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Product market cooperation under efficient bargaining with different disagreement points: a result¹

*Domenico Buccella*²

Abstract: This paper analyzes the effects of product market cooperation in a duopoly with homogeneous goods. Labor unions and firms are locked in bilateral monopoly relations and bargaining within the industry takes place under the efficient bargaining (EB) model. The paper discusses the role of different firms' disagreement payoff on bargaining outcomes and their effect on social welfare components. It shows that the disagreement point of firms can play a crucial role in solving potential conflicts of interest between unions and firms concerning bargaining issues.

Keywords: efficient bargaining, cooperation, unionized oligopoly, social welfare.

JEL codes: D43, J51, L13.

Introduction

The interactions between product and labor markets are at the core of the functioning of advanced economies. Recently the impact of product market cooperation on negotiations between firms and unionized labor has attracted the attention of economists and antitrust authorities because of the consequences for social welfare. The literature has developed a large number of studies related to the impact on welfare of labor union activities. The research considered both the conduct of negotiations with firm-level unions [e.g. Horn and Wolinsky 1988; Symeonidis 2008, 2010] and industry-wide unions [e.g. Mukherjee 2010]. These works primarily focus on the right-to-manage (RTM) model [e.g. Nickell and Andrews 1983; Dobson 1994, 1997; Naylor 2002; López and Naylor 2004]: unions and firms first negotiate the wages; then, once the wages are fixed, the firms retain the right to choose employment levels. In comparison, the analysis carried out on the efficient bargaining (EB) model, where unions and firms negotiate simultaneously over wages and employment [e.g. McDonald and Solow

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1981; Oswald 1985; Espinosa and Rhee 1989; Bughin 1995, 1996] is scant. Kraft [2006] points out that several empirical studies have shown that negotiations conducted under the EB model have been practiced [MaCurdy and Pencavel 1986; Bughin 1993; more recently, Dobbaleare and Mairesse 2011]. The aim of this paper is to shed light on the impact of the EB agenda on product and labor market interactions.

Notable exceptions are represented by Symeonidis [2010] and Buccella [2014]. Symeonidis [2010] briefly discusses the case of firm-level negotiations with cross-ownership in an industry where the EB model is the reference bargaining framework. The author obtains the standard results that an increase in the degree of market cooperation, by restricting industry output, decreases the overall social welfare. The firms' disagreement payoff is represented by a fraction of the monopoly output. Using a conjectural variation model Buccella [2014] analyzes the impact of market competition intensity on profits, union rent, consumer surplus and social welfare in a duopoly with differentiated goods where an industry-wide union conducts negotiations with the firms simultaneously, although separately, according to the EB model. The author shows that the consumer surplus definitely declines when the market becomes less competitive. On the other hand the industry-wide union and the duopolists mutually benefit from the restriction of market competition: the industry profits and the union utility increase. With regard to welfare the impact of the market competition on its overall level depends on the degree of product differentiation: with perfect substitute goods, Cournot competition maximizes social welfare; for more differentiated goods, intermediate levels of market competition maximizes welfare; for virtually independent goods, a less competitive market unambiguously decreases the social welfare.

The paper further extends Symeonidis' [2010] analysis taking into consideration the situation where, in the case of breakdown of negotiations in one bargaining unit, the other firm can operate at the anticipated duopoly equilibrium level of output [e.g. Horn and Wolinsky 1988]. The paper demonstrates that, under the specific assumptions of the linear demand function, constant returns to scale technology and risk-neutral unions, the firms' disagreement payoff is not crucial in determining the relationship between product market cooperation, consumer surplus and social welfare; however, it has a key role in shaping the potential conflict of interest between firms and unions during the bargaining process. In fact whilst increasing product market cooperation decreases wages when the firms' disagreement payoff during negotiations is based on monopoly output, the opposite holds true in the case of the anticipated duopoly equilibrium output as a disagreement point. As a consequence both industry profits and union rents increase to the detriment of consumer surplus. This result mirrors Buccella [2014], therefore suggesting that, in certain cases, the EB framework may solve the conflict of interest between firms and unions, regardless of the form of product market cooperation.

The remainder of the paper is organized as follows. Section 1 describes the model and presents the results. The next section closes with plausible directions for further research on the subject.

1. The model and the results

Consider an industry with two firms, denoted 1 and 2, competing in homogeneous goods à la Cournot. Labor, l , is the only factor of production with a constant returns to scale technology. For simplicity, it is assumed that each worker produces one unit of the goods, $l = q$: hence, output and employment levels are equal.

