

THE ROLE OF EXCLUSIVE CONTRACTS IN FACILITATING MARKET TRANSACTIONS*

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Abstract

We examine the relationship between market conditions and the adoption of exclusive contracts. In particular, we develop a matching model in which agents may decide to adopt exclusive contracts to reduce bilateral bargaining inefficiencies in the presence of private information. We show that it is optimal for agents to adopt exclusive contracts in thin markets but not in thick markets and that for intermediate levels of market thickness strategic complementarities lead to multiple equilibria. We study the welfare properties of market equilibria and discuss under what circumstances courts should enforce exclusive contracts.

Keywords: exclusive contracts, private information, search and matching

JEL classifications: D82, D83, L14

*We are very grateful to Yeon-Koo Che and two anonymous referees for very useful comments. We would also like to thank Kathy Spier and seminar participants at the Kellogg School of Management, the London School of Economics, the 2003 Northwestern-Toulouse IO Conference, the 2003 Summer Meetings of the Econometric Society, the University of Geneva and the University of Virginia for helpful discussions.

1 Introduction

Vertical contracts between a buyer and a seller often contain exclusivity provisions that restrict the ability of either of them to transact with third parties. The economics literature has focused on three broad explanations for the use of exclusive contracts: motivating agents to make relationship-specific investments (Segal and Whinston 2000; Che and Sákovics 2004; de Meza and Selvaggi 2004), extracting rents from third parties (Diamond and Maskin 1979; Aghion and Bolton 1987; Spier and Whinston 1995) and restricting entry by potentially more efficient competitors (Rasmusen, Ramseyer, and Wiley 1991).¹ In this paper we analyze a fourth potential reason for the use of exclusive contracts and argue that agents who commit to such contracts *ex ante* are able to reduce the risk of inefficient bargaining breakdowns *ex post*. In other words, we argue that exclusive contracts can mitigate the *ex post* inefficiencies that arise when a buyer and a seller haggle over the sharing of quasi-rents and thus waste time and resources before reaching an agreement.

Such inefficiencies are likely to occur if *ex post* bargaining takes place in the presence of private information (Myerson and Satterthwaite 1983). A buyer and a seller who anticipate that future bargaining between them will be hindered by private information may be able to reduce the expected inefficiency by adopting an appropriate contract before they become privately informed. This can be done, for instance, by committing to a contract that changes the agents' *ex post* disagreement payoffs, *i.e.*

¹For an overview of the related literature see Section 2.

the payoffs that they realize if they fail to reach an agreement with each other ex post (Matouschek 2004). In this paper we investigate how agents who operate in a decentralized matching market can use exclusive contracts to mitigate ex post bargaining inefficiencies by reducing disagreement payoffs. The focus of our analysis is on how the adoption of exclusive contracts by individual agents depends on market conditions and on the contractual choices of the other market participants.

Specifically, we investigate a decentralized matching market in which buyers and sellers are brought together bilaterally. As an illustration, suppose that each buyer is interested in purchasing a house and that each seller is a builder who can build one house. When a particular buyer and a particular builder are brought together, they first negotiate over the contract that will govern their relationship. The difficulty in fully describing all the features of the house in advance, however, makes it impossible for them to contract ex ante over the price of the house that has to be paid ex post. They can, however, contract over the exclusivity of their relationship. In particular, the buyer and the builder can contractually commit to breach damages that one party has to pay to the other if he or she chooses to transact with a third party in the future. These damages can, for instance, take the form of a down payment that the buyer has to make and that is forgone if he hires a different builder before the house is completed. We then say that the agents adopt an ‘exclusive contract’ if the contract specifies damages for both agents that are sufficiently high to discourage them from transacting with third parties.

After the initial contract has been signed and some time has passed, uncertainty about the precise features of the house is realized and the buyer learns his true valuation. At this stage the buyer and the builder have to negotiate over the price. These negotiations, however, are hindered by the fact that the builder is imperfectly informed about the buyer's valuation and, as a result, the two parties sometimes fail to reach an agreement although it would be jointly efficient to trade. The focus of our analysis is on how this bargaining inefficiency depends on the contractually specified breach damages and on market conditions.

The key effect of breach damages is that they discourage the buyer and the builder to search for, and transact with, alternative trading partners. A buyer who has made a significant down payment, for instance, has less of an incentive to identify and hire a different builder if doing so implies the loss of the down payment than if it does not. The downside of breach damages therefore is the increased cost of bargaining breakdowns. The upside, however, is that a buyer and a builder who anticipate higher costs of bargaining breakdowns, adopt less aggressive bargaining strategies, which reduces the probability that such breakdowns occur in the first place. The higher the down payment, for instance, the more likely the buyer is to accept an offer by the builder and thus the higher the likelihood that they reach an agreement.

We show that which one of these effects dominates, and thus what type of contracts the agents adopt, depends on the thickness of the market, i.e. on the probability with which buyers and sellers are matched. Market thickness, in turn, depends crucially on

the endogenous contract choices of all market participants and on exogenous market characteristics, such as the efficiency of the matching technology and the inflow of new market participants.

In particular, we show that if the market is very thin for exogenous reasons, the unique market equilibrium has all buyer-seller pairs adopting exclusive contracts. Essentially, when the market is sufficiently thin, it is very costly for any agent to search for trading partners. This is true independently of the contractual decisions of all other buyer-seller pairs. As a result, it is very important for matched agents to minimize the probability of bargaining breakdowns and they can achieve this by adopting exclusive contracts.

In contrast, if the market is very thick for exogenous reasons, the only equilibrium has no agent committing to exclusive contracts. Essentially, when the market is sufficiently thick, the costs of a bargaining breakdown for any buyer-seller pair is very small, independently of the contractual choices of the other market participants. Thus, there is no need to reduce the probability of bargaining breakdowns by adopting exclusive contracts.

Finally, when the exogenous market characteristics take intermediate values, the contract choice of any buyer-seller pair depends on those of all other market participants. In particular, there exist two equilibria, one in which all agents adopt exclusive contracts and one in which none do. Essentially, when all other market participants adopt exclusive contracts, the market is so thin that any particular buyer-seller pair

finds it optimal to adopt an exclusive contract too. If, in contrast, none of the other market participants adopt exclusive contracts, the market is sufficiently thick that it is optimal for any given buyer-seller pair not to adopt an exclusive contract.

The analysis in this paper provides a possible justification for the refusal of US courts to enforce breach damages that are deemed to be excessive (Chung 1998). In particular, we show that the adoption of exclusive contracts gives rise to search externalities that can introduce a wedge between privately and socially optimal contractual choices. Essentially, a buyer-seller pair that adopts an exclusive contract reduces the trading opportunities of all other agents and, through this channel, can affect their contractual choices. As a consequence of this externality, it can be the case that all agents adopt exclusive contracts although, in a sense to be made precise below, society would be better off if none of them did. Specifically, this is the case if exogenous market characteristics take intermediate values and thus multiple equilibria exist.

