Privatization with Political Constraints:

Auctions versus Private Negotiations

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Abstract

This paper investigates the design of privatization mechanisms in emerging market economies characterized by political constraints that limit the set of viable privatization mechanisms. Our objective is to explain the striking diversity of privatization mechanisms observed in practice and the frequent use of an apparently suboptimal privatization mechanism: private negotiations.

We develop a simple model wherein privatization is to be carried out by a government agent who plays favorites among bidders and is potentially disciplined by forthcoming elections. We find that it is the degree of political constraints that determines which mechanism is more successful in raising funds. If the political environment is such that the privatization agent himself aims at raising the fair value for the company, then privatization auctions and private negotiations are equally successful in raising public revenues. If, however, political constraints distort the agent's incentives, then one mechanism outperforms the other. In particular, if the distortion is moderate, then private negotiations can raise more value for a successful enterprise than privatization auctions. In this case the agent may play favorites among the bidders, but to the extent he cares about the price, he will use his bargaining power to negotiate his target price. If, however, the distortion is severe so that the agent lacks sufficient motivation to raise a fair price for the company, then privatization auctions will outperform private negotiations. Even though the agent may play favorites among the bidders, he would not put pressure on the bidders to raise the price during negotiations. In an auction, in contrast, the presence of other bidders, regardless how informed they are, induces competition and places a lower bound on the equilibrium winning bid. We also show that information disclosure laws may have negative welfare implications: they may help the privatization agent to collude with some of the bidders to the disadvantage of non-colluding bidders. Our theory provides further regulatory implications for privatization procedures in emerging market economies.

1 Introduction

With the increasing prominence of emerging markets and newly privatized economies, the role of banks and markets and the strategies of privatization have become topics of central importance in public policy. This in turn has generated an increased academic focus on the design of markets and institutions (for example, Berkovitch and Israel (1996), Boot and Thakor (1994), Diamond (1996), Titman and Subrahmanyam (1997)).

One interesting issue in institutional design is how to transfer state-owned enterprises to private investors. Privatization of state-owned enterprises has grown into an economic tidal wave during the 1990s. Existing literature highlights the striking diversity of privatization mechanisms used in different settings (see for example Frydman and Rapaczynsky (1991)) and documents the use of numerous and arguably suboptimal mechanisms, particularly the overwhelming choice of private negotiations in Eastern Europe (Figure 1).

In their detailed analysis of the Polish, Czech and Russian privatization processes, Boycko et al. (1994) argue that privatization mechanisms in these countries were selected on the basis of political constraints and were simplified to meet political feasibility even at the expense of economic principles. The importance of political considerations in the choice of a privatization mechanism is also emphasized by Baldwin and Bhattacharyya (1991) in their case study of the privatization of Conrail by the US government. In 1984, an auction was held by the Department of Transportation to sell the government's 85% stake in Conrail. A group of private investors challenged the auction and no proposal succeeded to win congressional approval. In 1987 a public equity offering of Conrail netted the government $700 million more than the winning bid in the auction.

An important aspect of privatization in emerging market economies is the extent to which the flow of information is controlled by the people in charge of privatization. Privatization in these countries is typically carried out by an agent who derives private benefits from his position. This agent is either the manager of the state-owned company who is appointed to privatize his or her company[1], or a government bureaucrat from the state privatization agency. In either case the

[1] A commonly used privatization mechanism for small and medium-sized companies in Hungary, called self-privatization, is to appoint the manager of the state-owned firm to privatize his or her company (Major (1994)).

privatization agent is in a position to potentially monopolize information about the company in question.[2] Business and financial information is typically scarce in emerging market economies. Financial markets are nonexistent or barely at their infancy. Many of the companies that are up for sale have never been audited before and follow ancient accounting practices. It is hard to know where to look for information[3]. Ten different information sources may be circulating while the eleventh with the most relevant information remains hidden. Being in charge, the agent may have access to this eleventh source of superior information about the company's assets, or he may have private information about the privatization of competing businesses that can affect future competition of the firm. In either case, the agent may choose to disclose his information to a favorite bidder only. In our model we are concerned with the potential impact of the privatization agent providing informational advantage to one of the bidders.

One important political factor in the privatization process is how much money can be raised by the sale of state-owned companies. Whereas in developed markets these funds may be of lesser importance, in transitional economies they represent a token of a successful start.[4] In addition to incentives to raise revenues, another important aspect of privatization in emerging market economies is the public concern for entrepreneurs losing money in the privatization process[5]. These goals translate into an incentive scheme that penalizes the privatization agent for a positive value-price differential ex-post while it does not reward him for raising more than the company is worth. When modeling the privatization process in emerging market economies, our aim is to incorporate these incentives into the objective function of the privatization agent.

The political factors that the privatization process entails in emerging market economies are the focus of our paper. First, conflict-of-interest regulations naturally exclude explicit profit-sharing contracts between the Treasury and the political-bureaucrat in charge of privatization. Profit-sharing contracts with politicians are politically unacceptable in both developed and

[2]For a different view of the advantage of developed markets in diffusing information as compared to emerging markets see Berkovitch and Israel (1996).

[3]As J. Mark Mobius, portfolio manager of the Templeton Russia fund explains: "We invest in the face of very iffy data. The amount of information available leaves a lot to be desired." (Best Single Country Fund: Templeton Russia, Mutual Funds, March 1997, Page 48).

[4] The funds raised through privatization can be used to pay off the country's debt, endow the social security system and thereby lower the tax rate for businesses and decrease the resistance against the privatization process itself.

[5]To prevent severe losses by entrepreneurs, governments in these economies frequently grant bidders the right to sell the privatized company back to the government within a period of three to five years at the price it was purchased for, or, alternatively, offer compensation packages for unexpected losses incurred by entrepreneurs during the first few years of operation (Major (1994)).

emerging market economies since they are viewed as wealth transfers to those who hold public office. Secondly, political factors may also weaken the enforcement of social contracts (La Porta et al (1996)). In particular, if the country's attention is focused on issues of national security or ethnic conflicts, then privatization may seem too small an issue to warrant attention and the privatization agent may not be disciplined despite large value-price differentials[6]. Finally, beside aiming at a fair price, non-price criteria such as employment, investment or national interest (Fluck, John and Ravid (1996)) may also constrain the privatization process. These objectives may also alter the incentives of those involved in the privatization process and make the modeling of the bidding process substantially more complex.

Auctions and private negotiations are the most widely employed privatization mechanisms in emerging market economies. The typical auctions are first-price sealed-bid auctions ("The Revenge of the Nerds", 1994). Our paper investigates how much revenue privatization auctions and private negotiations raise in emerging market economies by explicitly modeling the political constraints discussed above.

We find that in addition to the negotiating skills of the agent, it is the degree of political constraints that determines which mechanism is more successful in raising funds. If the privatization agent himself aims at raising the fair value for the company, then privatization auctions and private negotiations are equally successful in raising public revenues. In this case the privatization agent will disclose all information publicly and, consequently, the winning bid will approach value. If, however, political constraints distort the agent's incentives, then one mechanism outperforms the other. In particular, if the distortion is moderate, then private negotiations can raise more value for a successful enterprise than privatization auctions. When political constraints distort the agent's incentives, then he may no longer choose to make all information public. In this case the agent may play favorites among the bidders, but to the extent he cares about the price, he will use his bargaining power to negotiate his target price. As long as the agent's target exceeds the expected winning bid of a respective privatization auction with asymmetric information, private negotiations can attain higher revenues than privatization auctions. If, however, the distortion is severe so that the agent lacks sufficient motivation to raise

[6] As the following example illustrates one can control the public reaction to the announcement of the winning bid by picking the time of the announcement carefully: "The whole telecommunication industry competed in the tender of the first Austrian private mobile phone system. Victor Klima, who conducted the tender proved to be an excellent tactician. Even though he selected the bidder with fourth highest bid as the

a fair price for the company, then privatization auctions will outperform private negotiations with respect to revenues raised. Even though the agent may play favorites among the bidders, he would not put pressure on the bidders to raise the price during negotiations. However, in a privatization auction the presence of less informed bidders induces the colluding bidder to compete and places a lower bound on the equilibrium winning bid.

The intuition is that even though a bureaucrat in charge of the privatization process may compromise both auctions and private negotiations, he or she has much less direct control over the outcome of an auction than the outcome of private negotiations. Whereas in private negotiations the privatization agent can potentially attain his most preferred outcome, the winning bid in an auction may very well exceed or fall short of the agent's target. If the agent's target is sufficiently high, the expected winning bid in the privatization auction is likely to fall short of the agent's target. If the agent's target is low, then the expected winning bid in the auction is likely to beat the agent's target. Interestingly, our results hold regardless of whether information disclosure is mandated for the bidders in the economy.

The rest of the paper is organized as follows. In Section 2 we describe the assumptions of the model. In Section 3 we discuss the benchmark case when the privatization agent voluntarily reveals information to all bidders. In Section 4 and 5 we investigate the optimality of auctions versus private negotiations when disclosure rules are in effect and when they are not in effect. In Section 6 we discuss the regulatory implications of our model. In Section 7 we present a detailed discussion of related technical literature. We close the paper with some concluding remarks and recommendations for the design of privatization procedures.

