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Abstract

This paper investigates the design of privatization mechanisms in emerging market economies. We identify an emerging market economy by the 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 apparantly suboptimal privatization mechanism: private negotiation.

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 succesful 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 a privatization 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 further find 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 noncolluding 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 increased academic attention on the design of markets and institutions (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 (Frydman and Rapaczynsky (1993)) and documents the use of numerous 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 which privatization mechanism to use 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 were held by the Department of Transportation to sell the government's 85 percent 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.

One interesting aspect of privatization in emerging market economies is the extent to which the privatization agent controls the flow of information about the company. Privatization in emerging market economies 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

[1] A commonly used privatization mechanism for small and medium-sized companies in Hungary, called

privatization agency. In either case the privatization agent is in a position to potentially monopolize information about the company. 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[2]. Ten different information sources may be circulating while the eleventh with the most relevant information remains hidden.

There are several alternative scenarios that may follow. Being in charge, the manager may have access to this eleventh source of superior information about the company's assets that he may choose to disclose to a favorite bidder only. Alternatively, the manager of a state-owned company may be just another government bureaucrat, who is no expert to assess the growth prospects of his company once it is privatized since running a state-owned company in a centralized economy is an altogether different task from running a private business in a market economy. Nevertheless, the bureaucrat (the manager-bureaucrat or the privatization agency bureaucrat) can arrange for a screening of the company before it is offered for sale. Once informed, the bureaucrat may be tempted to withhold part of the information so as to entrench himself (Shleifer and Vishny (1989)). Alternatively, the bureaucrat may disclose his information to a favorite bidder. Thirdly, a bureaucrat at the privatization agency may also have vital information about the sequencing of privatization, particularly the privatization of competing businesses that may affect future competition of the firm. The bureaucrat may also know of future government regulations that have the potential of helping or hurting the prospects of this company. Whereas such information quickly becomes public in developed markets, it can be easily monopolized for extended periods in emerging market economies[3]. In our model we are concerned with the impact of

self-privatization, is to appoint the manager of the state-owned firm to privatize his or her company (Major (1994)).

[2]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.).

[3]For a different aspect of how developed markets have advantage in diffusing information as compared to

the privatization agent providing informational advantage to one of the bidders.

Another important aspect of privatization 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. 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. 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. 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)). These two goals are met by aiming to raise a fair price for the company. They 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.

There are several other political factors that the privatization process entails in emerging market economies. First, conflict-of-interest regulations naturally exclude explicit profit-sharing contracts between the Treasury and the politician-bureaucrat in charge of privatization. Profit-sharing contracts with politicians are politically unacceptable in both developed and 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[4]. Finally, beside aiming at a fair price, non-price criteria such as employment,

emerging markets see Berkovitch and Israel (1996).

[4]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

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 may make 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). Unlike open auctions that can always attract additional bidders, potential bidders in privatization auctions of emerging market economies come from a tight group of insiders, some of whom have close ties with those in charge of privatization and are 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. When conducting private negotiations, the privatization agent may target each potential bidder, or a subset of these bidders.

Our paper investigates how much revenues privatization auctions and private negotiations raise in emerging market economies. We find that 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

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 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)).

target price. As long as the agent's target exceed 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 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.

Our 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 private negotiations can surely attain the privatization agent's 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.

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 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 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 side-payments, μ, and private benefits from staying in office, W. The colluding parties split the gains according to an affine sharing rule α so that $\mu = \alpha \times (v - p)$, $\alpha \in (0, 1)$ whenever $v > p$ and 0 otherwise. W captures the value of perks, power and the agent's ability to generate side-payments in the future. The likelihood of the agent staying in office depends on his performance and whether or not public attention is focusing on privatization. The probability of the public focusing privatization issues, π, is assumed to be an increasing function of the value-price differential, $v - p$. That is, the larger the discrepancy is between the value of the company and the price the winner paid for it, the more likely it is that the public attention should turn to privatization issues. The value of π is positive and increasing for $v > p$ and 0 for $v \leq p$. The agent's objective is:

$$\max_{p} \alpha \times (v - p) + (1 - \pi(v - p)) \times W, \tag{1}$$

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

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. Uninformed bidders can decide whether or not to purchase information at a cost c from a research agency who can assess the company's true worth. Our modelling 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 official; or (2) the information purchased from the research company is complementary to the information of the privatization official.