The rest of the paper is organized as follows. In the next section we discuss the related literature. In Section 3 we describe the model and discuss some of its main assumptions and solve it in Section 4. In Section 5 we discuss the policy implications of our analysis and conclude in Section 6.

2 Related Literature

The paper most closely related to ours is Matouschek (2004). He develops a property rights theory of the firm in which the presence of private information hinders ex post

bargaining between a buyer and a seller. There are two main differences between his paper and ours. First, while both papers investigate how simple contracts can be used to mitigate ex post bargaining inefficiencies by manipulating disagreement payoffs, they differ in the type of contracts on which they focus. In particular, Matouschek (2004) concentrates on contracts over asset ownership while we concentrate on exclusive contracts. Second, Matouschek (2004) analyzes the bilateral contracting problem in isolation while we embed it in a dynamic matching market. This allows us to link the contractual choices of agents to market fundamentals and to study the contractual complementarities in which we are most interested in this paper.

Another related paper is Matouschek, Ramezzana and Robert-Nicoud (2005). They develop a search model of the labor market to study the consequences of inefficient bargaining for the functioning of labor markets. Their focus is on the welfare effects of different types of labor market liberalizations. They also investigate how such liberalizations affect the optimal level of separation costs to which firms and workers commit so as to reduce the probability of inefficient job separations. In doing so, however, they abstract from the contractual interdependencies between different pairs of agents which are the focus of this paper.²

The aim of this paper is to contribute to the literature on exclusive contracts. As mentioned in the introduction, this literature can be divided into three main strands. One strand of the literature investigates the role of exclusive contracts as barriers to

²Contractual interdependencies are absent in their model since they assume a simple matching function with constant returns to scale.

entry. It has long been controversial whether an incumbent seller can use exclusive contracts with its buyers to prevent entry by a more efficient competitor. The so-called Chicago School has argued that this is not possible since such contracts would be prohibitively expensive for the seller (see, for instance, Posner 1976 and Bork 1978). In contrast, Rasmusen, Ramseyer and Wiley (1991) have shown that it can be profitable for the incumbent seller to offer such contracts, and thereby prevent entry, provided that coordination between buyers is difficult.

A second and related strand of the literature investigates how exclusive contracts between a buyer and a seller can be used to extract rents from a third party. Aghion and Bolton (1987) consider a setting in which an incumbent seller and a buyer first negotiate over an exclusive contract with contractually specified damages after which a potential upstream entrant makes its entry decision. They show that if, upon entry, the entrant has market power, the incumbent seller and the buyer have an incentive to sign an exclusive contract with breach damages. This is the case since such a contract forces the entrant to lower its price if it enters the market. In an earlier contribution Maskin and Diamond (1979) make a similar point in a dynamic search model in which buyers and sellers are matched bilaterally. Spier and Whinston (1995) revisit the analysis in Aghion and Bolton (1987) and show that their result depends crucially on the assumption that exclusive contract cannot be renegotiated. They also show, however, that their result continues to hold if contracts can be renegotiated and agents can make relationship-specific investments.

A third strand of the literature investigates the extent to which exclusive contracts can be used to strengthen the incentives of agents to make relationship-specific investments. Segal and Whinston (2000) show that if the investments of a buyer and a seller are specific and do not change the value of trade with a third party, then an exclusive contract between the buyer and the seller does not affect their investment incentives. Subsequent papers have identified conditions under which this irrelevance result does not hold. Specifically, de Meza and Selvaggi (2004) show that it does not hold in a setting in which ex post bargaining is non-cooperative, rather than cooperative as in Segal and Whinston (2000). Che and Sákovics (2004) show that the irrelevance result does not hold in a dynamic model in which the timing of investments and bargaining is endogenous. In particular, they show that if the individual rationality constraint of the buyer or the seller is binding, giving this party exclusivity rights does affect his or her incentive to make specific investments.³

3 The Model

In this section we describe the set-up of the model and discuss its main assumptions before proceeding to solve it in the next section.

³This strand of the literature is related to earlier work in the law and economics literature which focuses on the effect of standard court-imposed damage measures, such as expectation damages, reliance damages and specific performance, on reliance expenditures (see, for instance, Shavell 1980 and Rogerson 1984).

3.1 The Structure of the Model

We consider a dynamic market in which time is continuous and runs indefinitely. All agents are risk-neutral, liquidity unconstrained, and discount the future at rate r .

There are two types of agents: ‘sellers’ and ‘buyers.’ At every point in time an exogenous mass x of new sellers and new buyers is born. Buyers and sellers are brought together by a random (Poisson) matching process. In particular, the total number of contacts per unit time is given by the matching function $M = aM(N_b, N_s)$, where N_b and N_s denote the number of buyers and sellers searching the market for a counterpart and the parameter a captures the efficiency of the matching process. The fact that equal numbers of buyers and sellers are born per unit time and that, as will become clear below, buyers and sellers leave the market in pairs makes it so that at any point in time $N_b = N_s = N$. Therefore buyers and sellers meet a counterpart with the same (Poisson) arrival rate $m = M/N = aM(N, N)/N$. We postpone a discussion of the properties of the matching function $M(N, N)$ to Section 4.3, in which we will analyze the implications of these properties for market equilibria.

Upon meeting, a buyer and a seller have the opportunity to exchange one unit of a good. In particular, the exchange process takes place in two stages: the ex ante contracting stage and the ex post bargaining stage. At the ex ante contracting stage the agents negotiate over the contracts that will govern their relationship. Specifically, the agents can specify breach damages $d_b \geq 0$ and $d_s \geq 0$ which the buyer and the seller, respectively, have to pay to each other if they ever re-enter the market to search

for alternative trading partners. We follow the incomplete contracting literature in assuming that the good that can be exchanged between the agents is too complex to be described in advance.⁴ As a result, the agents are unable to contract ex ante over the price of the good. Moreover, although the bargaining game that is played ex post is known to both players ex ante, they cannot contractually commit to playing a different bargaining game.⁵ The ex ante contract negotiations take the form of Nash-bargaining, with the buyer and the seller assumed to have equal bargaining power. In the case of disagreement over the contract, the buyer and the seller can choose between leaving the market forever, and thereby receiving a zero payoff, and returning to search the market for alternative trading partners. Since Nash-bargaining is efficient, in equilibrium, the buyer and the seller always agree ex ante on the contract that maximizes their expected joint utility.

After having signed the contract, the parties move to the beginning of the ex post bargaining stage at which point the buyer privately observes his valuation v of the good. This valuation is drawn from a continuous and publicly observable distribution with cumulative density function $G(v)$, density function $g(v)$, and support $[0, \infty)$. We denote the inverse of the hazard rate by $H(v) \equiv [1 - G(v)]/g(v)$ and assume it to be non-increasing, i.e. $H'(v) \leq 0$. It is instead common knowledge that the seller's cost of producing the good is $c \geq 0$. Once the buyer has observed his valuation v , the agents

⁴For a general discussion of this assumption see Hart (1995) and, in the context of exclusive contracts, see Segal and Whinston (2000). For formal justifications of this assumption see Che and Hausch (1999), Hart and Moore (1999) and Segal (1999).

