The Role of Market Power in Agricultural Contracts

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Abstract

I study the economic consequences of shifting bargaining power in relational contracts through interventions such as the formation of a Bargaining Group (BG) for the side of sellers in a market where buyers traditionally hold significant market power. Existing theories of relational contracts predict that such a power transfer will have no impact on market efficiency. In contexts where enforcement institutions are weak, a standard assumption from existing theories of relational contracts - the existence of an enforceable base payment - may not hold. In this case, I show that a transfer of bargaining power can erode market efficiency in a dynamic relational contracting environment, which contradicts findings from existing models of relational contracting. When buyers hold significant market power, they forgo short-term opportunistic behavior by honoring promised performance bonuses in order to keep sellers engaged in trade over time and to accumulate surplus over many periods. With market power eroded by interventions such as the BG, buyers' long-run gains to trade shirk. When this is coupled with the absence of an enforceable base payment, short-term opportunistic behavior becomes more appealing and trade is more likely to break down. The results here provide policy-makers insight into the economic consequences of enacting policies attempting to balance market power within a framework of fully informal contract enforcement.

Key words: contracts, incomplete enforcement, bargaining group, distribution, institutions.
JEL Codes: D86, K12, L14, O12, Q13.

Laws and institutions regulating contract enforcement are critical for ensuring the participation of economic agents in markets, and therefore for economic growth and development. Market participants use contracts as a common instrument to coordinate economic relationships in both developed and developing countries. However, the cost of enforcing contracts through formal mechanisms like courts vary across countries (Djankov et al. 2003) and may be higher when some contract terms (e.g., quality, effort) are difficult for a third party to verify. When the cost of formal enforcement is too high or enforcement by courts is not feasible, contracts are often enforced by counterparties via the threat of terminating the relationship as an informal mechanism. This self-enforcement provides opportunity for significant opportunism, which is enhanced when one of the parties has more market power. In this sense, in the last few decades many markets have experienced a path of consolidation in which a few major firms have acquired significant market power in some stages of the production chain. This concentration of power may provide some participants with the ability to extract more of the contract's benefits at the expense of more dispersed participants including growers, production workers, and consumers. From a public policy perspective implementing policies such as supporting bargaining groups that shift the bargaining power may improve the weaker party's long-term economic situation by increasing their negotiating power over prices and contract terms. This paper models the decision of cooperation between trading partners as a function of each party's market power and the level of contract enforcement. In the light of the Asymmetric Nash Bargaining Solution (ANBS), I examine the consequences for efficiency, cooperation, and distribution of gains from trade of shifting bargaining power through interventions such as the inclusion of a bargaining group (BG) in a market characterized by a high degree of monopsony and repeated trading. The model developed here shows that in this context, the existence of an institution whose objective is to balance market power and redistribute the surplus, has different impacts on cooperation between trading partners, and perhaps social efficiency, depending on the contract enforcement level.

I examine two extreme cases and one intermediate case of contract enforcement: i) a fully complete enforcement case, which is the benchmark, where the characteristics of the good are observable and verifiable by a third-party, therefore all terms in the contract are enforceable by a court; ii) a case of fully incomplete enforcement, in which the characteristics of the product are observable but not verifiable by a third-party, and where none of the terms of the contract, including all payments, are enforceable by a court ex-post; and iii) a case in which part of the payment schem is enforceable; that is a base payment portion of contracts can be fully enforced by a court but discretionary bonuses cannot be third-party verified.

I find that under the assumptions considered in this paper, the model predicts that including an institution to mitigate market power and redistribute trading surplus may undermine individual incentives for cooperation and consequently may damage efficiency when exchange takes place in an environment where contract enforcement is fully lacking. This result has different implications for efficiency and distribution of surplus from those of the relational contracts model. For instance, Levin (2003) states that any distribution of the trade surplus can be reached, without changing the incentives for efficiency, by changing the fixed compensation in a stationary contract. In contrast, this paper shows cases in which changing the fixed compensation to redistribute surplus in the negotiation stage through the presence of a BG or other intervention to redistribute bargaining power among trading partners when all terms in the contract can only be enforced informally, may change the incentives to induce efficiency even when both parties are willing to participate in the relationship.

The economic explanation of the result above is that sellers demand a greater share of the gains from trade through a higher fixed payment from the bargaining process. As the sellers' market power increases, the fixed payment demanded increases and the buyers lose the ability to share surplus in the contract. Consequently, the range of discretionary payments decreases since the payment schedule is bounded by the gains of the relationship. As a result, the contract is characterized by small explicit contingency payments which in some cases will be insufficient to induce the high quality. Nevertheless, efficiency is not harmed because of such small discretionary payments but because of the lack of cooperation. Sellers are willing to supply efficient quality because they become residual claimants of the trade surplus as their market power increases. Though, as sellers market power increases the set of discount factors that sustain cooperation and relational contracts of the Sub-game Perfect Nash Equilibrium (SPNE) decreases causing the relationship to collapse. That is buyers have a higher incentive for opportunistic behavior when their gains over the surplus shrink resulting in a lack of cooperation and the presence of shorter relationships. If buyers do not have incentive to honor the contract then supplying high quality on the part of the sellers is not attractive anymore because there is a high probability that the buyer will renege on the contract and pay nothing. Therefore, efficiency may not be reached under these circumstances and trade declines. As a key result, the problems of efficiency and distribution of surplus can no longer be separated.

The benchmark case of complete contract enforcement and a partial enforcement regime are also analyzed. In the former case, the model shows that interventions to balance power in the market, i.e. supporting BG, achieves the goal of a higher compensation for its members as a higher share of surplus while full effi-

ciency and cooperation are attainable too. Moreover, the results in the partial enforcement case are similar: growers may get higher compensation through bargaining and achieve cooperation when parties have a high valuation of future gains, that is high discount factors. However, this high valuation does not need to be as high as the one in the fully incomplete enforcement regime, which means that there are a wider range of discount factors that sustain cooperation. This is a key result for policy makers as it shines light on the policies that may help to improve the conditions of the growers facing informal enforcement mechanisms.

The results of this paper are relevant because contracts, including base payment, are unenforceable in many markets, due to unverifiable product characteristics and the frequent reliance upon informal incentives. This lack of verifiability of product characteristics makes contracts unenforceable by a neutral third-party, who is often unable to corroborate if contractual obligations have been met. This situation opens the door for opportunistic behavior from the party who has market power as Wu and Roe (2007a) find in their experiments: when buyers have market power in an environment of full informal contract enforcement, in a significant proportion of the trades made, sellers earned ex-post profits below reservation payoff due to the opportunistic behavior of the other party.

On the other hand, this analysis is important because it fits real-world cases. There are many transactions that take place between partners that reside in different jurisdictions and that are ruled more by self-enforcement than by a common law. MacLeod (2007) supports this argument by stating that parties have few options to use formal courts as a mechanism to enforce commitments between buyers and sellers that may not be located in the same country. Even when trading partners are located in the same legal jurisdiction many trading relationships are ruled by social and business norms, because of the convenience and flexibility such informal terms of trade provide both parties.

Moreover, in the agricultural sector contracts are often incomplete (Wu 2006), and processors often have the power to make take-it-or-leave-it offers to growers, who do not have much room to negotiate. In addition, payments are normally made after the product is delivered, which allows buyers to make price adjustments depending on product's quality and other unrelated factors such as market conditions. In this sense, if the market is characterized by some monopsony power then the buyer could reduce the paid compensation to growers under reservation payoffs (Sexton and Zhang 1996).

In some developing countries, producers face weaker institutions to enforce contracts and in addition, they often sell their products to multinational traders who have increased their market power by bargaining for trade agreements and gathering extensive information about markets and prices (Grow et al. 2003).