We consider two scenarios: when disclosure laws in the sense of Grossman and Hart (1980) are in effect; (2) when information disclosure is not mandated. When disclosure laws are in effect, parties who purchased information are expected to disclose their information. Otherwise, this information as well as the identity of parties who purchased information remains private information. Naturally, disclosure rules do not bind the colluding bidder. Since bribery is a more serious offense than failing to reveal information, his agreement with the privatization agent is kept in secret. Hence he appears to be uninformed from the point of view of the legal system.

Following this stage the privatization process starts. 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. Bidding in the auction is conducted in multiples of the smallest allowable bidding unit, ϵ, so that one can bid $\underline{v}$, $\underline{v}+\epsilon$, $\underline{v}+2\epsilon$, etc. The company is awarded to the highest bidder. Private negotiations are structured as follows. The official can make an offer to one of the bidders. The offer specifies a price the bidder pays for the company conditional on the value and a split of the profits. If the bidder accepts, he evaluates the company and pays the agreed-upon price. If the bidder rejects, the agent may make the same offer to the other bidder. If both bidders reject, the agent can sweeten his offer or can make the information public.

Once the company is privatized, the price is paid. Side-payments are made according to the agreements. Once the winner starts to operate the company, the value of the company

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

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 disclose all information whenever he values staying in office more than any bribe.

$$W \times (\pi(\overline{v} - \underline{v}) - \pi(\epsilon)) \geq \overline{v} - \underline{v} - \epsilon \tag{2}$$

for every $p \geq \underline{v}$.

If both bidders were perfectly informed of the value of the company then they would bid aggressively and 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 $p = \overline{v} - \epsilon$ 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 $\overline{v} - \epsilon$ 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 $\overline{v} - \epsilon$. Bidding $\overline{v} - \epsilon$ for the company yields an expected profit of $\epsilon/2$ 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 reveals information to both bidders can extract 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* $\overline{v}-\epsilon$ *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 on public revenues. Formally, an agent is approachable if $W \times (\pi(\overline{v}-\underline{v}) - \pi(\epsilon)) < \overline{v} - \underline{v} - \epsilon$. 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, when information disclosure laws are in effect (Section 4) and when they are not in effect (Section 5). We model disclosure rules in the spirit of Grossman and Hart (1980), that is, diclosure rules require that any information that the party have about the value of the company must be reveal it to everybody. Mandatory

information disclosure applies to bidders in takeover contests in the United States (Grossman and Hart (1980)).

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.

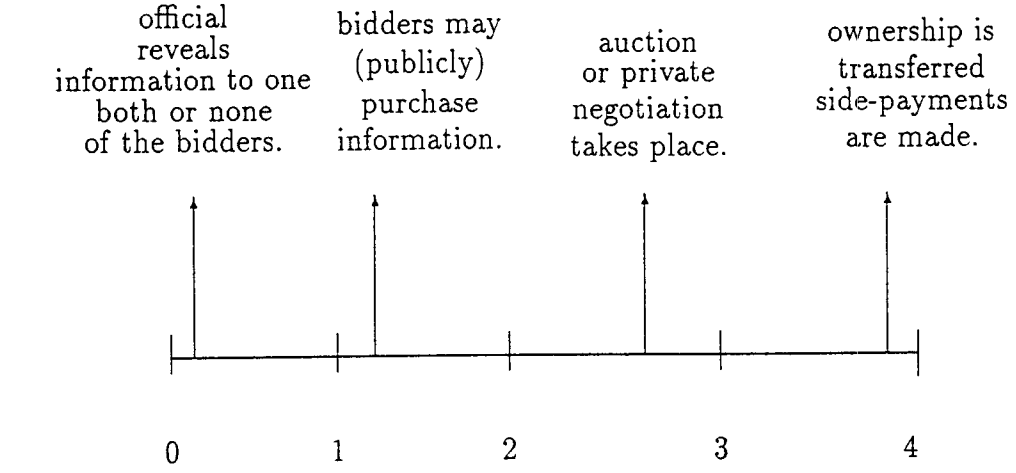


Figure 2: The timing of the model when disclosure rules are in effect.

