Open Shop Unions and Product Market Competition

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Abstract

In this paper we analyse the impact of changes in product market competition on wage outcomes in the presence of an open shop union. With less than full union membership, product market competition is shown to affect not only a unionised firm’s profits but also its payoff in the event of a dispute. In contrast to the prediction of the standard model, increases in product market competition may now increase wage levels. The model is therefore able to accommodate the mixed empirical findings regarding the impact of product market competition on union wages.

Keywords: Bargaining, open shop trade unions, product market competition.

JEL Classification: J51; J52; L13

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1 Introduction

The standard model of union bargaining in a Cournot oligopoly gives clear and intuitively plausible predictions on the effect that product market competition has on wages. In a widely cited paper, Dowrick (1989) finds that, under decentralised bargaining, an increase in the number of firms competing in an industry has the unambiguous effect of reducing the bargained wage.\(^1\) In two recent papers, Naylor (2002a,b) explores the implications of this result for profits, both at the industry and firm level. Naylor (2002a) shows that because of the wage moderation effect that results from product market competition, firm entry may actually lead to an increase in industry profits. Naylor (2002b) demonstrates that, for similar reasons, it is actually possible for every firm’s profit to increase with firm entry.

In contrast to the clear theoretical predictions, the evidence on the effect of product market competition on bargained wages is mixed. For the US, a number of studies have found that higher product market power is frequently associated with lower union wages e.g. Block and Kuskin (1978) and Freeman and Medoff (1981). Other studies suggest a more complicated story. Hendricks (1975), using information on union contracts, finds that an increase in the degree of sales concentration raises wages only in highly unionised industries. In industries characterised by low and medium unionisation, wages are significantly and negatively associated with industry concentration. Further, Abowd and Tracy (1989) find that the impact of industry sales concentration on union wages is positive at low levels of concentration and negative at high levels of concentration. Bratsberg and Ragan (2002), analysing the effect of deregulation on the union wage premium over the period 1972-99, show that the results also vary considerably across industries.

For the UK the results are similarly mixed. Stewart (1983) finds that the level of

\(^1\) Under the standard assumption of zero disagreement payoffs, this result holds whether bargaining is restricted to wages or covers both employment and wages.
concentration in the industry has no significant effect on the earnings of union members, whilst MacPherson and Stewart (1990) and Van Reenen (1996) find a negative and (weakly) significant effect of concentration on wages.

Our aim in this paper is to develop a model that can accommodate these mixed empirical results. We show that the established theoretical prediction of a positive relationship between bargained wages and industry concentration depends crucially on the assumption that the union is a closed shop with 100% level of membership, implying that unionised firms stop producing in the event of a strike. This assumption is, however, seldom realistic. In most developed countries, open shop arrangements, where the union is recognised for bargaining purposes but membership is not compulsory, are the dominant form of union organisation (see, for example, Boeri et al. (2001), Visser (2003) and Booth and Bryan (2004)). In addition, empirical evidence indicates that firms normally do not stop operating during a strike. In the present paper, we analyse the impact of product market competition on the outcome of union-firm bargaining when workers are organised in open shop unions that represent only part of the workforce of a firm, implying that unionised firms can produce with their non-unionised workers in the event of a strike.²

Gramm (1991) and Gramm and Schnell (1994) examine firms’ operating capacity at struck facilities during a strike. They use a sample of 35 large strikes (involving 1,000 or more workers) in single firm bargaining units in the US during 1984-1988, and 21 small strikes (involving 6 or more workers in 1984-85 and 20 or more workers in 1986-88) in New York. In the US sample they find an average operating capacity of 57% when no replacements are hired, 77% when temporary replacements are hired, and 90% when permanent replacements are used. In the New York sample the average operating capacity was 60% regardless of the use of replacements. Cramton and Tracy (1998) analyse strikes involving bargaining units of at least 1,000 workers in the period 1980-89. They find that the firm’s average operating capacity during the strike is 43% when no replacements are hired, 67% with temporary replacements, and 56% with permanent replacements. In addition, they find that the fraction of strikes involving replacements is relatively small (14.1%), which is in accordance with previous evidence provided by Olson (1991) and Gramm (1991).