In the economy there is a continuum of identical consumers who have preferences over goods Q and y , characterized by a separable utility function $V(Q; y)$. The representative consumer maximizes $V(Q; y) = U(Q) + y$, linear in the numeraire goods y , with respect to quantities subject to the budget constraint $pQ + y = M$, with Q non-negative and M the exogenous consumer's income. The utility function $U(Q)$ is assumed continuously differentiable and satisfies the desirable standard properties of the consumer theory [see e.g. Singh and Vives 1984]. Given the quasi-linearity of the function $V(Q; y)$, there are no income effects on the duopolistic sector. Therefore for an adequately high level of income, the optimization problem of the representative consumer is to choose Q to maximise $U(Q) - pQ + M$. The utility maximization problem leads to the

(inverse) demand function $p = \frac{\partial U}{\partial Q} = p(Q)$.³

Following the usual specification of Dixit [1979] and Singh and Vives [1984], to obtain explicit demand functions the representative consumer is assumed to have a quadratic utility function over the homogeneous goods produced by the two firms and a linear function of a numeraire good, y . Thus the preferences of the representative consumer over Q are $U(Q) = aQ - \frac{Q^2}{2}$. From this quadratic utility function, the maximization problem of the representative consumer subject to the budget constraint $pQ + y = M$ leads to the linear (inverse) market

³ The paper analyzes only the standard case when homogenous goods are normal. Thus the paper abstracts from cases where the homogenous goods might fall into the categories of Giffen and Veblen goods. The rationales for this choice are as follows. Giffen goods (where the income effect dominates the substitution effect) are relatively rare and the only empirical evidence of the existence of such goods can be found in Jensen and Miller [2008]. Anecdotal evidence indicates that Veblen goods (consumers are willing to pay a higher price for functionally equivalent goods) might be empirically considerable in markets for luxury goods [Bagwell and Bernheim 1996]. Empirical studies on Veblen effects are, e.g. Clark and Oswald [1996], Bowles and Park [2005] and Carlsson, Johansson-Stenman and Martinsson [2007].

demand curve $p = a - Q$, where p is the price and $Q = \sum_i q_i = \left(\sum_i l_i \right)$, $i = 1, 2$ total output.

Both firms are unionized and the bargaining structure is firm-specific. In other words the firms and the unions are cast into bilateral monopoly relations. The EB model characterizes negotiations. Thus unions and management at each bargaining unit simultaneously negotiate wages and employment. The firm i 's profits can be written as

$$\Pi_i = \pi_i + \lambda \pi_j = (p - w_i)q_i + \lambda(p - w_j)q_j, \quad i, j = 1, 2; i \neq j. \quad (1)$$

As per Symeonidis [2008, 2010] the parameter $\lambda \in [0, 1)$ represents the degree of firms' cross-ownership or, alternatively, the degree of product market cooperation [Mukherjee 2010]. The union utility takes the following form

$$\Omega_i = (w_i - w_0)q_i, \quad i = 1, 2, \quad (2)$$

that is each union is risk-neutral. A different interpretation of (2) is that unions assign an equivalent weight to wage and employment in their preferences (neutrally oriented unions). The positive utility derives from the fact that negotiated wages w_i lie above the reservation wages w_0 , or what workers receive if unemployed. In the present model, and without a loss of generality, w_0 equals zero.

Under the above outlined assumptions, it can be derived that the expression of the consumer surplus is [Mukherjee 2010]

$$CS = \frac{Q^2}{2}. \quad (3)$$

The social welfare of the economy is given by the sum of the industry profits, unions' utility and consumer surplus, that is,

$$SW = \sum \Pi_i + \sum \Omega_i + CS = Q \left(a - \frac{Q}{2} \right), \quad i = 1, 2. \quad (4)$$

Under the EB framework, the parties set w_i and q_i to maximize the following generalized Nash Product

$$\max G_i(w_i, q_i) = (\Omega_i)^\alpha (\pi_i + \lambda \pi_j - \lambda \pi_j^*)^{1-\alpha}, \quad (5)$$

where $\alpha \in (0, 1)$ is the relative bargaining power, assumed equal across units, and $\lambda \pi_j^*$ is the firm i 's disagreement point in the case of negotiations' failure. The