Since disclosure rules have no impact on the colluding parties who would not comply with them, they enable the colluding parties to fully realize their cost advantage over the non-colluding 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 $c \leq \epsilon/4$, then the noncolluding party always purchases information and the subsequent sealed-bid auction facilitates the transfer of the good company's ownership at price $p = \overline{v} - \epsilon$;

(2) If $c > \epsilon/4$, 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, $\frac{\underline{v}+\overline{v}}{2}$.

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, 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 nonnegligible, 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 would be lower than $\epsilon/4$.

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. We illustrate the equilibrium 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: $\pi(\overline{v}-p) = (\overline{v}-p-\epsilon) \times 0.1$ if $\overline{v}-p \leq 2$ and $\pi(\overline{v}-p) = (\overline{v}-p-\epsilon) \times 0.15$ otherwise. The colluding parties split the profits equally, so α is assumed to be 1/2.

Private negotiations:

The privatization agent's utility function is maximized at a price \$4 million when he expects a bribe of \$1 million. Consequently, he negotiates a price of \$4 million for the good company and pockets a bribe of \$1 million. The colluding bidder makes a profit of \$1 million. When the value of the company is revealed, the agent faces a dismissal with probability 1/5.

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 pur-

chase 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 $\mathbf{q}$ 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 uniformed noncolluding 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, say, 3 for the bad company brings a loss of 2 to the uninformed. Bidding 3 for the good company and getting it yields a profit of 3 to him. When bidding 3, he incurs a loss with probability 1/2. He profits from bidding 3 with probability $q_2 + \frac{q_3}{2}$. We get three equations:

$$4q_2 = 0.5 \tag{3}$$

$$3(q_2 + \frac{q_3}{2}) = 1 \tag{4}$$

$$q_2 + q_3 + q_4 + q_5 = 0.5. \tag{5}$$

Solving them, we get $q_2 = \frac{1}{6}$, $q_3 = \frac{1}{3}$, $q_4 = 0$. That is, in equilibrium, the colluding party bids 3 with probability 2/3 and 2 with probability 1/3 when the company is good. Similar reasoning establishes that for the colluding party bidding 1 yields $\frac{5p_1}{2}$, 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, $p_1 + p_2 + p_3 = 1$. Consequently, if the noncolluding party bids 1 with probability 3/5, 3 with probability 2/5, then the colluding party is indifferent between bidding 2 and 3, prefer either of these bids to 4, and may as well bid 2 with probability 1/3 and 3 with probability 2/3. The colluding party wins 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[5]. 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. 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 \$3.6 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 gets a bribe of \$2 million with probability 1/5, a bribe of \$1.5 million with probability 8/15 and no bribe otherwise. He prefers revealing information to one bidder only since by doing so, he expects the equivalent of \$3.7 million in utility terms. □

So far we 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 the official's choice of mechanism, private negotiations, coincides with revenue-maximization. In an ex ante comparison private negotiations dominate auctions if the price p^* at which the agent's utility is maximized exceeds the expected winning bid in the auction, $E(b^w)$. This can happen for a wide range of preferences,

[5]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.

since the expected winning bid in the auction for the good company is significantly below $\frac{\underline{v}+\overline{v}}{2}$. The more the agent values staying in office or the less approachable he is, the higher the revenues private negotiations generate. First we make an ex ante comparison.

Proposition 6 *Suppose that $c > \frac{\epsilon}{4}$ and the price that maximizes the utility of the privatization official exceeds the expected winning bid in the auction with asymmetrically informed bidders $E(b^w)$, then, depending on the parameter values, one of the following two scenarios emerges:*

(i) 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.

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

Proof: in Appendix.

Proposition 6 implies two scenarios: one scenario (i) in which the privatization agent reveals information to one bidder only regardless of the mechanism used, and a second scenario (ii) when the official's choice of how widely to disseminate information depends on the mechanism used. Interestingly enough, when the privatization official is approachable his choice of how widely to disseminate information may depend on the mechanism used. In scenario (ii) 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. Given his bargaining power to extract bribes, α, he selects the choice which gives him higher utility. When p^* is close to $\overline{v} - \epsilon$, 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 $\overline{v} - \epsilon$.

For the case when the privatization agent reveals information to only one bidder regardless of the mechanism used, 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 $\frac{\underline{v}+\overline{v}}{2}$), private negotiations led by this corrupt official raise more value than the corresponding asymmetric information auction can. 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. Auctions raise more revenues than private negotiations, whenever the price that maximizes the utility of the privatization official falls short of the expected winning bid in the auction with asymmetrically informed bidders $E(b^w)$.

