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ABSTRACT

Employers' Associations, Industry-wide Unions, and Competition

by Paul Heidhues*

This paper investigates the effects of industry-wide unions and employers' associations in a duopolistic industry. Using an efficient bargaining model, we show that it is profitable for workers to form an industry union if firms produce goods that are substitutes. In our model industry-wide unionization raises serious antitrust issues since it leads to a monopolistic product market outcome - regardless of whether bargaining is centralized or not. Firms respond to an industry union by forming an employers' association to increase their bargaining power. If firms' productivity differences are relatively small or their products relatively heterogeneous, employers' associations have distributional but not efficiency consequences. If, however, productivity differences between firms are relatively large and their products are relatively homogeneous, employers' associations may further reduce welfare.

ZUSAMMENFASSUNG

Arbeitgeberverbände, Industriegewerkschaften und Wettbewerb

Dieser Beitrag untersucht die ökonomischen Auswirkungen von Industriegewerkschaften und Arbeitgeberverbänden in einer duopolistischen Industrie. Anhand eines effizienten Verhandlungsmodells zeigen wir, dass es sich für Arbeitnehmer lohnt, eine Industriegewerkschaft zu gründen, wenn die Unternehmen substituierbare Güter herstellen. Die Bildung einer Industriegewerkschaft ist aus wettbewerbspolitischer Sicht jedoch höchst bedenklich, da sie zu einer Monopolisierung des Produktmarktes führt – unabhängig davon, ob Lohnverhandlungen zentral oder dezentral durchgeführt werden. In unserem Modell ist es für die Unternehmen optimal, auf eine Industriegewerkschaft mit der Gründung eines Arbeitgeberverbandes zu reagieren, weil das die Verhandlungsmacht gegenüber der Gewerkschaft erhöht. Wenn die Produktivitätsunterschiede zwischen den Firmen relativ klein sind oder die Firmen sehr heterogene Produkte produzieren, beeinflussen Arbeitgeberverbände zwar die Verteilung, aber nicht die Höhe der Industrierente. Arbeitgeberverbände können die gesamtwirtschaftliche Wohlfahrt senken, wenn die Produktivitätsunterschiede zwischen den Unternehmen groß und die Produkte relativ homogen sind.

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1. Introduction

Centralized bargaining is a widespread phenomenon observable in most European labor markets. In Germany, as in many other European countries, politicians and economists are scrutinizing this phenomenon as they devise methods to combat unemployment. To understand the implications of centralized bargaining, we propose investigating both parties involved. While there is a considerable body of literature on union formation,[1] employers' associations have for the most part been ignored by economists.[2]

This paper attempts to explain the raison d'etre and the effects of both unions and employers' associations. We investigate not only how these associations affect labor market bargaining in oligopolistic industries, but also how the formation of these associations affects the behavior of firms on the product market. Whenever competing firms meet to coordinate certain aspects of their behavior, there is a lurking fear that they will use such meetings to curtail competition in other stages of their interaction. We analyze how unions and employers' associations affect the production decisions within an oligopolistic industry. From a policy perspective, this enables us to address the question of whether labor market associations should be exempt from antitrust laws.

Consider Germany as a topical example. Historically, industry-wide employers' associations formed around the turn of the century in response to the newly founded industry unions. At present, industry-wide bargaining between a union and an employers' association is observed in most German industries.[3] As a constitutional principle, the state has no right to interfere in labor

1. See, for example, Davidson (1988), Horn and Wolinsky (1988a, 1988b), Jun (1989), and Stole and Zwiebel (1996). For a survey on wage bargaining models see Manzini (1998).
2. A reader studying, for example, the "Handbook of Labor Economics" will find no reference to employers' associations.
3. According to German labor economics textbooks there is a broad consensus that about 80 percent of the German workforce is employed in firms that are members of an employers' association. See, for example, Keller (1997) and Franz (1996).

disputes. Hence, it is natural to analyze labor disputes in a bargaining framework. Furthermore, with few exceptions, bargaining outcomes between the unions and the employers' association are only binding for the members of the employers' association.[4] Because in Germany, as in many other countries, unions and employers' associations are exempt from antitrust laws, firms are free to choose whether to enter (or exit) an employers' association.[5] Thus, from a modeling perspective, membership in an employers' association must be individually rational.

For the most part, the existing literature on labor negotiations in oligopolistic industries has applied the right-to-manage model in which firms and unions bargain over wages only. In contrast, this paper investigates how different bargaining institutions in the input market affect strategic product market competition in an efficient bargaining model. One contribution of our paper is to clarify the implications of efficient bargaining for the relation between input and output market structure in the presence of an industry-wide union.[6] In particular, our analysis shows that the current empirical approaches used to test whether labor market bargaining is efficient are inappropriate if unions are formed on an industry rather than a firm-level basis.

Considering the case of a single industry-wide union that is bargaining separately with each firm in the industry,[7] we show that efficient bargaining implies that firms will noncooperatively choose to produce the monopoly quantity on the output market, even if an employers' association does not exist.[8] An implication of the analysis is that, in contrast to firm-level unions, the exemp-

4. Usually collective wage contracts only bind the employers and employers' associations that negotiated the contract. If certain restrictive conditions are met, however, the Ministry of Labor can make agreements generally binding by an extension rule, the so called AVE. See Haucap et al. (1999) for analysis of wage bargaining in the presence of generally binding wage agreements.
5. For a detailed overview of the laws governing centralized bargaining in Germany see Drescher (1993).
6. Dorwick (1989) investigates an efficient firm-level bargaining model within an oligopolistic industry. He conjectures that union coordination on wages does not affect the industry outcome. He does not, however, investigate the ability of firms to use unions in order to change the nature of product market competition.
7. This case has been studied extensively in a right-to-manage environment. See, for example, Davidson (1988), Dobson (1994), and Horn and Wolinsky (1988b).

tion of industry-wide unions from antitrust laws reduces welfare in the efficient bargaining case by abolishing effective product market competition.

We solve the industry union's bargaining problems - in the absence of an employers' association - using an extension of the Nash solution, which following Jun (1989) may be interpreted as the unique subgame perfect outcome of a Rubinstein-type alternating-offer model. The proposed bargaining solution can be implemented by a pair of contracts specifying the workers' wage and a minimum employment level for each firm.

We then introduce an employers' association as a collection of independent firms that negotiate labor contracts jointly. A firm is said to be independent if it has to realize its profits on the output market and can not rely on side payments from fellow members. We propose that this is an intuitively plausible way to distinguish an employers' association from a merger. In our model, forming an employers' association increases the set of agreements that lie in the core. Thereby, it affects the size of the pie players are bargaining over, which puts the members of an employers' association in a stronger bargaining position. The main result of this paper is that it is profitable for competing firms to respond to an industry union by forming an employers' association, regardless of their productivity differences.[9] Our analysis also shows that this countervailing power move may be welfare reducing.

From a modeling point of view, we introduce an employers' association as a coalition of firms that is bargaining jointly. As in Chae and Heidhues (1999), we aggregate the coalition's

8. Boughin and Vannini (1996) make a similar observation in the case of fully centralized bargaining. They do not, however, consider the case of decentralized bargaining in the presence of an industry-wide union.
9. We find it intuitively plausible that firms form an employers' association to increase their bargaining power vis-a-vis an industry union. Interestingly, however, this is *not the case* if one uses a *right-to-manage* framework; indeed, in the right-to-manage version of our model, forming an employers' association between symmetric and competing firms will increase wages.

preferences from its members' preferences by an internal contract. The aggregation approach used in the current paper differs from Chae and Heidhues (1999) in that an employers' association, in contrast to a merger, is not allowed to engage in side payments. If the productivity differences between firms are large enough, the internal contract of the employers' association implies that the bargaining problem between the employers' association and the industry union is not a pie-splitting problem. We, therefore, carefully characterize the feasible set of the bargaining problem between an employers' association and the industry union in order to establish that this bargaining problem has a unique solution.

Our paper is closely related to work by Petrakis and Vlassis (1996), who investigate the endogenous formation of wage-bargaining institutions in a right-to-manage model. In their model, institutional arrangements are created by winning coalitions. They argue that if a majority of firms and unions are in favor of centralized bargaining, such an institution will evolve and be binding for *all* firms. In their model, efficient firms cooperate with unions to set higher wages in order to raise their rivals' costs and thereby gain a strategic advantage on the product market. In countries such as Germany, however, the agreement between a union and an employers' association is only binding for its members. Therefore, members of an employers' association cannot rely on any legal institution to enforce higher wages for firms that do not join the employers' association. Although unions recently have been lobbying to make centralized wage agreements binding for all firms in an industry, whether they are members of an employers' association or not, this does not explain why employers' associations currently exist.

Whether efficient firms may form an employers' association to engage in a "raising rivals' cost" strategy in the absence of generally binding wage agreements is questionable. In such a model, efficient firms would use an employers' association to raise their wages in order to

increase the wages of their competitors. In a right-to-manage model, however, increasing the wages paid by member firms of the employers' association decreases their labor demand. So, even if labor supply is upward sloping, higher wages within the employers' association do not increase the wages paid by inefficient firms. To resurrect Petrakis and Vlassis's argument, one needs to model why higher wages paid by efficient firms force inefficient firms to (substantially) raise their wages. In addition, such a model should explain the role of an employers' association in such a raising rivals' cost strategy. Instead of pursuing this, we use an efficient-bargaining model in which it is individually rational for each firm in the industry to join the employers' association. In our model, firms form an employers' association not to adopt a raising rivals' cost strategy but simply to gain a bargaining advantage in the labor market.