2 The Model

2.1 The basic setup

We consider a company to be privatized which can be either a *gem* or a *lemon* with equal probabilities. The gem is valued at $\overline{v}$, the lemon is valued at $\underline{v}$. There are two bidders for the company in question. The bidders are risk-neutral profit-maximizers. Each bidder is equally capable of operating the company. The bidders know the agent's preferences and the distribution of company values. They may learn the value of the company they bid for if the agent who has

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winner, he made the announcement just before New Year's Eve, when half of Austria is skiing and thereby managed to avoid the public outcry as well as subsequent lawsuits ("The Politician" (1997)).

access to the company's books discloses the books to both or one of the bidders, or if they decide to purchase information from a research company. Once the winner starts running the privatized company, the value of the company is publicly revealed.

The privatization program is to be carried out by a government agent who derives utility from both pecuniary benefits, μ, and private benefits from staying in office, W. The pecuniary benefits are the side-payments he receives if he colludes with a bidder.[7] The non-pecuniary benefits, W capture the value of perks, power, and the agent's ability to generate side-payments in the future. We normalize the agent's salary to zero.

The agent maximizes the sum of *his monetary payoff* and *his expected private benefits*. Our specification for the agent's preferences stems from the corporate control literature. Examples of similar objective functions in the context of selling an enterprise include Grossman and Hart (1988), Harris and Raviv (1988), Hart and Moore (1989), Shleifer and Vishny (1995), Burkart et al. (1998).

The agent's monetary payoff, μ, depends on the value-price differential, *v-p*, and on his bargaining power (negotiating skills), α. The higher the value-price differential, *v-p*, the more the colluding parties can split as side-payment. Moreover, the agent can extract more from the bidder, the better his bargaining position, α is. Note that the extreme cases of no rent-sharing rule out collusion. If the bidder is able to capture all the rents, the agent's objective reduces to maximizing his expected private benefits from staying in office. In this case the agent has no incentive to collude with the bidders. If all rents accrue to the privatization agent, then the bidders have no incentive to collude with the agent. As long as the official expects future favors from the colluding bidder when he is dismissed (eg. a high level appointment in the bidder's firm), he is willing to split the rents with the bidder. Similarly, as long as the colluding bidder expects future

[7] This paper focuses on collusion between a bidder and a seller's representative. As such, it provides new insights into this type of collusion. While collusion among bidders received a lot of attention in the literature (see McAfee and McMillan (1987) p. 724. or Rothkopf and Harstad (1994) for excellent surveys of this literature or Porter and Zona (1993) for a recent study of this type of collusion), collusion between a bidder and a seller's representative is still largely unexplored. Although we recognize that collusion among bidders may affect privatization auctions as well, to keep our model tractable we assume away the possibility of this type of collusion here. Nevertheless, we would like to point out that the first-price auctions we discuss are somewhat less susceptible to bidder's collusion than second-price auctions. For a real-life perspective on the subject, see Cramton's (1997) comprehensive description of the considerations underlying the design of the FCC spectrum auctions.

favors from the privatization agent if the agent stays in office (eg. information about companies to be privatized later), he is willing to share his rents with the agent.

The agent's expected private benefits depend on the likelihood that he remains in office in the future. In the corporate finance context it is common to assume that the agent loses his private benefits of control with a certain probability. This would happen when he is dismissed due to decisions by the corporate board, proxy fights, takeovers and bankruptcies. Such models were developed by, among others, Harris and Raviv (1988), and Stulz (1988), and Fluck (1998).

In our context of privatization, the likelihood that an agent stays in office depends on his performance and on whether or not public attention is focused on privatization. If the public focuses on privatization issues and it is learned that a company was sold at a price far below value then the agent is dismissed. Hence we model the probability, π, that the agent is dismissed as an increasing function of the value-price differential, *v-p*. That is, the larger the discrepancy between the value of the company and the price the winner paid for it, the more likely it is that public attention should turn to privatization issues and the agent will be dismissed. The value of π is positive and increasing for $v > p$ and 0 for $v \leq p$. Thus the agent's objective function takes the following form:

$$\max_{p} m(v-p, a) + (1-p(v-p)) \times W, \qquad (1)$$

where π characterizes the economy, W the privatization agent and α the bargaining process.

Notice that the privatization agent faces the following trade-off when deciding how to price the firm: On the one hand, he would like to sell the firm for a low price to capture some of the buyer's profits. On the other hand, he would like to sell the firm for a price as high as possible so as to increase his chances of keeping his private benefits.

We compare two mechanisms, a first-price sealed-bid (common-value) auction and private negotiations, with a minimum bid set at $\underline{v}$ in either case. Since one of our aims is to derive policy implications for the privatization process, we want to model auctions and private negotiations in a manner that closely approximates the actual bidding process. In privatization

auctions bidding is allowed only in currency units or multiples of currency units[8]. Thus, in our model bidding is conducted in multiples of currency units with the smallest allowable bidding unit set at ε. In other words, one can bid $\underline{v}$, $\underline{v}$ +ε, $\underline{v}$ + 2ε, etc.

There are two bidders in the auction. Unlike open auctions that can always attract additional bidders (Hendricks et al. (1993), Bulow and Klemperer (1996)), potential bidders in privatization auctions of emerging market economies come from a tight group of insiders. Some of these insiders have close ties with those in charge of the privatization process and tend to be frequent participants at other privatization auctions. The typical bidders are competitor-firms, well-known wealthy individuals, or investor groups. They are screened well in advance to assure that they can raise the necessary funds to finance the deal. Thus, we model privatization auctions and private negotiations with a fixed number of bidders, one of whom may have a continuing relationship with the privatization agent.

In the case of the auction the timing of the model is as follows. The privatization agent decides whether to disclose information to one or both parties or to none at all. The colluding parties privately agree on the side-payment conditional on the value-price differential. Since the agent may have difficulty in enforcing the bidders' promises (bids or side-payments) ex-post, the side-payments are assumed to be made up-front. If the agent's bargaining power is α, then, for the good company, the bidder pays the agent α fraction of the *expected* value-price differential as side-payment, where expectation is taken over the set of possible winning bids in the auction.[9] Uninformed bidders can decide whether or not to purchase information at a cost c from a business research company who can assess the company's true worth. Our modeling choice of assuming such high level of precision by the research company substantially simplifies the analysis without altering the nature of our results. With appropriate changes in the parameter restrictions, our results will carry through even if (1) the information purchased from the research company has lower precision than the information revealed by the privatization officials; or (2) the information

[8] Much of the auction literature analyzes continuous auctions. However all real-life auctions are, almost by definition, discrete. In fact, in the largest auction to date in this country, the FCC spectrum auction, the FCC explicitly set discrete bid increments (the design also included discrete time intervals between bids). As it turned out, there were interesting behavioral consequences to the discrete bid intervals, as is the case in our paper (see Cramton (1997)).

[9] Our result would be qualitatively the same, if the side-payment would be α fraction of the expected value-price differential with expectation taken over the set of possible winning bids in the auction *conditional* on the colluding bidder winning, or if the side-payments were to be paid ex-post. In the latter case, however, the enforcement of the side-payments ex-post might pose a problem for the agent.

purchased from the research company is complementary to the information of the privatization official.

In the case of private negotiations the privatization agent decides whether to disclose information to one or both parties or to none at all. If he decides to disclose information publicly, then he can only accept bids that approximate value. If he decides to disclose information privately, then he approaches one of the bidders. He offers to disclose information and sell the company to the bidder in exchange of sharing the rents. Since the agent has less leverage to enforce the bidders' promises ex-post, the side-payments are assumed to be made up-front. If the agent's bargaining power is α, then, the parties negotiate a payment $\underline{v} + \alpha(v - \underline{v})$ from the bidder to the agent. That is, each party's share of the rents is proportional to his bargaining power. The payment is $\underline{v} + \alpha(v - \underline{v})$ for the good company and $\underline{v}$ for the bad. Since the bidder is indifferent as to how much of his payment become public revenue and how much will end up as a bribe, he lets the agent decide the price that will be publicly announced, and lets him pocket the rest of the payment. Naturally, the agent chooses the price that maximizes his objective function (1) subject to the constraints that $\mu + p = \underline{v} + \alpha(v - \underline{v})$, $\mu \geq 0$, $p \geq 0$.

Once the winner starts to operate the company, the value of the company is publicly revealed. If public attention is focused on privatization, and if there is a discrepancy between the value of the company and the price paid for it, then the official is dismissed. If the public attention is focused on issues other than privatization then the agent stays in office.

Since it has been suggested that information disclosure laws generate more revenues by making the privatization process more transparent, we consider two alternative scenarios in our model. In the first scenario (Section 4) disclosure laws in the sense of Grossman and Hart (1980) are in effect; in the second scenario (Section 5) information disclosure is not mandated. When no disclosure laws are in effect, then the purchase of information remains the parties' private information. When disclosure laws are in effect, parties who purchased information are expected to disclose their information.