⁵See Section 6 for a discussion of a model in which agents are able to contract over the ex post bargaining game.

bargain over the price of the good. In particular, the seller makes a take-it-or-leave-it price offer p . If this offer is accepted by the buyer, the good is exchanged, the buyer obtains utility $(v - p)$, the seller obtains utility $(p - c)$, and both agents leave the market forever. If, instead, the offer is rejected, the buyer and the seller each decide whether to leave the market and earn a zero payoff or pay the contractually specified breach damages and return to the market to search for alternative trading partners.

We conclude this section by defining the terms ‘exclusive contract’ and ‘non-exclusive’ contract. Specifically, we say that a buyer and a seller adopt an exclusive contract if they commit to breach damages that are sufficiently high to discourage both from returning to the market in search for alternative trading partners. Similarly, they adopt a non-exclusive contract if they commit to breach damages that are so low that, in the case of ex post disagreement, both agents choose to return to the market.

3.2 Discussion of the Main Assumptions

Before moving on to solve the model, it is useful to discuss some of its main assumptions. First, a key assumption is that ex ante contracts are incomplete, in the sense that they do not specify the ex post price or the bargaining game that determines this price.⁶ As mentioned above, this assumption is common in the incomplete contracting literature and can be justified by the complexity of the good that is to be traded.

⁶Note, however, that while the buyer and the seller cannot contract over the bargaining game both of them anticipate what bargaining game will be played ex post.

In particular, if the good is too complex to be described in advance, contracts that specify the terms of trade cannot be enforced. It is important to note, however, that the inability to specify in advance the precise characteristics of the good does not prevent a buyer and a seller from committing to breach damages that either of them pay if they trade with third parties in the future. This is so since breach damages can be made conditional on either agent engaging in any trade with a third party and do not require the specific characteristics of trades to be specified in advance. Recall, for instance, the builder-home buyer example from the introduction. The building contracts to which builders and home buyers commit to naturally leave open a number of specifications, such as, for instance, the number of coats for the interior painting.⁷ This incompleteness is due to the complex nature of houses that makes an advance description of all specifications difficult. In spite of the difficulty in fully describing the house in advance, however, the building contract can include breach damages. For instance, as discussed in the introduction, the home buyer can be required to make a down payment to the builder that is foregone should he engage in any contractual relationship with a different builder before the house is completed. As a second example, consider a CEO who is negotiating an employment contract with a particular firm. The complex nature of the job of a CEO makes it very difficult to write a complete employment contract that specifies all the actions that have to be taken in all possible states of the world. Instead, the parties may agree to an incomplete employ-

⁷For a description of standard building contracts see, for instance, the “House-n-Home House Building Guide” at www.house-n-home-building.com.

ment contract and negotiate over specific issues when they arise at a later date. In spite of its incompleteness, however, such an employment contract can contain breach damages that the firm has to pay to the CEO if it decides to prematurely terminate the employment relationship and hire a different CEO. Such damages are a common feature of CEO employment contracts and, in that context, are referred to as ‘golden parachute payments.’

Second, we assume that the agents contract over breach damages before the buyer’s valuation is realized. This assumption not only simplifies the analysis but also fits the type of long term contracting situations described above. For instance, it seems reasonable to assume that a home buyer still faces significant uncertainty over his valuation of a house when he first contracts with his builder. Similarly, at the initial hiring stage a firm is likely to face significant uncertainty over its valuation of a particular CEO.

Third, we assume that breach damages can be made conditional on re-entering the search market. This implies that it is verifiable whether, after failing to trade with each other, agents remain out of the search market or re-enter it to look for alternative trading partners. In the builder example, for instance, this would imply that it is possible to verify whether, upon failing to reach an agreement with his builder, a buyer gives up on getting his house built or whether he searches for alternative builders. A related assumption we make is that agents do not make their breach damages contingent on starting a trading relationship with a third party but merely

on re-entering the search market. We make this assumption to abstract from the well-known rent extraction motive for signing exclusive contracts that has been analyzed in Diamond and Maskin (1979), Aghion and Bolton (1987) and Spier and Whinston (1995). In particular, if the buyer and the seller could contract over breach damages that only have to be paid upon starting a relationship with a third party, they may want to do so even if it does not facilitate their ex post negotiations, simply because the third party would end up having to pay at least some of the damages.

Fourth, we assume that the buyer's valuation v is match-specific, i.e. it applies only to the good carried by the particular seller with which the buyer is matched. This assumption is reasonable when one is interested in markets in which goods are very heterogeneous and so are the needs of buyers. It also has the merit of greatly simplifying the analysis and therefore allowing us to take a first step towards understanding the role played by exclusive contracts in markets with private information.⁸

Finally, we rule out ex post renegotiation of contracts. This assumption facilitates the exposition and could be justified on the following grounds. First, in many cases renegotiation of an exclusive contract is likely to be costly, for instance because of the presence of private information. We conjecture that the results we derive below hold as long as renegotiation of an exclusive contract involves some costs, even if these costs are not, as we assume here, prohibitive. Second, there may be technological reasons

⁸For an analysis of the equilibrium and welfare properties of a search model with ex ante vertical heterogeneity – i.e. in which agents' types are correlated across matches – in an environment with perfect information and efficient bilateral bargaining see Shimer and Smith (2000).

that prevent renegotiation, as is the case if an exclusive relationship also involves some specific and at least partially irreversible investment, such as, for example, locating the seller's plant close to the buyer's.

4 Solving the Model

In this section we characterize the equilibria of the economy described above. Our analysis will proceed backwards: in Sections 4.1 and 4.2 we characterize the outcomes of the bargaining game and the optimal breach damages for a given matching rate m . In Section 4.3 we then analyze the market equilibrium of the model and study how the choices of d_b and d_s depend on, and in turn affect, the equilibrium matching rate m .

4.1 The Bargaining Game

We denote by D_b and D_s the utility obtained by a buyer and a seller, respectively, if trade with the current counterpart fails. Since the seller does not observe the buyer's valuation for the good, she charges a unique price p knowing that this price is accepted by the buyer if and only if $v - p \geq D_b$. Given the price p offered by the seller, exchange takes place if and only if

$$v \geq \tilde{v} \equiv p + D_b. \tag{1}$$

Since there is a one-to-one relationship between the price p offered by the seller and the marginal buyer type \tilde{v} who accepts it, in order to solve the seller's expected profit maximization problem we can think of the seller choosing the marginal buyer

\tilde{v} , which is equivalent to her choosing the price p . The seller aims at maximizing his expected profit and therefore solves

$$\max_{\tilde{v}} (\tilde{v} - D_b - c) [1 - G(\tilde{v})] + G(\tilde{v})D_s.$$

The first order condition for an interior solution is

$$\tilde{v} - H(\tilde{v}) - c = D, \tag{2}$$

where $D \equiv D_b + D_s$ denotes the sum of the agents' disagreement payoffs and $H(v)$ is the inverse of the hazard rate.