²In the theoretical literature on open shop unions, it is typically assumed that during a strike the firm continues production with those of its workers who are not members of the union (see Naylor and Cripps (1993), Naylor and Raasum (1993), Corneo (1993, 1995)). In these models, by affecting the payoff of the firm in event of a dispute, the level of union density impacts on the outcome of collective bargaining. However, this literature does not include explicit models of the product market and firm’s oligopolistic behaviour so they are unable to explain the interactions between product markets structure and union-firm bargaining.
As our main result, we show that for sufficiently low (but strictly positive) levels of union density increased product market competition leads to higher wages, thereby reversing the prediction of the standard model, while the standard result prevails for sufficiently high levels of union density. The intuition as to why the standard result can be overturned in the case of open shop unions is straightforward: Product market competition affects not only unionised firms’ profits but also their payoff in the event of a dispute. If a union strikes at one firm, competitors will optimally expand their production. As a consequence, the firm’s disagreement payoff falls, helping the union in the bargain. Hence the union captures a larger share of a smaller pie, and the net effect on the wage rate is indeterminate. Due to the robustness of this mechanism, our main result holds for a broad class of specifications used in the literature with respect to the union objective function and to the scope of bargaining.

The remainder of the paper is organised as follows. In section 2, we introduce the basic model and derive the outcome of collective bargaining. We start by analysing the case in which a monopolist bargains over wages with an open shop union. We then examine how the outcome of collective bargaining changes when the same firm competes with a second firm, which may or may not be unionised. In section 3 we show that, under fairly mild assumptions, our mains results are reinforced if union membership is endogenously determined. In section 4, we proceed by briefly discussing the robustness of our main results with regard to the scope of collective bargaining. Section 5 concludes.

2 The model

Consider the market for a homogeneous commodity with inverse linear demand

\[ p = a - by \] (1)
where $p$ denotes product price and $y$ total output. Changes in the degree of product market competition are captured in the simplest way possible by comparing a monopoly firm 1 (in which case $y = y_1$) and a Cournot duopoly with firms 1 and 2 (in which case $y = y_1 + y_2$). Assume that this market is small relative to the rest of the economy, so that we can abstract from income effects. Firm 1 is assumed to be unionised, while firm 2 may or may not be unionised.

Each firm is assumed to produce under constant returns to scale, with labour $l_i$ ($i = 1, 2$) as the only input. The marginal product of labour is normalised to unity. Therefore, one can denote output and employment interchangeably ($y_i = l_i$) and firm $i$’s profit equals

$$
\pi_i = (p - w_i)y_i = (a - by - w_i)y_i.
$$

(2)

The objective of the union in firm 1 is represented by the Stone-Geary utility function

$$
\Omega_1 = (w_1 - w^c)\theta l_1^{1-\theta},
$$

(3)

where $w^c$ denotes the reservation wage and parameter $\theta \in (0, 1]$ the relative strength of the union’s preference for wages over employment. This functional form encompasses the common assumptions of rent maximisation ($\theta = 1/2$) and wage maximisation ($\theta = 1$) as special cases. The reservation wage is assumed to be exogenous and, without further loss of generality, is set equal to zero ($w^c = 0$). If a second unionised firm is present in the market, the utility of the union in this firm is represented by a function analogous to (3).

We assume that the union is an open shop, and the fraction of workers who are union members is denoted by $\mu \in (0, 1]$. The firm pays all its workers, whether they are union members or not, the same bargained wage, $w_1$.\(^4\) In this section, our main

\(^4\)This amounts to assuming that the union wage effect is a pure public good. For empirical evidence supporting this assumption see Barth et al. (2000) and Booth and Bryan (2004). Using matched employer-employee data for Norway and the UK, respectively, these papers provide evidence that, when
results are derived under the assumption that union density is exogenously given when collective bargaining takes place, and hence that the individual decision to become a union member is independent of wage formation. In section 3, we show that, under fairly mild assumptions, the introduction of endogenous union membership would only reinforce our main results.

Following Naylor and Cripps (1993) and Naylor and Raaum (1993), we consider a sequence of contract periods. In each contract period, the model can be described as a two-stage game. In stage one, firm(s) and union(s) bargain over wages, for a given level of union density. In stage 2, firms decide on their level of production, and hence employment, taking as given the wage of the other firm (in the case of a duopoly) and taking into account their labour demand schedule.\(^5\) In order to solve the model analytically, we proceed by backwards induction.

### 2.1 Solving for production

Under the right-to-manage assumption, firms will choose the level of output (employment) in order to maximise profits given the bargained wage. Consider first that firm 1 is a monopolist. Solving the first order condition for profit maximisation yields

\[
y_1^* = \frac{a - w_1}{2b}.
\]

(4)

Using (2) and (4), the monopolist’s profit follows as

\[
\pi_1 = \frac{(a - w_1)^2}{4b},
\]

(5)

controlling for the level of union density in the establishment, the individual membership status ceases to have a significant effect on the wage.