The remainder of the paper is organized as follows: Section 2 introduces the product market and solves for the firms' behavior given the bargaining outcome. Section 3 analyzes the decentralized bargaining cases with firm- and industry-level unions. In Section 4 we introduce an employers' association and solve the centralized bargaining case. To justify our approach, Section 5 summarizes arguments in favor of using an efficient-bargaining model rather than a right-to-manage model. It also discusses implications of our model for testing the efficiency of labor market bargaining. Finally, Section 6 provides the conclusion. Most proofs are relegated to an appendix.

2. Product Market Competition

Throughout this paper, employers and unions bargain over wage and employment combinations in different institutional settings. The various first-stage bargaining games considered are followed by a noncooperative second stage in which the firms compete against each other. This second stage has the same structure in all bargaining regimes that are considered within this paper. We thus start by solving the second stage, taking the first stage outcome as given.

Following Horn and Wolinsky (1988b), we model the second stage as a differentiated-quantity-competition game. That is, we assume that firms simultaneously choose quantities facing the following inverse demand curves:

$$p_i = 1 - q_i - cq_j.$$

Furthermore, we assume that $0 \leq c \leq 1$. Products are independent for $c = 0$. For $c = 1$ the products are perfect substitutes. In the intermediate cases where $0 < c < 1$, the products are imperfect substitutes with a greater value of c indicating a higher degree of homogeneity of products.

Firms' technology is assumed to be linear, such that $L_i = \alpha_i q_i$ where L_i is the labor input of firm $i = 1, 2$. The input-output ratio $\alpha_i \in (0, 1]$ denotes the amount of labor necessary to produce one unit of output. The lower the input-output ratio the more efficient a firm is. Let $\overline{L}_i$ denote the employment level specified in the labor contract, i.e., the first-stage bargaining outcome. If the union and the firm did not reach an agreement in the first stage, we define the breakdown point by $\overline{L}_i = 0$, which states that production does not take place unless the firm and the union settle their labor dispute in the first stage. Let w_i be the wage rate specified in the labor contract. In case the first stage bargaining breaks down, we assume that all obligations of both the

firm and the union cease and simply set $w_i = 0$. Requiring subgame perfection, we look for a Nash equilibrium in the second stage taking $(\overline{L_1}, \overline{L_2}, w_1, w_2)$ as given; that is, in the second stage of the game firm *i* solves the following maximization problem:

$$\max_{q_i} (1 - q_i - cq_j)q_i \text{ s.t. } 0 \le \alpha_i q_i \le \overline{L_i}.$$

Thus, the best reply correspondence is

$$q_i = \max\left\{0, \min\left\{\frac{\overline{L_i}}{\alpha_i}, \frac{1 - cq_j}{2}\right\}\right\}.$$

The above equation states that a firm sells the maximum quantity that its fixed labor force can produce, unless this quantity exceeds the revenue maximizing amount taking the other firm's quantity as given.

3. Decentralized Bargaining

Based on the second stage introduced above, this section develops a simple two-stage model in which two firms are bargaining simultaneously with an industry-wide union before competing against each other on the output market. We start by analyzing two benchmark cases, one being firm-level bargaining and the other being an industry planner who maximizes the joint rent from cooperation between an industry union and both firms. We then relate these benchmark cases to the bargaining problems faced by an industry union. The main result of this section is that an industry union induces the monopoly product market outcome.

3.1. Firm-level bargaining with firm-level unions

In this subsection, we consider two independent firm-level unions, each negotiating with a given firm. Let $\overline{w} \in [0, 1)$ denote the opportunity cost of labor.[10] The utility of firm *i*'s union is

assumed to be $U_i = L_i(w_i - \bar{w})$ and each firm's (owner's) utility is assumed to be equal to the firm's profits.[11] For notational simplicity, let $\alpha_1 \leq \alpha_2$; that is, firm 1 has a weakly higher productivity.

Assume that a union and a firm, when bargaining with each other, take the solution of the rival firm's bargaining problem as given.[12] Throughout this paper we use the Nash solution (or extensions thereof) to model the bargaining outcome. One of the defining axioms of the Nash solution is that players agree on a Pareto-efficient outcome.[13] Most alternative bargaining solutions that have been proposed also require players to agree on Pareto efficient trades. Hence, we emphasize results that depend on Pareto efficiency only, such as

Proposition 1. The labor inputs chosen in firm-level bargaining with firm-level unions are identical to those chosen by a Cournot duopolist facing a given wage $\bar{w}$. *That is, if* $c/2 > (1 - \alpha_2\bar{w})/(1 - \alpha_1\bar{w})$, *then* $L_1 = \alpha_1(1 - \alpha_1\bar{w})/2$ *and* $L_2 = 0$. *If* $c/2 \leq (1 - \alpha_2\bar{w})/(1 - \alpha_1\bar{w})$, *then* $L_i = \alpha_i[2(1 - \alpha_i\bar{w}) - c(1 - \alpha_j\bar{w})]/(4 - c^2)$, *for* $i \neq j$.

Intuitively, Pareto efficiency implies that the owner of the firm and the union maximize the joint rent of cooperation. Hence, each firm's labor input, which is determined in the first-stage bargaining, must be optimal given the other firm's choice. With linear technology, the amount of labor input determines output. In other words, each firm's output is chosen optimally given the

10. This parameter restriction ensures that each firm would produce a positive amount if it were a monopolist on the output market.
11. Thus, in the terminology of Oswald (1985) we assume a utilitarian union with risk-neutral members.
12. Note that this assumption is implied by *unobservable* contracts. If contracts are observable, however, then there also exist solutions in which each union-firm pair makes their contract contingent on the other union-firm pairs' contract in order to reduce product market competition. However, the conclusion that forming an industry union is profitable is not affected by either assumption. Furthermore, as we show below, with an industry-wide union the assumption that contracts are unobservable is not restrictive in our model.

other firm's output. Therefore, a firm's output is equal to the Cournot output in a differentiated product game. Thus, the firm and the union jointly behave as would a neoclassical firm facing a competitive labor market with wage $\overline{w}$.

Hence, the joint rents from cooperation between the union and the firm are equal to the Cournot profits. Since we assume that both the union and the firm are risk-neutral, symmetry of the Nash solution implies that the firm and its union share benefits equally. Thus, both the union's and the firm's payoff are half of the Cournot profits. We summarize this result in

Proposition 2. With firm-level bargaining, the utility of each firm's union is equal to half of the differentiated Cournot duopoly profit.

3.2. Industry Planner's Solution

We use the term industry planner to describe a single decision maker who controls both firms and who can hire labor at its opportunity cost. An industry planner is a natural benchmark, because he earns the maximum rents that the bargaining parties can divide between themselves. Consider such an industry planner and assume he faces the inverse demand functions specified in Section 2. Thus, the industry planner solves the following maximization problem:

$$\max_{L_1, L_2} \left(1 - \frac{L_1}{\alpha_1} - c\frac{L_2}{\alpha_2}\right)\frac{L_1}{\alpha_1} + \left(1 - \frac{L_2}{\alpha_2} - c\frac{L_1}{\alpha_1}\right)\frac{L_2}{\alpha_2} - \overline{w}(L_1 + L_2) \quad \text{s.t. } L_1 \geq 0, L_2 \geq 0.$$

It is easy to show that the objective function is concave. Thus, solving the above Kuhn-Tucker

13. Pareto efficiency or efficient bargaining refers to agreements between players who negotiate with each other. Thus, firm-level bargaining is called efficient if the union and the firm are negotiating over the wage and employment level. Because each firm-level bargaining does not internalize the effect of an increased production on the other firm-union pair, the outcome is not efficient from the overall industry perspective. Nevertheless, the term efficient bargaining is conventionally used in the manner described above, which is justified if contracts are unobservable.

problem, one has

Proposition 3. *The labor inputs chosen by an industry planner are identical to the ones chosen by an industry-wide monopolist facing a given wage* $\bar{w}$. *That is, if* $c > (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$, *then* $L_1^* = \alpha_1(1-\alpha_1\bar{w})/2$ *and* $L_2^* = 0$. *If* $c \le (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$, *then* $L_i^* = \alpha_i[(1-\alpha_i\bar{w}) - c(1-\alpha_j\bar{w})]/[2(1-c^2)]$, *for* $i \neq j$.

The intuition behind the above is simple. If the goods produced are close substitutes, then the industry planner uses only the more efficient firm to produce. As the goods become less substitutable, the planner will produce both goods and thus operate both firms. When compared to firm-level bargaining, an industry planner is quicker to close down the less efficient firm, which follows from comparing Proposition 3 to Proposition 1. Intuitively, an industry planner internalizes the effect of an increase in one firm's output on the other firm's demand. Because in our model firms produce substitutes, it is less profitable for an industry planner to operate a less efficient firm. For the same reason, an industry planner chooses lower output levels in our model whenever it is optimal for him to produce both goods.