Equation (2) has important implications for the rest of our analysis that are worth pointing out here. First, given the existence of private information, bargaining is ex post inefficient, in the sense that some trades that would be ex post efficient – i.e. trades between agents for which $v - c \geq D$ – might not be effected in equilibrium, since $\tilde{v} - c > D$.⁹ Second, the probability that any pair of agents trade, $[1 - G(\tilde{v})]$, depends only on the sum of their disagreement payoffs, D , and not on the distribution of these payoffs between the buyer and the seller. Finally, the probability that any pair of agents trade is decreasing in D , as can be seen from totally differentiating (2):

$$\frac{d\tilde{v}}{dD} = \frac{1}{1 - H'(\tilde{v})} > 0. \tag{3}$$

This last property of the bargaining between sellers and buyers will play a crucial role in the rest of our analysis and owes to the fact that, when disagreement is

⁹Note that this is simply the standard quantity distortion introduced by a monopolist that cannot price discriminate.

less costly, agents adopt more aggressive bargaining strategies which imply a higher probability of trade breakdowns.

Since in the following sections we will allow agents to sign contracts that influence the value of their disagreement payoffs in a market equilibrium, it is important to characterize how the expected utility of these agents varies with the value D of these disagreement payoffs. Specifically, since ex ante the agents agree on the contract that maximizes the aggregate utility of a buyer-seller match, we are particularly interested in determining the effects of changes in D on this aggregate utility. Denoting by J_b the expected utility of a buyer who has met a seller but does not yet know his own valuation v for the good and by J_s the expected utility of a seller who has met a buyer but does not yet know whether her offer will be accepted, the joint expected utility of a representative buyer-seller match $J \equiv J_b + J_s$ is:

$$J(D) = G(\tilde{v})D + \int_{\tilde{v}}^{\infty} (v - c)dG(v), \quad (4)$$

where \tilde{v} is implicitly defined in (2) and the notation $J(D)$ reminds the reader that J is a mapping from D to \mathbb{R} . Equation (4) shows that the aggregate expected utility J of a buyer-seller match can be decomposed into two terms. The first term is the aggregate utility that the agents obtain when they fail to trade, which happens with probability $G(\tilde{v})$ and leaves the agents with an aggregate payoff equal to D . The second term is the aggregate expected utility that the agents obtain when they do trade, which happens when $v \geq \tilde{v}$ and leaves the agents with an aggregate payoff equal to $(v - c)$. Note that for given \tilde{v} , and thus for given probability of trade, an increase in D has a

positive direct effect on the joint expected utility J , since it makes the agents better off when they happen not to trade. However, as can be seen from (3), an increase in D also has the effect of increasing \tilde{v} , which has a negative effect on the joint expected utility J . It is the trade-off between these two effects of a change in D on the expected utility of a buyer-seller match that is the key trade-off considered by agents when deciding the optimal degree of contractual commitment. Differentiation of (4) helps quantify these two opposite effects:

$$\begin{aligned} \frac{dJ}{dD} &= \frac{\partial J}{\partial D} + \frac{\partial J}{\partial \tilde{v}} \frac{\partial \tilde{v}}{\partial D} \\ &= G(\tilde{v}) - \frac{1 - G(\tilde{v})}{1 - H'(\tilde{v})}. \end{aligned} \quad (5)$$

The first term in (5) represents the direct marginal benefit of an increase in D : whenever the buyer and the seller disagree, which happens with probability $G(\tilde{v})$, they obtain a higher payoff the higher is D . The second term in (5) represents the marginal cost of an increase in D : the more aggressive bargaining decreases the probability of trade, i.e. $\partial \tilde{v} / \partial D > 0$, which has a negative effect on the agents' expected utility. This is the case since in equilibrium $\partial J / \partial \tilde{v} < 0$, i.e. the agents trade 'too little.'

The total effect of changes in D on J clearly depends on the sign of (5). In order to grasp the intuition behind the signing of (5), it is useful to sign it for very large and very small values of D , before signing it for all possible values of D .

When $D \rightarrow \infty$, equation (2) implies that $\tilde{v} \rightarrow \infty$ and thus that $G(\tilde{v}) \rightarrow 1$, which in turn implies that $dJ/dD > 0$. Essentially, when the aggregate disagreement payoff

is very large, the buyer and the seller are very likely to disagree on the price of the product. As a result, the marginal benefit of a higher disagreement payoff – i.e. receiving a higher payoff whenever disagreement does occur – dominates the marginal cost - i.e. further increasing the already very high probability of disagreement.

When instead $D = 0$, the threshold level \tilde{v} above which the seller's offer is accepted reaches its lower bound \tilde{v}_0 , which from (2) is defined by $\tilde{v}_0 - c = H(\tilde{v}_0)$. Thus, the probability of disagreement is relatively small and, as a result, the marginal benefit of receiving a higher disagreement payoff whenever disagreement does occur is also relatively small. Indeed, it can be sufficiently small to be dominated by the marginal cost of an increase in the probability of disagreement. In other words, it can be the case that (5) is negative at $D = 0$. For the remainder of the analysis we assume that this is indeed the case, i.e. we assume that (5) is negative for $\tilde{v} = \tilde{v}_0$.

To sign (5) for intermediate levels of D it is useful to consider the second derivative of J with respect to D :

$$\frac{d^2 J}{dD^2} = g(\tilde{v}) \left\{ \frac{2 - H'(\tilde{v})}{1 - H'(\tilde{v})} - \frac{H(\tilde{v})H''(\tilde{v})}{[1 - H'(\tilde{v})]^2} \right\} \frac{d\tilde{v}}{dD}. \quad (6)$$

Note that this derivative is positive provided that $H''(\tilde{v})$ is not ‘too positive.’ Specifically, $d^2 J/dD^2 > 0$ if and only if $H''(\tilde{v}) < (1 - H'(\tilde{v}))(2 - H'(\tilde{v}))/H(\tilde{v})$. This condition is satisfied by a number of common distributions, including the exponential, Pareto, and uniform distribution and for the remainder of the analysis we restrict attention to distributions for which it is satisfied. We therefore have that the expected joint utility of a buyer-seller match is convex in the sum of their disagreement payoffs.

4.2 The Contracting Problem

We now turn to the contracts to which the buyers and sellers commit at the ex ante contracting stage. In particular, in this section we characterize the contracts that agents sign upon being matched as a function of the matching rate m . In the next section we then address the endogenous determination of m and close the model.