\(^5\)The alternative of efficient bargaining, where firms and unions bargain over wages and employment, is considered in Section 4.
while the utility of the union implied by (3) and (4) is equal to

$$\Omega_1 = w_1^\theta \left( \frac{a - w_1}{2b} \right)^{1-\theta}.$$  \hspace{1cm} (6)

Alternatively, with a duopoly in the product market, best reply functions are given by

$$y_i = \frac{a - w_i}{2b} - \frac{1}{2} y_j \quad i, j = 1, 2, i \neq j \quad (7)$$

and equilibrium outputs follow as

$$y_i^* = \frac{a - 2w_i + w_j}{3b} \quad i, j = 1, 2, i \neq j.$$ \hspace{1cm} (8)

The profit for unionised firm 1 is then given by

$$\pi_1 = \frac{(a - 2w_1 + w_2)^2}{9b},$$ \hspace{1cm} (9)

while union utility follows from (3) and (8) as

$$\Omega_1 = w_1^\theta \left( \frac{a - 2w_1 + w_2}{3b} \right)^{1-\theta}.$$ \hspace{1cm} (10)

### 2.2 Solving the wage bargain

The wage $w^r_1$ paid by firm 1 in each contract period is the outcome of a Nash bargain with the union:

$$w^r_1 = \arg \max_{w_1} \left\{ \Omega_1^\beta (\pi_1 - \pi_1^i)^{1-\beta} \right\},$$ \hspace{1cm} (11)

where superscript $r$ denotes the respective production regime, and it equals either $um$ (unionised monopoly), $ud$ (unionised duopoly) or $md$ (mixed duopoly, i.e. the case where firm 2 is not unionised). The disagreement payoff by the firm is given by $\pi^i_1$, while
\( \beta \in (0, 1) \) represents the relative bargaining power of the union, and reflects possible asymmetries in the underlying bargaining procedure.\(^6\) We assume that, in the event of a disagreement, union workers strike and receive their reservation wage \( w^c \), which we have normalised to zero.\(^7\) If a second unionised firm is in the market, bargaining within this firm is represented by a function analogous to (11). Clearly, \( \pi_1, \pi_1^u \) and \( \Omega_1 \) depend on the market structure, and hence so does the union wage \( w_1^r \). We now proceed to derive \( w_1^r \) for the unionised monopoly, unionised duopoly and mixed duopoly cases, respectively.

### 2.2.1 Unionised monopoly

The standard assumptions that the firm and the union behave rationally and possess complete information excludes the possibility of a strike in equilibrium. However, by affecting the disagreement payoff of the firm, the threat of a strike is crucial in the bargaining process.\(^8\) As in Naylor and Cripps (1993) and Naylor and Raaum (1993) we assume that, in the event of a strike, the firm continues production with its non-union workers under the terms of the contract negotiated in the previous period and, furthermore, that the firm is myopic in the sense that it neglects the impact of its current employment decisions on future wage negotiations.

Hence, the monopolist’s total sales under a strike are equal to the output it can produce with its non-union workers, given the wage rate negotiated in the previous contract period (\( \bar{w}_1 \)). Therefore, the output of firm 1 under a strike is given by \( y_1^s = \)

\(^6\)This formalisation is consistent with the non-cooperative interpretation of the Nash solution offered by Binmore et al. (1986). In this context, the union’s relative power should not depend on union density provided that the influence of this variable is captured on the firm’s disagreement payoff. Nevertheless, all qualitative results of the model would go through if \( \beta \) was assumed to be an increasing function of \( \mu \).

\(^7\)Income of union members during a strike may consist of strike pay financed by union resources and/or income from temporary jobs that union members obtain during the dispute (see Layard et al. (1991)). If workers were to receive strike pay of less than the reservation wage \( w^c \), there would be a minimum level of union density that the union had to achieve in order to raise the wage above \( w^c \) (see Naylor and Cripps (1993) and Naylor and Raaum (1993)).