union i 's disagreement point equals zero. As known [Horn and Wolinsky 1988], the disagreement payoff of the bargaining parties may have different specifications. This paper investigates the two most common assumptions considered in literature. First, the analysis focuses on the situation where, in the case of disagreement, firm j can produce the monopoly output. In this case, the firm i 's disagreement payoff is $\lambda\pi_{jM}^* = \lambda[(a - q_{jM}^* - w_{jM}^*)q_{jM}^*]$, where q_{jM}^* and w_{jM}^* are the equilibrium monopoly output and wage, respectively. Second, the analysis investigates the situation where, in the case of disagreement, firm j produces at the anticipated duopoly equilibrium level of output. In this case, firm i 's disagreement payoff is $\lambda\pi_{jD}^* = \lambda[(a - q_{jD}^* - q_{iD}^* - w_{jD}^*)q_{jD}^*]$, where q_{jD}^* and q_{iD}^* are the firms j and i 's equilibrium quantities, and w_{jD}^* is wage.

1.1. Partial monopoly output as the firms' disagreement point: a discussion

After the derivation of first-order conditions for maximization of (5), it can be derived that the firm i 's equilibrium output is $q_i^* = \frac{a}{(\lambda + 3)}$, and the equilibrium wage $w_i^* = \frac{\alpha a}{(\lambda + 3)}$, $i = 1, 2$ (see Appendix). As Symeonidis [2010] discusses, when bargaining is over wages (input price) and employment (quantities), straightforward calculations show that $\frac{\partial Q^*}{\partial \lambda} < 0$, $\frac{\partial w_i^*}{\partial \lambda} < 0 \quad \forall \alpha \in (0, 1)$, and $\frac{\partial w_i^*}{\partial \alpha} > 0 \quad \forall \lambda \in [0, 1)$. The first is the standard result: an increase in the degree of product market cooperation decreases total output in the industry.

Given (3) the qualitative effects on consumer's surplus of an increase in λ is identical. The second finding establishes that the equilibrium wage decreases as λ increases. For given wages an increase in the degree of cooperation between firms causes a fall in total industry output. On the one hand, this increases firms' profits and oligopoly rents: unions may demand higher wages, on the other, the fall in production levels due to coordination leads to a lower demand for labor at each firm. This poses a downward pressure on wages. However the latter effect dominates the former and the final result is a wage reduction. As expected the equilibrium wage is increasing in the union's relative bargaining strength.

Reinserting the equilibrium wages and output into the relevant equations, the values for the industry profits, total unions' rents, consumer surplus and social welfare are obtained

$$\Pi = \Pi_1 + \Pi_2 = \frac{2a^2(1 - \alpha + \lambda)(1 + \lambda)}{(3 + \lambda)^2}, \quad \Omega = \Omega_1 + \Omega_2 = \frac{2a^2\alpha}{(3 + \lambda)^2},$$

$$CS = \frac{2a^2}{(3 + \lambda)^2}, \quad SW = \frac{2a^2(2 + \lambda)}{(3 + \lambda)^2}.$$

Analytical inspection shows that $\frac{\partial \Pi}{\partial \lambda} > 0$, $\frac{\partial \Pi}{\partial \alpha} < 0$, $\frac{\partial \Omega}{\partial \lambda} < 0$, $\frac{\partial \Omega}{\partial \alpha} > 0$, $\frac{\partial CS}{\partial \lambda} < 0$ and $\frac{\partial SW}{\partial \lambda} < 0$ in the relevant parameters' space. The above results can be summarized in the following proposition.

Proposition 1. *In an efficient bargaining framework if the firms' disagreement point is a fraction of the monopoly output, a higher degree of product market cooperation: 1) decreases industry output and wages; and 2) increases industry profits at the expenses of unions' rents and consumer surplus, decreasing overall social welfare.*

1.2. Partial anticipated duopoly equilibrium output as the firms' disagreement point

Let us now consider the case of partial anticipated duopoly equilibrium output as the firm i 's disagreement point. From the first-order conditions for

maximization of (5), it is obtained that the equilibrium output is $q_i^* = \frac{a}{(\lambda + 3)}$,

$i = 1, 2$, identical to the previous case. Consequently total industry output equals

$$Q^* = \frac{2a}{(\lambda + 3)}, \text{ with } \frac{\partial Q^*}{\partial \lambda} < 0. \text{ However the equilibrium wages are } w_i^* = \frac{\alpha a(1 + \lambda)}{(\lambda + 3)},$$