When a buyer and a seller are first matched, they Nash-bargain over the breach damages. Since Nash bargaining is efficient, the buyer and the seller agree on the damages that maximize their expected joint utility J as given in (4). The level of the damages on which the agents agree determine the disagreement payoffs that they realize if they fail to trade ex post. Since J only depends on the aggregate disagreement payoff D , and not on the individual disagreement payoffs D_b and D_s separately, and since it is convex in D , it immediately follows that it is always in the agents' interest to commit to breach damages that either minimize or maximize D .

Given this insight, we next investigate the levels of breach damages that, respectively, minimize and maximize D . For this purpose, let U_b and U_s be the utilities that a buyer and a seller can, respectively, realize if they return to the market to search for alternative trading partners (gross of any breach damages). Suppose next that a buyer-seller pair has specified damages d_b and d_s that the buyer and the seller have to pay to each other if they leave their relationship and return to the market to search for alternative trading partners. Upon failing to reach an agreement ex post, each agent $i = b, s$ returns to the market if the payoff from doing so $U_i - d_i$ is larger than the

zero payoff that can be obtained by leaving the market. Thus, in the case of ex post disagreement, agent $i = b, s$ makes damage payments d_i and returns to the market if $d_i \in [0, U_i)$ and he or she avoids having to make damage payments by not returning to the market if $d_i \in [U_i, \infty)$.¹⁰ It then follows that the aggregate disagreement payoff D reaches its maximum level $D = U_b + U_s \equiv U$ if $d_i \in [0, U_i)$ for $i = b, s$ and that it reaches its minimum level $D = 0$ if $d_i \in [U_i, \infty)$ for $i = b, s$.

The intuition behind this result is that breach damages only have efficiency implications, in the sense of changing J , if they affect the agents' search behavior. This is the case since expected joint utility J only depends on the aggregate disagreement payoff D and not on how this payoff is distributed between the buyer and the seller. For damages $d_i \in [0, U_i)$, for $i = b, s$, for instance, the agents always return to the market if they fail to reach an agreement. As a result, the aggregate disagreement payoff is always given by $D = U$ and the expected joint utility is given by $J(U)$. Similarly, for damages $d_i \in [U_i, \infty)$, for $i = b, s$, the agents never return to the market so that $D = 0$ and $J(0)$. Thus, the only relevant decision the agents have to make at the ex ante contracting stage is whether to sign an exclusive contract, i.e. to commit to any breach damages $d_i \in [U_i, \infty)$ for $i = b, s$, or to sign a non-exclusive contract, i.e. to commit to any breach damages $d_i \in [0, U_i)$ for $i = b, s$.

¹⁰If $d_i = U_i$, agent i is indifferent between returning to the search pool and not doing so. We assume that in this case the agent decides not to return to the search pool. This is only for expositional convenience and does not affect our analysis.

Place Figure 1 approximately here

To characterize the conditions under which it is optimal to adopt an exclusive contract, consider Figure 1. This figure plots J as a function of the joint value of search U if the agents adopt a non-exclusive contract. The agents always have the option to commit to an aggregate disagreement payoff $D = 0$ by signing an exclusive contract. In this case their expected joint utility, $J(0)$, corresponds to the intercept of the curve in the graph, whatever the value of search U . When the value of search U is below \tilde{U} , the expected utility under an exclusive contract, $J(0)$, is higher than the utility that the agents would obtain by adopting a non-exclusive contract, which is represented by the dashed portion of curve J . Thus, in this case, the agents agree to an exclusive contract. However, when U is above \tilde{U} , the agents can obtain a higher level of joint expected utility by ensuring that their aggregate disagreement payoff D takes its maximum value $D = U$ which is achieved by adopting a non-exclusive contract. The solid line in Figure 1 represents therefore the maximum expected joint utility that the agents can achieve by optimally choosing the degree of exclusivity. Note that Figure 1 depicts the case in which J is decreasing in U at low levels of U . If, instead, J were everywhere increasing in U , then $\tilde{U} = 0$ and the agents would never choose an exclusive contract. These observations allow us to establish the following lemma.

Lemma 1 *There exists a unique $\tilde{U} \geq 0$ such that:*

1. if $U < \tilde{U}$, the agents adopt an exclusive contract, i.e. they commit to breach damages $d_i \in [U_i, \infty)$ for $i = b, s$,
2. if $U > \tilde{U}$, they adopt a non-exclusive contract, i.e. they commit to breach damages $d_i \in [0, U_i)$ for $i = b, s$, and
3. if $U = \tilde{U}$, they are indifferent between adopting an exclusive and a non-exclusive contract.

Having established how the choice of contracts depends on the value of search U we now need to determine how the latter, which is an endogenous variable in the model, depends on the matching rate m . For the time being we take m as given and postpone its endogenous determination to the next section.

At the ex ante contracting stage, the disagreement payoffs for a buyer and seller are given respectively by U_b and U_s and their expected joint utility from agreeing to a contract is given by J , evaluated at the optimal contract. Specifically, it follows from (4) and Lemma 1 that the equilibrium value of the expected utility from agreeing to the optimal contract is given by

$$J = \begin{cases} \int_{\tilde{v}_0}^{\infty} (v - c) dG(v) & \text{if } U \leq \tilde{U} \\ \int_{\tilde{v}_U}^{\infty} (v - c) dG(v) + G(\tilde{v}_U)U & \text{if } U \geq \tilde{U}, \end{cases} \quad (7)$$

where \tilde{v}_0 and \tilde{v}_U solve (2) for $D = 0$ and $D = U$ respectively. Since buyers and sellers have equal bargaining power it follows that their ex ante payoffs are

$$U_i + \frac{(J - U)}{2}, \quad i = b, s, \quad (8)$$

where J is given by (7). Taking into account that agents need to search in order to find a counterpart, we obtain the following expression for the expected utility of an unmatched agent of type $i = b, s$ in steady-state

$$U_i = \frac{m}{r} \frac{(J - U)}{2}, \quad (9)$$

where r is the discount rate. This equation tells us that the expected utility of an unmatched agent of type i is equal to the net present value of the gains in utility that the agent expects to obtain from being matched in the future. In particular, the derivation of the right hand side of (9) can be explained intuitively as follows. An agent is matched at every point in time with probability proportional to m . When the agent is matched, the change in his utility is equal to the difference between the expected utility from bargaining, given in (8), and his current level of utility U_i ; i.e. the change in his utility from being matched with a counterpart is $[U_i + (J - U)/2 - U_i] = (J - U)/2$. Therefore the expected gain from search is equal to $m(J - U)/2$ at every point in time. When appropriately discounted at a rate r , this yields an expected utility from search equal to that specified in (9).