\(^8\)As noted by Binmore et al. (1986), the Nash bargaining solution can be interpreted by looking at an underlying dynamic game of the type proposed by Rubinstein (1982). Therefore, the disagreement payoffs should correspond to the streams of income that accrue to the parties when they are in a state of disagreement.
\( (1 - \mu)\mathcal{Y}_1 \), where \( \mathcal{Y}_1 = (a - w_1) / (2b) \) is the output (and employment) of the domestic firm in the previous contract period (that is, the firm’s profit maximising level of output at the wage rate \( w_1 \)). Output losses inflicted upon the firm in the event of a strike are therefore an increasing function of union density. The conflict payoff of the monopolist then follows as

\[
\pi_1^* = (1 - \mu^2) \frac{(a - w_1)^2}{4b}. \tag{12}
\]

We are now in a position to solve for the steady-state Nash bargained wage. This involves two steps. First, using (5), (6) and (12), we maximise the Nash product in (11), taking as given the wage of the previous contract period (\( w_1 \)). This leads to the first order condition for the current period Nash bargaining problem. The steady-state bargained wage follows by imposing the condition \( w_1 = w_1^* \). This gives:

\[
w_1^{num} = \frac{\beta \theta \mu^2}{2 - \beta (2 - \mu^2)} a. \tag{13}
\]

It is straightforward to check that the steady-state bargained wage is increasing in \( \mu, \beta, \) and \( \theta \). The bargained wage also tends to zero whenever any of these parameters tends to zero.

### 2.2.2 Mixed duopoly

Consider now the entry of a second firm which, in this section, is assumed to be non-unionised. In the absence of a union, this firm pays its workers the reservation wage \( w_2 = w^c = 0 \). Hence, \( \pi_1 \) and \( \Omega_1 \) are obtained by setting \( w_2 = 0 \) in Eqs. (9) and (10), respectively. By analogy with the previous section, the output of the unionised firm in the event of a strike equals \( y_1^* = (1 - \mu)\mathcal{Y}_1^* \), where now \( \mathcal{Y}_1^* = (a - 2w_1) / (3b) \).

In order to find the disagreement payoff for the unionised firm, one needs to know the supply response of the non-unionised competitor in case of a strike. This is found
by substituting $y_1^s$ into the best-reply function of the non-unionised firm, yielding

$$y_2^s = \frac{(2 + \mu)a + 2(1 - \mu)\bar{w}_1}{6b}. \quad (14)$$

It is easily checked by comparing (14) to (8) that firm 2 would expand its output in case of a strike, as would be expected. Given this response, the disagreement payoff (profit) for firm 1 follows as:

$$\pi_1^a = \left[1 - \frac{\mu(1 - \mu)}{2}\right] \frac{(a - 2\bar{w}_1)^2}{9b}. \quad (15)$$

Solving for the steady-state wage yields:

$$w_1^{md} = \frac{\beta \mu(1 + \mu)}{8 - \beta(8 - 2\mu(1 + \mu))} a. \quad (16)$$

As in the monopoly case, the steady-state bargained wage is increasing in the parameters $\mu$, $\beta$, and $\theta$.

Subtracting (16) from (13) yields the wage differential $D$ between the unionised monopoly and mixed duopoly regimes:

$$D = w_1^{um} - w_1^{md} = A \frac{\beta \mu}{2} a \quad (17)$$

where

$$A \equiv \frac{2\mu}{2 - \beta(2 - \mu^2)} - \frac{1 + \mu}{4 - \beta(4 - \mu(1 + \mu))}.$$ 

Market entry of a non-unionised firm increases the wage paid by the unionised firm if and only if $A < 0$. In the case of symmetric Nash bargaining ($\beta = 1/2$), this is true for $\mu \in (0, 0.312)$.

In order to gain some intuition for this result note that, in the borderline case of zero union membership ($\mu = 0$), a strike would not have any effect, and the firm pays

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9 A critical level of union density below which increasing product market competition raises the bargained wage can be shown to exist for all relative bargaining strengths.
the competitive wage in both situations \((w_{1}^{um} = w_{1}^{md} = 0)\). With strictly positive union membership on the other hand, the profit differential \(\pi_{1} - \pi_{1}^{s}\) and hence the bargained wage rate becomes regime specific. Under monopoly, a marginal increase of \(\mu\) starting from 0 has only a second-order effect on the disagreement payoff. This is different under mixed duopoly: There is now a negative first-order effect on the disagreement payoff because of the increase in the competitor’s output that occurs during a strike. Therefore, for sufficiently small union densities, the profit differential \(\pi_{1} - \pi_{1}^{s}\) (and therefore the wage) is smaller under unionised monopoly than under mixed duopoly. At the opposite extreme, when \(\mu = 1\), \(\pi_{1} - \pi_{1}^{s}\) is higher under monopoly than under mixed duopoly. This follows from the fact that, when union membership is 100\%, the disagreement payoff is zero in either case, while the profit is higher in the monopoly case in the absence of a strike. By continuity, this implies that at some intermediate level of density, wage rates are equal in both situations. The result is illustrated in figure 1, where \(\mu^{*}\) denotes

Figure 1: Bargained Wages and Union Density
the critical level of union density below which increased product market competition increases the wage rate.