Naturally, disclosure rules do not bind the colluding bidder. Since bribery is a more serious offense than failing to reveal information, this bidder's agreement with the privatization agent is kept in secret. Hence he appears to be uninformed from the point of view of the legal system. There is one additional assumption needed here, however. This assumption concerns the

rate of detection for collusion. In particular, when bribery is a more serious offense than failing to reveal information, then, for the act of collusion to be incentive compatible for the bidder, it must be the case that bribery is more difficult to discover. This assumption seems reasonable, since collusion is typically carried out in a careful manner, and therefore it is rather difficult to prove. This contrasts with business transactions such as purchasing information from a research company which leave a paper trail behind. These transactions are more easily traceable through bills and tax filings.

Note that the willingness of the bidders to collude with the privatization agent depends on the *expected* legal cost of being caught. Thus, when the rate of detection for collusion is sufficiently low, then it becomes incentive compatible for one bidder to collude with the agent and for another bidder to voluntarily reveal information purchased from the research company.

3. The case of voluntary information revelation

We first discuss a benchmark case in which the agent greatly values staying in office so that he refuses to be bribed and voluntarily reveals information to all bidders. This is a scenario in which political constraints do not matter. The privatization agent refuses bribe and voluntarily discloses all information whenever he values staying in office more than any bribe. Formally,

$$W \times (p\ (\ \bar{v} - p) - p\ \ (e)) \geq \bar{v}\ - p - e \qquad (2)$$

for every p ≥ $\underline{v}$. For every p, the right hand side shows the *maximum* bribe the official can get when he raises p and accepts a bribe as opposed to raising $\bar{v}$ - ε and accepting no side-payment. The left hand side of the inequality shows the difference between the expected private benefits associated with these strategies.

If both bidders know the value of the company, then they would bid aggressively so that price would approach value.

Proposition 1 *When the privatization agent discloses information to both bidders then the subsequent sealed-bid auction facilitates the transfer of ownership at a price p =* $\bar{v}$ *-e for the good company, and at a price p =* $\underline{v}$ *for the bad company in any perfect equilibrium.*

The intuition is straightforward. If both bidders know that the company is a lemon, then neither will bid more than $\underline{v}$ in equilibrium. If, however, they find out that the company is good, then they will not bid below $\overline{v} - e$ since they may lose the auction otherwise. If either bids $\overline{v}$, then she may win or tie with the other bidder. In either case zero profit is made. Either bidder can do at least as well by lowering her bid to $\overline{v}$ -ε. Bidding $\overline{v}$ -ε for the company yields an expected profit ε/2 for both bidders in equilibrium.

When there are no political constraints, then for the privatization agent maximizing utility is equivalent to minimizing the probability of being dismissed. We can trivially show:

Proposition 2 *Whenever (2) holds, the privatization agent voluntarily reveals information to both bidders in any perfect equilibrium.*

Whenever (2) holds, then revealing information to both parties, as Proposition 1 demonstrates, leads to the price that maximizes the utility of the privatization agent. Obviously, no strategy can improve upon this. In fact, as we shall see later, other strategies will result in strictly worse outcomes from the agent's point of view.

Disclosure rules do not matter when (2) holds. Since both parties are getting information from the privatization agent, nobody is purchasing information, so there is nothing to disclose.

Finally, whenever, (2) holds, then an auction is as good a revenue-maximizer as private negotiations. The privatization agent who publicly reveals information to both bidders can extract nearly full value from the bidders: they will be indifferent between buying at value or walking away.

Proposition 3 *Whenever (2) holds, the privatization agent raises* $\overline{v} - e$ *for the good company and* $\underline{v}$ *for the bad company through private negotiations.*

The next sections focus on the behavior of approachable agents. An agent is called *approachable* if for a high enough bribe he is willing to compromise public revenues. Formally, an agent is approachable if W x $(p(\overline{v} - \underline{v}) - p(e)) < \overline{v} - \underline{v} - e$. When the agent is

approachable disclosure rules make a difference. As we shall see later they play an important role in our discussion.

4. Privatization when disclosure laws are in effect

We investigate two scenarios. In one case, information disclosure laws are in effect (Section 4). In the other case, information disclosure is not mandated (Section 5). Mandatory information disclosure applies to bidders in takeover contests in the United States (Grossman and Hart (1980)).

We model disclosure rules in the spirit of Grossman and Hart (1980), that is, disclosure rules require that any information that a party has about the value of the company must be revealed to everybody. In our model it is equivalent to requesting that the research company reveal its client list or else lose its license. Such rules can be mandated relatively easily. As we shall see later, most of our findings generalize to the case when information disclosure is not mandated. Interestingly, public revenues will generally be higher when information disclosure is not mandated.

Disclosure rules have two implications in our model. They force the party who purchased information to reveal this information and thereby reveal their identity. Secret information transactions on the other hand, by nature, are not known to anyone but the parties involved. When disclosure rules are in effect the model takes the following form.

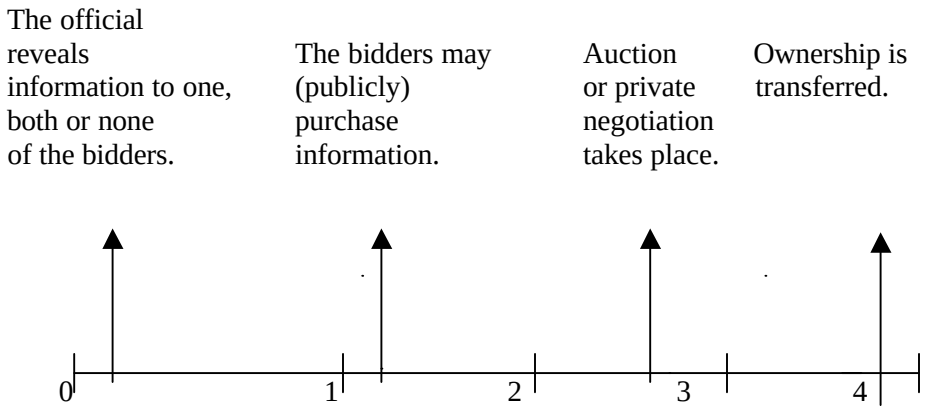

Figure 2: The timing of the model when disclosure rules are in effect.

Since disclosure rules have no impact on the colluding parties who do not comply with them, they enable the colluding parties to fully realize their cost advantage over the noncolluding party. As a consequence, it does not pay for the noncolluding party to purchase information unless the cost of acquiring information is negligible. The outcome is an auction with asymmetrically informed bidders.

Proposition 4 *When disclosure rules are in effect and when the privatization agent discloses information to one bidder only, then one of the following applies:*

(1) if c £ Î /4, then the noncolluding party always purchases information and the subsequent sealed-bid auction facilitates the transfer of the good company's ownership at price $p = \bar{v} - e$;

(2) if c > Î /4, then no party purchases information. There is a unique perfect Nash equilibrium in mixed strategies in the subsequent sealed-bid auction in which the expected winning bid for the good company is significantly below the unconditional expected value, $\frac{\underline{v} + \bar{v}}{2}$.

Proof: in Appendix.

The colluding parties have an advantage with respect to their cost of producing information. When disclosure laws are in effect then, in equilibrium, each bidder knows who the informed parties are. The identity of the party who purchased information is disclosed and the identity of the colluding party is revealed in equilibrium since all parties have rational expectations. Therefore, as long as the information structure is symmetric and the cost of purchasing information is non-negligible, colluding parties can realize their cost advantage in obtaining information. Notice that if the information provided by the research company is of

lower precision than the information obtained from the privatization official, the threshold for information purchase will be lower than $\varepsilon / 4$.

There is no pure strategy Nash equilibrium in the sealed-bid auction. Since the uninformed would never want to place a bid higher than $\frac{\underline{v}+\overline{v}}{2}$ any bid above $\frac{\underline{v}+\overline{v}}{2}$ is a winning bid. A bid above $\frac{\underline{v}+\overline{v}}{2}$ is not a best response for the colluding bidder unless the uninformed is bidding exactly $\frac{\underline{v}+\overline{v}}{2}$ or in case $\frac{\underline{v}+\overline{v}}{2}$ is not an acceptable bid, the highest allowable bid below $\frac{\underline{v}+\overline{v}}{2}$. In case the colluding bidder does bid this high, it is not a best response for the uninformed to bid $\frac{\underline{v}+\overline{v}}{2}$. However, if the informed bids less than $\frac{\underline{v}+\overline{v}}{2}$ in the good state, then it is a best response for the uninformed to place a higher bid (but never higher than $\frac{\underline{v}+\overline{v}}{2}$) independently of the realization of the state.
Staying out is not a Nash equilibrium strategy either.

There is a unique perfect Nash equilibrium in mixed strategies, however. The equilibrium is such that no bid exceeds the unconditional expected value with positive probability. The equilibrium is very intuitive. In this equilibrium the colluding party always bids $\underline{v}$ when the company is of low quality. When the company is of high quality, the informed mixes between his sure winning bid (the one just below the unconditional expected value) that may be unnecessarily high and lower bids that are potentially more profitable winning bids. The uninformed bids either cautiously or aggressively, each with high probability so as to minimize his potential realized losses and his opportunity losses.

Obviously, private negotiations are not affected by disclosure rules. We illustrate the outcome of the auction and of private negotiations with a simple example.