Adding (9) over $i = b, s$ and remembering that we use $U = U_b + U_s$ and $J = J_b + J_s$ to denote the sum of the agents' utilities, we obtain

$$U = \frac{m}{r} (J - U). \quad (10)$$

Place Figure 2 approximately here

We can now use equations (7) and (10) to characterize J and U for any given m . For this purpose consider Figure 2 which represents (7) and (10) in (J, U) space. Note from (2) and (7) that the equilibrium value of J is continuous in U , strictly positive at $U = 0$ and has slope $dJ/dU = 0$ if $U < \tilde{U}$ and slope $dJ/dU = G(\tilde{v}_U) - (1 - G(\tilde{v}_U))/(1 - H'(\tilde{v}_U)) < 1$ if $U > \tilde{U}$. In contrast, the line $((r + m)/m)U$ that represents (10) is equal to zero at $U = 0$ and has slope that strictly greater than one. This establishes that for any given m , there exists a unique equilibrium value of U . Furthermore, since the slope of the linear curve is decreasing in m while the other curve does not depend on m directly, the equilibrium value of U is monotonically increasing in m . Together with Lemma 1 these insights establish the following lemma.

Lemma 2 *There exists a unique $\mu \geq 0$ such that:*

1. *if $m < \mu$, the agents adopt an exclusive contract, i.e. they commit to breach damages $d_i \in [U_i, \infty)$ for $i = b, s$,*
2. *if $m > \mu$, they adopt a non-exclusive contract, i.e. they commit to breach damages $d_i \in [0, U_i)$ for $i = b, s$, and*
3. *if $m = \mu$, they are indifferent between adopting an exclusive contract and a non-exclusive contract.*

Note that μ corresponds to that particular value of m for which the line $((r + m)/m)U$ goes through the kink of J in Figure 2.

4.3 Market Equilibrium

Although agents take the matching rate m as given, in market equilibrium this depends on the properties of the matching function and, if it displays increasing returns to matching, on the actions of other agents in the market. We now close the model by endogenizing the matching rate m .

To do so, we assume that the matching function $M = aM(N, N)$ introduced in Section 3 is homogeneous of degree $1 + \sigma$, $\sigma \geq 0$, and normalize $M(1, 1) = 1$. This implies that the matching rate for any buyer and seller can be written as

$$m = \frac{M}{N} = aN^\sigma. \quad (11)$$

If there are constant returns to matching, i.e. if $\sigma = 0$, this rate is simply equal to a and independent of the number of agents searching. If instead $\sigma > 0$, there are increasing returns in matching and the probability that any given agent finds a trading partner is increasing in the number N of agents searching on each side of the market, which in turn depends, among other things, on the type of contracts that are adopted. Denoting by γ the share of agents who adopt non-exclusive contracts and by $(1 - \gamma)$ the share of agents who adopt exclusive contracts, the dynamics of the number of agents searching on each side of the market is given by

$$\dot{N} = x - m(1 - \gamma)N - m\gamma[1 - G(\tilde{v}_U)]N. \quad (12)$$

The first term on the right hand side is simply the inflow of newly born agents. The second term is the number of agents who are matched and are bound by exclusive

contracts: these agents leave the market independently of whether they trade or not. Finally, the third term refers to the number $m\gamma N$ of agents who are matched and are not bound by exclusive contracts: these agents leave the market only if bargaining is successful and they trade the good, which happens with probability $[1 - G(\tilde{v}_U)]$. In steady state $\dot{N} = 0$ and we have

$$N = \frac{x}{m[1 - G(\tilde{v}_U)\gamma]}. \quad (13)$$

Using (13) to substitute for N in (11), we have that the steady state level of the matching rate is

$$m = \phi \left(\frac{1}{1 - G(\tilde{v}_U)\gamma} \right)^{\frac{\sigma}{1+\sigma}}, \quad (14)$$

where $\phi \equiv (ax^\sigma)^{1/(1+\sigma)}$ is a parameter that gathers all the exogenous characteristic of the market that have a positive effect on the matching rate, such as the efficiency of the matching technology a and the exogenously given number of agents entering the market per unit time x .

For $\gamma = 0$ a steady state matching rate that solves (14) exists and, in particular, is given by $m = \phi$. For $\gamma = 1$, however, the existence of a steady state matching rate is not immediate. This is the case since, when $\gamma = 1$, the right hand side of (14) depends on m through the equilibrium value of search U . Specifically, using (2), (7) and (10) and letting $z(U) \equiv (1 - G(\tilde{v}_U))^{\frac{\sigma}{1+\sigma}}$, the derivative of the right hand side of

(14) with respect to m is given by

$$\frac{d(\phi/z(U))}{dm} = \frac{(\sigma/(1+\sigma))\phi(J-U)}{z(U)H(\tilde{v}_U)[1-H'(\tilde{v}_U)][r+m(1-G(\tilde{v}_U))(1+1/(1-H'(\tilde{v}_U)))]}, \quad (15)$$

which is weakly positive and increasing in σ . Since the left hand side of (14) is increasing in m at a rate equal to one and the right hand side is always positive, a sufficient condition for the existence of a unique steady state matching rate m for $\gamma = 1$ is that $\phi/z(U)$ increases at a rate less than one. The existence of a steady state equilibrium for $\gamma = 1$ is therefore ensured if the degree of increasing returns of the matching function σ is not ‘too large,’ in the sense that (15) takes a value less than one. For the remainder of the analysis we assume that this is indeed the case.

We can now establish the following proposition which establishes the equilibria in our market economy.

Proposition 1 *There exist two critical values $\underline{\phi}, \bar{\phi} \geq 0$ such that:*

1. *an equilibrium in which all agents adopt exclusive contracts exists if and only if $\phi \in [0, \bar{\phi}]$,*
2. *an equilibrium in which all agents adopt non-exclusive contracts exists if and only if $\phi \in [\underline{\phi}, \infty)$,*
3. *an equilibrium in which a share $\gamma \in (0, 1)$ of the agents adopt non-exclusive contracts and a share $(1 - \gamma)$ adopt exclusive contracts exists if and only if $\phi \in (\underline{\phi}, \bar{\phi})$; this equilibrium is unstable, and*

4. $\bar{\phi} = \underline{\phi}$ if $\sigma = 0$ and $\bar{\phi} > \underline{\phi}$ if $\sigma > 0$.

There do not exist any other equilibria besides those described in 1, 2 and 3.

Proof: We know from Lemma 2 that all agents adopt exclusive contracts if the steady state matching rate satisfies $m < \mu$, all adopt non-exclusive contracts if $m > \mu$ and agents are indifferent between exclusive and non-exclusive contracts if $m = \mu$. There can therefore only exist three types of equilibria: equilibria in which all agents adopt exclusive contracts, equilibria in which all agents adopt non-exclusive contracts and equilibria in which a share $\gamma \in (0, 1)$ of the agents adopt non-exclusive contracts and a share $(1 - \gamma)$ adopt exclusive contracts. We now study the conditions under which each of these types of equilibria exist.