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 $c > \epsilon/4$ and that $p^* > \underline{v} + \epsilon$. 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 $\frac{\underline{v}+\overline{v}}{2}$ 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 the price that maximizes the utility of the privatizatization 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 corruptible, that his most preferred price for a good company is $\frac{\underline{v}+\overline{v}}{2}$, 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 advantegous for the non-colluding party to purchase information.

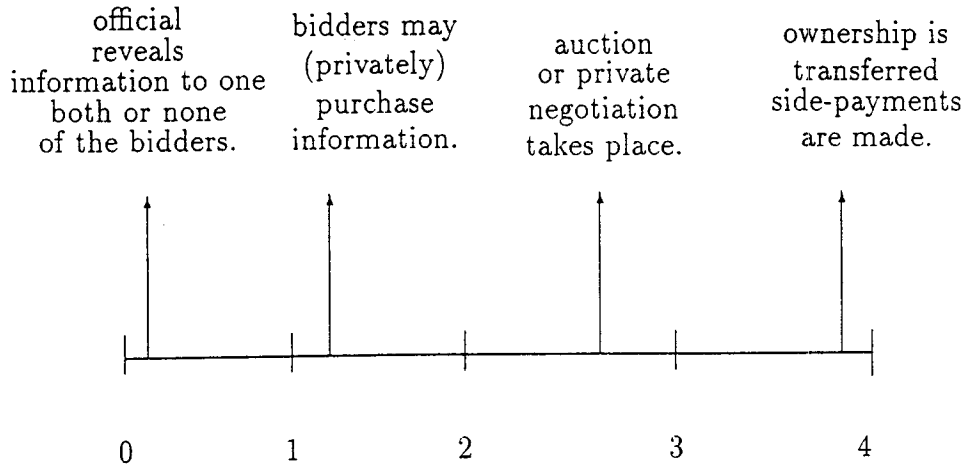


Figure 5: The timing of the model when no disclosure rules are in effect.

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 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 $\frac{\overline{v}+\underline{v}}{2}$ if $\frac{\overline{v}+\underline{v}}{2}$ is an allowable bid, and for the closest allowable bid to $\frac{\overline{v}+\underline{v}}{2}$ from above if $\frac{\overline{v}+\underline{v}}{2}$ 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 $c \leq \epsilon/4$, 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 $p = \overline{v} - \epsilon$;

(2) If $c > max\{\frac{\overline{v}-EV^*}{4}, \frac{\overline{v}-EV^*-\epsilon}{2}\}$ holds, then 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, $\frac{\underline{v}+\overline{v}}{2}$.

(3) If $\epsilon/4 < c < max\{\frac{\overline{v}-EV^*}{4}, \frac{\overline{v}-EV^*-\epsilon}{2}\}$ 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 a 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 $\epsilon/4 < c < max\{\frac{\overline{v}-EV^*}{4}, \frac{\overline{v}-EV^*-\epsilon}{2}\}$ 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[6]. 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.

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

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 agressively 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 noncolluding 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 noncolluding party when he is 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 $(3q_2 + \frac{q_3}{2}) - 1$ and is dominated by buying information and bidding 3 for the good company only, a strategy that yields $(3q_2 + \frac{q_3}{2}) - 0.75$. 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 noncolluding party $2(q_2 + q_3 + \frac{q_4}{2}) - 0.75$, whereas bidding 4 would yield an uninformed noncolluding party $2(q_2 + q_3 + \frac{q_4}{2}) - 2$.

Solving the corresponding optimization problem we get $p_1 = 3/7$, $p_2 = 0$, $p_3 = 2/7$, $p_4 = 2/7$, and $q_1 = 0$, $q_2 = 1/4$, $q_3 = 0$, $q_4 = 1/4$. That is, the noncolluding party purchases information with probability 4/7 and bids either 3 or 4 for the good company with probability half each. 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.

Bidders bid more agressively 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 agressively. In contrast, if c were to exceed \$2 million, the noncolluding party would never purchase information and would bid the same as in Example 1.