The relationships between these companies and small producers are characterized by relational trading and international transactions which makes enforceability of contracts more difficult. In fact, Catelo and Costales (2008) state that many small producers in the developing world engage in contracts of a more informal kind. Even if contracting with large buyers provides access to finance tools and technical and market information for producers, buyers use those contracts as an instrument to impose additional restrictions (United Nations 2008). In addition, the UNCTAD reports that there are cartels that extract rents from "coffee producers in Kenya and Latin America, cotton, tea and tobacco growers in Malawi, milk processors in Chile, and fish processors near Lake Victoria (United Nations 2008)". For instance, small producers of tobacco in Brazil sell their product to international tobacco companies, and they have to accept the payment conditions that the companies offer ex-post (Franko 2003; Curtis 2006). This fact is compatible with the findings of Bhuyan and Lopez (1997) who state that tobacco is one of the 37 sub-sectors of US industry that reflect the exercise of some market power. Consequently, poorer households will achieve very little benefit from participating in these markets and may make perpetual the cycle of poverty and lack of upward mobility by not getting enough rents, with which households can use to accumulate wealth and make further investment. In addition, other research has shown that even when a large firm is vertically integrated with growers, they are more likely to offer production contracts to large farms and hesitate to work with small and medium-size farmers who provide less volume of the product (the Democratic Staff 2004; Catelo and Costales 2008). As a consequence, in a large number of cases, some farmers, especially the smallest and poorest, are excluded from sharing the surplus generated by trading and economic growth.

The findings of this paper have important implications for public policy by addressing issues related to the distribution of wealth and upward economic mobility. When contract enforcement is lacking, the use of institutions or policies to prevent opportunistic behavior or to redistribute gains from trade may cause non-desirable outcomes in terms of cooperation and possibly on efficiency. In this sense, this paper contributes to the existing literature by shifting bargaining power in favor of the weaker party in the context of self-enforcing, relational contract theory with the objective to provide some insight into the economic consequences of such institutions for public policy. As a result policy-makers can meet the goal of redistributing surplus by implementing policies such as supporting collective bargaining when there is complete enforcement of contracts. However, as contracts become partially or completely unenforceable, the shift of power can undermine the cooperation necessary to sustain efficient relational trading. Therefore, policies to increase the completeness of contracts should be also in place to assure cooperation.

The structure of this paper is as follows. Section two states the general assumptions of the principal-agent problem used and introduces the bargaining group as an intervention to shift power among parties in the context of asymmetric Nash bargaining. Section three analyzes contract enforceability levels, and finally, section four discusses some policy implications and presents some conclusions.

The model: The principal-agent problem

Suppose there is an infinitely repeated game between m buyers and n sellers, where buyers have market power ($n > m$). Both sellers and buyers are risk neutral and an intervention to increase sellers' bargaining power is in place. For simplicity, I assume from now and the rest of the paper that such intervention is the implementation of legislation to support bargaining groups (BG). However, one may apply the same analysis to any intervention directed to increase sellers' bargaining power and that fulfills all assumptions that are made for the BG in the context of this paper.

As a consequence of this intervention, sellers costlessly get together in a bargaining group to negotiate contracts with buyers. Parties can trade at periods $t = 1, 2, 3 \ldots$. At the beginning of each period t, buyers offer a contract: $\{P(q), Q\}$, where Q is the quality requested of one unit of a good and $P(q)$ is a payment schedule conditioned on actual quality delivered by sellers, $q \in [\underline{q}, \overline{q}]$, where q is observable but may not be enforceable; that is quality may not be measurable in a way that a court or a neutral third-party can verify. The payment schedule is defined as $P(q) = p + D(q)$, where p is a *promised* fixed payment to be paid at the end of period t and which has been negotiated at $t-1$ period between the buyer and the BG through a Nash bargaining process. It may also not be enforceable following Wu and Roe (2007b) which relaxes the conventional assumption about the fixed payment; finally, $D(q)$ denotes a discretionary payment depending on the quality delivered, that can be positive or negative and its existence depends on the level of contract enforcement. Since the contingency payment depends on quality, it cannot be made a legally binding obligation if quality is not enforceable. If quality is not enforceable, than the discretionary payment is an instrument to induce desired quality.

Each individual seller can accept or reject the contract offered by an individual buyer after participating in a group to drive the bargaining process over the promised fixed payment. If a seller accepts the contract, trade occurs, and the buyer gets $\pi = R(q) - P(q)$ where $R'(q) > 0$, $R''(q) \leq 0$, and $R(\underline{q}) = 0$. The seller gets $U = P(q) - c(q)$ where $c(q)$ is the cost of supplying quality q and I assume that $c'(q) > 0$, $c''(q) \geq 0$, and $c(\underline{q}) = 0$. I also assume that $R'(q) > c'(q) \; \forall \; q \in [\underline{q}, \overline{q}]$, so it is socially efficient to trade $q = \overline{q}$.

If the seller rejects the contract, then no trade occurs, and each agent receives reservation payoffs given by $\overline{u}$ and $\overline{\pi}$ respectively, which I assume are less attractive than trading and represent the next best market alternative. At the end of each period, each party decides whether or not to stay in the current relationship.

The net social surplus is given by $S(q) - \overline{s}$, where $S(q) = R(q) - c(q)$ is the return to the relationship (MacLeod and Malcomson 1998); $\overline{s} = \overline{u} + \overline{\pi}$ is the value of the outside opportunities and I assume $S(q) - \overline{s} > 0 \ \forall \ q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$, and $S(\overline{q}) > 0 = S(\underline{q})$. The net social surplus is equivalent to the rent to the relationship because it represents the difference between the return of the relationship and the second-best market opportunity.

In addition, parties interact repeatedly following the assumptions of the theory of repeated games (Watson 2002; MacLeod 2006; Wu and Roe 2007b). The assumptions are: (i) buyers and sellers know only the past actions of trading partners with whom they've traded; this allows for the creation of reputation between trading partners and to build relationships in which trust and cooperation are important characteristics; (ii) parties care about the sum of a stream of discounted future payoffs, where the common discount factor is $\delta \in (0,1]$[1]; and (iii) equilibrium will be sustained by a trigger strategy. That is parties cooperate if the history of play in all periods before has been cooperation. Parties break-off trade forever if any deviation is observed and parties cannot renegotiate the trading decision after performance is observed. Following Levin (2003), this allows for relational contracts since it contains a complete plan for the relationship that describes behavior on and off the equilibrium path. Additionally, I assume that the contracts are self-enforcing. That means that each period is played following Nash equilibrium (Levin 2003), and there are enough rents to the relationship for each party that make them decide to enforce the contract and stay in the relationship (MacLeod and Malcomson 1989, 1998; Baker, Gibbons, and Murphy 1994; MacLeod 2006). In addition and in the spirit of Bull (1987), the self-enforcing constraint is binding to sustain the relationship when no formal legal enforcement is in place.

Following these assumptions I look at the future stream of payments for each of the players to solve for the equilibrium of the model, which depends on the contracting enforcement level and the presence of the bargaining association. Trigger strategies and repetition allow players to maintain a SPNE where both parties honor the contract and maintain long-term relationships which create surplus that is shared by trading partners.

Shifting bargaining power

I now include the bargaining group in the model, and for that I assume that the bargaining process is resolved using the asymmetric Nash bargaining solution (ANBS). The objective of including a BG in this context is to balance market power and increase the rents that sellers get from trading. It relaxes the assumption of the conventional theory that the principal has all market power. For simplicity, I assume that the cost for all sellers of joining the group and the cost of bargaining are zero.[2] Also, I assume that the BG only serves as a bargaining agent and make no profit as in Oczkowski (2006) and therefore only negotiates on behalf of its members over the fixed price of one unit of the good with the buyers, matching real objectives of BGs (Iskow and Sexton 1992; Hueth and Marcoul 2002). In addition, I assume that sellers' outside options are less attractive than participating in the BG, so they are better off being a member of it. This makes sense since in real situations spot prices are normally below the prices set through contracts. For instance, Lawrence (2004) states that selling cattle at spot price may represent a decrease between 12 and 25 per-cent of the long run growers' profits.

