specifications are a source of weakness, the proposed framework provides a benchmark for obtaining novel and meaningful insights.
V. FULL EFFECTS OF MEMBERSHIP FEES ON UNEMPLOYMENT AND WAGE RATE

The solution to the system of equations 10, 12 and 13 implies that the full effects of membership fees on the trade union bargaining power, the final-fallback wage rate differential and unemployment level can be explicitly rendered as:

\[ BP = \sqrt{\frac{\mu_0[mL - \delta m^2]}{\sigma_0 \alpha \beta}} \]  
\[ W = \sqrt{\frac{\alpha \mu_0[mL - \delta m^2]}{\beta \sigma_0}} \]  
\[ U = \sqrt{\frac{\alpha \beta \mu_0[mL - \delta m^2]}{\sigma_0}}. \]

(14)  
(15)  
(16)

By differentiating these expressions with respect to \( m \) the following proposition is obtained.

PROPOSITION: Up to a critical membership fee, the trade union bargaining power, final-fallback wage rate differential and unemployment level rise with the trade-union’s membership fee but decline thereafter. The critical membership fee is equal to \( 0.5u(S) / (1 - t) \), i.e., the ratio of half the upper-bound on members’ level of satisfaction from the trade-union services to their disposable income rate.

The underlying rationale for these inverted U-shaped curve effects is that, despite the decline in membership, up to a membership fee of \( 0.5u(S) / (1 - t) \) members’ commitment and the trade-union's budget increase and more rapidly than the unemployment level. Consequently, the trade-union's power in campaigning for a wage-increase rises. Beyond this critical membership fee, bargaining power and final-fallback wage rate differential decline as the trade-union's budget and bargaining power diminish with the shrinking membership. Given that the labour-demand curve is downwardly sloping, the unemployment level rises initially with membership fees and then declines.
In other words, the trade union bargaining power, wage rate and unemployment rise initially with trade unions’ membership fees as the positive effect of greater cohesion and commitment outweighs the adverse effect of decreasing density on the trade-union bargaining power. However, beyond a critical membership fee, wage and unemployment rates decline as the reduced density effect dominates the increased cohesion-commitment effect. The greater the upper-bound on members’ capacity to enjoy the trade-union service and the higher the rate of tax rebate, the larger the gains that can be reaped by trade unions in terms of wage rate; albeit with a higher level of unemployment within the labour force as a whole.

VI. IMPLICATIONS FOR THE DETERMINATION OF MEMBERSHIP FEES

Membership fees can vary with the nature and objective of the trade union. The following analysis considers a trade union striving to achieve targets of final-fallback wage rate differential \( W^* \) and unemployment level \( U^* \) and setting the membership fee so as to minimise the quadratic loss from not achieving these targets \( \{\phi_1(W - W^*)^2 + \phi_2(U - U^*)^2\} \), with \( \phi_1 \) and \( \phi_2 \) positive scalars, subject to the final-fallback wage rate differential and unemployment equations 15 and 16. For this trade union the efficient membership fee \( m^o \) is:

\[
m^o = \left[ \frac{0.5}{\delta} - \left( \frac{0.5}{\delta} \right)^2 - \left( \frac{\sigma_0}{\alpha \mu_0 L \delta} \right) \Omega^2 \right]^{0.5}
\]

where,

\[
\Omega = \frac{(\phi_1 W^* + \phi_2 \beta U^*) \sqrt{\beta}}{\phi_1 + \phi_2 \beta^2}.
\]

and \( \delta \) is, as defined in 11, equal to \( (1 - t) / u(S) \). (See the Appendix for details.)

It is assumed that the discriminant \( \Delta \) in expression 17 is positive so as to allow for a real solution for the efficient membership fee to exist. The following properties are obtained under this assumption.

1. The efficient membership fee rises with the intrinsic level of the standard deviation of commitment (i.e., the intrinsic lack of cohesion) within the trade union \( \sigma_0 \).
2. The efficient membership fee declines with the intrinsic level of the mean of commitment within the trade union ($\mu_0$).

3. The efficient membership fee declines with the average effect of the trade union's bargaining power on the final-fallback wage rate differential ($\alpha$).

4. The efficient membership fee declines with the membership withdrawal coefficient $\delta$ (i.e., rises with both the tax rate and the upper-bound on members’ capacity to enjoy the trade-union service) if:

$$0.5L + 0.5\Delta^{-0.5}\left[\frac{\Omega^2\sigma_0}{\alpha\mu_0} - \frac{0.5L}{\delta}\right] > 0,$$

but otherwise rises with the membership withdrawal coefficient (i.e., declines with both the tax rate and the upper-bound on members’ capacity to enjoy the trade-union service).

5. The efficient membership fee declines with the size of the labour force ($L$). From the trade-union density equation we obtain that the larger the labour force the lower the trade-union density attainable with a given membership fee and consequently the bargaining power. Therefore, the larger the labour force, ceteris paribus, the lower the membership fee set by a trade union.