$i = 1, 2$ (see Appendix). The differentiation shows that $\frac{\partial w_i^*}{\partial \alpha} > 0 \quad \forall \alpha \in (0, 1)$, as

expected; however, $\frac{\partial w_i^*}{\partial \lambda} > 0 \quad \forall \lambda \in [0, 1)$: the equilibrium wage increases as the

degree of product market cooperation increases. For given wages an increase in the degree of cooperation between firms triggers a fall in total output. As before there are two effects on negotiated wages. On the one hand, firms' cooperation increases profits and oligopoly rents: unions, therefore, may claim higher wages, on the other the reduction in production levels decreases labor demand. Nonetheless if negotiations break down when the disagreement point is the partial anticipated duopoly output, the industry output will be higher than in the case of partial monopoly output as the disagreement point. As a consequence unions ask for higher wages. This result complements Symeonidis [2010] who shows that in the presence of bilateral monopoly relations, if the firms' disagreement point is the partial monopoly output, under the EB framework the impact of higher product market cooperation (or cross-ownership) on negotiated wages in equilibrium is negative.

Substituting the equilibrium output and the equilibrium wage into the relevant equations, the following values for the industry profits and total union rents are obtained

$$\Pi = \Pi_1 + \Pi_2 = \frac{2a^2(1-\alpha)(1+\lambda)^2}{(3+\lambda)^2}, \Omega = \Omega_1 + \Omega_2 = \frac{2a^2\alpha(1+\lambda)}{(3+\lambda)^2},$$

$$CS = \frac{2a^2}{(3+\lambda)^2}, SW = \frac{2a^2(2+\lambda)}{(3+\lambda)^2}.$$

An analytical inspection reveals that, in the relevant parameters' space, the following comparative statics hold: $\frac{\partial \Pi}{\partial \lambda} > 0$, $\frac{\partial \Pi}{\partial \alpha} < 0$, $\frac{\partial \Omega}{\partial \lambda} > 0$, $\frac{\partial \Omega}{\partial \alpha} > 0$, $\frac{\partial CS}{\partial \lambda} < 0$ and $\frac{\partial SW}{\partial \lambda} < 0$. It is extremely significant to remark that industry profits as well as union utility are now increasing in λ : firms and unions find mutual benefit in increasing the degree of product market cooperation. That is both bargaining parties raise their relative gains to the detriment of consumers. Thus the technical conditions of the firms are relevant in determining the bargaining outcomes. In fact, if the firms are quantity constrained and cannot produce more than $Q^C \in [\lambda\pi_M^*, \lambda\pi_D^*]$, negotiations may end with a situation of either conflict or common interest between labor and management. These results can be summarized in the following proposition.

Proposition 2. *In an efficient bargaining framework, if each firm's disagreement point is a fraction of the anticipated duopoly output in equilibrium, a higher degree of the product market cooperation: 1) decreases industry output; 2) increases wages; and 3) increases industry profits and union rents at the expenses of consumer's surplus, decreasing overall social welfare.*

Conclusions

In an industry characterized by the EB model with firms and unions locked into bilateral monopoly relations this paper has investigated the impact of different degrees of product market cooperation on profits, union rents, consumer surplus and social welfare and analyzes the role of different firms' disagreement payoffs.

The analysis has shown that the firms' disagreement point plays a key role in solving potential conflicts of interest between unions and firms in respect of bargaining issues. In fact the noteworthy finding is that, when the disagreement payoff is based on the partial anticipated duopoly equilibrium output, firms and unions mutually gain from product market cooperation because both industry profits and unions' utility increase. Nevertheless the robustness of these findings needs to be checked for different conjectures concerning the strategic behaviour of firms in the product market. A more competitive product market environment (for instance, price competition à la Bertrand with differentiated products) may reverse many of the results obtained here. This issue is left for future research.

Appendix

When the disagreement payoff of the firms is based on the partial anticipated monopoly output, the maximization problem in (5) is

$$\begin{aligned} \max G_i(w_i, q_i) &= (w_i q_i)^\alpha \times \\ &\times \left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jM}^* - w_{jM}^*)q_{jM}^* \right]^{1-\alpha}, \\ & \quad i, j = 1, 2 \quad i \neq j. \end{aligned} \quad (\text{A.1})$$