For future reference, let $\Pi(\alpha_1, \alpha_2, \bar{w}, c)$ be the industry planner's reduced form profits. Substituting the optimal labor inputs as specified in Proposition 3, one has

Proposition 4. *If* $c > (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$, *an industry planner's reduced form profits are* $\Pi(\alpha_1, \alpha_2, \bar{w}, c) = (1-\alpha_1\bar{w})^2/4$. *If* $c \le (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$, *an industry planner's reduced form profits are*

$$\Pi(\alpha_1, \alpha_2, \bar{w}, c) = [(1-\alpha_1\bar{w})^2 + (1-\alpha_2\bar{w})^2 - 2c(1-\alpha_1\bar{w})(1-\alpha_2\bar{w})]/[4(1-c^2)].$$

3.3. Firm-level bargaining with an industry-wide union

We are now prepared to analyze the case of an industry-wide union that is bargaining simultaneously with both firms. Let the industry-wide union's utility be defined as the sum of the utility of its members, i.e., let $U = (w_1 - \overline{w})L_1 + (w_2 - \overline{w})L_2$. As in the firm-level case, the industry union can be interpreted as a utilitarian union with risk-neutral members. In this interpretation, the union cares about all (potential) workers in the industry. For each individual worker, there are three possible states: He is employed at w_1, he is employed at w_2, or he is not employed at all and receives $\overline{w}$. If all workers are risk neutral, the union's objective is equivalent to maximizing $(w_1 - \overline{w})L_1 + (w_2 - \overline{w})L_2$.

The industry union bargains with the firms about how to distribute the rents from cooperation, i.e., about the profit level each firm receives and the industry union's utility level. Once an agreement is reached, we assume that it is implemented as a contract specifying (w_i, L_i). That is, we assume that the union and the firms can costlessly specify wage rates and employment levels in their first stage bargaining agreements. We show in the Appendix that

Lemma 1. If $c \leq (1 - \alpha_2\overline{w})/(1 - \alpha_1\overline{w})$, *any bargaining solution to the pair of bargaining problems between a centralized union and each firm that is Pareto-efficient induces the product market output that an industry planner would choose.*

Economists widely believe that negotiating players should agree on Pareto-efficient outcomes. If, however, the industry union and the firms agree to a jointly Pareto-efficient outcome, then an industry union leads to the monopoly output on the product market, thereby, having an adverse effect on consumer surplus and overall welfare.

Recently, Boughin and Vannini (1996) emphasized the necessity of critically evaluating industry-wide bargaining from an antitrust perspective. Our analysis adds to this reasoning by pointing out that it is not centralized bargaining *per se* that is required to enforce cartel-like agreements on the output market. It is sufficient if one player is horizontally integrated to enforce the industry-wide monopoly output. Therefore, our model predicts that abolishing centralized bargaining without disbanding industry unions will not avoid cartel-like product market outcomes.

One should be careful when drawing antitrust conclusions based on the analysis so far. We have not yet ruled out that Pareto-efficient bargaining outcomes require a firm to engage in side payments to its rival.[14] Such side payments, if necessary, would fall under antitrust scrutiny, and existing laws in many countries already forbid such bargaining agreements. However, in the bargaining solution we propose below no such side payments are necessary. The bargaining solution we use, which is Pareto-efficient, can be implemented through a pair of bilateral contracts (between the union and each firm) that only cover the wage rate and the minimum amount of labor. To derive this result, we use

Lemma 2. *If* $c > (1 - \alpha_2 \overline{w})/(1 - \alpha_1 \overline{w})$, *any bargaining solution to the pair of bargaining problems between a centralized union and each firm that is Pareto-efficient and in which firm 2 receives zero profits induces the product market output that an industry planner would choose.*

Since the proof is similar to that of Lemma 1, it is omitted. In the above lemma, firm 2's profits are set to zero because we require each firm to realize its profits on the output market. If $c > (1 - \alpha_2 \overline{w})/(1 - \alpha_1 \overline{w})$, no agreement in which firm 2 is required to earn positive profits, i.e., produce positive amounts, can induce the industry planner's product market outcome, because in

14. Boughin and Vannini (1996) consider the case of perfectly symmetric firms only. Hence, they do not have to investigate the issue of side payments between firms.

this case an industry planner would choose to shut firm 2 down. In the bargaining solution used below, however, firm 2 receives zero profits if the industry planner would choose to shut it down.

Next, we propose a solution to the union's two-front bargaining problem, which is an extension of the Nash bargaining solution. We argue that the agreement between the industry-wide union and firm *i* must be the Nash solution to their bargaining problem, taken as given that the other bargaining problem is resolved.[15]

Definition 1. The *bargaining solution between the industry union and either firm* is the Nash bargaining solution, taking as given that the bargaining between the union and the other firm resulted in an agreement about the other firms' profit level.

As a strategic motivation of the above definition, consider the following Rubinstein-type alternating-offer model: In the first period the union offers each firm a profit level $\pi_i(w_i, L_1, L_2)$. If both firms accept, the game ends with the firms receiving $\pi_i(w_i, L_1, L_2)$. If only one firm accepts, it is paid the offer it received. The remaining firm and the union bargain precisely as in Rubinstein (1982), with the firm making the opening offer. If both firms reject the offer, they simultaneously make counter-offers to the union in the next period, and the bargaining proceeds in the same way as above. Players have a common discount rate δ. It follows from Lemma 1 in Jun (1989) that this alternating-offer model has a unique subgame perfect equilibrium outcome. In the limit, as the time between periods goes to zero, this outcome converges to the bargaining solution proposed above and solved for below.

15. This is the usual assumption if the bargaining parties can write binding agreements. Within a right-to-manage model, this approach has been used by, for example, Horn and Wolinsky (1988b). It is also used in Chipty and Snyder's (1999) bargaining study of the cable industry.

Let Π_j^m denote the maximum joint rent of the union and firm *j*, given that firm *i* produces nothing. Thus, $\Pi_j^m = (1 - \alpha_j \bar{w})^2/4$.

Definition 2. Firm i's veto-power $\Pi - \Pi_j^m$ is the amount of the industry rents that depend on firm *i*'s participation in production. It will be denoted V_i.

Clearly a firm's veto-power depends on both the product market substitutability and the technological differences between firms. For example, if the firms produce independent goods, $c = 0$, then firm *i*'s veto-power is equal to Π_i^m. In contrast, if the goods are perfect substitutes, $c = 1$, and the firms' technologies are identical, $\alpha_1 = \alpha_2$, then each firm's veto power is equal to zero. More generally, substituting the appropriate values of Π from Proposition 4 into Definition 2 yields

Proposition 5. If $c > (1 - \alpha_2 \bar{w})/(1 - \alpha_1 \bar{w})$, *then firm 1's veto power is* $V_1 = [(1 - \alpha_1 \bar{w})^2 - (1 - \alpha_2 \bar{w})^2]/4$ *and firm 2's veto power is* $V_2 = 0$. *If* $c \leq (1 - \alpha_2 \bar{w})/(1 - \alpha_1 \bar{w})$, *then firm i's veto power is*

$V_i = [(1 - \alpha_i \bar{w}) - c(1 - \alpha_j \bar{w})]^2/[4(1 - c^2)]$ *for* $i \neq j$.

Given that the union and firm *j* resolved their bargaining problem, firm *i* and the union negotiate over the incremental benefit generated if the union also reaches an agreement with firm *i*. Thus, the union and firm *i* are bargaining about V_i. Given the risk-neutral utility functions specified above, the symmetry axiom of the Nash solution ensures that the players share V_i equally. We summarize this discussion in

Proposition 6. The bargaining solution between the industry union and both firms, for any vector (Π, V_1, V_2)*, is a vector of payoffs in which firm i's profits are* $V_i/2$ *and the union's utility is equal to* $\Pi - (V_1 + V_2)/2$.

In the above bargaining solution the players' shares add up to Π, which implies that the labor inputs are chosen to maximize industry rents. To illustrate why the bargaining pairs do not choose the labor inputs that produce the Cournot quantity, consider the following simple strategic model: In the first period firms simultaneously make a take it or leave it offer. This offer is a demand for a certain profit level, which intuitively can be thought of as a rental fee. In the next period the union chooses whether to accept or reject each individual offer. There is a unique subgame perfect equilibrium outcome in which each firm receives V_i and the union utility is $\Pi - (V_1 + V_2)$.[16] In this model, the union when accepting an offer becomes the residual claimant of any profits (or losses) greater (or less) than the rental fee. Because the union is the residual claimant in both firms, it wants to maximize industry rents. We emphasize that an industry union leads to the monopoly production if each bargaining problem is resolved efficiently, independent of the union's bargaining power.

16. In this footnote, we sketch the proof that no other subgame perfect pure strategy equilibrium outcome exists. (The proof that no other mixed strategy equilibrium outcome exists is similar.) By subgame perfection the union accepts every offer below V_i. Thus, no offer below V_i can be part of a subgame perfect equilibrium, since firm *i* would want to raise its offer slightly. Whenever the sum of the firms' demands is greater than $V_1 + V_2$ the union is better off rejecting (at least) one of the offers. Consider the subcase in which the accepted offer is greater than V_i. Then firm *j* can make a deviating offer slightly greater than V_j that is accepted by subgame perfection and yields positive profits. Thus, this subcase can not be an equilibrium outcome. Consider the remaining subcase in which the accepted offer is identical to V_i. Hence, the offer of firm *j* is greater than V_j. In this case, if $c > 0$ firm *i* can make an offer slightly greater than V_i that the union accepts. Thus, for $c > 0$ this subcase can not be an equilibrium outcome. If $c = 0$ in this subcase, firm *j* could earn positive profits when offering (slightly below) V_j. Thus no pure strategy subgame perfect equilibrium exists in which a firm demands more than V_i.