As shown in Appendix A, increasing product market competition not only raises wages but also union utility for sufficiently low levels of union membership. The range of membership levels for which this is true is, however, smaller than that for wages. This is due to the fact that product market competition causes a contraction in the employment of the unionised firm which, ceteris paribus, lowers union utility. Therefore, union utility will only increase if this fall is compensated for by a sufficiently large increase in the negotiated wage.

2.2.3 Unionised duopoly

Consider now the case where the second firm is unionised as well. Workers are organised in firm-specific unions and bargaining is decentralised in the sense that each firm bargains independently with the corresponding union. In addition, it is assumed that the negotiations take place simultaneously, and that firm 1 and its union correctly anticipate the outcome of the bargain between firm 2 and its union when negotiating their own wage.

To keep the model analytically tractable, we consider the perfectly symmetric case. In particular, we assume that union density is the same in both firms ($\mu_1 = \mu_2 = \mu$), and that unions have identical objective functions ($\Omega_1 = \Omega_2$) and bargaining power ($\beta_1 = \beta_2 = \beta$). As before, the output of firm 1 in the event of a strike is $y_1^s = (1 - \mu)\bar{y}_1^1$, where this time $\bar{y}_1^1 = (a - 2w_1 + w_2)/(3b)$. Substituting into the best reply function of firm 2 gives

$$y_2^s = \frac{a(2 + \mu) + (2w_1 - w_2)(1 - \mu) - 3w_2}{6b},$$

which is the level of production of firm 2 in the event of a strike in firm 1. The disagre-
ment payoff of firm 1 then follows as

$$\pi^s_1 = \frac{(a - \bar{w}_1)(1 - \mu) [(a - 2\bar{w}_1)(2 + \mu) - \bar{w}_2(1 - \mu) + 3w_2]}{18b}. \quad (19)$$

As in the previous section, the solution for the steady-state Nash bargained wage is obtained in two steps. First, we maximise the Nash maximand in (11), taking as given the wages negotiated in the previous contract period \((\bar{w}_1, \bar{w}_2)\) and the contemporaneous wage of the other firm \(w_2\). This leads to the first order condition for the current period Nash bargaining problem. Second, using the first order condition, we solve for the steady-stage bargained wage by imposing that \(w_1 = \bar{w}_1\) and \(w_2 = \bar{w}_2\). This gives

$$w_{1d}^* = w_{2d}^* = \frac{\beta \theta \mu (1 + \mu)}{8 - \beta (8 - (2 - \theta) \mu (1 + \mu))} a. \quad (20)$$

Comparing (16) and (20) one can see immediately that \(w_{1d}^* > w_{1d}^{\text{ind}}\) as long as \(\beta, \theta\) and \(\mu\) are strictly positive. Hence, firm 1 pays a higher wage in the steady-state equilibrium if the competing firm 2 is unionised as compared to a situation where firm 2 is non-unionised. There is therefore now an even larger interval of union density values for which increasing product market competition increases wages. In Appendix A it is shown that for the special case of a rent maximising union \((\theta = 1/2)\), the same is true for union utility.

### 3 Endogenous union membership

In the analysis so far, we have adopted a deliberately parsimonious set-up in order to highlight the key mechanism at work in our model. In this section, we show under what conditions our results continue to hold if union membership is endogenously determined.

It is now well established in the literature on open shop unions that, since the bargained wage is a pure public good and union membership involves a private cost (the
membership fee), any theory of voluntary union membership has to deal with the free-rider problem associated with the individual decision to join a union. In order to explain voluntary union membership in the context of an open shop union, the existing literature typically assumes that the union provides a private good to its members. Examples of this excludable good, available only through membership, are privileged access to grievance procedures or reputation gains from complying with a social custom. The valuation of these benefits are assumed to vary across individuals, and a worker will become a union member if the utility gain associated with the private good provided by the union more than compensates for the utility loss caused by the membership fee. In order to formally explore how firm entry impacts on the individual membership decision, we draw on the work of Booth and Chatterji (1995), who develop a simple model of union membership determination in the context of an open-shop union.

3.1 Union membership determination under a monopoly

Consider union membership determination at the monopoly firm 1 described in section 2.2.1. At the beginning of the contract period, each worker $k$ employed at firm 1 in the previous period decides whether or not to join the trade union at the establishment. Once the level of union density is defined, the current period collective wage $w_1$ is determined by a decentralised Nash bargaining process. Subsequently, the firm unilaterally chooses employment according to the labour demand curve.