Example 1:

Let $\underline{v}$ = \$1 million and $\overline{v}$ = \$6 million. The increment between subsequent bids is \$1 million. The unconditional expected value of the company is \$3.5 million. The government agent's private benefits from staying in office is \$4 million. The cost of information purchase is \$750,000. The political constraints specified by the probability

of dismissal are as follows:

$$p\,(\bar{v}-p)=(\bar{v}-p-e)\times 0.08 \text{ if } \bar{v}-p\le 3 \text{ and } p\,(\bar{v}-p)=(\bar{v}-p-e)\times 0.2 \text{ otherwise.}$$

Private negotiations:

The parties negotiate a payment $\underline{v} + \alpha(\bar{v} - \underline{v})$ from the bidder to the agent for the good company. That is, each party's share is proportional to its bargaining power. Since the bidder is indifferent as to how much of his payment become public revenue and how much end up as bribe, he lets the agent decide the price that will be publicly announced, and lets him pocket the rest of the payment. The agent chooses μ and p that maximize (1) subject to the constraints that $\mu + p = \underline{v} + \alpha(\bar{v} - \underline{v})$, $\mu \ge 0$, $p \ge 0$. The colluding bidder makes a profit of $(1-\alpha)(\bar{v} - \underline{v})$ million. When the value of the company is revealed, the agent faces a dismissal with probability $\pi(\bar{v} - p)$. For example, if $\alpha=2/3$, then the agent will negotiate a price of \$4 million, and pocket a bribe of 1/3 of a million. His utility from doing this will be 4.01 million that is higher than the 4 million he can achieve by revealing information publicly. The bidder receives a profit of 5/3 of a million. The agent faces a dismissal with probability 0.08.

The auction:

Perfection implies that no party plays weakly dominated strategies. This requirement rules out the colluding party bidding above $\underline{v}$ when the company is of low quality. After iteratively eliminating the remaining weakly dominated strategies, we get the set of strategies that may be played with positive probability in any perfect Nash equilibria. Applying the iterated dominance argument we find that (step 1) the noncolluding party will never purchase information; (step 2) the noncolluding party will not bid more than the unconditional expected value, \$3.5 million; (step 3) the colluding party will not bid above \$3.5 million with positive probability for the good company; (step 4) the colluding party will not bid \$1 million with positive probability for the good company.

There is a unique perfect equilibrium strategy **q** for the colluding party which specifies bidding 2 and 3 with positive probabilities for the good company. When the colluding party plays his equilibrium strategy, the uninformed non-colluding party is indifferent between unconditional bids of 1, 2 and 3, and is never inclined to bid more than 3. Bidding 1 yields 0 to the noncolluding party since it is never the winning bid when the company is good. Bidding 2 for the

bad company brings a loss of 1 million to the uninformed. Bidding 2 for the good company and getting it yields a profit of 4 million to him. When bidding 2, he incurs a loss with probability ½. He profits from bidding 2 only when the colluding party also bids 2 and their bids tie. The colluding party bids 2 for the good company with probability q_2, so the non-colluding party profits from bidding 2 with probability $q_2/2$. Thus, bidding 2 yields an expected profit of $2q_2$ - 0.5. Bidding 3 for the bad company brings a loss of 2 million to the uninformed. Bidding 3 for the good company and getting it yields a profit of 3 million to him. When bidding 3, he incurs a loss with probability 1/2. He profits from bidding 3 with probability $q_2 + \frac{q_3}{2}$. Thus, bidding 3 yields an expected payoff of $3(q_2 + \frac{q_3}{2}) - 1$ to the uninformed. Furthermore,

$q_2 + q_3 + q_4 + q_5 = 0.5$.

Similar reasoning establishes that for the colluding party bidding 1 yield $\frac{5p_1}{2}$, bidding 2 yields $4(p_1 + \frac{p_2}{2})$, bidding 3 yields $3(p_1 + p_2 + \frac{p_3}{2})$, bidding 4 yields $2(p_1 + p_2 + p_3)$. Furthermore, $p_1 + p_2 + p_3 = 1$. In equilibrium, each bidder is indifferent between strategies that are played with positive probabilities and prefer these strategies to those that are played with zero probability.

Solving the resulting system of equations, we get $q_2 = \frac{1}{6}$, $q_3 = \frac{1}{3}$, $q_4 = 0$ and $p_1 = 0.6$, $p_2 = 0$, $p_3 = 0.4$. That is, in equilibrium, the colluding party bids 3 with probability 2/3 and 2 with probability 1/3 when the company is good. Furthermore, if the noncolluding party bids 1 with probability 3/5, 3 with probability 2/5, then in the good state the colluding party is indifferent between bidding 2 and 3, prefers either of these bids to 4, and may as well bid 2 with probability 1/3 and 3 with probability 2/3. Similarly, if the colluding party bids 2 with probability 1/3 and 3 with probability 2/3 for the good company and 1 for the bad company, then the non-colluding party is indifferent between bidding 1 and 3 and might as well bid 1 with probability 3/5 and 3 with probability 2/5. The colluding party wins the good company with probability 11/15.

The joint distribution of bids is shown in Table 1 and is illustrated in Figure 3 and 4. The expected price at which the good company is sold turns out to be $2.8 million, about 20 percent

below the unconditional expected value and less than half of what the company is worth[10]. This significant underpricing happens even when the agent himself would prefer a price of $4 million and is able to negotiate this price in the absence of the auction. This would happen for example when $\alpha = 2/3$. However, when his only option is to conduct an auction he prefers the expected winning bid of $2.8 million to the $5 million he can raise by foregoing his bribe and revealing information to both bidders. His utility from raising $5 million by foregoing his bribe and revealing information to both bidders is $4 million. When he reveals information to one bidder only, he raises $2 million with probability 1/5 and $3 million with probability 4/5 for the good company. He receives a bribe of $1/5 \times \alpha \times \$4$ million + $4/5 \times \alpha \times \$3$ million = $16/5 \times \alpha$. Depending on α, he prefers revealing information to one bidder only. This happens for example when $\alpha = 2/3$. In this case, the agent prefers revealing information to one bidder only, since by doing so, he expects the equivalent of 5.14 million in utility terms. ♦

So far we have assumed that when auction mechanism is used to privatize the company the official discloses information to one or both party. Our next step is to establish that the official *will* always designate at least one party as informed in equilibrium. As Proposition 5 below shows, the official will always prefer disclosing information to both bidders to not disclosing information to anyone. Depending on his preferences, he either prefers to disclose information to one bidder only (see Example 1) or to both bidders (see the case of voluntary information revelation).

Proposition 5 *When disclosure rules are in effect and when a sealed-bid auction is used to sell the company, then in equilibrium the official will reveal information to at least one bidder.*

Proof: in Appendix.

Next we investigate conditions under which one mechanism outperforms the other. In an ex ante comparison private negotiations dominate auctions if the negotiated price p* exceeds the expected winning bid in the auction $E(b^w)$. This can happen for a wide range of preferences and bargaining skills, since the expected winning bid in the auction for the good company is

[10] The expected price the colluding party pays for the good company when he wins is $2.7 million, so the colluding party pays less than the noncolluding party when winning the good company.

significantly below $\frac{\underline{v}+\bar{v}}{2}$. Given α, the more the agent values staying in office or the less approachable he is, the higher the revenues private negotiations generate.

Proposition 6 *Suppose that* $c > \frac{\in}{4}$ *and p*, the price the official would negotiate if he colluded with a bidder exceeds the expected winning bid in the auction with asymmetrically informed bidders* $E(b^w)$. *Then, depending on the parameter values, one of four scenarios emerges:*

(i) Regardless of the mechanism used, the privatization agent reveals information publicly. Auctions raise as much revenues as private negotiations do.

(ii) Regardless of the mechanism used, the privatization agent reveals information to one bidder only. Private negotiations raise more revenues for the sale of good companies, auctions raise more revenues for the sale of bad companies.

(iii) When conducting an auction, the privatization agent discloses information to one bidder only. When conducting private negotiations the privatization agent publicly discloses information to both bidders. Private negotiations raise more revenue for good companies, auctions raise more revenues for bad companies.

(iv) When conducting an auction, the privatization official discloses information to both bidders. When conducting private negotiations, the privatization agent reveals information to one bidder only. Auctions raise more revenues than private negotiations.

Proof: in Appendix.

Proposition 6 provides us with new insights about the interaction between the private benefits of control, the firing threat, and the negotiation game between the privatization agent and the potential buyer. It implies four scenarios. In scenario (i) the privatization agent reveals information to both bidders regardless of the mechanism used. This happens when π takes very high values, or when W is very high. Such a case is illustrated in Section 3.

In scenario (ii) the privatization agent reveals information to one bidder only regardless of the mechanism used. Here, Proposition 6 presents an intriguing result: even if the privatization agent is so corrupt that *half* of the company's value disappears in the pocket of the colluding parties (recall that $E(b^w)$ is strictly less than $\frac{\underline{v}+\bar{v}}{2}$), private negotiations led by this corrupt official can raise more value than the corresponding asymmetric information auction can. A case for scenario (ii) is illustrated in Example 1. Proposition 6 also highlights the limitation of private negotiations. The success of private negotiations critically depends on the privatization official in charge of the negotiations. For example, auctions raise more revenues than private negotiations, whenever p*, the price that maximizes the utility of the privatization official given α falls short of the expected winning bid in the auction with asymmetrically informed bidders $E(b^w)$.