6. The efficient membership fee rises with the target levels of the final-fallback wage rate differential and unemployment.

7. The efficient membership fee declines with the trade-off coefficient between unemployment and wage ($\beta$) if:

$$\frac{W^*}{U^*} < \frac{2\phi_2^2 \beta^3}{0.5\phi_1^2 - 1.5\phi_1 \phi_2 \beta^2}$$

and rises otherwise.

8. The efficient membership fee rises with the importance of the unemployment target relatively to the wage target ($\phi = \phi_2 / \phi_1$) if:

$$\frac{W^*}{U^*} < 1 + \phi \beta^2 - \phi \beta$$

but declines otherwise.

**VII. CONCLUSION**

This paper expanded the literature on the bargaining power of trade unions by suggesting the possibility of a trade off between the conventional quantitative source of power
stemming from trade union density and the novel qualitative source of power stemming from members’ overall commitment and group cohesion. The analysis showed that up to a critical membership fee, the bargaining power of trade unions, final-fallback wage rate differential and unemployment level rise with membership fees as the effect of improved members’ commitment and trade union’s cohesion dominate the effect of reduced trade union density. This proposition is consistent with the argument that a small army of volunteers can be more effective than a large army of conscripts. However, beyond the critical membership fee, the bargaining power of trade unions, final-fallback wage rate differential and unemployment level decline with membership fees as the reduced density effect dominates the increased aggregate commitment and cohesion effects.

More specifically, the paper suggested that the relationships between trade unions’ bargaining power, final-fallback wage rate differential, unemployment and trade-unions’ membership fee can be depicted by inverted U-shaped curves where maximum bargaining power and wage rate are achieved, but at the cost of maximum unemployment, by setting the membership fee at half the ratio of the upper-bound on members’ level of satisfaction from the trade-union services to their disposable income rate.

The paper incorporated the above-mentioned proposition into the determination of the efficient membership fees by a trade union oriented to minimise the loss stemming from missing wage rate and unemployment targets. The analysis of the efficient membership fee indicates the importance of the trade union degree of cohesion and commitment. If initially the trade union’s cohesion level is very low, the gain in bargaining power from improving the trade-union level of cohesion by raising the membership fee exceeds the loss in bargaining power from the reduced trade-union density. Similarly, when the overall commitment is high the gain, in terms of bargaining power, from increasing the membership fee so as to strengthen the overall commitment any further is smaller than the loss in terms of bargaining power stemming from the reduced trade-union density. The analysis also indicates that the efficient membership fee is negatively associated with the size of the relevant labour force and that if the average effect of the trade union's bargaining power on the final-fallback wage rate differential is high and the wage is already high there is no much scope in raising the membership fee and risking density and employment.
APPENDIX

By substituting equations 15 and 16 into \( \{\phi_1 (W - W^*)^2 + \phi_2 (U - U^*)^2\} \) for \( W \) and \( U \), respectively, squaring \((W-W^*)\) and \((U-U^*)\) and collecting terms the loss function can be expressed as

\[
LOSS = \left(\frac{\phi_1}{\beta} + \phi_2 \beta\right) \frac{\alpha \mu_0}{\sigma_0} [mL - \delta Lm^2]
- 2\left[\frac{\phi_1 W^*}{\sqrt{\beta}} + \phi_2 U^* \sqrt{\beta}\right] \sqrt{\frac{\alpha \mu_0}{\sigma_0}} mL - \delta Lm^2 \nonumber + \phi_1 W^* + \phi_2 U^* \nonumber. \tag{A1}
\]

By differentiating with respect to \( m \) and setting the resultant to be equal to zero we obtain that the efficient trade union membership fee should satisfy the following first-order condition

\[
\left(\frac{\phi_1}{\beta} + \phi_2 \beta\right) \frac{\alpha \mu_0}{\sigma_0} [L - 2\delta Lm^0]
= \left(\frac{\phi_1 W^*}{\sqrt{\beta}} + \phi_2 U^* \sqrt{\beta}\right) \sqrt{\frac{\alpha \mu_0}{\sigma_0}} \frac{[L - 2\delta Lm^0]}{\sqrt{m^0 L - \delta Lm^{02}}} \tag{A2}
\]

By eliminating the common factor \([L - 2\delta Lm^0]\), multiplying both sides by \([m^0 L - \delta Lm^{02}]\) and rearranging terms the above condition can be expressed as a second order polynomial in \( m^0 \):

\[
m^{02} - \left[\frac{1}{\delta}\right]m^0 + \left[-\frac{\sigma_0}{\alpha \mu_0 L \delta}\right] \Omega^2 = 0. \tag{A3}
\]

The solution to this polynomial is given by equation 17 and \( \Omega \) is as defined by equation 18.
REFERENCES