The assumption that bargaining is efficient is, however, stronger in the oligopoly case than in the monopoly case. It is not sufficient only to bargain over wages and employment within a given firm. Instead, wage and employment levels in one firm have to be made contingent on whether the other bargaining problem is resolved.[17] It is easy to find examples in which both firms in the industry gain when the scope of bargaining is restricted to non-contingent wage and employment levels in each firm.[18] It is unclear, however, what is meant by (credibly) committing not to bargain over a certain variable.[19] In an alternating-offer model, for example, the union could always make its offer contingent on whether the other bargaining problem is resolved. Also, even in the ultimatum offer game considered above, a firm cannot make itself better off by unilaterally committing only to bargain over wages and employment.

Once reached, the bargaining solution can be implemented by a pair of contracts between the union and each firm over the firm's wage rate and employment level.

Proposition 7. *If* $c > (1 - \alpha_2\overline{w})/(1 - \alpha_1\overline{w})$, *then the solution to the bargaining problem between the industry union and both firms can be implemented by a pair of contracts specifying*

$$\left(w_1 = \frac{(1 - \alpha_1\overline{w})^2 + (1 - \alpha_2\overline{w})^2}{4\alpha_1(1 - \alpha_1\overline{w})} + \overline{w}, L_1^* = \frac{\alpha_1(1 - \alpha_1\overline{w})}{2} \right) \text{ and } (w_2 = w_1, L_2^* = 0).$$

If $c \leq (1 - \alpha_2\overline{w})/(1 - \alpha_1\overline{w})$, *then the solution to the bargaining problem between the industry union and both firms can be implemented by a pair of contracts specifying*

17. In contrast to the firm-level bargaining case, however, the contracts between the union and the firms do *not* have to be *observable* to implement the overall monopoly outcome. Instead, it is sufficient to let the union choose L_i and to make each firm's wage payment contingent on its observed profit levels.

18. Consider for example identical firms producing homogenous products, in which case $V_i = 0$.

19. Obviously, the firms would prefer not to bargain over wages at all. Now, suppose that the firm has to bargain over wages. Then Dorwick (1990) shows under fairly general conditions that, when facing firm-level unions, firms prefer only to bargain over wages rather than wages and employment.

$$\left(w_i = \frac{(1-\alpha_i\bar{w}) + c(1-\alpha_j\bar{w})}{4\alpha_i} + \bar{w},\ L_i^* = \frac{\alpha_i[(1-\alpha_i\bar{w}) - c(1-\alpha_j\bar{w})]}{2(1-c^2)} \right) \text{ for } i \neq j .$$

PROOF: Substituting the appropriate values for any tuple (Π, V_1, V_2) from Proposition 4 and Proposition 5 into Proposition 6, recalling that Pareto efficiency implies that the labor inputs are identical to the labor inputs specified in Proposition 3, yields the desired result. *Q.E.D.*

It is easy to check that at the contracts introduced above, firms have an incentive to hire less labor than written into the contract. Hence, the contracts need to specify the wage rate and minimum employment level only. Also, note that for $c > 0$ the industry-wide union's payoff specified in Proposition 6 is greater than half of the maximum overall rent from cooperation Π. Since by definition Π is greater than or equal to the industry rents in the case of product differentiated Cournot competition, an industry union makes the group of workers as a whole better off. Thus, it is always profitable for workers to form an industry union if firms produce substitutes.

We view the bargaining problems between the industry-wide union and the firms as simultaneous bargaining problems. Alternatively, one might model the bargaining as sequential. Assume for the moment that the union bargains first with firm 1 and then with firm 2.[20] When facing firm 2, there are two classes of subgames to consider: First, subgames in which the union reached an agreement with firm 1 about firm 1's profit level. In these subgames, the union and firm 2 bargain over the incremental benefit of reaching an agreement with firm 2, i.e., over V_2 as specified in Proposition 5. If the union did not reach an agreement with firm 1, then it bargains with firm 2 about how to divide Π_2^m. Symmetry implies in either case that both players receive half of the pie over which they bargain.

20.Dobson (1994) interprets this as pattern bargaining. Using a right-to-manage model, Dobson also finds that pattern bargaining generally results in asymmetric wages rather than standardized wages.

Now consider the bargaining problem between firm *i* and the union. By subgame perfection, players foresee that if their negotiations break down the union's payoff is $\Pi_2^m/2$. They also foresee that if they reach an agreement about firm 1's profit level, the union will pay $V_2/2$ to firm 2. Thus, in case firm 1 and the union reach an agreement, they are left to split $\Pi - V_2/2$ of the industry profits. Since the union's breakdown point in the first stage bargaining is $\Pi_2^m/2$, the net pie of the first bargaining is $\Pi - (V_2/2 + \Pi_2^m/2)$. By symmetry of the Nash solution, the union and the firm share this net pie equally.[21] If the goods are substitutes, $c < 1$, then $\Pi_2^m > V_2$ and thus firm 1 receives a higher profit level in the sequential bargaining case. The union thus receives a lower share. Nevertheless, the union is still the residual claimant to the industry profits, ensuring that industry rents are maximized.

In this section, we showed that it is always beneficial for workers to form an industry union if firms produce substitutes. We also showed that, even though bargaining is decentralized, the formation of an industry union leads to the same product market output that an industry monopolist would choose. Thus, the main antitrust issue is not whether bargaining is decentralized but whether the parties involved are organized on a decentralized basis. If this is not the case, the industry union can be used by the bargaining parties to eliminate effective product market competition.

To avoid effective product market competition, the bargaining parties have to agree on a wage rate and a minimum employment level. Because the wage rate is used to distribute rents

21. To implement the Nash solution noncooperatively, consider the following two period model: In time period one, the union bargains with firm 1 in an infinite alternating-offer model similar to the one introduced in Binmore *et al.* (1986). Their setup replaces the time cost of rejecting an offer by the exogenous risk that the bargaining ends. In time period two the union bargains with firm 2 in the same fashion. Production takes place at the end of period two. Binmore *et al*. show that as the breakdown probability approaches zero the unique subgame perfect outcome of such an alternating-offer model approaches the Nash solution. Thus, in the limit as the breakdown probability approaches zero in both bargaining problems, subgame perfection implies that players share the industry rents as specified in the main text.

from overall cooperation to the individual workers, it is a distorted signal of the firms' labor cost. Individual firms would prefer to hire less labor at the ongoing wage, but are restricted by the minimum employment level specified.

4. Centralized Bargaining and Employers' Associations

In this section we introduce the concept of an employers' association. We start out by solving for the centralized bargaining outcome when the members of an employers' association can engage in side payments, which, alternatively, can be interpreted as a merger between firms. In contrast to Horn and Wolinsky (1988b), such a merger is profitable in our framework. We then characterize the solution to the centralized bargaining case if firms are not allowed to engage in side payments. The main result of this section is that it is always profitable for competing firms to form an employers' association independent of their productivity differences.

4.1. Employers' Associations

We model an employers' association as a coalition of firms that decide to bargain jointly with the industry union. In contrast to a merger, members of an employers' association are restricted only to cooperate on the input market. That is, they are allowed to bargain jointly about price and quantity combinations on the input market, but they are (legally) restricted from cooperating explicitly otherwise. This rules out any form of side payments between firms. For example, a firm can not pay its rival to produce less. Firms can not agree on a profit-sharing scheme. A member of an employers' association is not allowed to pay a fellow member to accept an otherwise unfavorable union offer. An employers' association can only be used by firms to bargain jointly in the labor market. Hence, in our model firms behave noncooperatively on the output market.

For an employers' association to influence the labor market bargaining, its members need to commit to negotiate jointly. We model this commitment as an implicit contract. This contract specifies how the share of the employers' association is divided between its members. Thus, the employers' association is committed to accept only those offers from the union that induce the agreed-upon relative profitability of firm 1 to firm 2. Firms have an incentive to use the labor market bargaining to induce an implicit side-payment scheme through insisting on the appropriate wage differentials. However, they are restricted by the fact that the union can not force a worker to work below the opportunity cost of labor.

Definition 3. An *employers' association* is a coalition of firms that maximizes the sum of its members' profits subject to an agreed upon division scheme (s_1, s_2), where $s_i \in (0, 1)$ denotes the proportion of the share of the employers' association, Π^{EA}, that firm *i* receives and $s_1 + s_2 = 1$.

4.2. Centralized bargaining with side payments

As a benchmark, we investigate the case where the members of an employers' association can engage in side payments, which alternatively can be interpreted as a merger between firms. If side payments are feasible, Pareto efficiency implies that the union and the employers' association will agree on the optimal labor inputs specified in Proposition 3. That is, the employers' association and the union in this case will maximize the overall industry rents and bargain over a division thereof. We assume that the bargaining *solution* for the *bargaining problem between the employers' association and the union* is the Nash bargaining solution. Since both the union and

the employers' association are assumed to be risk neutral, Pareto efficiency and symmetry of the Nash solution imply

Proposition 8. If side payments are feasible, the Nash solution to the bargaining problem between the employers' association and the industry union is the vector $(\Pi/2, \Pi/2)$.

To further justify our approach, we provide a strategic motivation for the bargaining solution between the union and the employers' association. Given the division specified in the "founding contract" of the employers' association, let either firm represent the employers' association in a Rubinstein-type alternating-offer model with a common discount factor. Chae and Heidhues (1999) show that if the coalition members are identical and share the benefits identically, then the unique subgame perfect equilibrium is independent of which coalition member represents the coalition. For the linear utility functions we use, it is straightforward to generalize this irrelevance result to any fixed sharing rule. In the limit as $\delta \to 1$, the unique subgame perfect outcome converges to the Nash solution specified above.