In scenario (iii) the privatization agent publicly reveals information to both bidders when conducting private negotiations but not when holding an auction. This happens if the official faces an increased threat of dismissal (i.e. the political constraints are less severe) relative to Example 1. For example, when the political constraints in Example 1 are replaced by

$$p\,(\bar{v}-p)=(\bar{v}-p-e)\times 0.1 \text{ if } \bar{v}-p\le 3 \text{ and } p\,(\bar{v}-p)=(\bar{v}-p-e)\times 0.2 \text{ otherwise}$$

then an agent with bargaining power α = 2/3 (the same α that was assumed in Example 1) prefers to disclose information to both bidders during private negotiations and the company will be sold for $5 million. The agent gets 4 million in utility terms which is higher than he could obtain by disclosing information to one bidder only. In the auction, however, he prefers to disclose information to one bidder only since by doing so he receives 5.01 million in expected utility terms.

In scenario (iv) the official's choice of how widely to disseminate information also depends on the mechanism used. In scenario (iv) auctions raise more revenues than private negotiations because auctions may induce the privatization official to reveal information to both bidders. Notice that the privatization official can only influence the outcome of the auction by his decision of how many bidders he shares information with. He discloses information to more or fewer bidders depending on which decision results in higher utility. When p*, the official's most

preferred price given α, is close to $\bar{v} - \varepsilon$, he may prefer to reveal information publicly when conducting an auction. When negotiating with the colluding bidder, in contrast, the official can fine-tune the price to p*, which he strictly prefers to $\bar{v} - e$. This happens when the threat of dismissal of the agent is particularly severe for larger value-price differentials. For example, when the political constraints in Example 1 are replaced by

$$p\,(\bar{v} - p) = (\bar{v} - p - e) \times 0.08 \quad \text{if } \bar{v} - p \leq 2 \text{ and } p\,(\bar{v} - p) = (\bar{v} - p - e) \times 0.3 \text{ otherwise}$$

then an agent with bargaining power α = 2/3 will disclose information publicly when holding an auction. He gets 4 million in utility terms for the good company which is more than the 3.49 million that he would get by colluding with one of the bidders. Nevertheless, when conducting private negotiations, the official will disclose information to one bidder only and enjoy 4.01 million in utility terms.

Thus, when the official has good negotiating skills and is reasonably motivated to raise a fair price for the company, then except for scenario (iv), private negotiations raise more revenues than auctions. In scenario (iv) the official is very motivated to avoid severe underpricing but not so motivated to avoid small value price differences. There is efficient disciplining for large value-price differences (which matters for the agent particularly when auctions are used), hence the official discloses information publicly so as to raise the winning bid in the auction.

It also follows from Proposition 6 that if the official has good negotiating skills but does not have much interest in raising public revenues, then auctions will outperform private negotiations with respect to revenues raised.

Another comparison relevant for political considerations, is the ex post comparison of mechanisms. Here we compare the *realized* winning bid of an auction with the price attained through private negotiations.

Corollary 1 *Suppose that $c > e/4$ and that $p^* > \underline{v} + e$. Then, whenever, the official reveals information to one bidder only, there is at least one price in the auction which private negotiations can improve upon.*

Since any bid below $\frac{\underline{v}+\bar{v}}{2}$ is sufficiently high to win the good company with positive probability in the auction with asymmetrically informed bidders, the corollary above demonstrates that there is always a price in the auction private negotiations can improve upon ex post, provided that p*, the price that maximizes the utility of the privatization official exceeds $\underline{v}$. Since low bids are used with high probability (see Example 1) the domination may be quite strong. The reverse of the statement is not true: for a range of preferences of the privatization agent, all prices in the auction are dominated by private negotiations. Even if the official is so corrupt, that his most preferred price for a good company is $\frac{\underline{v}+\bar{v}}{2}$, then all prices in the auction can be improved upon by private negotiations. The situation is somewhat different when disclosure rules are not in effect.

5. Privatization when no disclosure laws are in effect

When information disclosure is not required, then it is potentially advantageous for the non-colluding party to purchase information. Our analysis in this section shows that the qualitative results we derived previously are not simply an artifact of the disclosure laws.

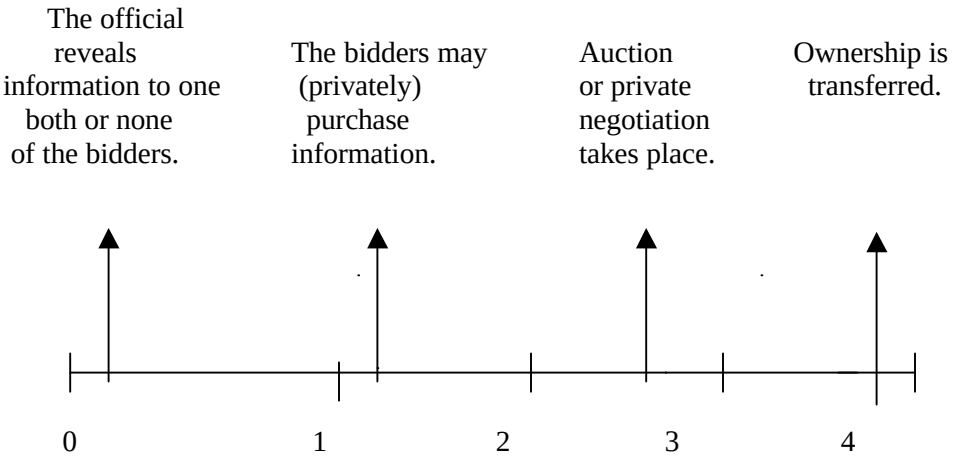

Figure 5: The timing of the model when no disclosure rules are in effect.

In this case the information structure is asymmetric: the colluding parties do not know whether they face an informed or an uninformed bidder in the sealed-bid auction. The lack of disclosure protects the non-colluding agent and makes it worthwhile for him to purchase information in equilibrium with some probability. In equilibrium everyone will assess these

probabilities correctly but only the bidder himself can tell when he is actually informed and when he is uninformed. Having an informational advantage, a non-colluding bidder can compete away part of the rent the colluding parties could otherwise realize from their cost advantage. As a result more revenues can be raised from privatization when information disclosure is not mandated.

Let EV* stand for $\frac{\bar{v}+\underline{v}}{2}$ if $\frac{\bar{v}+\underline{v}}{2}$ is an allowable bid, and for the closest allowable bid to $\frac{\bar{v}+\underline{v}}{2}$ from above if $\frac{\bar{v}+\underline{v}}{2}$ is not an allowable bid. Then,

Proposition 7 *When no disclosure rules are in effect and when the privatization agent discloses information to one bidder only, then, depending on the cost of purchasing information, the following applies:*

(1) If c £ e /4, then the noncolluding party always purchases information and the subsequent sealed-bid auction facilitates the transfer of ownership for the good company at a price $p = \bar{v} - \in$ *;*

(2) If $c > \max\left\{\frac{\bar{v}-EV^*}{4}, \frac{\bar{v}-EV^*-e}{2}\right\}$ *holds, then no party purchases information. There is a unique perfect Nash equilibrium in mixed strategies in the subsequent sealed-bid auction in which the expected winning bid for the good company is significantly below the unconditional expected value,* $\frac{\underline{v}+\bar{v}}{2}$.

(3) If $e / 4 < c < \max\left\{\frac{\bar{v}-EV^*}{4}, \frac{\bar{v}-EV^*-e}{2}\right\}$ *holds, then the noncolluding party will purchase information with some probability. There is a unique perfect Nash equilibrium in the subsequent sealed-bid auction in which the noncolluding party plays mixed strategies conditional on whether or not he has purchased information. The expected price at which a good company is sold is higher when disclosure rules are not in effect than when they are in effect.*

Proof: in Appendix.

Notice that in scenarios (1) and (2) the expected price at which the good company is sold is the same no matter whether or not disclosure rules are in effect. Unlike scenarios (1) and (2), in scenario (3) the expected price at which a good company is sold is higher when disclosure rules are *not* in effect. Whenever $e/4 < c < max\left\{\frac{\overline{v} - EV^*}{4}, \frac{\overline{v} - EV^* - e}{2}\right\}$ holds, then the noncolluding party is willing to purchase information with some probability since his purchase of information can not be detected by the colluding parties. He would be willing to purchase information as long as the cost of purchasing information can be recovered[11]. In equilibrium, the noncolluding party purchases information with some probability and bids differently depending on whether or not he is informed. When he purchased information and learned that the company is good, the noncolluding party is willing to bid higher than when he is ignorant about the value of the company. In a perfect equilibrium parties do not play weakly dominated strategies. In particular, they do not bid more than $\underline{v}$ when they know that the company is of low quality.

After iteratively eliminating dominated strategies that can not be played with positive probability in any perfect Nash equilibrium, we get that (1) when uninformed, the noncolluding party will not bid above the unconditional expected value with positive probability; (2) when uninformed, the noncolluding party will bid $\underline{v}$ with positive probability for the good company; (3) no informed party will bid $\underline{v}$ with positive probability for the good company; (4) the colluding party will bid more aggressively than the noncolluding party.

Example 2:

Let $\underline{v}$ = 1 million and $\overline{v}$ = \$6 million and let the minimum increment be \$1 million. Let, furthermore, the cost of information purchase be \$750,000. The unconditional expected value of the company is \$3.5 million. The political constraints and the outcome of the private negotiations are specified as in Example 1.