An individual’s total utility $u_k$ is given by

$$u_k = \begin{cases} 
    u(w_1) & \text{if not a union member} \\
    u(w_1 - \alpha) + \delta_k & \text{if a union member}
\end{cases},$$

where $u(\cdot)$ is a continuous, twice differentiable indirect utility function, which is strictly increasing and concave in the individual’s income, $\alpha$ is the monetary cost associated with being a union member, and $\delta_k$ denotes individual $k$’s valuation of the private
good provided by the union. We assume that $\alpha$ is smaller than $w_1$ and identical for all individuals and that $\delta$ varies across individuals (and specifically that it is uniformly distributed between 0 and 1). Workers not employed in the unionised firm 1 receive their reservation wage, and hence their utility is $u(0)$.

The marginal union member is indifferent between joining the union or not, and hence $\delta^* = u(w_1) - u(w_1 - \alpha)$, where $\delta^*$ denotes the critical level of $\delta$ above which a worker will decide to join the union.\(^\text{10}\) Due to the assumption that $\delta$ is uniformly distributed, we have $\mu = 1 - \delta^*$. The membership demand curve can therefore be expressed as:

$$\mu(w_1, \alpha) = 1 - [u(w_1) - u(w_1 - \alpha)] \tag{21}$$

where $[u(w_1) - u(w_1 - \alpha)]$ is normalised to lie in the interval $[0, 1]$. Thus, by concavity of the individual’s utility function, the membership demand function is positively sloped in $(w_1, \mu)$-space. Intuitively, with a higher wage rate the utility loss incurred from paying the membership fee is reduced, making it worthwhile for workers with a lower valuation of membership to join the union.

A steady-state equilibrium in wages and membership is determined simultaneously from the union membership demand function (21) and the bargained wage function (13). Given that both these curves are positively sloped in $(w_1, \mu)$-space, multiple equilibria may exist. For the comparative statics to be meaningful, we follow Booth and Chatterji (1995) in assuming that the equilibrium satisfies the condition $\phi \eta < 1$, where $\phi$ and $\eta$ denote, respectively, the elasticity of the union membership demand function with respect to the wage rate and the elasticity of bargained wage function with respect to union density. Intuitively, this assumption implies that the membership demand function is steeper in $(w_1, \mu)$-space than the bargained wage function at the equilibrium point.

\(^{10}\)As in Booth and Chatterji (1995), we assume that the probability of being employed in the current period is independent of the worker’s union membership status and that membership fees are refunded to the unionised worker if they are eventually not employed by the firm.
Equilibrium density clearly depends on the position of each of the two curves. It can be easily checked that the equilibrium level of union density is increasing in $\beta$ and $\theta$ and decreasing in the size of the membership fee $\alpha$.

3.2 The impact of firm entry on wages and membership

Within this setting, it is now straightforward to analyse the effects of market entry by a second firm. Figure 2 plots two alternative membership demand curves, $\mu^A$ and $\mu^B$ (where $\mu^B$ represents a situation with a lower union membership fee), and furthermore replicates the bargained wage curves $w_{1um}$ and $w_{1md}$ from figure 1. Under unionised monopoly, the equilibrium union densities are given by $\mu^I$ and $\mu^{II}$, respectively. Entry of a second firm, as explained previously, changes the bargained wage curve – figure 2 represents this situation for the case where firm 2 is non-unionised. With endogenous membership, the new equilibrium wage is given by the intersection point of the respective
membership demand curve ($\mu^A$ or $\mu^B$) with $w^md_1$ (not drawn in order to avoid clutter). It is easily checked that the induced change in union density in both cases contributes to reinforce the wage effect described in the previous sections. If the equilibrium level of density under a monopoly is below $\mu^*$, the shift of the bargained wage curve induced by higher product market competition leads to higher union density and therefore to an even more pronounced rise in the equilibrium wage. Conversely, if the equilibrium level of density under a monopoly is above $\mu^*$, the shift of the bargained wage curve induced by increased product market competition causes a fall in union membership and hence leads to an even lower wage.

4 Efficient bargaining

As a further robustness check, we consider whether changing the scope of bargaining qualitatively alters the results. Specifically, we look at the case of efficient bargaining, in which firms and unions negotiate over both wages and employment. This section contains a description of the outcomes for the case of a rent maximising union, with the detailed calculations being delegated to Appendix B.

