Market Selection Hypothesis and Wage-Employment Bargaining

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Abstract. This paper analyses an industry in which firms and enterprise unions bargain over wages and employment. In modelling the unions objective function we account for the market selection hypothesis so that unions care about profits. The bargaining outcome implies lower wages and higher profits, while employment/output is higher or lower depending on whether the union has more bargaining power over wage or over employment. If the union has more bargaining power over employment, an increase in product market competition may lead to higher profits and output and lower employment and wages. Finally, productive efficiency is raised by an increase in competition as the existence of the monopolistic rent becomes more uncertain.

1 Introduction

Over the past two-three decades, there has been a remarkable expansion of the economic theory of the trade union. Modelling unionised economies requires making assumptions about both the union's preferences and the likely outcome of the bargaining process between unions and firms. The latter problem has been solved by applying tools developed in the game theory literature. As for the former, it is usually assumed that unions care mainly, though not exclusively, about wage and employment. Profits, by contrast, are traditionally supposed to be the objective of the firm and not to enter the union's utility (see Booth [2]).

In this paper we argue that, somewhat indirectly, profits should be accounted for in the union's preferences. The theoretical underpinning is provided by the market selection hypothesis. This states that, as we move to a competitive environment, a firm that does not maximise profits will eventually be driven out of the market. This argument is mainly associated with the work by Friedman [4] and, although it has not been without its critics (see, for example, Blume and Easley [1], Dutta and Radner [3], and Nelson and Winter [7]), it is adopted in our model. In particular, we assume that a firm making higher profits than its competitors has better chances of survival. Further, the survival chances of a low profit firm may worsen as the market becomes increasingly competitive. So, profits are of concern to the union not because it derives utility from them, but because the survival of the firm, and, hence, the very existence of employment and wages, depend on them. The same argument has been used in Pompermaier [11]. There a general equilibrium model in which unions determine employment, but not wages, was analysed. Here, instead, we look at a single industry and consider firm-union bargaining over both wage and employment. Specifically, bargaining occurs between each firm and the enterprise union representing its workers. Under the market selection hypothesis, the industry equilibrium is generally characterised by lower wages and higher profits, employment, and output. Still, if the unions bargain over both wages and employment and have more bargaining power over the latter, both wages and employment turn out to be lower. Having derived the equilibrium, we also assess the likely impact of an increase in product market competition. Usually competition is thought to be good for employment and production and bad for wages and profits. We shall see that, partially because of the market selection hypothesis, this may not be the case. In particular, competition may raise profits and output while lowering wages and employment. Finally, we establish a positive link between competition and firm efficiency. The link derives from the uncertainty regarding the survival of the firm rather than from the shrinking of

the monopolistic rent associated with increasingly competitive markets.
The paper is organised as follows. The basic model is outlined in section 2. Section 3 describes the industry equilibrium under different bargaining settings. Section 4 analyses the consequences of an increase in competition. Section 5 discusses the link between firm efficiency and product market competition. Section 6 contains final remarks.

2 The model

In this section we outline the basic building blocks of the model, the firms, the unions, and the structure of the product market.

2.1 Industry structure

We consider a monopolistically competitive industry made up of a continuum of firms, each of them producing a single good j, with $j \in [0,1]$. All firms are assumed to have identical production functions and to face identical demand schedules. However, their products are differentiated so that each of them has a certain degree of monopolistic power. Demand for good j, d_j, is of CES type. Specifically

$$d_j = \left(\frac{p_j}{P}\right)^{-\frac{1}{1-\lambda}} \frac{I}{P} \qquad j \in [0,1] \tag{1}$$

$1/(1-\lambda)$, where $\lambda \in (0,1)$, denotes the constant elasticity of demand corresponding to the elasticity of substitution between any two consumption goods produced in the industry. I is the amount of nominal income consumers spend on goods from the industry and P is the industry price index, which is given by

$$P = \left(\int_{j=0}^{1} {p_j}^{\frac{\lambda}{\lambda-1}}\right)^{\frac{\lambda-1}{\lambda}}. \tag{2}$$