The noncolluding 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 \$3.6 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 gets a bribe of $2 million with probability 3/14, a bribe of $1 million with probability 3/7 and no bribe otherwise. He prefers revealing information to one bidder only since by doing so, expects $3.7 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 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, whenever $c > \epsilon/4$ and that the price that maximizes the utility of the privatizatization official 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 of information to a favorite bidder.

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 in 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, depending on the agent's

preferences, 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 for extracting bribes, α, affects the public revenues generated by the two mechanisms. The higher the privatization official's bargaining power is, the less likely that he voluntarily discloses information and the more likely that he colludes with one of the bidders regardless of the mechanism used. Given that the privatization agent colludes with one of the bidders, the lower α is, the higher the price he demands through private negotiations. Whereas α does not affect the outcome of the auction, it influences the price attained through private negotiations. Hence, the more bargaining power the agent has for extracting bribes, the less public revenues private negotiations generate.

7 Further discussion of related literature

Laffont and Tirole (1993) in a paper 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 Wil-

son (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 simultanous 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 mechanism in privatizating a company. An agency problem spanned by political constraints have interesting implications. Private negotiations raise more value than auctions when the agent in charge highly values staying in office and use 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 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 affects the choice of mechanism between privatization auctions and private negotiations. Moreover, our theory sheds some light to the puzzling statistics shown in Figure 1 of why private negotiations may be frequently used in economies where political constraints are significant.

Appendix

Proof of Proposition 4:

Step 1: Information purchase. ($c \leq \epsilon/4$)

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 $\overline{v} - \epsilon$ in perfect equilibrium (Proposition 1) and the noncolluding party makes a gross profit of ϵ with probability 1/2. Consequently, it is only worthwhile for the uninformed to purchase information if $c \leq \epsilon/4$.

Step 2: No information purchase ($c > \epsilon/4$). 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 $\underline{v}+\varepsilon$ 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 form this bid. Consequently, there exists no pure strategy equilibrium.

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

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 $E(v+\epsilon)$ 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 $c > \epsilon/4$.

It follows from step 3 that there exists $\tilde{b}^C \in (\underline{v}, \overline{v})$ 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 $(\underline{v}, \overline{v} - 2\epsilon)$ 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 $b^C \overline{<} \hat{b}^C$, 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 $\frac{\underline{v}+\overline{v}}{2}$.

(i) When $E(v)$ is an acceptable bid, it trivially follows from step 3 that no bidder will 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 $\frac{\underline{v}+\overline{v}}{2}$.

(ii) When $E(v)$ is not an acceptable bid, then let EV^* and EV_* denote the closest allowable bid that bracket $\frac{\underline{v}+\overline{v}}{2}$ from above and below, respectively. Note that since both $\underline{v}$ and $\overline{v}$ are acceptable bids, $EV^* = \frac{\underline{v}+\overline{v}+\epsilon}{2}$ and $EV_* = \frac{\underline{v}+\overline{v}-\epsilon}{2}$. 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 noncolluding bidder bids EV_* with some probability. For the

noncolluding bidder to bid EV_* it must be the case that

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

$$Prob(EV_*^N wins) \geq \frac{EV_*}{2(\overline{v} - EV_*)}.$$

Since $\frac{EV_*}{\overline{v}-EV_*} \geq \frac{1}{2}$, therefore, $Prob(EV_*^N wins) \geq \frac{1}{4}$. However, for $Prob(EV_*^N wins) \geq \frac{1}{4}$, it must be the case that the noncolluding bidder bids EV^* for the good company with probability less than $\frac{1}{2}$. 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: $c \leq \frac{\epsilon}{4}$.

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 $\overline{v} - \epsilon$ 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 $(\pi(\frac{\overline{v}-\underline{v}}{2}) - \pi(\epsilon)) \times \frac{W}{2}$. Whenever $c \leq \epsilon/4$, 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 noncolluding bidder will purchase information, the bids will tie at $\overline{v} - \epsilon$ for the good company and when the colluding bidder wins, the official also gets a side-payment.

Step 2: $c > \frac{\epsilon}{4}$. Revealing information to one, both or none of the bidders may raise the same revenue when $c > \frac{\epsilon}{4}$. 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 (ii) is straightforward and is omitted.