Suppose first that all agents adopt exclusive contracts. In this case $\gamma = 0$ in (14) and the steady state matching rate is $m = \phi$. From Lemma 2 it is then optimal for each buyer-seller pair to adopt exclusive contracts if and only if $m = \phi \leq \mu$. Setting $\bar{\phi} \equiv \mu$ then proves 1.

Suppose next that all agents adopt non-exclusive contracts. In this case $\gamma = 1$ in (14) and the steady state matching rate satisfies $m = \phi/z(U)$, where $z(U) \equiv [1 - G(\tilde{v}_U)]^{\sigma/(1+\sigma)} \in (0, 1]$. From Lemma 2 it is then optimal for each buyer-seller pair not to adopt an exclusive contract if and only if $m \geq \mu$. Let $\underline{\phi}$ be the value of ϕ for which the steady state matching rate m is equal to μ , i.e. for which $m = \underline{\phi}/z(U) = \mu$. To see that $\underline{\phi}$ exists note that $m = 0$ if $\phi = 0$ and that m is monotonically increasing in ϕ . The latter fact can be shown by using (2), (7) and (10) to implicitly differentiate

the steady state matching rate m :

$$\frac{dm}{d\phi} = \left[\left(1 - \frac{d(\phi/z(U))}{dm} \right) z \right]^{-1} > 0,$$

where $d(\phi/z(U))/dm$ is given by (15) and the inequality follows from the assumption that $d(\phi/z(U))/dm < 1$. Since $m = \phi/z(U)$ is increasing in ϕ , it then follows from Lemma 2 that it is optimal for each buyer-seller pair to adopt a non-exclusive contract if and only if $\phi \geq \underline{\phi}$. This proves 2.

Suppose next that a share $\gamma \in (0, 1)$ of the agents adopt non-exclusive contracts and a share $(1 - \gamma)$ adopt exclusive contracts. For γ to be a number strictly between zero and one, agents must be indifferent between adopting exclusive and non-exclusive contracts. From Lemma 2 this is the case if and only if $m = \mu$. We need to show that there exists a $\gamma \in (0, 1)$ such that the steady state matching rate as defined in (14) takes the value μ if and only if $\phi \in (\underline{\phi}, \bar{\phi})$. Setting $m = \mu$, substituting $\bar{\phi}$ for μ and solving (14) for γ we obtain $\gamma = \left(1 - (\phi/\bar{\phi})^{\frac{1+\sigma}{\sigma}} \right) / G(\tilde{v}_U)$. Thus, $\gamma > 0$ if and only if $(\phi/\bar{\phi})^{\frac{1+\sigma}{\sigma}} < 1$, i.e. $\phi < \bar{\phi}$. Also, $\gamma < 1$ if and only if $\left(1 - (\phi/\bar{\phi})^{\frac{1+\sigma}{\sigma}} \right) / G(\tilde{v}_U) < 1$, i.e. $\phi > z(\tilde{U})\bar{\phi} \equiv \underline{\phi}$. This proves that an equilibrium as described in 3 exists if and only if $\phi \in (\underline{\phi}, \bar{\phi})$. Finally, if such an equilibrium does exist, it is unstable. In particular, suppose that $\phi \in (\underline{\phi}, \bar{\phi})$ and let $\gamma \in (0, 1)$ solve (14) for $m = \mu$. Now consider a perturbation in which an infinitesimally small share of agents ϵ switches from non-exclusive to exclusive contracts. Then, from (14) the matching rate decreases to $m < \mu$ so that, from Lemma 2, the remaining $\gamma - \epsilon$ agents would also find it optimal to switch to exclusive contracts. This proves 3.

Finally, note that $z(U) = 1$ if $\sigma = 0$ and $z(U) < 1$ if $\sigma > 0$. Thus, $\underline{\phi} = \mu z(U) = \bar{\phi}$ if $\sigma = 0$ and $\underline{\phi} = \mu z(U) < \bar{\phi}$ if $\sigma > 0$. This proves 4. ■

The intuition underlying the results and the proof of Proposition 1 has to do with the presence of strategic complementarities in the choice of contracts. Consider first the case in which $\underline{\phi} \leq \phi \leq \bar{\phi}$. This case describes well markets with intermediate levels of efficiency of the matching technology, a , or intermediate market size, x . At any given ϕ in this region both an equilibrium with exclusive contracts and an equilibrium with non-exclusive contracts exist. If all agents choose to adopt non-exclusive contracts, a large number of agents searches the market and the matching rate m is high, in particular $m > \mu$. Therefore any given pair of agents holding these expectations about the behavior of the rest of the agents in the economy also chooses to adopt a non-exclusive contract, which is therefore an equilibrium outcome. This equilibrium is represented by point A in Figure 3 in which m' denotes the steady state matching rate when no agent adopts an exclusive contract.

Place Figure 3 approximately here

If, instead, all agents adopt exclusive contracts, only a few agents are searching the market and the steady state matching rate is small, in particular $m = \phi \leq \mu$. As a result, it is optimal for any one buyer-seller pair also to adopt an exclusive contract. This equilibrium is represented by point B in Figure 3. The presence of strategic complementarities therefore implies that, for intermediate levels of ϕ , ex-ante

identical economies can have very different equilibrium contractual arrangements.

Also note that if $\phi < \underline{\phi}$ the adoption of exclusive contracts by all agents, i.e. $\gamma = 0$, is the unique equilibrium, as $m < \mu$ for any $\gamma > 0$. In this case, notwithstanding the presence of complementarities, the level of market frictions is simply too high or the market simply too small for an equilibrium with no exclusive contracts to be sustainable. If instead $\phi > \bar{\phi}$ the unique equilibrium has no exclusive contracts, owing to the opposite logic of the case discussed above.

5 Policy Implications

Whether or not exclusive contracts should be enforced is an important policy question. In our model two opposing effects are at work that make the answer to this question not obvious. On the one hand, as we have shown above, any matched buyer-seller pair can benefit from its ability to commit to an exclusive contract since doing so increases the probability of trade and, through this channel, can increase the expected gains from trade. On the other hand, however, provided that the matching technology is characterized by increasing returns any buyer-seller pair that commits to an exclusive contract imposes a negative search externality on all other searching buyers and sellers. This is the case since the probability with which buyers and sellers are matched depends positively on the number of agents who are searching in the market. When a buyer and a seller agree to an exclusive contract, they reduce this number and, through this channel, reduce the expected utility of other agents.

To understand the implications of these two opposing effects, suppose first that there are constant returns to matching, i.e. $\sigma = 0$. In this case it follows from (14) that the probability with which agents are matched is given by $m = \phi$ and is thus independent of the agents' contractual decisions. As a result, search externalities do not arise and the adoption of exclusive contracts is both privately and socially optimal. In such a case, courts should always enforce exclusive contracts when the parties adopt them.