As for the supply side, each firm employs two factors of production: capital and labour. We take a Cobb-Douglas function with constant or decreasing returns to scale. So

$$x_j = \frac{n_j^{\alpha} k_j^{\beta}}{\alpha^{\alpha}\beta^{\beta}} \qquad j \in [0,1] \tag{3}$$

x_j is firm j's output; k_j and n_j are, respectively, the amount of capital and of labour employed by firm j; $\alpha > 0$ and $\beta > 0$ are technology parameters with $\alpha + \beta \leq 1$. Firm j takes P, I, and the cost of capital r as given and chooses k_j so as to maximise profit. The same applies to n_j, unless bargaining over employment is considered. We assume, in fact, that each firm's workers are organised in a firm union. Firms bargain with unions either over wages or over both wages and employment. Unions preferences and objectives are explained in the next section.

2.2 Market selection hypothesis and unions utility

In this section we incorporate the market selection hypothesis into the unions objective function. According to the market selection hypothesis, in a competitive environment, a firm that does not maximise profits will eventually be driven out of the market. We assume that a fraction $1 - \epsilon$, $\epsilon \in (0, 1)$, of all monopolistic firms will go bankrupt in the wake of some exogenous adverse shock. This means that each firm has a likelihood of survival equal to ϵ. However, the probability of going bankrupt for a given firm increases (decreases) if it posts high (low) profit. More generally, the higher is firm j's profit relative to the other firms' profit, the more likely is firm j to survive. This discussion leads us to model unions preferences as an expectation. Specifically, union j, who acts on behalf of the workers of firm j, has the following expected utility function

$$H_j = \epsilon \Psi(\pi_j, \pi_{-j}) U(n_j, w_j) \qquad j \in [0, 1] \tag{4}$$

$U_j \equiv U(n_j, w_j)$ is the utility function of union j. It depends on employment, n_j, and wage, w_j. Its value when the firm goes bankrupt is equal to zero. $\Psi_j \equiv \Psi(\pi_j, \pi_{-j})$, combined with ϵ, measures the probability of survival of firm j. It depends on its profit, π_j, and on π_{-j}, which is a measure of the profits of all other firms in the industry. As usual, U_j is increasing in both its arguments, that is, $\partial U_j / \partial n_j > 0$ and $\partial U_j / \partial w_j > 0$. Following the market selection hypothesis, Ψ_j is increasing in π_j and decreasing in π_{-j}, i.e., $\partial \Psi_j / \partial \pi_j > 0$ and $\partial \Psi_j / \partial \pi_{-j} < 0$. Finally, the usual assumptions of continuity, differentiability, and concavity apply to (4).
In what follows we choose specific functions for U_j and Ψ_j. So

$$U_j = n_j(w_j - \theta) \qquad j \in [0, 1] \tag{5}$$

$$\Psi_j = \begin{cases} (\pi_j/\pi_{-j})^{\sigma} & \text{if} \quad \pi_j \leq (1/\epsilon)^{1/\sigma}\pi_{-j} \\ 1/\epsilon & \text{otherwise} \end{cases} \qquad j \in [0,1] \tag{6}$$

θ denotes the wage level when the labour market is perfectly competitive (no bargaining) while σ is a non-negative parameter.
(5) is widely used in the trade union literature to model unions preferences. It states that unions care about the wage surplus, that is, the difference between the wage bill under bargaining and that associated with a perfectly competitive labour market.
As for (6), the parameter σ measures the impact of a discrepancy between π_j and π_{-j} on the probability of survival of firm j. The larger is σ, the more likely is that a relatively low π_j will lead to firm j demise. If firm j's profit is sufficiently large relative to the other firms' profit, then it is certain to survive. When σ is equal to zero, the market selection hypothesis is removed. We shall denote this situation as the benchmark.
In the next section we derive the industry equilibrium when firms and unions bargain over both employment and wage. Our framework nests as special cases the right-to-manage model and the efficient bargaining one. Since all firms and all unions are identical, we drop the subscript j and develop the analysis in terms of a representative firm-union pair.