After iteratively eliminating dominated strategies, the remaining bids for the non-colluding party are 1, 2, 3 and 4. Bidding 1 yields 0 to the noncolluding party when uninformed and a loss when he is informed. Bidding 2 yields $4\frac{q_2}{2}$ - 0.5 to the non-colluding party when he is

[11] He would always purchase information if $c \leq \frac{\in}{4}$.

uninformed, whereas only $4\frac{q_2}{2}$ - 0.75 when he is informed. Therefore, buying information and bidding 2 for the good company is dominated by not buying information and bidding 2. Bidding 3 when uninformed yields $\left(3q_2+\frac{q_3}{2}\right)-1$ and is dominated by buying information and bidding 3 for the good company only, a strategy that yields $\left(3q_2+\frac{q_3}{2}\right)-0.75$. Similarly, the noncolluding party bids 4 only if he has good information. Bidding 4 for the good company and bidding 1 for the bad company would yield an informed non-colluding party $2\left(q_2+q_3+\frac{q_4}{2}\right)-0.75$, whereas bidding 4 would yield an uninformed non-colluding party $2\left(q_2+q_3+\frac{q_4}{2}\right)-2$.

Solving the corresponding optimization problem we get $p_1 = 3/7$, $p_2 = 0$, $p_3 = 2/7$, $p_4 = 2/7$. That is, the noncolluding party purchases information with probability 4/7 and if he learns the company is good, he bids either \$3 or \$4 million with probability half each. If he learns the company is bad, he bids \$1 million for sure. With probability 3/7 he remains ignorant and bids no higher than \$1 million. In contrast, the colluding party bids either \$2 or \$4 million for the good company with probability half each. He bids \$4 million half of the times, a bid high enough to win against an equally informed bidder. He also bids \$2 million half of the times to take advantage of bidding against an uniformed bidder. For the bad company, the colluding bidder bids \$1 million.

Bidders bid more aggressively in the case of no disclosure than in the case of full disclosure. They both bid \$4 million with positive probability in the case of no disclosure, a bid none of them placed with positive probability in the case of full information disclosure. Were the cost of information lower, they would bid even more aggressively. In contrast, if c were to exceed \$2 million, the non-colluding party would never purchase information and would bid the same as in Example 1.

The non-colluding party has no incentive to deviate from his equilibrium strategy even after purchasing information and learning that the company is good. Notice that he is indifferent between bidding \$3 and \$4 million for the good company both ex ante and ex post provided that the colluding party follows his equilibrium strategy. The noncolluding party would profit less by

bidding higher than $4 or lower than $3 million after getting good information. Notice also that *the noncolluding bidder does not bid the same as the colluding bidder even when they both know the value of the company*. The reason is that even though the two bidders have the same information about the value of the company then, the noncolluding party is better informed than the colluding party. In contrast to the colluding party, the noncolluding party knows when he is informed and when he is uninformed.

The joint distribution of bids for the good company is shown in Table 2 and is illustrated in Figure 6 and 7. The expected price at which a good company is sold is $3.4 million in this case. This price is about 20 percent higher than the $2.8 million price the auction raises when disclosure rules are in effect but still falls short of the $4 million the agent would be able to raise through private negotiations. However, when the official's only option is to conduct an auction he prefers the expected winning bid of $3.4 million to the $5 million he can raise by foregoing his bribe and revealing information to both bidders. His utility from raising $5 million by foregoing his bribe and revealing information to both bidders is $4 million. When he reveals information to one bidder only, he raises $2 million with probability 3/14, $3 million with probability 1/7 and $4 million with probability 9/14 for the good company. He receives a bribe of $3/14 \times \alpha \times \$4 + 1/7 \times \alpha \times 3$ million + $9/14 \times \alpha \times 2$ million = $18/7\ \alpha$. When for example $\alpha = 2/3$, he prefers revealing information to one bidder only since by doing so, he expects 4.9 million in utility terms. ♦

So far we assumed that the privatization agent discloses information to one party only. The next proposition establishes that, as in the case of disclosure rules, the privatization agent will disclose information to at least one party even when no disclosure rules are in effect. Since there is imperfect monitoring of information purchases, we need to establish that the privatization agent can not make himself better off by confusing bidders and designating no one with some probability when bidders can privately purchase information.

Proposition 8 *When no disclosure rules are in effect then the privatization agent always reveals information to at least one bidder.*

Proof: in Appendix.

As Proposition 8 demonstrates the official will always prefer disclosing information to both bidders to not disclosing information to anyone. Depending on his preferences, he either discloses information to one bidder only (see Example 2) or to both bidders (see the case of the voluntary information revelation).

Having established the equilibrium bids in the auction, it is straightforward to see that Corollary 1 would also hold for the case when information disclosure is not mandated. That is, when $c > e/4$ and when p^*, the price that maximizes the utility of the privatization official, given α, exceeds $\underline{v}$, then no matter what the preferences of the privatization agent are, there is at least one price in the auction which private negotiations can improve upon. It is important to point out that the probabilities implied by the two scenarios are quite different. When information disclosure is not required, auctions produce higher revenues (see Proposition 7). Depending on the preferences of the privatization official, private negotiations may still raise more value than auctions but for a smaller range of parameter values since the expected winning bid in the auction is higher when information disclosure is not mandated. The comparison of the two cases reveals that information disclosure rules give rise to lower public revenues and higher bribes.

6 Regulatory implications

There are several policy implications one can draw from our model. The first implication concerns the design of privatization auctions and the dissemination of information, in particular the cost of information relative to the bidding increment. Auctions designed with high bidding increments may give rise to higher public revenues and lower bribes. Intuitively, the higher the bidding increment, the more costly a wrong bid, and the more useful is information. Low cost information will reduce the unfair advantage of the colluding bidder and will make it more likely that higher prices should be attained in auctions. In particular, if the cost of information is less than a quarter of the bidding increment, then there is no way that an official can manipulate the outcome of the auction by strategically releasing information to a favorite bidder.

Thus, incremental bids are beneficial by leaving some profit on the table to bidders which induces information acquisition. It is a natural question to ask, however, whether there are alternative mechanisms to achieve this goal. One such mechanism would be subsidizing information acquisition by bidders or subsidizing the cost of producing information. Since subsidies can distort the incentives to produce quality information and can lead to inefficiencies,

it is unclear whether subsidization would be a less costly mechanism than the setting of high bidding increments.

The second, perhaps most striking implication of our model concerns the choice of privatization mechanisms. A general implication of our theory is that the choice of privatization mechanism depends on the availability and dissemination of information and the severity of political constraints. Our model suggests that in economies or in industries where information is widely available, valuation is straightforward and political constraints do not matter, auctions and private negotiations are equally successful in raising revenues. In contrast, in economies or industries where information is scarce, valuation is highly uncertain and political constraints are present, then one or the other mechanism emerges as the winner. The crux of the issue is the recognition that a corrupt official will be corrupt whether he is negotiating in private or organizing an auction. Whereas an official can both compromise auctions and private negotiations he or she has much less direct control of the outcome of an auction than the outcome of private negotiations. Whereas private negotiations can attain the price corresponding to the official's constrained optimum, the expected winning bid in the corresponding auction may very well exceed or fall short of the agent's target.

It is interesting to note how the agent's bargaining power α, affects the public revenues generated by the two mechanisms. The higher the privatization official's bargaining power is, the less likely it is that he will voluntarily disclose information and the more likely it is that he will collude with one of the bidders regardless of the mechanism used. Thus, a higher α may actually translate into lower public revenues.

Notice also that whereas α does not affect the outcome of the auction directly, only through the official's decision concerning the disclosure of information, it directly influences the price attained through private negotiations. Given that the privatization agent colludes with one of the bidders, the more bargaining power the agent has, or the better negotiating skills he possesses, the more public revenues private negotiations generate.

It is interesting to relate our paper to Dewenter and Malatesta (1997) who analyze the outcomes of privatizations in several countries and compare the returns to IPOs in the private sector to those in the public sector in various industrialized and developing countries. Although Dewenter and Malatesta (1997) study stock market privatizations and our paper focuses on

private negotiations and auctions, both papers aim to examine the effect of the degree of market development on the terms of privatizations. Dewenter and Malatesta (1997) find that both raw returns and market adjusted returns are generally much higher in Hungary, Malaysia, Poland and Thailand than they are in Canada, France, Japan and the U.K. This finding is consistent with the setting of our model, since in the former countries markets are less transparent and more amenable to the type of collusion we describe. Furthermore, the private and government sector are generally quite intertwined in these countries. Dewenter and Malatesta also document a significant positive relationship between a variable indicating "primitive capital markets" and market adjusted returns in privatizations, which is again consistent with the thrust of our model.

We have studied privatization auctions and private negotiations led by a potentially corruptible government agent. Another interesting question to analyze is whether hiring an investment bank or a consulting firm can substantially alter the relationship between the seller's agent and the bidders in the privatization process. Depending on the information partition and the negotiating skills of the investment banker there are several cases to be considered.

If the investment banker is perfectly motivated by reputational considerations, then Proposition 2 applies and auctions will be as good in raising revenues as private negotiations. If, however, the investment banker is interested in providing special treatment to a favorite customer, then we are back in the setting of the approachable agents.