I also assume that even under contracts negotiated by BG, sellers' product is subject to buyers' specifications. That is BG is a type of cartel that control disposition of members' product but does not control the quality of the product. Then, sellers negotiate the product one to one with buyers but under the conditions of the contract established by the group as in the U.S. fruits and vegetables industry (French 1987).

Bargaining power depends on the share of product/crop that the BG supplies as a group in the industry, and can vary depending on the membership and the quantity supplied by each member. French (1987) argues that in the U.S. fruit and vegetable industry this share varies across commodities and time in a range from 10% to as much as 80%. In particular, I assume that members are loyal to the BG and that a majority of producers belong to the group so this confers the ability to control an important part of the supply which gives some market power to the group to countervail the other party's strength.

Then, the BG and buyers bargain over the price of one unit of good of quality q. In this case if both parties have some market power to influence price, then price is not set on the demand curve or on the supply curve. However, I consider demand and supply as upper and lower boundaries for the price bargaining process (Folwell, Mittelhammer, and Wang 1997; Oczkowski 2006).

Following all the assumptions above and maximizing the Asymmetric Nash Product (ANP) of the objective functions from both parties I derive a condition which buyers face when offering a contract to sellers. Then the negotiation space is defined by the bargaining power of each of the parties and the outside

options that each one may have. Then, the ANP optimization program is:

$$\max_{P(q),q} (P(q)-c(q)-\overline{u})^{\beta}(R(q)-P(q)-\overline{\pi})^{1-\beta}$$
$$\text{subject to} \quad q \in [\underline{q},\overline{q}].$$

where the first and second expressions within parentheses are the objective functions of the seller and buyer respectively, which include the outside option of both: $\overline{u}$ and $\overline{\pi}$, and β represents the bargaining power of the bargaining group. If $\beta = 1$ then it is the case of monopoly from sellers. If $\beta = 0$, it is the case of monopsony which was already analyzed by Wu and Roe (2007b). And finally when $\beta \in (0,1)$, it is the case under bargaining in which both parties have some market power. In this paper β is assumed to be exogenous. This brings us to the first proposition of the paper.

Proposition 1. *If there exists a bargaining group with the objective of maximizing sellers' profits, the sellers' individual rationality constraint does not bind, and buyers maximize profits subject to a Nash Bargaining Rent Condition, that is given by*

$$P(q)-c(q) \quad = \quad \overline{u}+\beta(S(q)-\overline{s}) \tag{1}$$

where $\beta \in (0,1]$ [3] *and represents the bargaining power of the bargaining group.*

Proof. See appendix □

The Nash Bargaining Rent Condition (NBRC) (equation (1)) states that now when a buyer offers a contract he is constrained by a new condition which arises due to the existence of a BG formed by sellers. This condition is binding and depends on the bargaining power of the BG. This implies that buyers have to offer higher compensation to sellers in order for sellers to accept the contract. The higher the sellers' bargaining power, the higher the minimum price that sellers will accept. Then, Proposition 1 results in the bilateral monopoly outcome (Muthoo 1999) where parties set quality at the level where the gains from trade (S(q)) are maximized and price is the instrument to split the surplus. Thus, the buyers solve the following maximization problem when offering a contract:

$$\max_{P(Q),Q} (R(Q)-P(Q))$$
$$\text{subject to} \quad P(Q)-c(Q) \quad = \overline{u}+\beta(S(Q)-\overline{s}) \tag{2}$$
$$\text{and} \quad Q \in [\underline{q},\overline{q}].$$

where Q is the quality that the buyer wants delivered.

Contract Enforceability

I examine the two extreme levels of contract enforcement: a complete contract environment in which agents agree on a contract and both quality and price are costlessly enforced by a third party (benchmark). The other regime is a fully incomplete contract environment in which neither $P(Q)$ nor Q are enforceable by a third-party, so there exists full discretion for both parties to adjust quality and price ex-post respectively. I also examine a third case of partial enforcement in which the promised fixed payment is enforceable ex-post. I assume that the level of contract enforcement is exogenous to the model and I solve the model focusing on the outcomes regarding both efficiency and distribution given a certain level of enforcement and how, in this context, agents make decisions about cooperation and the building of long-term relationships.

Bargaining power and complete enforceability

When there exists a bargaining group, contracts are completely enforceable, and there is repeat interaction, the game is as follows: after negotiating the promised fixed price with the BG, a buyer offers a contract (P,Q) to a seller that decides to accept or reject. If he accepts, a third-party enforces P and Q, so $q = Q$ and $P = p$, where p is the promised fixed payment determined through asymmetric Nash bargaining. Since it is a repeated game, the buyer maximizes his stream of future payoffs subject to the to the Nash Bargaining Rent Condition[4]:

$$\begin{aligned} &\max_{P,Q} \left(\frac{R(Q)-P}{1-\delta}\right) \\ &\text{subject to} \quad P - c(Q) \quad = \overline{u} + \beta(S(Q)-\overline{s}) \\ &\text{and} \quad Q \in [\underline{q}, \overline{q}]. \end{aligned} \tag{3}$$

Proposition 2. *In the presence of a bargaining group, no cost of bargaining, completely enforceable contracts, and any distribution of market power ($\beta \in [0,1]$), full efficiency is reached by $Q = \overline{q}$, the monetary transfer is given by $P = c(\overline{q}) + \overline{u} + \beta(S(\overline{q}) - \overline{s})$, and gains from trade are more equally distributed depending on the bargaining power of the bargaining group, which characterize the parties' profit functions:*

$$\pi = \frac{(1-\beta)(R(\overline{q}) - c(\overline{q}) - \overline{u}) + \beta\overline{\pi}}{1-\delta}, \text{ and} \tag{4}$$

$$U = \frac{(1-\beta)(\overline{u}) + \beta(R(\overline{q}) - c(\overline{q}) - \overline{\pi})}{1-\delta} \tag{5}$$

Proof. See appendix □

Proposition 2 gives the results for efficiency and distribution under full contract enforceability. In this case, full efficiency is reached and sellers get a price that is positively related to the bargaining power of the group. When the BG has power greater than zero, then the seller gets more than her reservation payoff by a β fraction of the total surplus generated.

Parties are forced to fulfill the agreement because the complete enforceability level of the contracts. In consequence, cooperation and long-term relationship are not important to reach efficiency. Then, both parties participate in trading no matter what is the distribution of market power, which can range from monopoly to monopsony, because each party receives at least the reservation payoff. This happens because, under this regime, parties can structure a contract that redistributes surplus without altering the incentives to provide full efficiency and generate social surplus.

Equations (4) and (5) characterize the distribution of surplus which depends on the value of β. Therefore, balancing market power through the existence of a bargaining group under a regime of full contract enforceability helps to redistribute the surplus generated by trading more equally between the partners while full efficiency can be achieved. In other words, the distribution of the market power only affects the distribution of the welfare but not efficiency.

Bargaining power and incomplete enforceability

In this section I analyze the case of fully incomplete enforceability of contracts, where neither $P(Q)$ nor Q are enforceable by a third-party. Hence, buyers include in the compensation package a discretionary payment, $D(q)$, that depends on the quality observed ex-post and it is used by the buyers to induce the quality desired.

It is important to clarify that p, the fixed payment, is now a *promise* not an obligation, and it is paid at the end of each period after observing quality. The fact that it is a *promise* means that in the case analyzed in this section it is not enforceable by a third-party as in Wu and Roe (2007b), which allows the buyer to back out of his original promise without legal consequences. The immediate result is that the ex-post total compensation, including both the fixed and the discretionary portions, can fall below the fixed promised payment. In this case buyers do not have the means to enforce quality and sellers cannot obtain payment from buyers through formal mechanisms.