3 Bargaining and industry equilibrium

The industry equilibrium is characterised by a level of capital, k^*, which is independent of wage and employment. Specifically

$$k^* = \frac{\beta\lambda I}{r}. \tag{7}$$

It follows that the equilibrium can be fully described by only two variables, wage and employment. In fact, given (3) and (7), the equilibrium output will differ across the various bargaining settings only if employment does. In particular, more (less) employment under a specific setting implies more (less) output. We therefore limit our analysis to wage and employment.
The bargaining model we use is the one introduced by Nash [6]. In particular, we borrow the two-stage procedure described in Manning [5]. This is a two stage Nash bargaining, whereby first firm and union bargain over wage and then over employment. The solution is found by working backwards from

the second stage. The equilibrium levels of wage, w^*, and employment, n^*, are as follows

$$w^* = \theta \left(1 + \frac{v\gamma}{v\sigma + 1}\right) \geq \theta \tag{8}$$

$$n^* = \left(1 + \frac{q\gamma}{q\sigma + 1}\right) \left(1 + \frac{v\gamma}{v\sigma + 1}\right)^{-1} \frac{\alpha\lambda I}{\theta} \tag{9}$$

where

$$\gamma := \frac{1 - (\alpha + \beta)\lambda}{\alpha\lambda}.$$

$v \in [0, 1]$ and $q \in [0, 1]$ are, respectively, the union's bargaining power over wage and employment. Setting $v > 0$ and $q = 0$ yields the right-to-manage model, while $v = q$ corresponds to the efficient bargaining one. The equilibrium level of profit, π^*, is given by

$$\pi^* = \gamma \left(1 - \frac{q}{q\sigma + 1}\right) \alpha\lambda I. \tag{10}$$

Equations (8) to (10) lead to the following proposition

Proposition 1 *The comparison between the benchmark ($\sigma = 0$) and the market selection hypothesis ($\sigma > 0$) yields the following results:*

(a) wage is always higher under the benchmark and decreasing in σ;

(b) if $q > v$ ($v > q$) employment/production is higher (lower) under the benchmark and decreasing (increasing) in σ;

(c) if $q = v$ employment/production is independent of σ;

(d) if $q > 0$, profit is lower under the benchmark and increasing in σ.

Proof: see (8) to (10). □

Proposition 1 states that incorporating the market selection hypothesis into the bargaining process has always a negative impact on wage. The one on employment/output is, instead, positive unless union's bargaining power is higher over employment ($q > v$). In the latter case, accounting for the market selection hypothesis reduces the industry level of employment/output. This means that if the union is concerned about the survival of the firm, it will

settle for low wages and low employment. This is because under the market selection hypothesis the union cares about the profitability of the firm and is therefore less aggressive when bargaining. In fact, setting $\sigma > 0$ has an effect similar to lowering the union's bargaining power over both employment and wage. If $q > v$, the negative impact on the union bargaining power of σ is larger at the employment bargaining stage than at the wage bargaining one. As a consequence, the equilibrium level of employment falls although wage too is lowered. Notably, as σ increases, the equilibrium approaches the no bargaining outcome ($v = q = 0$). This is because as σ becomes large, profitability becomes increasingly important for the survival of the firm. This also provides an explanation for point *d*. Finally, note that, under efficient bargaining ($q = v$), the employment/output equilibrium is the same under both settings and equal to the one emerging under a perfectly competitive labour market.