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

Proof of Corollary 1:

It follows from the Proof of Proposition 4 that in the auction $\underline{v} + \epsilon$ will be a winning bid for the good company with positive probability in the perfect equilibrium when $c > \epsilon/4$. Whenever the price at which the utility of the privatization agent is maximized exceeds $\underline{v}$ then private negotiations will attain at least $\underline{v}+\epsilon$. 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: $\epsilon/4 < c < max\{\frac{\overline{v}-EV^*}{4}, \frac{\overline{v}-EV^*-\epsilon}{2}\}$

If the colluding party plays his equilibrium strategy derived in the proof of Proposition 4. Then it is worthwhile for the uninformed to purchase information and to outbid him as long as the conditions of Proposition 7 hold. On the other hand, given that the noncolluding 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 $\overline{v} - \epsilon$ (see also Proposition 1). If, on the other hand, the noncolluding party bids $\overline{v} - \epsilon$ for the good company then the noncolluding party will never purchase any information as long as $c \geq \epsilon/4$. However, if the noncolluding party never purchases any information then the colluding party will bid the same as in Proposition 4. Consequently, the noncolluding 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: $c < \frac{\epsilon}{4}$. The official is at least as well off or is better off by diclosing information to both bidders than by not disclosing information to anyone. When the official discloses information to both bidders, they bid $\overline{v} - \epsilon$ for the good company with probability 1 (see Proposition 1). When the official does not disclose information to anyone then depending on the bidders' information acquisition and their beliefs about the other bidder's information they bid $\overline{v} - \epsilon$ for the good company with probability 1 or less (see Proposition 1) and they bid less otherwise.

Step 2: $c \geq \frac{\epsilon}{4}$. Revealing information to one both or none of the bidders may raise the same revenue when $c \leq \frac{\epsilon}{4}$. 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. □

References

[1] Baldwin, C. Y. and S. Bhattacharyya, 1991, "Choosing the Method of Sale: a Clinical Study of Conrail", *Journal of Financial Economics*, 30: 69–98.

[2] Berkovitch, E. and R. Israel, 1996, Optimal Bankruptcy Laws across Different Economic Systems, Working Paper, University of Michigan

[3] Boycko, M., A. Shleifer and R.W. Vishny, 1994, "Voucher Privatization", *Journal of -Financial Economics*, 35: 249–266.

[4] Bulow, J. and P. Klemperer, 1996, "Auctions and Negotiations", *American Economic Review*,

[5] Diamond, D., 1996, Liquidity, Banks and Markets: Effects of Financial Development on Banks and the Maturity of Financial Claims, Working Paper, University of Chicago

[6] Engelbrecht-Wiggans, R., P. R. Milgrom and R. J. Weber, 1983, "Competitive Bidding and Proprietory Information", *Journal of Mathematical Economics*, 11: 161–169.

[7] Fluck, Z., K. John and S. A. Ravid, 1995, "Privatizing in Stages and the Dynamics of Ownership Structure", *Pacific-Basin Finance Journal*, 4, 277–296.

[8] Frydman, R. and A. Rapaczynski, 1991, "Markets and Institutions in Large-Scale Privatization", in V. Corbo, F. Coricelli and J. Bossac, eds: *Reforming Central and Eastern European Economies*, Washington D.C: The World Bank.

[9] Frydman, R., A. Rapaczynski, J.E. Earle et al., 1993, *The Privatization Process in Central Europe*, New York: Central European University Press.

[10] Grossman, S. and O. Hart, 1980, "Disclosure Laws and Takeover Bids", *Journal of Finance*, 35, 323–334.

[11] Hendricks, K., R. H. Porter and C. A. Wilson, 1993, "Optimal Selling Strategies for Oil and Gas Leases with an Informed Buyer", *American Economic Review Papers and Proceedings*, 83: 234–239.

[12] Hendricks, K., R. H. Porter and G. Tan, 1994, "Auctions for Oil and Gas Leases with an Informed Bidder and a Random Reservation Price", *Econometrica*, 62: 1415–1444.

[13] La Porta, R., F. Lopez de Silanos, A. Shleifer and R. Vishny, 1996, Law and Finance, Working Paper, Harvard University

[14] Major, I., 1994, "The Constraints on Privatization in Hungary: Insufficient Demand or Inelastic Supply?", *Most*, 4: 107–146.

[15] Manelli, A. M. and D. R. Vincent, 1995, "Optimal Procurement Mechanism", *Econometrica*, 63: 591–620.