The first-order conditions from the maximization of (A.1) are

$$\begin{aligned} \frac{\partial G_i}{\partial w_i} &= \frac{\alpha G_i}{w_i} + \\ & - \frac{(1-\alpha)G_i q_i}{\left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jM}^* - w_{jM}^*)q_{jM}^* \right]} = 0, \end{aligned}$$

$$\begin{aligned} \frac{\partial G_i}{\partial q_i} &= \frac{\alpha G_i}{q_i} + \\ & + \frac{(1-\alpha)G_i \left[a - 2q_i - w_i - (1+\lambda)q_j \right]}{\left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jM}^* - w_{jM}^*)q_{jM}^* \right]} = 0, \end{aligned}$$

which, solved for w_i , lead to

$$w_i = \alpha \left[a - q_i - (1+\lambda)q_j \right] \text{ (rent-sharing curve)}, \quad (\text{A.2})$$

$$w_i = a - (2-\alpha)q_i - (1+\lambda)q_j \text{ (contract curve)} \quad i, j = 1, 2 \quad i \neq j. \quad (\text{A.3})$$

Equating (A.2) and (A.3), firm i 's production as a function of the rival firm's output is

$$q_i = \frac{a - (1+\lambda)q_j}{2}, \quad i, j = 1, 2 \quad i \neq j. \quad (\text{A.4})$$

Solving the system of equations in (A.4), the equilibrium output and employment at each firm is $q_i^* = \frac{a}{(\lambda+3)}$, $i = 1, 2$, and the further substitution in (A.2) leads to the equilibrium wage $w_i^* = \frac{\alpha a}{(\lambda+3)}$ as reported in the main text.

On the other hand when the disagreement payoff of the firms is based on the partial anticipated duopoly output, the maximization problem in (5) becomes

$$\max G_i(w_i, q_i) = (w_i q_i)^\alpha \left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jD}^* - q_{iD}^* - w_{jD}^*)q_{jD}^* \right]^{1-\alpha},$$

$$i, j = 1, 2 \quad i \neq j, \quad (\text{A.5})$$

where q_{jD}^* and q_{iD}^* are the firms j and i 's duopoly equilibrium quantities, and w_{jD}^* is the equilibrium wage.

The first-order conditions from the maximization of (A.5) are

$$\frac{\partial G_i}{\partial w_i} = \frac{\alpha G_i}{w_i} + \frac{(1-\alpha)G_i q_i}{\left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jD}^* - q_{iD}^* - w_{jD}^*)q_{jD}^* \right]} = 0,$$

$$\frac{\partial G_i}{\partial q_i} = \frac{\alpha G_i}{q_i} + \frac{(1-\alpha)G_i \left[a - 2q_i - w_i - (1+\lambda)q_j \right]}{\left[(a - q_i - q_j - w_i)q_i + \lambda(a - q_i - q_j - w_j)q_j - \lambda(a - q_{jD}^* - q_{iD}^* - w_{jD}^*)q_{jD}^* \right]} = 0.$$

Considering that at equilibrium $(a - q_i - q_j - w_j)q_j = (a - q_{jD}^* - q_{iD}^* - w_{jD}^*)q_{jD}^*$, those conditions reduce to

$$\frac{\partial G_i}{\partial w_i} = \frac{\alpha(w_i q_i)^\alpha \left[(a - q_i - q_j - w_i)q_i \right]^{1-\alpha}}{w_i} + \frac{(1-\alpha)q_i (w_i q_i)^\alpha \left[(a - q_i - q_j - w_i)q_i \right]^{1-\alpha}}{\left[(a - q_i - q_j - w_i)q_i \right]} = 0,$$

$$\frac{\partial G_i}{\partial q_i} = \frac{\alpha(w_i q_i)^\alpha \left[(a - q_i - q_j - w_i)q_i \right]^{1-\alpha}}{q_i} + \frac{(1-\alpha)(w_i q_i)^\alpha \left[(a - q_i - q_j - w_i)q_i \right]^{1-\alpha} \left[a - 2q_i - w_i - (1+\lambda)q_j \right]}{\left[(a - q_i - q_j - w_i)q_i \right]} = 0.$$

Solving the above system of equations for w_i , it is obtained

$$w_i = \alpha(a - q_i - q_j) \quad (\text{rent sharing curve}) \quad i, j = 1, 2 \quad i \neq j, \quad (\text{A.6})$$

$$w_i = a - (2 - \alpha)q_i - [1 + \lambda(1 - \alpha)]q_j \quad (\text{contract curve}) \quad i, j = 1, 2 \quad i \neq j. \quad (\text{A.7})$$

Equating (A.6) and (A.7), the resulting firm's i reaction function to the rival firm's production is as in (A.4). Therefore the equilibrium output and employment at each firm is $q_i^* = \frac{a}{(\lambda + 3)}$, $i = 1, 2$; however, the further substitution of the output expression in (A.6) leads to the equilibrium wage $w_i^* = \frac{\alpha a(1 + \lambda)}{(\lambda + 3)}$ reported in the main text.

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