4 The impact of a change in product market competition

In this section we address the question of how product market competition affects the industry equilibrium. As a measure of product market competition we use λ, which is the degree of substitutability between the different goods produced in the industry. The larger is λ, the more substitutable are the goods, and the more competitive is the market. To assess the impact of product market competition on the equilibrium we look therefore at changes in λ. Thereby we assume that σ itself is a non-negative function of λ. That is, we allow σ either to be constant or to be positively correlated to competition. The latter amounts to hypotesise that, as competition increases, profitability becomes more important for firm survival. In other words, profitability affects more the survival chances of a competitive firm than those of a monopolistic firm. If this is the case, equations (3), (7), (8), and (9) lead to the following proposition

Proposition 2 *If* $\lim_{\sigma\to\infty} \sigma_\lambda < \infty$ *and* σ_λ *is non-negative and continuous, an increase in product market competition has the following implications:*

(a) wage is decreasing for any $\sigma \geq 0$*;*

(b) if $q < v$ *employment and production are increasing for any* $\sigma \geq 0$*;*

(c) if $q > v$ *and* σ_λ *is non-increasing in* σ*,*

(c1) either employment is increasing for any $\sigma \geq 0$ *or there exists a* $\overline{\sigma} > 0$ *such that employment decreases (increases) if* $\sigma < \overline{\sigma}$ *(*$\sigma > \overline{\sigma}$*);*

(c2) either output is increasing for any $\sigma \geq 0$ *or there exists a positive* $\hat{\sigma} < \overline{\sigma}$ *such that output decreases (increases) if* $\sigma < \hat{\sigma}$ *(*$\sigma > \hat{\sigma}$*);*

(d) if $q > v$ *and* σ_λ *is increasing in* σ *or non-monotonic, employment and output may be increasing or decreasing for any* σ*;*

(e) profit decreases (increases) if $\sigma_\lambda < \sigma^*_\lambda$ *(*$\sigma_\lambda > \sigma^*_\lambda$*), where*

$$\sigma^*_\lambda := \frac{(q\sigma + 1 - q)(q\sigma + 1)}{((\alpha + \beta)^{-1} - \lambda)q^2}.$$

Proof: see (3), (7), (8), and (9). □

The qualitative impact of competition is largely unchanged whether we account or not for the market selection hypothesis. More competition means lower wages and, in general, higher employment and production. However, when the union has more bargaining power over employment than over wages, the impact of competition becomes ambiguous. In fact, depending on the behaviour of σ_λ and the value of σ, employment can either fall or rise and so can output. This is because of the interaction of two effects of competition on employment: a direct effect and an indirect one due to the change in σ, σ_λ. Formally we can write the change in employment as follows

$$\frac{dn^*}{d\lambda} = n^*_\lambda + n^*_\sigma \sigma_\lambda \tag{11}$$

n^*_λ is the direct effect while $n^*_\sigma \sigma_\lambda$ is the indirect one. Both effects are positive when $q < v$. Hence, point *b*.
When $q > v$, the indirect effect is always negative and the direct one may be also negative for low values of σ. However, both n^*_λ and n^*_σ are increasing in σ and, as σ tends to infinity, (11) becomes positive. It follows that, if σ_λ is non-increasing in σ and (11) is negative for $\sigma = 0$, there exists a unique positive σ, $\overline{\sigma}$, such that (11) is equal to zero. In this case, competition lowers employment when σ is smaller than $\overline{\sigma}$ and raises it when σ is larger than $\overline{\sigma}$ (point *c1*).
By contrast, if σ_λ is increasing in σ or non-monotonic (point *d*), the indirect effect is no-longer monotonic increasing and there may be therefore multiple values of σ for which (11) is equal to zero. At each of these values the impact

of competition on employment changes from positive to negative and vice-versa.
As for output, its change is determined by the change in employment and by that in capital. Since the latter is always positive, when σ_λ is non-increasing in σ, the cut-off value of σ, $\hat{\sigma}$, is smaller than $\overline{\sigma}$ (point *c2*).
From *a* and *e* follows that competition, while always reducing wages, may increase profits. If $\hat{\sigma} < \sigma < \overline{\sigma}$ and $q > v$, this happens while employment falls and output expands. In other words, more competition may lead to job losses and a lower wage for those who are still employed, while firms are producing more and making higher profits. The economic intuition behind this result is easily explained. If σ rises with competition, it means that profitability becomes increasingly important for the survival of the firm. The union recognises this by accepting low wages and low employment. Put differently, the union shares the monopolistic profit in terms of employment and wages. As competition increases the existence of a pie to share becomes uncertain. So the union is more willing to give up part of its gain in order to be sure that there will be some gain at all.
Finally, note that, if competition has no impact on σ (σ_λ=0), output is always increasing in λ while employment is raised by competition if σ is larger than σ^*, where