This assumption changes the results of the game and changes parties' strategies. This contrasts with the announcements used conventionally in the literature as in MacLeod and Malcomson (1998) and Levin (2003). Both of these papers model a labor market in which a fixed wage is enforceable by a third party but a discretionary bonus cannot be formally enforced (I consider such a situation in the next section). Therefore, the fixed payment is paid no matter what the final outcome is. This assumption implies that it is enforceable by a third-party no matter if it is paid ex-ante or ex-post. However, in non-labor contracts such as common supply contracts ex-post reductions as a response to a low quality product delivery are acceptable (Wu and Roe 2007b). For instance, Banerjee and Duflo (2000) show evidence from the Indian software industry in which firms ameliorate own errors by paying part of the overrun with the objective to maintain a good reputation in the market. Then, in the context of this paper, using the alternative assumption that p may not be enforceable, gives a more interesting result in the context of agricultural contracts. For instance, in both the developed and the developing world, business practices are such as payments to producers are often delayed up to 60 days after delivery time with no upfront payments as a way to ensure quality (Brown and Sander 2007). This clearly creates an opportunity for buyers to withhold payments.

The reductions in prices can be granted by the seller or can be imposed by buyers depending on the contract enforcement level and the timing of the game. In the case of this paper buyers have the latitude of imposing a deduction. Then, a buyer can make potential adjustments upward or downward since the fixed payment is not enforceable, which can be seen in two ways: (1) the buyer offers a contract with promised fixed payment that is not enforceable and later he can renege on paying or (2) he promises only a discretionary payment. In both cases, the buyer can adjust the total payment to zero. In the following analysis I adopt the former case.

Under this regime, the game is the same as in the complete enforcement level but now after a seller accepts a contract $(P(Q),Q)$, she can cooperate and choose $q \geq Q$, or can shirk by supplying $q < Q$. Then the buyer, after observing the quality delivered, chooses $P(q) \geq 0$, using the discretionary payment.

I assume that if both parties cooperate, then the seller supplies $q \geq Q$ and the buyer, after observing the quality supplied, honors the contract paying the fixed payment, p, plus a positive discretionary payment, $D(q) = b(q)$, called a bonus that is defined as $b(q) = P(q) - p > 0$. If this is the case, under the assumptions of a trigger strategy, since both parties cooperate, parties are willing to cooperate in the future and stay in the relationship.

On the other hand, parties can deviate. Since the contract is completely unenforceable, after the buyer observes q, he can deviate by choosing any $P(q)$ he wants. That is, he reneges on the positive discretionary payment setting $b(q) = 0$ and furthermore since p is not enforceable he can renege and set the total payment equal to zero, implicitly deducting the promised price.

This negative discretionary payment, $D(q) = d(q)$, is defined as $d(q) = P(q) - p < 0$ and is called a deduction, which will terminate the relationship. In this case I am assuming that the buyer can use $d(q)$ unilaterally and he will use deductions to behave opportunistically and that will break off cooperation. Then, following Wu and Roe (2007b) I assume that the buyer chooses $d(q) = -p$ since it is the most profitable deduction, setting the total payment to zero. Then the compensation package is given by $P(q) = p + b(q)$ if $q \geq Q$ if the buyer cooperates, or $P(q) = p + d(q)$ if $q < Q$ if the buyer does not cooperate.

The concept of $d(q)$ is similar to a warranty, in which case the decision is made by the seller to grant it. In our scenario, this option is ruled out, because if the seller makes the decision, it makes sense that she will pay $d(q)$ if $q < Q$ and she wants to continue in the relationship. Sellers will chose this option if and only if $p + d(q) - c(q) > p + b(q) - c(q)$, which is obviously not true since $d(q)$ is a negative transfer for her. That is she has to pay back some money to the buyer in order to have him continue in the relationship. Then, it does not make sense to deviate because she will make more money by supplying the demanded quality. If this happens the fixed price will have to be enforceable and the model will collapse to the partial enforceability model.

The contract described above can be explained as follows. Let's say that a processor promises the grower to pay p when the product is delivered plus a bonus, $b(q)$, conditioned on the quality of the product. The grower can choose to shirk or deliver the quality requested by putting the necessary time (effort) and use the right inputs such as fertilizer, water, etc. to get the desired quality. Let's assume that she decides to supply high quality. At the delivery date, since the quality is not verifiable by a third party, then the processor has to decide to fulfill the initial agreement or to shirk. If he honors the agreement he pays what was agreed, $p + b(q)$, and trade continues overtime. If he decides to shirk then he can argue that the delivered product does not meet the requested quality, and therefore pay $b(q) = 0$. Even more, he can say that the quality is far away from the requested level and unilaterally decide to pay a lower fixed price than the one originally offered. This is equivalent to placing a deduction on the fixed price and will terminate the relationship.

On the other hand, when the seller shirks and $q < Q$ then under the assumptions of a trigger strategy, a deviation will cause non-cooperation from the buyer in the future. That is, the buyer will not pay the

discretionary payment and will also renege in the payment of p, setting a deduction on it. An important note is that if $q < Q$, the buyer and the seller can set $p < P$ and continue in the relationship, but this case is an exception and for simplicity it is not discussed here; instead I assume that any fault in fulfilling the contract results in break-off of trade forever. Given this trigger strategy and using backward induction to solve for the SPNE, the seller's dynamic incentive compatibility constraint (DICC) is given by:

$$(6) \qquad \frac{p+b(q)-c(q)}{1-\delta} \geq p+d(q)-c(\underline{q})+\frac{\delta}{1-\delta}\overline{u}$$

where the left hand side is the payoff of the seller for cooperating and supplying $q \geq Q$ and the right hand side represents the payoffs if she shirks. Note that the most profitable deviation for the seller is to supply $\underline{q}$, but in this case the buyer will impose $d(q) = -p$ since the relationship will be terminated anyway.

On the other hand, since the price is not enforceable either, even if the seller supplies $q \geq Q$, the buyer may pay $b(q)$ or may behave opportunistically by not paying it and imposing deductions. In this sense, the most profitable deviation for the buyer is to not pay $b(q)$ and to also impose $d(q) = -p$. Then, the buyer cooperates if and only if:

$$(7) \qquad \frac{R(q)-p-b(q)}{1-\delta} \geq R(q)-p-d(q)+\frac{\delta}{1-\delta}\overline{\pi}$$

which is the buyer's DICC and the left hand side gives payments if he cooperates and the right hand side gives payments if he deviates.

Again sellers bargain as a group for the terms of the contract, thus the expected compensation for them under cooperation is given by the NBRC and the individual seller's individual rationality constraint (IRC) does not bind. The buyer's IRC is given by:

$$(8) \qquad \pi = R(q)-P(q) \geq \overline{\pi}$$

Also as in Levin (2003), since both parties can deviate from the payments in the contract then the discretionary payment proposed has to be credible to ensure a self-enforcing contract. That is the compensation package is bounded by the future gains of the relationship. As a result the optimal stationary contract $(p, D(Q), Q)$ must satisfy equation (1) the Nash Bargaining Rent Condition, equations (6) and (7), the seller's and buyer's dynamic incentive compatibility constraints, and equation (8), the buyer's individual rationality constraint, where equations (1) and (7) bind (See appendix).