Since the Nash solution is the solution concept used throughout this paper, it is natural to model the employers' association as a coalition of players whose division scheme splits the gains from forming an employers' association between the firms according to the Nash solution. Assuming that after the firms fail to form an employers' association they can bargain with the union individually, one has

Lemma 3. Whenever side payments are feasible, the division scheme of the employers' association is defined by $s_1 = (\Pi + V_1 - V_2)/(2\Pi)$.

PROOF: A firm's breakdown payoff, when bargaining over whether or not to form an employers' association, is its profits if no employers' association forms. Thus, firm *i*'s breakdown point is $V_i/2$. The joint benefit of forming an employers' association is $[\Pi - (V_1 + V_2)]/2$. Because both firms are risk neutral, symmetry of the Nash solution implies that each firm receives the sum of its breakdown payoff and half of the benefit from forming an employers' association. Thus, s_1 is chosen such that

$$s_1 \frac{\Pi}{2} = \frac{\Pi - (V_1 + V_2)}{4} + \frac{V_1}{2}.$$

Rewriting yields the desired result. *Q.E.D.*

Combining Proposition 8 and Lemma 3 one has

Proposition 9. If side payments are feasible, the bargaining solution between the industry union and members of an employers' association is a vector of payoffs in which firm i's profits are $(\Pi + V_i - V_j)/4$, *for* $i \neq j$, *and the industry union's utility is equal to* $\Pi/2$.

4.3. Centralized bargaining without side payments

The feasible set without side payments is contained in the feasible set with side payments. Thus, by independence of irrelevant alternatives, the Nash solutions to both bargaining problems are identical if the Nash solution to the games with side payments can be implemented without using side payments. We thus start by investigating whether the Nash solution to the game with side payments can be implemented by a contract that only specifies the wage rate and employment level for each firm.

In the absence of side payments, a firm's payoff is equal to its revenue on the output market minus its cost. For notational simplicity, let

$$\pi_i(w_i, L_1, L_2) \equiv \left(1 - \frac{L_i}{\alpha_i} - c\frac{L_j}{\alpha_j}\right)\frac{L_i}{\alpha_i} - w_i L_i .$$

Assuming that the union can not force any worker to work for a wage rate below $\overline{w}$, one has

Lemma 4. If $c \leq (1 - \alpha_2\overline{w})/(1 - \alpha_1\overline{w})$ *then the maximum payoff of firm i that can be implemented without side payments at the industry wide optimal employment levels is*

$\pi_i(\overline{w}, L_1^*, L_2^*) = [(1 - \alpha_i\overline{w})^2 - c(1 - \alpha_i\overline{w})(1 - \alpha_j\overline{w})]/(4(1 - c^2))$ *for* $i \neq j$.

PROOF: A firm's revenue is determined by the employment levels only. Thus, given the optimal employment levels specified in Proposition 3, the maximum payoff a firm can receive without side payments is determined by its cost. Since $\overline{w}$ is the lowest feasible wage rate it must minimize costs for a given employment level. Substituting $(\overline{w}, L_1^*, L_2^*)$ into $\pi_i(w_i, L_1, L_2)$ gives the desired result. *Q.E.D.*

Next, we analyze the bargaining problem between the union and the employers' association for any given s_1. We start by proving that the side-payment solution is feasible without side payments if and only if the inefficient firm can earn its payoff on the product market.

Proposition 10. Let s_1 *be given. The Nash solution to the bargaining problem between the union and the employers' association is identical to the side-payment solution* $(\Pi/2, \Pi/2)$ *if and only if* $\pi_2(\overline{w}, L_1^*, L_2^*) \geq (1 - s_1)\Pi/2$.

We are left to characterize the Nash solution to the bargaining problem between an employers' association and an industry union for the cases where $\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi/2$. We start by showing that this bargaining problem is convex, which implies that it has a unique Nash solution.

Definition 4. Let s_1 be given. The *Pareto frontier* is a function mapping each feasible payoff of the employers' association, Π^{EA}, into the maximum feasible union's payoff. It will be denoted as $U(\Pi^{EA};s_1)$.

When side payments were feasible, $U(\Pi^{EA};s_1)$ was simply $\Pi - \Pi^{EA}$. Without side payments this is not generally true. By definition, however,

$$U(\Pi^{EA};s_1) + \Pi^{EA} = \pi_1(\bar{w}, L_1, L_2) + \pi_2(\bar{w}, L_1, L_2), \qquad (1)$$

for the Pareto-efficient labor inputs (L_1, L_2).[22] In the following, we will adopt the convention of calling the sum of the firms' profits and the union's utility the overall industry rents.

The following two lemmas enable us to show the convexity of the bargaining problem between the union and the employers' association.

Lemma 5. Let s_1 be given and let $\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi/2$. For any Π^{EA} for which $U(\Pi^{EA};s_1) + \Pi^{EA} < \Pi$ one has $w_2 = \bar{w}$.

Intuitively, if the bargaining parties are not able to extract the overall industry rents that a monopoly would, it is because the less efficient firm needs to earn its share on the product market.

22.Note that without side payments a Pareto-efficient labor input vector (L_1, L_2) does not have to equal (L_1^*, L_2^*).

Thus, to minimize the overall production distortions from an industry perspective, the bargaining outcome sets the wage rate in the inefficient firm equal to the reservation wage.

Let $\overline{\Pi}^{EA}(s_1)$, denote the maximum share the employers' association can receive such that, $U(\Pi^{EA};s_1) + \Pi^{EA} = \Pi$, for all $\Pi^{EA} \leq \overline{\Pi}^{EA}(s_1)$. One has

Lemma 6. Let s_1 be given and let $\pi_2(\overline{w}, L_1^*, L_2^*) < (1 - s_1)\Pi/2$. If $\Pi^{EA''} > \Pi^{EA'} > \overline{\Pi}^{EA}$ one has $U(\Pi^{EA''};s_1) + \Pi^{EA''} < U(\Pi^{EA'};s_1) + \Pi^{EA'}$.

The above lemma implies that the Pareto frontier is downwards sloping. Based on this result, we derive the following proposition in the Appendix:

Proposition 11. Let s_1 be given and let $\pi_2(\overline{w}, L_1^*, L_2^*) < (1 - s_1)\Pi/2$. The feasible set of bargaining problem between the union and the employers' association is convex.

Thus, we have proven that for any employers' association contract s_1, there exists a unique Nash solution to the bargaining problem between the employers' association and the industry union. Next, we establish the profitability of forming an employers' association. Note that we do not require any restriction on the productivity difference between the firms to establish this result.

Theorem 1. If $c > 0$, there always exists an agreement in which both firms gain by forming an employers' association.

PROOF: First, we show that

$$\pi_2(\overline{w}, L_1^*, L_2^*) \geq V_2. \tag{2}$$

This follows trivially if $V_2 = 0$. Thus, consider the remaining cases in which $c \leq (1 - \alpha_2\overline{w})/(1 - \alpha_1\overline{w})$. Proposition 5 and Lemma 4 imply that (2) can be rewritten as

$$\frac{(1-\alpha_2\bar{w})^2 - c(1-\alpha_2\bar{w})(1-\alpha_1\bar{w})}{4(1-c^2)} \geq \frac{[(1-\alpha_2\bar{w}) - c(1-\alpha_1\bar{w})]^2}{4(1-c^2)},$$

which is equivalent to $c \leq (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$.

Also, since $c > 0$, one has $\Pi/2 > V_1/2 + V_2/2$. Thus, there exist some s_1 for which

$$\Pi^{EA} = \Pi/2,$$
$$\Pi/2 > V_1/2 + V_2/2,$$
$$s_1\Pi/2 > V_1/2, \text{ and}$$
$$(1-s_1)\Pi/2 > V_2/2.$$

Hence for any $c > 0$, there exist an agreement in which both firms strictly gain by forming an employers' association. *Q.E.D.*

It is easy to check that an employers' association, in contrast to a merger, may reduce welfare in the presence of an industry union. For example, a member of an employers' association might continue producing a homogenous product even if he has lower productivity than a competing member of the employers' association. The increase in his production, however, would be offset by the decrease in the more efficient firm's production and thus the product market distortion would be unchanged. In this case an employers' association simply raises the cost of production. If the low productivity firm is not a member of an employers' association, then an industry-wide union would not be willing to settle this labor dispute and thereby shut such a low-productivity firm down.

5. The Scope of Labor Market Negotiations

In this section, we discuss the theoretical and empirical literature on the scope of labor market negotiations. We start off discussing the bilateral monopoly case, which is the focus of most of the collective bargaining literature. After presenting some support in favor of the efficient-bar-

gaining model in the bilateral monopoly case, we argue that in the case of strong industry-unions both labor and product market evidence is required to investigate the scope of labor market negotiations.

Suppose a monopolist needs to reach an agreement with a single union in order to produce. The main stream approach to this bilateral bargaining problem is to assume that the firm bargains with the union over wages only. Once a wage settlement is reached, the firm hires workers and produces output. This model thus captures the notion that we typically only observe wage negotiations.[23] Some evidence in favor of this presumption can be found in Oswald (1993) who, in a survey of American and British unions, asks whether they normally negotiate over jobs as well as wages. Not only are total employment levels usually unspecified in the labor contracts, but almost all of the unions surveyed answered that they do not negotiate over the number of jobs at all.

Nevertheless, based on earlier work of Leontief (1946), McDonald and Solow (1981) criticize the above right-to-manage approach since in these models the firm and the union can reach Pareto-efficient outcomes only if they negotiate over wages and employment.[24] Why then do the bargaining parties settle for a Pareto-dominated outcome?