Obviously if both agents are approachable, then they may collude with each other, in which case our analysis in Section 4 and 5 would directly apply. If they refuse to collude with each other, then each can compete away the other's rents. For example, if the official, the investment banker and the research company are equally informed and the investment banker is conducting an auction, then the investment banker will disclose information to one or both bidders and one of two cases will apply: (i) The official and the investment banker would secretly collude with a bidder; or (ii) The official would publicly disclose information (even if the investment banker would not). In either case more revenues are raised when an investment banker or a consulting firm is hired to conduct the auction.[12] When the investment banker is conducting private negotiations, then unless the official and the investment banker decide to collude, the official will disclose all information publicly even if the investment banker would prefer not to.

[12] The only exception is when $c < \varepsilon/4$ and when information disclosure is not mandated. In this case, revenues are the same whether or not an investment banker is hired to conduct the auction.

Suppose that the official is better informed than the investment banker and the research company (for example the official knows the sequencing of future privatization and the others do not). Suppose furthermore that the official and the investment banker would not collude with each other. Then in the auction the official may collude with a bidder or may make the information public. When the investment banker is conducting private negotiations, the official may disclose his information publicly or may collude with the chosen bidder in exchange for a bribe. In the latter case even if the investment banker is a better negotiator than the official, it is possible that the hiring of an investment banker leads to lower prices. As we pointed out earlier in this section, a higher α may actually translate into lower public revenues by making it less likely for the investment banker to publicly disclose information.

Finally if the official has less precise information than the investment banker or the research company, then his decision to disclose information publicly or privately will affect the outcome of the auction but may not affect the outcome of the private negotiations. For example, if the expected value of the company conditional on the official's information is less than the price the investment banker would negotiate, then the official's action will not influence the outcome of the negotiations.

Since a foreign investment banker is less likely to collude with the government agent (but equally likely to collude with a bidder, especially with foreign bidders), our discussion above can be interpreted to imply that hiring a foreign investment bank to conduct privatization auctions or private negotiations is likely to increase the transparency of the privatization process. On the other hand, a foreign investment bank is likely to hire well-connected resident experts to conduct the auctions or the negotiations. Since these experts may themselves be inclined to collude with the government agent, it is unclear to what extent the hiring of an investment banker (domestic or foreign) would benefit the privatization process.

7 Further discussion of related literature

Laffont and Tirole (1993) that is perhaps the closest to our analysis, investigate auction design when a supervisory agent can collude with a public utility bidding for a procurement contract. The authors consider a situation wherein the principal – a social welfare maximizing government – aims to award a procurement contract to the company with the lower cost or higher quality or

both. The cost, and the quality, are private information of the bidding firms, and the government appoints a supervisor to make inferences about these parameters. Since the supervisor may be tempted to collude with one of the bidding parties, the social welfare maximizing government may wish to bias the auction in favor of the party who is presumed not to have taken part in any collusion. In contrast to the Laffont and Tirole (1993), the information problem in our model is with respect to the value of the company.

Our paper is also related to the literature on the sale by auction of mineral rights on a tract of offshore territory (Wilson (1967), Milgrom and Weber (1982), Engelbrecht-Wiggans, Milgrom and Weber (1983), Hendricks, Porter and Tan (1993), Hendricks, Porter and Wilson (1994)). Wilson (1967), Milgrom and Weber (1982), Engelbrecht-Wiggans, Milgrom and Weber (1983), Hendricks, Porter and Tan (1993), Hendricks, Porter and Wilson (1994) investigate asymmetric auctions in which all of the bidders have access to publicly available geological data but one of the bidders has additional proprietary information acquired as result of work performed on an adjacent tract. Wilson (1967) introduces the model of auctions with asymmetric information. Engelbrecht-Wiggans, Milgrom and Weber (1983) characterize the equilibrium solution for the case when the set of possible values for the mineral rights and the set of allowable bids coincide. The authors find that the informed bidder bids his assessment of the true value in equilibrium. Their novel result, however, does not extend to the case when the set of values are coarser or finer than the set of allowable bids (our case). Milgrom and Weber (1982) focus on the value of acquiring additional information in the asymmetric auction setting of Wilson (1967) and Engelbrecht-Wiggans, Milgrom and Weber (1983). The authors find that the informed bidder's profit rises when he gathers more information, and the increase is greater when it is publicly known that he has gathered additional information. In contrast, the uninformed would prefer to collect information secretly. If the seller has access to some of the informed bidder's information, he can raise the price by making it public, whereas if the seller's information is complementary to that of the better informed bidder, then publicizing his information, the seller would lower the expected price. In our setting of costly information, acquisition of information by the uninformed only raises the expected price in the auction but yields no profit to the bidder himself regardless of how the information was collected. Moreover, in contrast to the revenue-maximizing seller in Milgrom and Weber (1982) who has no conflict of interest and who would not collude with any of the bidders, our seller, facing political constraints and agency problems, is not necessarily better off by making the informed bidder's information public. Since a seller has

less control over the outcome of an auction than over the outcome of private negotiations, we come up with the surprising conclusion that private negotiations often dominate auctions.

Taking the analysis of Wilson (1967) and Engelbrecht-Wiggans, Milgrom and Weber (1983) one step further, Hendricks, Porter and Tan (1993) investigate the optimality of simultaneous first-price sealed-bid auctions versus posted sale mechanisms for federal offshore lease sales. Hendricks, Porter and Tan (1993) find that simultaneous first-price auctions dominate posted sale mechanisms. The intuition is that in the posted sale mechanism the informed bidder can send a sufficiently large number of "dummy" firms and thereby drive out the uninformed firms whereas in the first-price sealed-bid auction an informed bidder has no incentive to send more than one representative since only the highest bid matters. The authors do not consider private negotiations. Their intriguing result that auctions dominate posted sale mechanisms is not applicable to privatization auctions in emerging market economies, however, since in these auction bidders are typically prescreened and preselected. Hendricks, Porter and Wilson (1994) generalize their result to simultaneous first price auctions with random reservation price.

In the context of the selling of a company or a fraction thereof, Bulow and Klemperer (1996) and Novaes (1995) study the implications of mechanism design. Bulow and Klemperer (1996) show that auctions dominate private negotiations from the seller's point of view since an auction can always attract additional bidders and thereby attain higher prices ex ante than private negotiations. Novaes (1995) finds that selling the firm directly to the manager, who knows the value of the company, is optimal for shareholders, who do not know the value of the company, only if the board of directors can commit to acquire information in case the manager does not pay the asking price. If this commitment is not possible then shareholders are better off with a sealed-bid second price auction. Novaes (1995)'s setting is that of a collusion between potential buyers in an asymmetric auction setting with a seller (the board of directors) who has no discretion over information, whereas ours is that of a collusion between buyers and a seller, who has discretion over information. Bulow and Klemperer's result does not apply in our privatization setting where potential bidders come from a tight group of insiders and are screened well in advance to assure that they can raise the necessary funds to finance the deal.

In a completely different setting from this paper, Manelli and Vincent (1995) obtain a result that is similar in spirit to ours. Manelli and Vincent (1995) study procurement contracts when, unlike in our paper, the seller has better information about the quality of the good to be

sold than the buyer does ex ante and a court can not verify quality ex post. Their model is most concerned with the adverse selection aspect of procurement contracts. Interestingly enough, the authors find that if the potential from trade is large and if the buyer values marginal quality more than the sellers, then arbitrarily selecting a seller and tendering a take-it-or-leave-it offer maximizes expected social surplus – competition among sellers can not be exploited to improve upon this outcome. On the other hand, if sellers value marginal quality more than the buyer, an auction is the optimal institution.

8 Concluding Remarks

This paper has analyzed the privatization process within an agency framework. We have focused on the role of a privatization agent and demonstrated that a potential agency conflict may substantially affect the choice of privatization mechanism. An agency problem spanned by political constraints has interesting implications. Private negotiations raise more value than auctions when the agent in charge highly values staying in office and uses his bargaining power to negotiate his target price. Alternatively, when conducted by a less motivated agent who would not put pressure on the bidders to raise the price, auctions raise more revenues than private negotiations. The presence of other bidders in the auction, regardless of how informed they are, induces competition and places a lower bound on the equilibrium winning bid. Our research highlights how the economic setting, the effectiveness of the political process, the severity of the political constraints and the availability of information affect the choice of mechanism between privatization auctions and private negotiations. Moreover, our theory sheds some light to the puzzling statistics shown in Figure 1 demonstrating the widespread use of private negotiations in economies where political constraints are significant.

Appendix

Proof of Proposition 4:

Step 1: Information purchase ($c \leq \hat{I}/4$).

Whenever the uninformed purchases information, then with probability 1/2 he learns that he is bidding for the good company. Since disclosure rules are in effect, his information acquisition is disclosed to the colluding parties. Consequently, both bidders bid $\overline{v}-\in$ in perfect equilibrium (Proposition 1) and the non-colluding party makes a gross profit of $\in$ with

probability 1/2. Consequently, it is only worthwhile for the uninformed to purchase information if $c \leq \hat{I}/4$.

Step 2: No information purchase ($c > \hat{I}/4$). Nonexistence of pure strategy equilibrium.