Proposition 3. *Under fully incomplete contract enforcement, in the presence of a bargaining group, no bargaining cost, and of repeat interaction, and assuming δ high enough, a stationary contract $(p, D(Q), Q)$ that implements $Q = \overline{q}$, must satisfy (1), (6), (7), and (8), and the total compensation package is characterized by:*

$$b(q) - d(q) \geq c(q) - c(\underline{q}) - \frac{\delta}{1-\delta}\beta(S(q) - \overline{s}) \text{ , and} \tag{9}$$

$$p + b(q) = \overline{u} + c(q) + \beta(S(q) - \overline{s}) \tag{10}$$

Proof. See appendix □

Proposition 3 shows that the range of contingent payments needed to induce quality is negatively related to β while the total compensation package is positively related to β. Inequality (9) gives the size of the conditional payment on quality that the buyer has to offer to induce a desired quality. On the right side the first two terms are equivalent to the difference in cost of providing desired quality and of providing low quality, which will be what should be paid with no BG to induce desired quality. However, in the presence of BG the range of conditional payments decreases by the third term, which represents the present value of the share of surplus that the seller gets given the market power of the BG. This result implies that what the buyer has to offer to induce high quality is less than what is needed when there is no BG. This is followed by equation (10) which shows that the total compensation is increasing in β. The intuition behind these results is that as the bargaining group's market power increases then the seller can obtain a higher fixed payment from the bargaining process that depends proportionally on the power that the group exercises. The fixed price is given by $p = \overline{u} + c(\underline{q}) - d(q) + \frac{\beta(S(q)-\overline{s})}{1-\delta}$ which is positively related to β even though it is negatively related to the negative discretionary payment.

A consequent result is that the range of discretionary payments available for buyers to induce quality decreases as the market power of the BG increases. This makes intuitive sense because if the compensation package that the buyers can offer is bounded by the gains of the relationship then when the component of fixed payment goes up, the discretionary payment component must go down. Then, as sellers demand a greater share of the gains from trade, buyers have a reduction in the degrees of freedom to share surplus through the contract. Therefore, the contract is characterized by small explicit contingencies payments. As in Baker, Gibbons, and Murphy (1994) as the alternative payment increases, which is set in our context by more power with the BG, then the available present value of the relationship for buyers falls so the feasible discretionary payment declines.

In practical terms, what this means is that the ability of buyers to induce high quality decreases. The discretionary payments are limited by the proportion of surplus that the buyer is able to extract given his market power. When the buyer negotiates with a bargaining group, which has some market power, he has to offer a higher fixed component of the payment schedule to satisfy the demands of the group. Consequently, the higher the power of the group, the lower the share of surplus the buyer owns after negotiating the fixed compensation. Therefore, the buyer offers a discretionary payment that is limited by a smaller share of the surplus. Then, the size of the contingent payment decreases.

A following implication may be that there is not enough room for buyers to induce the high quality given the smaller share of surplus they own. However, in this case the potential decrease in the range of discretionary payments through the increase of the BG's market power does not unravel the efficiency level as sellers become residual claimants of the trade surplus. Since their payment depends on a β proportion of the total surplus, then, it is of their interest to maximize the surplus as it will maximize their payment; consequently, the more the bargaining power of the group, the sellers are more willing to supply the high quality no matter what the discretionary payment is as long it is not negative. In this sense, the profits that sellers get increases with the market power of the BG while the buyers' profits decreases.

Proposition 4. *Under full incomplete enforceability of contracts, the presence of a BG, repeating trading, and no cost of bargaining, cooperation and relational contracts are unrevealed when* $\beta > \hat{\beta} = \frac{\delta R(q) - \delta\overline{\pi} - c(q) - \overline{u}}{S(q) - \bar{s}}$*, since it requires a discount factor,* δ*, close to one. At the limit when* $\beta = 1$*, then* $\delta \geq 1$*. That is self-enforcing agreement are not sustainable when the bargaining power of sellers is greater than* $\hat{\beta}$*.*

Proof. See appendix □

The reasoning behind this proposition is that as sellers' market power increases by collective bargaining, the set of discount factors that sustain cooperation and relational contracts decreases causing the relationship to collapse when the threshold value for β is crossed. The intuition for this is as follows: each party has a discount factor that reflects how much they value the future relative to the present. As the market power of the BG increases, the discount factor that is needed to cooperate and keep trading with the same partner raises. Although, it is possible that some parties strongly value the future, when the discount factor needed to sustain cooperation increases, the number of parties willing to participate in the relationship decreases until nobody is willing to cooperate. Thus, in a completely unenforceable contract environment,

if the BG achieves a higher market power than $\hat{\beta}$, only values equal or greater than one for δ can sustain cooperation. Therefore it is impossible to sustain the SPNE under this set of parameters: nobody values absolutely more the future than the present.

Under this regime, as the BG market power increases the model predicts greater rents for growers which encourage their self-motivation to deliver high quality. Then, conditional payments are not the most important factor for reaching efficiency. This is potentially offset by the fact that cooperative equilibrium is harder to sustain since opportunistic behavior takes over the relationship and buyers try to obtain short-term rents.

A possible explanation for this is that given that buyers can choose to pay any price, including a zero transfer to the seller, when they lose an increasing share of surplus with the BG power, they can behave opportunistically by withholding payment and earning short-term gains. Additionally, buyers are covered for low quality delivered by the ability of withholding payments; therefore, they are more willing to discontinue the relationship with a specific seller (Wu and Roe 2007b). Then, it is required that both parties have high discount factors for preventing buyers of shirking on price and instead having them cooperating.

These results contradict the standard relational contracting outcomes in which efficiency and the distribution of surplus can be separated. In this case shifting the distribution of surplus can alter efficiency because none of the terms of the contract are formally enforceable. When a self-enforcing contract generates additional surplus over the outside surplus $\bar{s}$, if sellers, through a BG, demand a greater share of the gains from trade through $\beta > \hat{\beta}$, buyers will have a reduction of the degree of freedom to share surplus in the contract. Consequently, even satisfying the participation constraints of the parties, cooperation is undermined as buyers will have to value the future at least as much as the present. As a consequence efficiency may be harmed by the lack of cooperation and the presence of shorter relationships since buyers have a higher incentive for opportunistic behavior when their gains over the surplus shrink.

Following Proposition 3, sellers have incentives to supply high quality as through the BG sellers become partial claimants of the trade residual. Even so, as the buyers do not have incentive to honor the contract by reneging the contract and pay nothing, supplying high quality on the part of the sellers is not attractive anymore. As a consequence, efficiency may not be reached under these circumstances and trade diminishes. This matches what Oczkowski (2006) finds in his paper. When the bargaining co-operative has the complete bargaining power then no trade occurs. He argues that under these circumstances if a buyer

chooses to participate in trade then he will incur a loss. Thus, we can state that under these assumptions the problem of efficiency can no longer be separated from the distribution of welfare derived from trading.

Bargaining power and partial enforceability

In this section I analyze a partial contract enforcement. This is an intermediate regime that falls in between the two extreme cases analyzed above and gives insights on the implementation of policies that support the BG and enforces part of the contract.

If a contract has partial enforcement in which the fixed price p is enforceable but the bonus is not, a conventional assumption used in the literature, then clearly the buyer can only renege on payment of the bonus. Consequently, the seller's and the buyer's DICC are respectively given by:

$$\frac{p+b(q)-c(q)}{1-\delta} \geq p-c(\underline{q})+\frac{\delta}{1-\delta}\overline{u}\text{ , and} \tag{11}$$

$$\frac{R(q)-p-b(q)}{1-\delta} \geq R(q)-p+\frac{\delta}{1-\delta}\overline{\pi} \tag{12}$$

Note that now the most profitable deviation for the seller is to continue to supply $\underline{q}$ and for the buyer is to not pay $b(q)$. However, in this case, the buyer cannot impose a deduction on the fixed price. The NBRC and the buyer's IRC remain the same as equations (1) and (8), respectively. Finally, the seller's IRC does not bind.