This theoretical problem is especially troublesome since in the right-to-manage model the bargaining problem is resolved using the "Nash solution," subject to the (binding) constraint that the employment level is on the firm's labor demand curve. The Nash solution, however, is a bargaining solution satisfying a set of axioms, one of which is Pareto efficiency. Followers of the

23.See, for example, Layard *et al.* (1991), who argue forcefully that labor negotiations only cover wages.

24.Oswald (1985, 1993), however, proposes a union model in which the median voter determines the union's preferences. Assuming that layoffs - but not wages - depend on seniority, he shows that "efficient" contracts lie on the labor demand curve in his model. If in Oswald's model wages are also allowed to depend on seniority (or tenure), however, then the median voter has an incentive to let the firm hire additional (low tenure) labor at lower wages; for this will increase the rents that the firm earns and hence it will also increase the median voter's share of these rents.

right-to-manage approach thus explicitly or implicitly assume that it is infeasible to write contracts specifying both employment levels and wage rates. Since we are not aware of any legal restrictions, one should model why efficient contracts are infeasible.

Inspired by the theoretical debate and the pioneering papers of Brown and Ashenfelter (1986) and MaCurdy and Pencavel (1986), there have been numerous empirical studies aimed at testing whether actual employment levels in unionized industries are consistent with the right-to-manage-model or the efficient-bargaining model. Most of these studies conclude that their empirical evidence favors the efficient-bargaining model.[25] This raises the puzzle as to why negotiations that seemingly cover wages only, lead to efficient outcomes.

One response in favor of the efficient-bargaining model is that we observe many features in labor contracts that indirectly determine employment levels. Such contractual features include unnecessary security rules that lead to overstaffing, overtime restrictions, overtime pay, firing rules, and so on. This response, however, raises the question as to why this implicit agreement dominates explicit ones. Also, as Oswald (1993) points out, some of these rules may be better interpreted as regulating effort than employment levels.[26]

Manning (1987), however, shows in a sequential employment-wage bargaining model that the efficient-bargaining outcome emerges if employment is set unilaterally by the firm before the parties bargain over wages. Thus, if the employment level is rigid after wage negotiations have

25. See, for instance, Brown and Ashenfelter (1986), MaCurdy and Pencavel (1986), Svenjar (1986), Card (1986), Abowd (1989), Martinello (1988), Dorion (1987), Bean and Turnbull (1988), Christofides and Oswald (1991), and Dorion (1992). A counterexample, however, is Card (1990).

26. Another response in favor of the efficient-bargaining model is that, even if the employment level is not explicitly determined by the labor contract, the bargaining outcome may be an implicit agreement on the amount of labor usage. Espinosa and Rhee (1989) and Eberwein and Kollintaz (1995) model supergames in which the union and the firm write contracts over wages only. They show that, for sufficiently low discount rates, trigger strategies can support the efficient-bargaining solution. Nevertheless, this does not explain why Oswald (1993) finds that unions and firms typically do not negotiate over employment levels.

ended, an efficient-bargaining model should be used to predict the outcome - even if unions and firms do not negotiate over employment. Furthermore, since at the solution of the efficient-bargaining model firms prefer to hire less labor, this result relies only on employment being downward rigid after wage-negotiations have ended. Thus, in countries with restrictive dismissal laws, such as Germany, wage negotiations may lead to the efficient outcome.[27]

The point here is not so much that dismissal laws - or some other specific contractual feature - will always lead to efficient bargaining outcomes, but rather that one needs to be careful when imposing observed (equilibrium) behavior as the rule of the game. The fact that we often see wage contracts does not imply that a right-to-manage model is a good predictor of labor market outcomes. While the scope of labor market negotiations is ultimately an empirical question, we believe that an efficient-bargaining model is a natural benchmark in situations in which a few parties are involved.[28] For if the outcome differs significantly form the efficient one, the parties have a strong incentive to reach a better agreement.

In the bilateral monopoly problem, bargaining over wages and employment always allows for an efficient solution. In the case of an industry-wide union facing an oligopoly this is not the case. If, for example, the industry union bargains with each firm over wages and employment, taking as given the wage and employment bargaining outcomes with the other firms, then the result will be excessive product market competition from an industry perspective. Hence, in such industries a

27. In Germany, for example, a firm wanting to dismiss a significant portion of its work force needs to negotiate a social dismissal plan with the work council. In case negotiations break down, there is a system of compulsory arbitration. Roughly speaking, a firm is usually required to pay each worker it dismisses an entire year's wage, unless the firm's financial situation prohibits such a solution. For a detailed discussion of the laws governing dismissals in Germany see Soltwedel *et al*. (1990).
28. Nevertheless, it may be interesting to investigate whether, in the absence of restrictive dismissal laws, collective bargaining agreements include contractual features that ensure downward rigidity of employment.

model in which players only bargaining over wages and employment should not be confused with an efficient bargaining model.

With industry-wide unionization, plugging the opportunity cost of labor into a firm's labor demand curve will *not* give the efficient employment level as is generally assumed in empirical studies.[29] Rather, it will lead to overemployment since additional employment has a negative externality on the other unionized firms in the industry. Indeed, while in the bilateral monopoly case the right-to-manage model leads to underemployment due to the double marginalization problem, this is not necessarily the case when an industry-wide union bargains with oligopolistic firms. In such a setup additional employment in a given firm has a negative externality on its rivals profits. If this product market externality dominates the double marginalization effect, then the efficient employment level is less than the right-to-manage employment level. Hence, in an oligopolistic industry in which labor is not organized on a firm-level basis, current empirical approaches are unable to test whether bargaining is efficient or not. Future empirical work will need to account for product market interdependencies between firms whose workers are organized by the same union.

29. An alternative test suggest by Abowd (1989) investigates whether unexpected changes in bargained upon labor costs lead to changes of equal size and opposite sign in shareholder wealth. If this is the case, Abowd maintains the null hypotheses that bargaining is efficient. For *given* efficient employment levels in our model, unexpected changes in the bargained upon labor cost would indeed lead to changes in shareholder wealth of equal size and opposite sign. There are two important caveats however: First, this is true for any other given employment level also. Hence, one may simply test whether employment is rigid in the short run. Second, and more seriously, in our model (as in the standard bilateral monopoly model) the predicted contract wage is an endogenous variable that changes only if either the opportunity cost of labor, the firms productivity, or the market demand changes. Such changes, however, will lead to changes in the efficient employment levels and, in this case, Abowd's testing approach is invalid.

6. Conclusion

In this paper, we showed that it is always profitable for workers to form an industry union if firms produce substitutes. We also showed that - even if bargaining is decentralized - the formation of an industry union leads to the same product market output an industry monopolist would choose. Thus, the main antitrust issue is not whether bargaining is decentralized but whether the parties involved are organized on a decentralized basis. If this is not the case, the industry union can be used by the bargaining parties to eliminate effective product market competition. Although the overall industry output is the same as the industry output a monopolist would choose, individual firms would prefer to reduce production levels even more in the proposed bargaining solution.

We then investigated the role of employers' associations. We showed that in an efficient-bargaining model, forming an employers' association increases the firms' bargaining power. Even if there are substantial productivity differences, competing firms have an incentive to respond to an industry-wide union by forming an employers' association. This countervailing power move, however, can lead to inefficiencies in production that otherwise would not exist.

If firms' productivity differences are small, employers' associations have distributional but not efficiency consequences. Thus our model predicts that a policy of abolishing centralized bargaining will not *per se* lead to higher output levels in industries that are characterized by efficient bargaining. Furthermore, to ensure a substantial increase in employment, according to our model, one would have to abolish both industry-wide bargaining and industry-wide unions.

Appendix

Proof of Proposition 1: A Pareto-efficient outcome maximizes the union's utility for a given profit level of the firm. Thus for a given L_j, it solves the following maximization problem:

$$\max_{w_i,\, L_i} (w_i - \overline{w})L_i$$

$$\text{s.t. } \hat{\pi} = \left(1 - \frac{L_i}{\alpha_i} - c\frac{L_j}{\alpha_j}\right)\frac{L_i}{\alpha_i} + w_i L_i,$$

for some nonnegative $\hat{\pi}$. Setting up the Lagrangian and differentiating yields the first-order conditions

$$L_i - \lambda L_i = 0,$$

$$(w_i - \overline{w}) + \lambda\left\{\frac{1}{\alpha_i} - 2\frac{L_i}{\alpha_i^2} - c\frac{L_j}{\alpha_i\alpha_j} - w_i\right\} = 0,$$

$$\hat{\pi} - \left(1 - \frac{L_i}{\alpha_i} - c\frac{L_j}{\alpha_j}\right)\frac{L_i}{\alpha_i} + w_i L_i = 0,$$

where λ denotes the Lagrange multiplier. Substituting $\lambda = 1$ from the first equation into the second yields

$$\frac{1}{\alpha_i} - 2\frac{L_i}{\alpha_i^2} - c\frac{L_j}{\alpha_i\alpha_j} - \overline{w} = 0,$$

which is the familiar reaction function from the differentiated product Cournot duopoly, if there is an interior solution in which both firms produce. Symmetry with respect to the other bargaining problem implies that an interior solution satisfies

$$1 - \alpha_i\overline{w} - 2\frac{L_i}{\alpha_i} - c\frac{L_j}{\alpha_j} = 0, \tag{3}$$

$$1 - \alpha_j\overline{w} - 2\frac{L_j}{\alpha_j} - c\frac{L_i}{\alpha_i} = 0. \tag{4}$$