$$\sigma^* := 1 - \frac{1}{q} + \frac{\beta}{\alpha}$$

σ^* is never positive when no capital is used in the production process ($\beta = 0$). In other words, if labour is the only production factor, then the impact of competition on employment is unambiguously positive, whatever the values of v, q, and σ. However, if capital is necessary ($\beta > 0$), then competition may reduce employment when $q > v$. This is most likely to be the case when the industry is capital-intensive (large β/α), the unions are not concerned about firms' profitability (low σ), and their bargaining power over employment is high (large q).

5 Product market competition and firm efficiency

It is often argued that competitive pressure makes firms more efficient. On this subject there is a flourishing literature, which, however, has not come yet to a definite conclusion about the real effect of competition on productive efficiency (for reviews see Nickell [9] and Nickell [10]). The usual argument

is that firms do not minimise production costs because ownership and management are separated. The existence of informational asymmetries between owners and managers gives rise to principal-agent problems and low levels of effort on the part of the managers. In this context, competition matters in that the existence of monopoly rents gives the managers the potential to capture these rents in the form of slack. A different argument identifies in the unions the main source of inefficiencies within firms (see, for example, Nickell and Nicolitsas [8]). This is also true in our model. Here, competition drives the firms towards cost minimisation under two aspects: first, it reduces the bargained wage. This can be easily seen from (8). Second, it modifies the ratio between capital and labour in such a way that it becomes closer to the cost minimising one (i.e., to the one equating technical rate of substitution and factor price ratio). This second effect is only present when unions bargain over employment ($q > 0$). If they do not, once bargaining over wage has taken place, firms always choose the cost minimising labour-capital ratio. More formally, we can look at this second effect by taking the ratio between the unit cost of production under wage-employment bargaining and the unit cost of production when bargaining occurs only over wage (if at all). The latter is the minimum unit cost of production for the bargained wage rate. This ratio looks as follows

$$F^* = (\alpha + \beta)^{-1} \left(1 + \frac{q\gamma}{q\sigma + 1}\right)^{-\alpha} \left[\alpha \left(1 + \frac{q\gamma}{q\sigma + 1}\right) + \beta\right]. \qquad (12)$$

If $q > 0$, F^* is larger than 1 and is reduced by an increase in λ. That is, as competition increases the unit cost of production at the bargained wage rate converges towards the minimum one.
Note that both effects are present in the benchmark case as well ($\sigma = 0$) and whether σ is constant or increasing with λ. However, the reduction in unit cost of production as well as the fall in wage have different economic explanations under the benchmark and under the market selection hypothesis. In the benchmark case, it is the reduction in monopolistic rent that causes wage and unit cost of production to fall. In the market selection hypothesis with $\sigma_\lambda > 0$, wage and unit cost of production fall also because the existence of a monopolistic rent to share becomes more uncertain. In fact, while the wage rate always falls in the wake of an increase in competition, profits rise if σ_λ is sufficiently large (see Proposition 1). This indicates that the unions do give up on wage not because the rent is lower but because it is more uncertain.

6 Conclusion

In this paper we extended the traditional approach to modelling unions preferences by accounting for the market selection hypothesis. In comparison with the benchmark model, in which unions are not concerned with profitability, the bargaining outcome yields lower wages and higher profits. Employment and production are also higher unless unions have more bargaining power over employment than over wages, in which case the market selection hypothesis yields lower employment and output. We also analysed the impact of an increase in product market competition. This turns out to be generally negative for wage and profit but positive for employment and output. However, if unions have more bargaining power over employment, more competition may lower both wage and employment while boosting profit and output. Finally, a positive relationship between product market competition and firm efficiency has been established. The link does not rest as much on the monopolistic rent becoming smaller when competition rises as rather on it becoming more uncertain.

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