Proposition 5. *Under partial contract enforcement, the presence of a BG, no cost to bargaining and repeated interaction, efficiency is achievable and cooperation and relational contracts are sustainable over time if the parties have a discount factor* $\delta > \hat{\delta} = \frac{c(q)-c(\underline{q})}{R(q)-c(\underline{q})-\overline{u}-\overline{\pi}}$*, and the total compensation package is characterized by:*

$$b(q) \geq c(q)-c(\underline{q})-\frac{\delta}{1-\delta}\beta(S(q)-\overline{s})\text{ , and} \tag{13}$$

$$p+b(q) = \overline{u}+c(q)+\beta(S(q)-\overline{s}) \tag{14}$$

Proof. See appendix □

Proposition 5 states that the results on efficiency and distribution in the case of a partial enforcement regime are the same as the ones in the complete enforcement case if parties have discount factors $\delta > \hat{\delta}$. That is full efficiency is reached and any distribution of surplus is achievable depending on the parties' market power resulting in the same profit functions of proposition 2. Cooperation is sustained if parties value the future a lot relative to the present, which makes difficult to sustain relational contracts over time. However, as a main result in this case, it is more likely to redistribute the surplus through the BG in this regime than

in the fully incomplete enforcement since even requiring high discount factors, the upper bound to sustain relational contracts is given by $\hat{\delta}$ and not by $\delta = 1$ as in the incomplete regime.

Policy Implications and Conclusions

The results discussed in the previous sections have several implications for public policy. The key question is: What are the implications of implementing legislation to transfer bargaining power from the stronger to the weaker counterpart in the cases analyzed? Two possible types of interventions are 1) support laws to increase the bargaining rights or market position of the weaker party; and 2) regulate the behavior of the market participants through contract regulation.

The first case I analyzed is the benchmark where contracts can be fully enforced by a formal court. In this case, if there is such a shift of bargaining power, it countervails the power of buyers and the gains from trade are more evenly distributed depending on each party's market power. Then, if, for instance, policies are used to support the position of a BG, they will contribute to balancing market power and sellers will gain more rents while economic efficiency is reached. Policies on contract regulation (other than enforcement of contracts) are not needed since parties through negotiation will reach an agreement that will reflect each party market's position and cooperation is sustained through formal enforcement of contracts.

In the second case analyzed where the contracts are completely unenforceable the implications are more ambiguous. If the government implements policies to transfer bargaining power from one party to the other then the consequences on efficiency can be negative if the market power of the weaker group is too high. The potential and practical implication of this result is that while government implements policies to balance market power in favor of growers, for example through collective bargaining, while they potentially reduce buyers' opportunism, they may also have significant costs in social efficiency by breaking down trading relationships.

Because the lack of enforcement is causing the bad outcome of the policy, the next step should be for the government to use the second kind of intervention, which is to regulate contracts and make them more complete. If the enforcement level is partially incomplete (that is, when the fixed payment is enforceable) then first-best efficiency is reachable and surplus can be split in any way depending on parties' bargaining power while cooperation is sustainable as shown in section 4.3. Then, policy-makers can implement legislation that makes the fixed payment enforceable while supporting collective bargaining or other intervention to rebalance market power to achieve this result. This contrasts with the theory of 'strategic ambiguity'

of Bernheim and Whinston (1998), which states that given the limits of third-party enforcement it may be optimal to increase the level of incompleteness in the contract to improve efficiency. In this case, increasing the level of completeness of the contract may result in a better outcome and the intervention can have the positive effect on distribution of welfare as it is its ultimate goal. However, there is a caveat: the model predicts that cooperation is achievable under the partial enforcement regime, but only if parties have a very high discount factors, $\delta > \hat{\delta}$. This implies that implementing this kind of policy will only work if all parties strongly value the future which in reality may not be the case given the specific conditions of each market.

In addition, the practical ability of governments to regulate and enforce contracts becomes an important issue for discussion. Generally, contracts are private and, often, incomplete agreements between parties, which makes enforcement difficult. If the government wants to enforce a base or upfront payments it has to place mechanisms to monitor their existence. For instance the government can encourage vertical cooperation agreements between the BG/growers and the processors/buyers. Through these vertical agreements growers can get upfront payments in the form of cash, seeds or capital for initial investment from the buyers. Additionally, BGs can act as an agent to monitor the upfront payment and a way to enforce the contract in general.

The government can also regulate the existence of bank guarantees from processors to generate a more formal obligation of paying. However, in this case, there will be additional transaction costs that might deter buyers from dealing with growers who require bank guarantees. But if sellers group representing an important share of the supply then it might worth it for the buyer to incur the financial cost. Therefore, the government's support for the BG formation is important for successful use of bank guarantees as a tool to ensure payments.

The implications of these kinds of policies in the agricultural sector are especially important for development since farming is still a family-owned operation in most places around the world (Siebert 2001). In this sense, economic analysis of this type of intervention is crucial and needs to account for intra-firm organization and relationships among firms as well the mechanisms in which poor producers and countries connect with producers and consumers in the global economy.

Two final items merit consideration. First, as economies open, outside options emerge from international markets, which give more opportunity to behave opportunistically even when there are policies in plate to redistribute bargaining power. The use of partners from other countries may make contracts more incomplete and make it more difficult for these policies to achieve their goals. Then, the results of this

research are highly important for analyzing the consequences of these changes. Second, from our model we can predict that no matter the level of contract enforcement, sellers can obtain more rents if they increase their negotiation power through bargaining as a group. However, under fully incomplete contract enforcement, cooperation is harder to sustain as the bargaining power of the sellers increases. This result combined with the possibility of multiple equilibrium within repeated-game monopoly-monopsony contexts suggests that it is necessary to conduct some empirical analysis to determine if these theoretical predictions match behavior of partners in real-world situations.

APPENDIX

Proof of Proposition 1. Let $\beta \in (0,1]$ be the bargaining power [5] of the bargaining group and $(\overline{u}, \overline{\pi})$ the Nash disagreement point. That is if there is no agreement seller gets $\overline{u}$ and buyer gets $\overline{\pi}$. The member's profit function is given by $U = P(q) - c(q) - \overline{u}$ and the buyer's profit function is $\pi = R(q) - P(q) - \overline{\pi}$. Assuming that a buyer seeks to maximize own profits and the BG maximizes members' profits, the Asymmetric Nash Bargaining maximization problem is:

$$\max_{P(q),q} (P(q) - c(q) - \overline{u})^{\beta} (R(q) - P(q) - \overline{\pi})^{1-\beta}$$
$$\text{subject to} \quad q \in [\underline{q}, \overline{q}].$$

From the FOC we have:

$$\text{(A-1)} \qquad P(q) - c(q) = \overline{u} + \beta (S(q) - \overline{s}) \text{ ,and}$$

$$\text{(A-2)} \qquad R'(q) = c'(q).$$

Equation (A-1) gives the Nash Bargaining Rent Condition (NBRC). Since it is assumed that $R'(q) > c'(q)$ for all $q \in [\underline{q}, \overline{q}]$ and $R'(\cdot)$ is monotone decreasing and $c'(\cdot)$ is monotone increasing the optimal quality level will be at the corner $\overline{q}$.

Next I show that the seller's participation constraint (PCs) or Individual rationality constraint(IRC), does not bind. Let PCs bind, that is $P(q) - c(q) = \overline{u}$. Substituting PCs into NBRC and rearranging gives $0 = S(q) - \overline{s}$, which is a contradiction since by assumption $S(q) - \overline{s} > 0 \; \forall \; q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$. Now, having NBRC binding: $P(q) - c(q) = \overline{u} + \beta (S(q) - \overline{s})$. Substituting it on PCs and rearranging we get: $S(q) - \overline{s} \geq 0$, which is satisfied since $S(q) - \overline{s} > 0 \; \forall \; q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$. □