It is straightforward to show that an interior solution exists if and only if $c/2 \leq (1-\alpha_2\bar{w})/(1-\alpha_1\bar{w})$. Solving equations (3) and (4) yields the labor inputs specified in Proposition 1. If no interior solution exists, the labor input of the inefficient firm $L_2 = 0$. Substituting this into equation (3) completes the proof of Proposition 1. *Q.E.D.*

Proof of Lemma 1: A Pareto-efficient outcome maximizes the union's utility, while holding the firms' profits constant at some pre-specified level. Thus, it solves the maximization problem

$$\max_{w_1, w_2, L_1, L_2} \; U - \lambda_1(\hat{\pi} - \pi^1) - \lambda_2(\bar{\pi} - \pi^2).$$

If the maximization problem has an interior solution, it can be found using the Lagrangian

$$\begin{aligned}\Lambda(w_1, w_2, L_1, L_2, \lambda_1, \lambda_2) \;=\; & (w_1 - \bar{w})L_1 + (w_2 - \bar{w})L_2 \\ & - \lambda_1\left\{\hat{\pi} - \left(1 - \frac{L_1}{\alpha_1} - c\frac{L_2}{\alpha_2}\right)\frac{L_1}{\alpha_1} + w_1 L_1\right\} \\ & - \lambda_2\left\{\bar{\pi} - \left(1 - \frac{L_2}{\alpha_2} - c\frac{L_1}{\alpha_1}\right)\frac{L_2}{\alpha_2} + w_2 L_2\right\},\end{aligned}$$

where λ_1, λ_2 denote the Lagrangian multipliers. An interior solution satisfies the following first order conditions:

$$(w_1 - \bar{w}) + \lambda_1\left\{\frac{1}{\alpha_1} - 2\frac{L_1}{\alpha_1^2} - c\frac{L_2}{\alpha_1\alpha_2} - w_1\right\} - \lambda_2 c\frac{L_2}{\alpha_1\alpha_2} \;=\; 0,$$

$$(w_2 - \bar{w}) + \lambda_2\left\{\frac{1}{\alpha_2} - 2\frac{L_2}{\alpha_2^2} - c\frac{L_1}{\alpha_1\alpha_2} - w_2\right\} - \lambda_1 c\frac{L_1}{\alpha_1\alpha_2} \;=\; 0,$$

$$L_1 - \lambda_1 L_1 \;=\; 0,$$

$$L_2 - \lambda_2 L_2 \;=\; 0,$$

$$\hat{\pi} - \left(1 - \frac{L_1}{\alpha_1} - c\frac{L_2}{\alpha_2}\right)\frac{L_1}{\alpha_1} + w_1 L_1 \;=\; 0,$$

$$\bar{\pi} - \left(1 - \frac{L_2}{\alpha_2} - c\frac{L_1}{\alpha_1}\right)\frac{L_2}{\alpha_2} + w_2 L_2 \;=\; 0\,.$$

The last two first order conditions specify the profits each firm receives. Since, $\lambda_1 \;=\; \lambda_2 \;=\; 1$, the first four equations can be summarized by the following two conditions:

$$\frac{1}{\alpha_1} - 2\frac{L_1}{\alpha_1^2} - 2c\frac{L_2}{\alpha_1\alpha_2} - \bar{w} \;=\; 0\,, \tag{5}$$

$$\frac{1}{\alpha_2} - 2\frac{L_2}{\alpha_2^2} - 2c\frac{L_1}{\alpha_1\alpha_2} - \bar{w} \;=\; 0\,. \tag{6}$$

It is straightforward to verify that for $c \le (1 - \alpha_2\bar{w})/(1 - \alpha_1\bar{w})$ one has an interior solution. Since conditions (5) and (6) are identical to the first order conditions of an industry planner they yield the same solution. *Q.E.D.*

Proof of Proposition 10: Since the Nash solution satisfies independence of irrelevant alternatives, it suffices to show that the side-payment solution is feasible without side payments if and only if $\pi_2(\bar{w}, L_1^*, L_2^*) \ge (1 - s_1)\Pi/2$. The only if statement is trivial. To prove the if statement, let $w_2 \ge \bar{w}$ be the wage rate such that $\pi_2(w_2, L_1^*, L_2^*) \;=\; (1 - s_1)\Pi/2$. Because firm 1 is weakly more efficient $\pi_1(\bar{w}, L_1^*, L_2^*) \ge \Pi/2$. Thus, there exist a $w_1 \ge \bar{w}$ such that $\pi_1(w_1, L_1^*, L_2^*) \;=\; s_1\Pi/2$. Since $\pi_1(w_1, L_1^*, L_2^*) + \pi_2(w_2, L_1^*, L_2^*) \;=\; \Pi/2$, one also has $L_1^*(w_1 - \bar{w}) + L_2^*(w_2 - \bar{w}) \;=\; \Pi/2$. *Q.E.D.*

Lemma A.1**:** *Let* s_1 *be given and let* $\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi/2$. *For any* Π^{EA} *for which* $U(\Pi^{EA}; s_1) + \Pi^{EA} < \Pi$ *one has* $\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi^{EA}$.

PROOF: One has

$$\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\frac{\Pi}{2}\,, \tag{7}$$

$$\pi_1(\bar{w}, L_1^*, L_2^*) \geq s_1 \frac{\Pi}{2}. \tag{8}$$

Equation (7) follows from the statement of the lemma and (8) follows from the fact that firm 1 is weakly more efficient. Because $U(\Pi^{EA};s_1) + \Pi^{EA} < \Pi$, the optimal labor inputs (L_1^*, L_2^*) are infeasible and, thus, at least one of the two following equations is satisfied:

$$\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi^{EA}, \tag{9}$$

$$\pi_1(\bar{w}, L_1^*, L_2^*) < s_1\Pi^{EA}. \tag{10}$$

Note that if both of the above equations are satisfied then Π^{EA} is not feasible. Suppose (9) is not satisfied. Hence, (10) must be. In this case, one can summarize equations (7) to (10) by the following two equations:

$$(1 - s_1)\Pi^{EA} \leq \pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\frac{\Pi}{2},$$

$$s_1\frac{\Pi}{2} \leq \pi_1(\bar{w}, L_1^*, L_2^*) < s_1\Pi^{EA},$$

which is absurd. Thus, (9) must be satisfied. *Q.E.D.*

Proof of Lemma 5: Suppose not. Then the Pareto-efficient utilities are induced by a tuple (w_1, w_2, L_1, L_2), for which $(L_1, L_2) \neq (L_1^*, L_2^*)$ and $w_2 > \bar{w}$. Because in the no-side-payment solution $\pi_2(w_2, L_1, L_2) = (1 - s_1)\Pi^{EA}$, $w_2 > \bar{w}$ implies that $\pi_2(\bar{w}, L_1, L_2) > (1 - s_1)\Pi^{EA}$. Since the side-payment solution is infeasible, Lemma A.1 implies that $\pi_2(\bar{w}, L_1^*, L_2^*) < (1 - s_1)\Pi^{EA}$. By continuity of $\pi_2(\bar{w}, \ , \ )$ in labor inputs, there exists a vector $(\tilde{L_1}, \tilde{L_2})$, on the straight line connecting (L_1, L_2) and (L_1^*, L_2^*), for which $\pi_2(\bar{w}, \tilde{L_1}, \tilde{L_2}) = (1 - s_1)\Pi^{EA}$. By concavity of the overall industry rents, overall industry rents are greater at $(\tilde{L_1}, \tilde{L_2})$ than at (L_1, L_2). By equation (1), overall industry rents can be written as $\pi_1(\bar{w}, \ , \ ) + \pi_2(\bar{w}, \ , \ )$. Since $\pi_2(\bar{w}, \tilde{L_1}, \tilde{L_2}) < \pi_2(\bar{w}, L_1, L_2)$, the increase in overall industry

rents implies that $\pi_1(\bar{w}, \tilde{L}_1, \tilde{L}_2) > \pi_1(\bar{w}, L_1, L_2)$. Thus, $(\tilde{L}_1, \tilde{L}_2)$ is a feasible choice which yields higher industry rents, contradicting the claim that (w_1, w_2, L_1, L_2) was Pareto optimal. *Q.E.D.*

Proof of Lemma 6: By equation (1), one has

$$U(\Pi^{EA''};s_1) + \Pi^{EA''} = \pi_1(\bar{w}, L_1'', L_2'') + \pi_2(\bar{w}, L_1'', L_2''),$$

where (L_1'', L_2'') denotes the optimal labor inputs given s_1 and $\Pi^{EA''}$. Since $\Pi^{EA'} < \Pi^{EA''}$, $\pi_1(w_1'', L_1'', L_2'') > s_1\Pi^{EA'}$ and $\pi_2(w_2'', L_1'', L_2'') > (1 - s_1)\Pi^{EA'}$. Hence, by continuity of $\pi_1(\ )$ and $\pi_2(\ )$, there exists an open ball around (L_1'', L_2'') such that for all (L_1, L_2) element of this open ball $\pi_1(w_1'', L_1, L_2) > s_1\Pi^{EA'}$ and $\pi_2(w_2'', L_1, L_2) > (1 - s_1)\Pi^{EA'}$. But, since the overall industry rents are a concave function of labor inputs, this open ball must contain a pair of labor inputs $(\hat{L}_1, \hat{L}_2)$ which yields higher overall industry rents. Since $(\hat{L}_1, \hat{L}_2)$ is a feasible choice at $\Pi^{EA'}$, overall industry rents are greater at $\Pi^{EA'}$ than at $\Pi^{EA''}$. *Q.E.D.*