When comparing the wage outcome in a unionised monopoly and a mixed duopoly, the logic from the right-to-manage model carries through: The presence of a competitor serves to improve the position of the union in the bargain, as the firm faces a reduction in its fallback level of profits in the event of a strike because its competitor expands output. There is therefore a range of union density for which increased product market competition leads to higher wage levels. Under efficient bargaining this range turns out to be even higher than under the right-to-manage model. Specifically, we find that product market competition from a non-unionised firm leads to a higher bargained wage for $\mu \in (0, 1/2]$.

The same however is not true if the competitor is unionised. This is because, under
efficient bargaining, the hands of a non striking firm are tied in the event of a strike at its competitor. If short term employment re-contracting during the strike is ruled out, the non striking firm cannot expand production in the event of a strike at the other firm. Indeed, we find that for levels of union density strictly between zero and one, the wage level is lower under unionised duopoly than it is under both monopoly and mixed duopoly.

5 Concluding comments

In this paper we have analysed the impact of changes in product market competition on the wage outcomes when workers are represented by open shop unions. In this case, unionised establishments continue to operate in the event of a strike with their non-unionised workers, and so the wage outcome is affected by the level of union density. Additionally, the bargain is now affected by the extent to which the firm’s competitors expand their own production in the event of a strike. This introduces a previously unnoticed mechanism whereby product market competition impacts on the negotiated wage. The implications of this extension to the simple union-firm bargaining framework are profound. In contrast to the prediction of the standard model, increases in product market competition may now increase wage levels. The model presented in this paper can therefore accommodate the diverse empirical findings regarding the impact of product market competition on bargained wages.

While the open shop assumption is a natural way of uncovering this previously unnoticed mechanism, we conjecture that the main insights of the model are also relevant for other applications of union-firm bargaining. In effect, for our results to hold, we essentially need two ingredients: Firstly, that unionised firms continue to operate at reduced capacity during a dispute; Secondly, that the shortfall in output imposed by the dispute

\[^{11}\text{The assumption that union contracts over wages and employment are binding is common in the unionised oligopoly literature (see, for example, Zhao (1995)).}\]
induces competitors to expand their own sales. The latter of these ingredients arises
directly from the standard Cournot model of competition. The former, besides being
supported by empirical evidence (see footnote 2 above), is a prevalent feature of many
other influential applications of union-firm bargaining in a bilateral monopoly set-up.
In fact Moene (1988) and Cramton and Tracy (1992) convincingly argue that a signif-
icant number of labour disputes take the form of ‘holdout’, ‘work-to-rule’ or ‘go-slow’
practices, where workers continue to operate at reduced productivity whilst bargaining
over a new collective agreement. In addition, casual observation suggests that in many
disputes, a union engages in ‘partial strikes’- involving work stoppages during nominated
days (or indeed during part of some working days). Lastly, as argued by Coles and Hil-
dreth (2000), even when firms fully stop production during a strike, they can continue
to sell from their inventory of finished goods, and hence have a positive disagreement
payoff. In all of these situations, the disagreement payoff of the firm would be influenced
by the extent to which the firm’s competitors expand production and, thus, the main
mechanism highlighted in this paper would be expected to apply.
Appendix

A Impact of product market competition on union utility

We may straightforwardly show for a mixed duopoly model that, for sufficiently low levels of union membership, increasing product market competition increases union utility. For simplicity, we confine attention to the case of symmetric Nash bargaining ($\beta = 1/2$) and a rent maximising union ($\theta = 1/2$). Substitution of (13) into (6) yields an expression for union utility in the monopoly case:

$$\Omega_{1}^{um} = \frac{a}{2\sqrt{b}} \left( \frac{4 + \mu^2}{2 + \mu^2} \right)^{1/2} \left( \frac{\mu^2}{4 + \mu^2} \right)^{1/4}$$  \hspace{1cm} (A.1)

Substituting (16) into (10) yields the equivalent expression for union utility in the presence of a non-unionised competitor:

$$\Omega_{1}^{md} = \frac{a}{2\sqrt{b}} \left( \frac{\mu(1 + \mu)}{4 + \mu(1 + \mu)} \right)^{1/2} \left( \frac{8 + \mu(1 + \mu)}{4 + \mu(1 + \mu)} \right)^{1/4}$$  \hspace{1cm} (A.2)

One can show by comparison of (A.1) and (A.2), that union utility is higher under a mixed duopoly when $\mu \in (0, 0.187)$.