Proof of Proposition 2. Let(P,Q) be the contract that a buyer offers to a seller who is member of a BG. A rational buyer that maximizes profits will offer a price that ensures the acceptance of the BG and the participation of the seller(IRCs). Since the IRCs does not bind and the NBRC binds, it yields to:

$$\text{(A-3)} \quad P = c(Q) + \overline{u} + \beta (S(Q) - \overline{s})$$

Substituting equation (A-3) into the objective function of the buyer and solving for the First Order Kuhn-Tucker conditions:

$$R'(Q)\begin{cases} < \frac{c'(Q)}{\delta} & \text{if } Q = \underline{q} \\ = \frac{c'(Q)}{\delta} & \text{if } \underline{q} < Q < \overline{q} \\ > \frac{c'(Q)}{\delta} & \text{if } Q = \overline{q} \end{cases}$$

since $R'(Q) > c'(Q)$ by assumption, the buyer sets $Q = \overline{q}$. Since the contract is completely enforceable, if the seller accepts, then she has to supply $q = \overline{q}$. This results in:

$$P = c(\overline{q}) + \overline{u} + \beta(S(\overline{q}) - \overline{s}) , \tag{A-4}$$

$$\pi = \frac{(1-\beta)(R(\overline{q}) - c(\overline{q}) - \overline{u}) + \beta\overline{\pi}}{1-\delta} , \text{ and} \tag{A-5}$$

$$U = \frac{(1-\beta)(\overline{u}) + \beta(R(\overline{q}) - c(\overline{q}) - \overline{\pi})}{1-\delta} \tag{A-6}$$

where (A-4) is the payment schedule, (A-5) is the profits for the buyer, and (A-6) is the profits for the seller. Now I check the participation constraint of the buyer (PCb): $\pi = R(q) - P \geq \overline{\pi}$. Substituting (A-4) into it, we get $R(\overline{q}) - c(\overline{q}) - \overline{u} - \beta(S(\overline{q}) - \overline{s}) \geq \overline{\pi}$, that results in $(1-\beta)(S(\overline{q}) - \overline{s}) \geq 0$, which is true since $q = \overline{q}$ and by assumption $S(q) - \overline{s} > 0 \; \forall \; q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$ and the result does not rely on the value of β.

Now let's prove that the results hold for any distribution of power. The case of $\beta = 0$ occurs when the BG does not exist or does not have market power. This case is the benchmark in which cooperation is sustainable. For more details on the results refer to Wu and Roe (2007b). Now I examine the extreme case when $\beta = 1$. Then, equation (A-4) becomes $P = c(\overline{q}) + \overline{u} + (S(\overline{q}) - \overline{s})$. Now profits are given by $\pi = \frac{\overline{\pi}}{1-\delta}$ and $U = \frac{(R(\overline{q}) - c(\overline{q}) - \overline{\pi})}{1-\delta}$ respectively. The participation constraint for the buyer is: $R(q) - c(q) - \overline{u} - (S(q) - \overline{s}) \geq \overline{\pi}$, and the LHS reduces to $\overline{\pi}$, so the condition is satisfied: $\overline{\pi} \geq \overline{\pi}$. □

Proof of binding constraints in the incomplete enforcement case. Proposition 1 proved that the sellers' IRC does not bind. Lets prove that the NBRC binds. If NBRC binds, then $p(q) - c(q) = \overline{u} + \beta(S(q) - \overline{s})$. From the sellers' DICC and since $d(q) = p$ and $b(q) = 0$, then we have: $\frac{p - c(q)}{1-\delta} \geq -c(\underline{q}) + \frac{\delta}{1-\delta}\overline{u}$. Substituting the NBRC in the seller's DICC it yields to: $\frac{\overline{u} + \beta(S(q) - \overline{s})}{1-\delta} \geq -c(\underline{q}) + \frac{\delta}{1-\delta}\overline{u}$. Following: $\overline{u} + \beta(S(q) - \overline{s}) \geq -c(\underline{q}) + \delta c(\underline{q}) + \delta\overline{u}$, which is true. Then the NBRC binds. Lets check if buyers' IRC binds. That is

$R(q) - P(q) = \overline{\pi}$. Substituting in the buyers' DICC we get $\frac{\overline{\pi}}{1-\delta} \geq R(q) + \frac{\delta}{1-\delta}\overline{\pi}$. This leads to $\overline{\pi} \geq R(q)$, which is not true for any $q > \underline{q}$. Then the buyers' IRC does not bind.

Now lets check the DICC for both seller and buyer. If the sellers' DICC binds then: $\frac{p+b(q)-c(q)}{1-\delta} = p + d(q) - c(\underline{q}) + \frac{\delta}{1-\delta}\overline{u}$. This results in $b(q) = d(q) + \delta(c(\underline{q}) + \overline{u} - p - d(q))$. Substituting this in the NBRC and since $d(q) = p$ we get: $-\delta(-c(\underline{q}) - \overline{u} - c(q) - \overline{u}) \geq \beta(S(q) - \overline{s})$. This leads to $-\beta(S(q) - \overline{s}) \geq (1-\delta)(c(\underline{q}) + \overline{u})$, which is not true. Then the DICC of the sellers does not bind.

If the buyers' DICC binds, then $\frac{R(q)-p-b(q)}{1-\delta} = R(q) - p - d(q) + \frac{\delta}{1-\delta}\overline{\pi}$. It follows that $b(q) = d(q) + \delta(R(q) - p - d(q) - \overline{\pi})$. Given buyers' IRC $R(q) - P(q) \geq \overline{\pi}$ and substituting the DICC we get $R(q) - \overline{\pi} \geq 0$, which is true for any $q > \underline{q}$. Then the buyers' DICC binds.

□

Proof of Proposition 3. Let $(P(Q), Q)$ the contract that a buyer offers to a seller, where $P(Q) = p + b(Q)$. The buyer has to satisfy the NBRC which at the same time satisfies the IRC of the seller. He wants to maximize profits thus he holds equation (A-1) with equality and solve for p:

(A-7) $p = c(q) + \overline{u} + \beta(S(q) - \overline{s}) - b(q)$

Since he wants to induce a contract quality of Q he also solves for p in the DICC for the seller given by: $\frac{p+b(q)-c(q)}{1-\delta} \geq p + d(q) - c(\underline{q}) + \frac{\delta}{1-\delta}\overline{u}$ we get:

(A-8) $p \geq \overline{u} + c(\underline{q}) - d(q) + \dfrac{d(q) - b(q) - c(\underline{q}) + c(Q)}{\delta}$

Substituting (A-7) on (A-8) and rearranging we get:

(A-9) $b(q) - d(q) \geq c(Q) - c(\underline{q}) - \dfrac{\delta}{1-\delta}\beta(S(Q) - \overline{s})$

Thus, we can define $b(q) \geq c(Q) - c(\underline{q}) + d(q) - \frac{\delta}{1-\delta}(S(Q) - \overline{s})$. Since the buyer is maximizing profits, he will only offer a $b(q)$ large enough to induce quality, so I can use the equation with equality and substitute it in (A-7) and rearranging it leads to:

(A-10) $p = \overline{u} + c(\underline{q}) - d(q) + \dfrac{\beta(S(Q) - \overline{s})}{1-\delta}$

which represents how the fixed payment is related to β.

Now to solve for the entire compensation package, from (A-9) we get:$-d(q) \geq c(Q) - c(\underline{q}) - b(q) - \frac{\delta}{1-\delta}\beta(S(Q) - \bar{s})$, setting it equal because maximizing behavior and substituting this in (A-10) we get:

$$\text{(A-11)} \quad P(q) = p + b(q) = \bar{u} + c(Q) + \beta(S(Q) - \bar{s})$$

Then, the buyer solves the following maximization problem when offering a contract:

$$\begin{aligned} &\max_{P(Q),Q} \left(\frac{R(Q) - P(Q)}{1-\delta}\right) \\ &\text{subject to} \qquad P(Q) \qquad = \bar{u} + c(Q) + \beta(S(Q) - \bar{s}) \\ &\text{and} \quad Q \in [\underline{q}, \bar{q}]. \end{aligned} \tag{A-12}$$

Recalling $S(q) - \bar{s} = R(q) - c(q) - \bar{u} - \bar{\pi}$, substituting $P(Q)$ in buyer's objective function, and solving for the First Order Kuhn-Tucker conditions results in:

$$R'(Q) \begin{cases} < c'(Q) & \text{if } Q = \underline{q} \\ = c'(Q) & \text{if } \underline{q} < Q < \bar{q} \\ > c'(Q) & \text{if } Q = \bar{q} \end{cases}$$

and since $R'(Q) > c'(Q) \ \ \forall\ q \in [\underline{q}, \bar{q}]$ and $q \neq \underline{q}$ by assumption then buyer requests $Q = \bar{q}$. Therefore, $P(\bar{q}) = p + b(\bar{q}) = c(\bar{q}) + \bar{u} + \beta(S(\bar{q}) - \bar{s})$.