Suppose the uninformed bids b_u and the informed bids $\underline{v}$ or b_i conditional on the value of the company. If the informed bids more than E(v) for the good company then the uninformed bidder's best response is to bid $\underline{v}$ (any above $\underline{v}$ bid would bring an expected loss to the uninformed). However, if the uninformed bids $\underline{v}$, then the informed's best response is to bid $\underline{v} + \in$ for the good company. If the informed bids less than E(v) then the uninformed's best response is to outbid him. However, for any bid by the uninformed, the informed's best response to outbid him whenever they bid for the good company. Finally, if the informed bids E(v) for the good company, then the uninformed will stay away from this bid. Consequently, there exists no pure strategy equilibrium.

Step 3: Characterization of the perfect equilibrium when $c > \in/4$.

The perfect equilibrium can be computed using iterated elimination of weakly dominated strategies. In a perfect equilibrium the only strategies that are played with positive probabilities are those that survive iterated elimination of weakly dominated strategies. Bidding $\underline{v}$ for the good company is strongly dominated for the colluding bidder. Bidding more than $\underline{v}$ for the bad company is weakly dominated for the colluding bidder. Bidding more than E(v) is weakly dominated for the noncolluding bidder. Taking the iteration one step further, bidding more than E($v + \in$) is also weakly dominated for the colluding bidder. If the colluding party bids E(v) or above with positive probability for the good company then the noncolluding party will never bid E(v) since bidding E(v) would yield him an expected loss.

Step 4: Uniqueness when $c > \in/4$.

It follows from step 3 that there exists $\tilde{b}^C \in (\underline{v}, \bar{v})$ such that for every $b^C > \tilde{b}^C$ $BR^N(b^C) = \underline{v}$ where BR^N is the best response correspondence for the noncolluding party. We select the smallest of these $\tilde{b}^C$s and denote it by $\hat{b}^C$. We know from Step 2 and Step 3 that whenever the noncolluding party bids between $(\underline{v}, \bar{v} - 2\in)$ the colluding party's best response is to outbid him. Similarly, whenever the colluding party's strategy specifies an expected bid $b^C < \hat{b}^C$, it is the noncolluding party's best response to outbid him. Consequently, for any $b^C < \hat{b}^C$, the hyperplane $b^C = b^N$ would separate $(BR^C)^{-1}$ and BR^N where $(BR^C)^{-1}$ is the inverse correspondence of the colluding party's best response correspondence. Hence, there exists no

$b^C < \hat{b}^C$, such that $BR^C(b^N) = BR^N(b^C))^{-1}$. Since from step 3 we know that there exists no b^N such that $BR^C(b^N) = \underline{v}$, therefore, $\hat{b}^C$ is the unique solution to $BR^N(b^C) = (BR^C(b^N))^{-1}$. It follows from Step 2 that there exists no Nash equilibrium in which the colluding party would play a pure strategy, therefore, $\hat{b}^C$ must be the outcome of a mixed strategy. Since the colluding bidder would not be willing to play the same nondegenerate mixed strategies against different mixed strategies by the noncolluding bidder there is a unique b^N that solves $BR^C(b^N) = \hat{b}^C$. Consequently, there is a unique perfect equilibrium in mixed strategies. Figure 6 illustrates the equilibrium as an intersection of the bidders' best response correspondences on an example when E(v)=11.

Step 5: The expected price of the good firm is less than $\frac{\underline{v} + \bar{v}}{2}$.

(i) When E(v) is an acceptable bid, it trivially follows from step 3 that no bidder will bid higher than E(v) and that no bidder will bid E(v) with probability 1 for the good company. Consequently, the expected price of the good firm is less than $\frac{\underline{v} + \bar{v}}{2}$.

(ii) When E(v) is not an acceptable bid, then let EV^* and EV_* denote the closest allowable bid that bracket $\frac{\underline{v} + \bar{v}}{2}$ from above and below, respectively. Note that since both $\underline{v}$ and $\bar{v}$ are acceptable bids, $EV^* = \frac{\underline{v}+\bar{v}+\epsilon}{2}$ and $EV_* = \frac{\underline{v}+\bar{v}-\epsilon}{2}$. Then, we need to show that q_I the probability the informed bids EV^* is less than half. For the colluding bidder to bid EV^* it must be the case that the non-colluding bidder bids EV_* with some probability. For the non-colluding bidder to bid EV_* it must be the case that

$$\frac{EV_*}{2} + (\bar{v} - EV_*) \times \Pr ob(EV_*{}^N \, wins) \geq 0,$$

$$\Pr ob(EV_*{}^N \, wins) \geq \frac{EV_*}{2(\bar{v} - EV_*)}.$$

Since $\frac{EV_*}{\bar{v} - EV_*} \geq$ ½, therefore, $Prob(EV_*{}^N \, wins) \geq$ ¼. However, for $Prob(EV_*{}^N \, wins) \geq$ ¼, it must be the case that the noncolluding bidder bids EV^* for the good company with probability less than ½. But if it is the case, then the expected winning bid for the good company is less than *E(v)*.

Obviously, the colluding party may not bid as high as EV^* with positive probability in which case the expected winning bid is even lower. ♦

Proof of Proposition 5:

Step 1: $c \leq \frac{\in}{4}$

The official is better off disclosing information to both bidders than not disclosing it to anyone. He gets no bribe either way, but in the former scenario he is more likely to stay in office. This so since an uninformed would never bid $\bar{v} - \in$ with probability 1 regardless of what his beliefs are about the other bidder. The official's expected gain from disclosing information to both bidders as opposed to none is bounded from below by $(p(\frac{\bar{v}-\underline{v}}{2}) - p(\in)) \times \frac{W}{2}$. Whenever $c \leq \in /4,$ revealing information to one bidder dominates revealing information to both or none of the bidders. This is because when the official reveals information to one bidder then the non-colluding bidder will purchase information, the bids will tie at $\bar{v} - \in$ for the good company and when the colluding bidder wins, the official also gets a side-payment.

Step 2: $c > \frac{\in}{4}$. Revealing information to one, both or none of the bidders may raise the same revenue when $c > \frac{\in}{4}$. However, the official strictly prefers revealing information to one bidder only to his other options since this is the only way he can receive an additional side-payment.

Consequently, not revealing information to any bidder is not part of any perfect equilibrium. ♦

Proof of Proposition 6:

The proof of (i) is straightforward (see Section 3) and is omitted.

(ii) The price the privatization official negotiates will exceed *E(v)*. Since the expected winning bid in the auction is less then *E(v)* (see Proof of Proposition 4), the negotiated price will exceed any equilibrium winning bid in the auction.

The proof of (iii) and (iv) is straightforward (see examples on pages 22-23) and is omitted. ♦

Proof of Corollary 1:

It follows from the Proof of Proposition 4 that in the auction $\underline{v} + \in$ will be a winning bid for the good company with positive probability in the perfect equilibrium when $c > \in /4$. Whenever the price at which the utility of the privatization agent is maximized exceeds $\underline{v}$ then private negotiations will attain at least $\underline{v} + \in$. It also follows from the Proof of Proposition 4 that

the highest winning bid for the good company in the auction is EV^*. Consequently, if the price at which the utility of the privatization agent is maximized exceeds EV^*, then the negotiated price will exceed any price attainable through auction.

Proof of Proposition 7:

The proof of Step 1, 2, 4 and 5 are identical to that of Step 1, 2, 4 and 5 in Proposition 4 and are omitted. The proof of Step 3 is shown below.

Step 3: $\in / 4 < c < \max\left\{\frac{\bar{v}-EV^*}{4}, \frac{\bar{v}-EV^*-\in}{2}\right\}$

If the colluding party plays his equilibrium strategy derived in the proof of Proposition 4, then it is worthwhile for the uniformed to purchase information and to outbid him as long as the conditions of Proposition 7 hold. On the other hand, given that the non-colluding party purchases information then the colluding party's best response is to outbid him so that the resulting winning bid for the good company will be $\bar{v}-\in$ (see also Proposition 1). If, on the other hand, the non-colluding party bids $\bar{v}-\in$ for the good company then the non-colluding party will never purchase any information as long as

$c \geq \in / 4$. However, if the non-colluding party will never purchase any information then the colluding party will bid the same as in Proposition 4. Consequently, the non-colluding party will purchase information with some probability (less than 1) in any perfect Nash equilibrium and the winning bids will exceed those in Proposition 4. ♦

Proof of Proposition 8:

Step 1: $c < \frac{\in}{4}$. The official is at least as well off or is better off by disclosing information to both bidders than by not disclosing information to anyone. When the official discloses information to both bidders, they bid $\bar{v}-\in$ for the good company with probability 1 (see Proposition 1). When the official does not disclose information to anyone than depending on the bidders' information acquisition and their beliefs about the other bidder's information they bid $\bar{v}-\in$ for the good company with probability 1 or less (see Proposition 1) and they bid less otherwise.

Step 2: $c \geq \frac{\in}{4}$. Revealing information to one, both or none of the bidders may raise the same revenue when $c \leq \frac{\in}{4}$. However, the official strictly prefers revealing information to one bidder only to his other options since this is the only way he can guarantee his side-payment.

Consequently, not revealing information to any bidder is not part of any mixed strategy Nash equilibrium. ♦

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