Suppose next that there are increasing returns and that $\underline{\phi} \leq \phi \leq \bar{\phi}$, in which case there exist multiple equilibria. In Figure 3 it can be seen that in the equilibrium in which no agent adopts an exclusive contract, represented by point A , the joint expected utility of matched and unmatched buyers and sellers is higher than in the equilibrium in which all agents adopt exclusive contracts, represented by point B . The joint expected utility of unmatched buyers and sellers, U , is higher in the former equilibrium than in the latter both because the matching rate is higher and because the joint expected utility upon being matched, J , is higher. The joint expected utility of being matched J , in turn, is higher in the former equilibrium than in the latter precisely because the disagreement payoffs U are higher. Notwithstanding the fact that the equilibrium without exclusive contracts (point A) Pareto dominates the equilibrium with exclusive contracts (point B), the economy can find itself in a socially suboptimal equilibrium in which all agents adopt exclusive contracts. This outcome, which may be caused by historical accident or forward looking expectations, is not

uncommon in the presence of strategic complementarities. In this particular case, in the equilibrium in which all agents agree to exclusive contracts it is privately efficient for every pair of agents to sign such a contract, given that the market is thin. However, every agent would gain if the economy were in an equilibrium with a thicker market in which nobody writes exclusive contracts. One way to make the economy switch from the thin market to the thick market equilibrium is for courts to commit not to enforce exclusivity clauses.

Next, suppose that $\phi < \underline{\phi}$, in which case the unique equilibrium has all agents adopting exclusive contracts.

Place Figure 4a approximately here

In Figure 4a point B represents the unique equilibrium if $\phi < \underline{\phi}$ and exclusive contracts are enforced. If exclusive contracts are not enforced the equilibrium is characterized by (2), (7) and (10) for $\gamma = 1$. It is intuitive that the steady state matching rate in this case, denoted by m'' , is higher than if exclusive contracts were enforced and it is smaller than μ , i.e. $\phi < m'' < \mu$.¹¹ A possible equilibrium when exclusive contracts are not enforced is represented by point A in Figure 4a, where m'' represents the steady-state matching rate in the case of non-enforcement. The figure shows that the joint expected utility of a matched buyer-seller pair is necessarily lower if contracts are not enforced than if they are. Essentially, matched agents choose

¹¹To see this, note that the matching rate in the case in which courts do not enforce exclusive contracts is the same as in the case in which courts enforce these contracts but agents do not adopt them. Since, as shown in Proposition 1, in the case with $\phi < \underline{\phi}$ the equilibrium without exclusivity cannot exist, it must be that $m'' < \mu$.

exclusive contracts since doing so is privately optimal for them and they are worse off if these contracts are not enforced. This is so even if non-enforcement makes it less costly for them to disagree, i.e. if it increases U . For unmatched buyers and sellers, however, non-enforcement of exclusive contracts has two opposing effects: on the one hand, the matching rate is higher which, all else equal, increases their joint expected utility. On the other hand, the joint expected utility upon being matched, J , is lower. As a result unmatched buyers and sellers may or may not be better off if exclusive contracts are not enforced than if they are. Figure 4a shows a case in which the non-enforcement makes unmatched buyers and sellers jointly better off while Figure 4b shows a case in which it makes them worse off.

Place Figure 4b approximately here

It is intuitive, and can be seen in the figure, that whether or not unmatched agents are made better off depends on how much the matching rate increases if contracts are no longer enforced. The increase in the matching rate, in turn, depends on σ . In particular, the smaller σ , the smaller the increase in the matching rate and the more likely it is that unmatched agents are made worse off by the non-enforcement of exclusive contracts. The results of this section are summarized in the following proposition.

Proposition 2 *For $\underline{\phi} \leq \phi \leq \bar{\phi}$, courts can increase social welfare by not enforcing exclusive contracts. For $\phi < \underline{\phi}$ the non-enforcement of exclusive contracts decreases*

the expected utility of matched agents and has ambiguous effects on the expected utility of unmatched agents and, thus, on social welfare.

Finally, note that the policy implications in the case in which $\phi > \bar{\phi}$ are immaterial: for this parameter range agents never wish to adopt exclusive contracts, regardless of whether courts enforce these contracts or not.

6 Conclusions

In this paper we have examined the relationship between market conditions and the adoption of exclusive contracts. In particular, we have developed a matching model in which agents may decide to adopt exclusive contracts to reduce bargaining inefficiencies in the presence of private information. We have shown that exclusive contracts can reduce ex post bargaining inefficiencies and that the adoption of an exclusive contract by a buyer-seller pair depends crucially on the market characteristics and the contracting decisions of all other market participants. In small markets or in markets characterized by severe search frictions all agents adopt exclusive contracts. Conversely, in large markets or in markets in which search is not very costly, no agent adopts exclusive contracts. In markets of intermediate size or with intermediate levels of search costs, the presence of complementarities in the contracting decisions of different buyer-seller pairs leads to multiple equilibria: there exist equilibria in which each buyer-seller pair adopts an exclusive contract if it expects all other agents to also do so and equilibria in which no buyer-seller pair adopts an exclusive contract if it

does not expect other agents to do so. Moreover, the existence of search externalities introduces a wedge between privately and socially optimal decisions and makes socially suboptimal equilibria possible. In particular, we have shown that in the range of parameters for which multiple equilibria exist, courts could increase social welfare by not enforcing exclusive contracts. For the range of parameters in which the unique equilibrium has all agents adopting exclusive contracts, non-enforcement of exclusive contracts always makes matched agents worse off and may or may not have positive effects on the expected utility of unmatched agents.

A key assumption in our analysis is that contracts are incomplete, in the sense that they do not specify the ex post price or the bargaining game that determines this price. In the model presented in this paper, if agents were able to commit to a bargaining game they could avoid the bargaining inefficiency without having to commit to any breach damages. It is important to note, however, that their ability to do so depends crucially on the assumption that only the buyer has private information at the ex post bargaining stage. If, instead, the seller also had private information, the agents may not be able to avoid the ex post bargaining inefficiency by committing to a particular bargaining game (Myerson and Satterthwaite 1983). In such a situation there would again be a role for breach damages.

The analysis in this paper can be related to the transaction cost literature (Williamson 1975, 1985) which has long argued that the mitigation of ex post inefficiencies is a key purpose of vertical contracts. In line with this literature we find that the contractual

decisions of agents depend crucially on their absolute gains from trade which, in a market context, are determined by exogenous market characteristics and by the behavior of other market participants. We differ from the transaction cost literature, however, by abstracting entirely from the hold-up problem and the associated investment inefficiencies investments. We do so, not because we believe that exclusive contracts do not have an effect on investment inefficiencies, but because we want to highlight the effect they have on bargaining inefficiencies. We believe that it would be very interesting to explore the use of exclusive contracts in a model that allows for both investment and bargaining inefficiencies but we leave this issue for future research.

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