Now let's check the participation constraint of the buyer. Substituting $P(q)$ we get: $R(Q) - c(Q) - \bar{u} - \beta(S(Q) - \bar{s}) \geq \bar{\pi}$, that ends being $(1-\beta)(S(Q) - \bar{s}) \geq 0$, which requires that social surplus is non-negative which is true since $q = \bar{q}$ and by assumption $S(Q) - \bar{s} > 0\ \forall\ q \in [\underline{q}, \bar{q}]$ and $q \neq \underline{q}$. □

Proof of Proposition 4. First check the participation constraint for the buyer when $\beta = 1$, e.g. BG has all market power: $R(\bar{q}) - c(\bar{q}) - \bar{u} - (S(\bar{q}) - \bar{s}) \geq \bar{\pi}$, which can be rewritten as $R(\bar{q}) - c(\bar{q}) - \bar{u} - R(\bar{q}) + c(\bar{q}) + \bar{u} + \bar{\pi} \geq \bar{\pi}$, which leads to $\bar{\pi} \geq \bar{\pi}$. For cooperation to be achievable, it must be the case that the DICC of both parties hold. In the case of the seller, she cooperates if and only if equation (6) is satisfied. If seller deviates buyer will choose the most profitable deviation that is given $d(q) = -p$, and substituting it in (6): $\frac{p+b(q)-c(q)}{1-\delta} \geq -c(\underline{q}) + \frac{\delta}{1-\delta}\bar{u}$. We know that $\frac{\bar{u}}{1-\delta} + \beta(S(q) - \bar{s}) \geq -c(\underline{q}) + \frac{\delta}{1-\delta}\bar{u}$ and $p + b(q) - c(q) \geq \frac{\bar{u}}{1-\delta} + \beta(S(q) - \bar{s})\ \forall q \geq \underline{q}$. Therefore, DICC for the seller does not bind. Turning to the buyer's DICC

given by equation (10), given $d(q) = -p$, and substituting it into (10): $\frac{R(q)-p-b(q)}{1-\delta} \geq R(q) + \frac{\delta}{1-\delta}\overline{\pi}$. Given $P = p + b(q) = c(q) + \overline{u} + \beta(S(q) - \overline{s})$, then:

$$\text{(A-13)} \quad \frac{R(q) - c(q) - \overline{u} - \beta(S(\overline{q}) - \overline{s})}{1-\delta} \geq R(q) + \frac{\delta}{1-\delta}\overline{\pi}$$

Solving for δ, we get:

$$\text{(A-14)} \quad \delta \geq \frac{c(q) + \overline{u} + \beta(S(q) - \overline{s})}{R(q) - \overline{\pi}}$$

When $\beta = 1$, then $\delta \geq 1$.

Now, to find the threshold for β, go back to the DICC of the buyer given by $\frac{R(q)-p-b(q)}{1-\delta} \geq R(q) - p - d(q) + \frac{\delta}{1-\delta}\overline{\pi}$, and given $d(q) = -p$, solve for β to get:

$$\text{(A-15)} \quad \hat{\beta} \leq \frac{\delta R(q) - \delta\overline{\pi} - c(q) - \overline{u}}{(S(q) - \overline{s})}$$

where $\hat{\beta}$ represent the higher value of the bargaining power of the BG under which cooperation and relational contracts are sustainable. □

Proof of Proposition 5. Let $(P(Q), Q)$ the contract that a buyer offers to a seller, where $P(Q) = p + b(Q)$. The buyer has to satisfy the NBRC which at the same time satisfy the sellers' IRC. As in the proof of proposition 3, the buyer maximizes profits holding equation (A-1) with equality, and solving for p in the both the NBRC and the DICC given by equation (11):

$$\text{(A-16)} \quad p \geq \overline{u} + c(\underline{q}) + \frac{c(Q) - c(\underline{q}) - b(q)}{\delta}$$

Substituting (A-7) on (A-16) and rearranging we get:

$$\text{(A-17)} \quad b(q) \geq c(Q) - c(\underline{q}) - \frac{\delta}{1-\delta}\beta(S(Q) - \overline{s})$$

Since the buyer is maximizing profits, he will only offer a $b(q)$ large enough to induce quality, so equation (A-17) holds with equality. Substituting back in (A-7) and rearranging it leads to:

$$\text{(A-18)} \quad p = \overline{u} + c(\underline{q}) + \frac{\beta(S(Q) - \overline{s})}{1-\delta}$$

Now to solve for the entire compensation package, adding (A-17) and (A-18) we get:

(A-19) $P(q) = p + b(q) = \overline{u} + c(Q) + \beta(S(Q) - \overline{s})$

Then, the buyer solves the following maximization problem when offering a contract:

$$\max_{P(Q),Q} \left(\frac{R(Q) - P(Q)}{1-\delta}\right)$$

(A-20) $$\text{subject to} \quad P(Q) = \overline{u} + c(Q) + \beta(S(Q) - \overline{s})$$

$$\text{and} \quad Q \in [\underline{q}, \overline{q}].$$

which satisfy the First Order Kuhn-Tucker conditions as in the proof of proposition 4, and again since $R'(Q) > c'(Q) \ \forall\, q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$ by assumption then buyer requests $Q = \overline{q}$. Therefore, $P(\overline{q}) = p + b(\overline{q}) = c(\overline{q}) + \overline{u} + \beta(S(\overline{q}) - \overline{s})$.

Now let's check the participation constraint of the buyer. Substituting $P(q)$ we get: $R(Q) - c(Q) - \overline{u} - \beta(S(Q) - \overline{s}) \geq \overline{\pi}$, that ends being $(1-\beta)(S(Q) - \overline{s}) \geq 0$, which requires that social surplus is non-negative which is true since $q = \overline{q}$ and by assumption $S(Q) - \overline{s} > 0 \ \forall\, q \in [\underline{q}, \overline{q}]$ and $q \neq \underline{q}$.

For cooperation to be achievable, the DICC of both parties must hold. Then, combining equations (11) and (12) we get:

(A-21) $$\hat{\delta} \geq \frac{c(q) - c(\underline{q})}{R(q) - c(\underline{q}) - \overline{u} - \overline{\pi}}$$

Hence, cooperation takes place for all values of delta that satisfy (A-21). □

Notes

[1]If δ is close to zero then parties do not care much about the future, so the range of parameters in which cooperation is achievable is smaller; if δ is high then players value the future a lot so cooperation is a more likely outcome. Note that δ is strictly less than one, suggesting that parties will always value present more than future.

[2]I recognize that in the real world there exist bargaining costs as well as other frictions that may affect the decision to participate in the BG or in the bargaining process; however, in this set up my objective is to find the consequences of balanced market power via a BG and not whether agents decide to participate in the BG or in the process of bargaining. However, I solved the model introducing a fixed cost of bargaining for sellers, and results do not change in any of the enforcement cases presented here (Proof available from the author). Another way to model it is having parties with different discount factors, which may reflect their level of impatience, which implicitly includes costs of delaying trading which can be seen as bargaining costs. In this case, for simplicity I assume that the discount factor is the same for both parties.

[3]I exclude zero from the interval because in this proposition I assume that there exists a BG with some bargaining power greater than zero

[4]Note that I already proved that the seller's individual rationality constraint does not bind, so it does not need to be included in the maximization problem.

[5]Here I assume that $\beta > 0$ because the BG has to have some bargaining power in order for this proposition to be relevant.

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