Proof of Proposition 11: Suppose not. Thus there exists some interval over which the Pareto frontier is a convex function. Since by Lemma 6 the Pareto frontier is downwards sloping, this implies that there exists a tuple $(\Pi^{EA'}, \tilde{\Pi}^{EA}, \Pi^{EA''})$ with $\Pi^{EA'} > \Pi^{EA''}$ and $\tilde{\Pi}^{EA} = (\Pi^{EA'} + \Pi^{EA''})/2$ such that

$$2U(\tilde{\Pi}^{EA};s_1) < U(\Pi^{EA'};s_1) + U(\Pi^{EA''};s_1).$$

Rewriting this inequality, one obtains

$$2[U(\tilde{\Pi}^{EA};s_1) + \tilde{\Pi}^{EA}] < [U(\Pi^{EA'};s_1) + \Pi^{EA'}] + [U(\Pi^{EA''};s_1) + \Pi^{EA''}]. \quad (11)$$

Let $(\hat{L}_1, \hat{L}_2) = ((L_1' + L_1'')/2, (L_2' + L_2'')/2)$. Thus, concavity of $\pi_2(\bar{w}, L_1, L_2)$ in labor inputs and Lemma 5 imply that

$$\pi_2(\bar{w}, \hat{L}_1, \hat{L}_2) > \frac{\pi_2(\bar{w}, L_1', L_2') + \pi_2(\bar{w}, L_1'', L_2'')}{2} = (1 - s_1)\frac{\Pi^{EA'} + \Pi^{EA''}}{2}.$$

Similar, one has

$$\pi_1(\bar{w}, \hat{L}_1, \hat{L}_2) > \frac{\pi_1(\bar{w}, L_1', L_2') + \pi_1(\bar{w}, L_1'', L_2'')}{2} \geq s_1\frac{\Pi^{EA'} + \Pi^{EA''}}{2} \quad .$$

where the strict inequality follows from concavity of $\pi_1(\bar{w}, \ , \ )$ in labor inputs and the weak inequality follows jointly from Lemma 5 and equation (1). The above two equations imply that $(\hat{L}_1, \hat{L}_2)$ is a feasible choice. Concavity of the overall industry rents and equation (1), however, imply that

$$\begin{aligned} &2[\pi_1(\bar{w}, \hat{L}_1, \hat{L}_2) + \pi_2(\bar{w}, \hat{L}_1, \hat{L}_2)] \\ &> [\pi_1(\bar{w}, L_1', L_2') + \pi_1(\bar{w}, L_1'', L_2'')] + [\pi_2(\bar{w}, L_1', L_2') + \pi_2(\bar{w}, L_1'', L_2'')] \\ &= [U(\Pi^{EA'}; s_1) + \Pi^{EA'}] + [U(\Pi^{EA''}; s_1) + \Pi^{EA''}]. \end{aligned} \tag{12}$$

Since, by the definition of the Pareto frontier,

$$[U(\tilde{\Pi}^{EA}; s_1) + \tilde{\Pi}^{EA}] \geq [\pi_1(\bar{w}, \hat{L}_1, \hat{L}_2) + \pi_2(\bar{w}, \hat{L}_1, \hat{L}_2)],$$

equation (12) contradicts equation (11). *Q.E.D.*

REFERENCES

Abowd, J. (1989): "The Effect of Wage Bargaining on the Stock Market Value of the Firm," *American Economic Review,* 79, 774-800.

Ashenfelter, O. and R. Layard (eds.) (1986): *Handbook of Labor Economics*, Vol. 1 and 2, Amsterdam: North Holland, (1986).

Bean, C.R. and P.J. Turnbull (1988): "Employment in the British Coal Industry: A Test of Labor Demand Model," *Economic Journal*, 98, 1092-1104.

Binmore, K., A. Rubinstein, and A. Wolinsky (1986): "The Nash Bargaining Solution in Economic Modeling," *The Rand Journal of Economics,* 17, 176-188.

Brown, J. and O. Ashenfelter (1986): "Testing the Efficiency of Employment Contracts," *Journal of Political Economy,* 94, S55-S78.

Bughin, J. and S. Vannini (1996): "To Be (Unionized) or Not to Be? A Case for Cost-Raising Strategies," *CEPR Discussion Paper Series #1527.*

Card, D. (1990): "Unexpected Inflation, Real Wages and Employment Determination in Union Contracts," *American Economic Review,* 80, 669-688.

Chae, S. and P. Heidhues (1999): "Bargaining Power of a Coalition in Parallel Bargaining: Advantage of Multiple Cable Operators," *WZB Discussion Paper FS IV 99-1, Social Science Research Center Berlin.*

Chipty, T. and C. Snyder (1999): "Horizontal Integration for Bargaining Power: Evidence from the Cable Television Industry," *Review of Economics and Statistics*, forthcoming.

Davidson, C. (1988): "Multiunit Bargaining in Oligopolistic Industries," *Journal of Labor Economics***,** 6(3), 397-422.

Dobson, P. (1994): “Multifirm Unions and the Incentive to Adopt Pattern Bargaining in Oligopoly,” *European Economic Review,* 38, 87-100.

Doiron, D. (1992): “Bargaining Power and Wage Employment Contracts in a Unionized Industry,” *International Economic Review,* 33, 583-608.

Dowrick, S. (1989): “Union-Oligopoly Bargaining,” *Economic Journal*, 99, 1123-1142.

Dowrick, S. (1990): “The Relative Profitability Of Nash Bargaining on the Labor Demand Curve or the Contract Curve,” *Economic Letters*, 33, 121-125.

Drescher, M. (1993): *Die Entwicklung des Rechts des Tarifvertrags in Deutschland: eine rechtshistorische Untersuchung über den Verlauf der Durchsetzung des Kollektivvertragsgedankens.* Frankfurt am Main: Peter Lang.

Eberwein, C. and T. Kollintzas (1995): “A Dynamic Model of Bargaining in a Unionized Firm with Irreversible Investment,” *Annales d’Economie et de Statistique*, 37/38, 91-115.

Espinosa, M. and C. Rhee (1989): “Efficient Wage Bargaining as a Repeated Game,” *Quarterly Journal of Economics*, 104, 565-588.

Franz, W. (1996): *Arbeitsmarktökonomik.* 3rd edition, Berlin: Springer.

Haucap, J., U. Pauly and C. Wey (2000): “Collective Wage Settling When Wages Are Generally Binding: An Antitrust Perspective,” *International Review of Law and Economics*, forthcoming.

Horn, H. and A. Wolinsky (1988a): “Worker Substitutability and Patterns of Unionization,” *Economic Journal*, 98, 484-497.

Horn, H. and A. Wolinsky (1988b): “Bilateral Monopolies and Incentives for Mergers,” *Rand Journal of Economics*, 19, 408-419.

Jun, B-H. (1989): “Non-cooperative Bargaining and Union Formation,” *Review of Economic Studies,* 56, 59-76.

Keller, B. (1997): *Einführung in die Arbeitspolitik.* 5th edition, München: Oldenbourgh.

Layard, R., S. Nickell and R. Jackmann (1991): *Unemployment: The Macroeconomic Performance of Labour Markets*. Oxford: Oxford University Press.

Leontief, W. (1946): ‘‘The Pure Theory of the Guaranteed Annual Wage Contract,” *Journal of Political Economy,* 54, 76-79.

MaCurdy, T.E. and J.H. Pencavel (1986): “Testing Between Competing Models of Wage and Employment Determination in Unionized Markets,” *Journal of Political Economy,* 94, S3-S39.

Manning, A. (1987): “An Integration of Trade Union Models in a Sequential Bargaining Framework,” *Economic Journal,* 97, 121-139.

Manzini, P. (1998): “Game Theoretic Models of Wage Bargaining,” *Journal of Economic Surveys,* 12(1), 1-41.

Martinello, F. (1989): “Wage and Employment Determination in a Unionized Industry: The IWA and the British Columbia Wood Products Industry,” *Journal of Labor Economics,* 7, 303-330.

McDonald, I. and R. Solow (1981): “Wage Bargaining and Employment,” *American Economic Review,* 71, 896-908.

Nash, J. (1950): “The Bargaining Problem,” *Econometrica*, 18, 155-62.

Oswald, A. (1985): “The Economic Theory of Trade Unions: An Introductory Survey,” *Scandinavian Journal of Economics*, 87(2), 160-193.

Oswald, A. (1993): “Efficient Contracts are on the Labour Demand Curve: Theory and Facts,” *Labour Economics*, 1, 85-113.

Petrakis, E. and M. Vlassis (1996): “Endogenous Wage-Bargaining Institutions in Oligopolistic Industries,” *Working Paper 96-02, Economic Series 02, Universidad Carlos III de Madrid.*

Rubinstein, A. (1982): “Perfect Equilibrium in a Bargaining Model,” *Econometrica,* 50, 97-109.

Soltwedel, R., ed. (1990): *Regulierungen auf dem Arbeitsmarkt der Bundesrepublik.* Tuebingen: J.C.B. Mohr.

Stole, L. and J. Zwiebel (1996): ‘‘Organizational Design and Technology Choice under Intrafirm Bargaining,” *American Economic Review,* 86(1), 195-222.

Svenjar, J. (1986): “Bargaining Power, Fear of Disagreement and Wage Settlements: Theory and Evidence from the US Industry,” *Econometrica*, 54, 1055-1078.

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1994, Almqvist & Wiksell International (Stockholm).

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