In the case of unionised duopoly, we again confine our attention to the case of symmetric Nash bargaining ($\beta = 1/2$) and a rent maximising union ($\theta = 1/2$). Substituting (20) into (10) yields an expression for union utility in the presence of competition from an equally unionised firm:

$$\Omega_{1}^{ud} = \frac{a}{2\sqrt{b}} \left( \frac{\mu(1 + \mu)}{48 + 9\mu(1 + \mu)} \right)^{1/2} \left( \frac{8 + \mu(1 + \mu)}{16 + 3\mu(1 + \mu)} \right)^{1/4}$$  \hspace{1cm} (A.3)

Comparison of (A.3) and (A.1) allows us to conclude that, if Nash bargaining is symmetric and the union maximises rents, the presence of product market competition from an equally unionised firm leads to higher union utility if $\mu \in (0, 0.193)$. 

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B Efficient bargaining

As a robustness check of our results, we repeat the analysis assuming efficient bargaining. As in the right-to-manage model, we consider a sequence of contract periods. In each contract period, bargaining is over both wages and employment. For simplicity we assume that the union maximises rents \((\theta = 1/2)\). This implies that output is independent of the bargained wage and equal to its competitive level:

\[
y^* = \frac{a}{2b}.
\]  

Equilibrium is given as the generalised Nash solution of the cooperative game played by the firm and the union:

\[
{w^*_1} = \arg \max_{w_1} \left\{ \Omega^*_1 (\pi_1 - \pi^*_1)^{1-\theta} \right\} \quad \text{s.t. } y_1 = y^*_1 \tag{B.2}
\]

where, as before, the union disagreement payoff is normalised to zero. Using (2), (3) and (B.1) we get

\[
\pi_1 = \frac{1}{b} \left( \frac{a}{2} \right)^2 - w_1 \left( \frac{a}{2b} \right) \tag{B.3}
\]

\[
\Omega_1 = w_1^{\frac{1}{1-\theta}} \left( \frac{a}{2b} \right)^{\frac{1}{1-\theta}} \tag{B.4}
\]

Using the same reasoning as in the right-to-manage model, the disagreement payoff of the firm is given by

\[
\pi^*_1 = \frac{a(1-\mu)(a(1+\mu) - 2\pi_1)}{4b}, \tag{B.5}
\]

and the steady-state bargained wage under monopoly follows as:

\[
w^*_{1,\text{um}} = \frac{\beta \mu^2}{4 - 2\beta(\mu - 2)} a. \tag{B.6}
\]
Introducing competition by a non-unionised firm 2, which pays all its workers the reservation wage \( w_2 = w^c = 0 \), yields equilibrium outputs of:

\[
y^*_1 = y^*_2 = \frac{a}{3b}
\]  

(B.7)

When evaluated at (B.7), firm 1’s profit and union utility are given by:

\[
\pi_1 = \frac{1}{b} \left( \frac{a}{3} \right)^2 - w_1 \left( \frac{a}{3b} \right)
\]  

(B.8)

\[
\Omega_1 = w_1^{\frac{1}{3}} \left( \frac{a}{3b} \right)^{\frac{2}{3}}
\]  

(B.9)

In the event of a strike, the unionised firm produces \( y^*_1 = (1 - \mu)y^*_1 \), where \( y^*_1 = a/(3b) \) is the level of employment in the previous period. From (7), this induces the non-unionised firm to produce \( y^*_2 = (1 + \mu/2)y^*_2 \). The conflict payoff of the unionised firm can now be derived as

\[
\pi^*_1 = \frac{a(1 - \mu)(a(2 + \mu) - 6w_1)}{18b}
\]  

(B.10)

Solving for the steady-state bargaining wage yields:

\[
w^{md}_1 = \frac{\beta(1 + \mu)}{6(2 - \beta(\mu - 2))}a
\]  

(B.11)

Comparing (B.6) and (B.11) shows that product market competition from a non-unionised firm leads to a higher bargained wage if \( \mu \in (0, 1/2) \).

If firm 2 is unionised as well, and if union contracts over employment are binding, the rival firm cannot expand production in case of a strike. The disagreement payoff of firm 1 becomes

\[
\pi^*_1 = \frac{a(1 - \mu)(a(1 + \mu) - 3w_1)}{9b},
\]  

(B.12)
This exceeds the disagreement payoff under mixed duopoly and under monopoly and, as
a consequence, the steady-state bargained wage is lower than under mixed duopoly and
under monopoly. Specifically, we obtain

\( w^{ud} = \frac{\beta \mu^2}{6 + 3 \beta (\mu - 2)} a. \)  \hspace{1cm} (B.13)
References