[16] Milgrom, P. and R. J. Weber, 1982, "The Value of Information in a sealed-bid auction", *Journal of Mathematical Economics*, 10: 105–114.

[17] Milgrom, P. and J. Roberts, 1990, "Bargaining and Influence Costs and the Organization of Economic Activity", in J. Alt and K. Shepsle, eds: *Perspectives on Positive Political Economy*, Cambridge: Cambridge University Press, Ch. 3.

[18] "The Politician", Heti Vilaggazdasag (Weekly World Economy), January 25, 1997, Page 9 (in Hungarian)

[19] "The Revenge of the Nerds", *The Economist*, July 23rd, 1994.

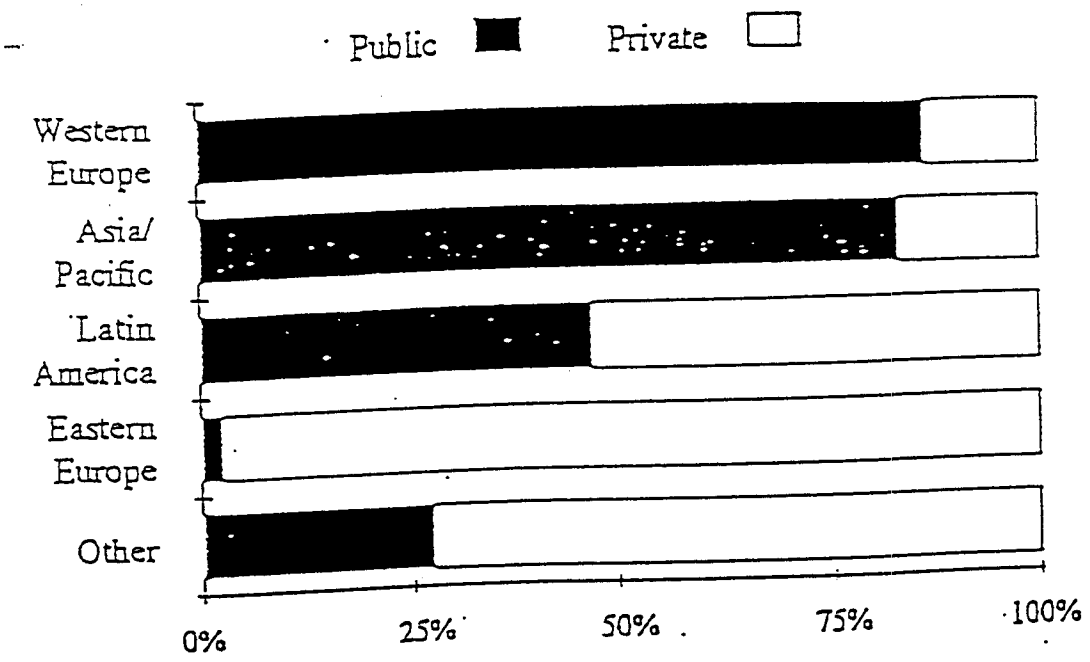
[20] Shleifer, A. and R. Vishny, 1989, "Management Entrenchment: The Case of Manager-Specific Investment", *Journal of Financial Economics*, 25: 123–139.

[21] Titman, S. and A. Subrahmanyam, 1997, IPOS, spinoffs and the Development of Financial Markets, Working Paper, Boston College

[22] Wilson, R., 1967, "Competitive Bidding with Asymmetric Information", *Management Science*, 13: A816–A820.

Exhibit 1

Privatization Worldwide: 1993
Public Equity Offerings vs. Privately Negotiated Deals
Based on Gross Proceeds Raised



Source: *International Privatization Update*, January 1994

The joint distribution of bids for the good company when disclosure rules are in effect

C / N	1	2	3	N bids	N wins
1	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	0
2	0	0	0	0	0
3	0	$\frac{2}{15}$	$\frac{4}{15}$	$\frac{2}{5}$	$\frac{4}{15}$
C bids	0	$\frac{1}{3}$	$\frac{2}{3}$		
C wins	0	$\frac{1}{5}$	$\frac{8}{15}$		

C: colluding bidder

N: noncolluding bidder

Table 1

The joint distribution of bids for the good company when no disclosure rules are in effect

N \ C	1	2	3	4	N bids	N bids
$\bar{1}$	0	$\frac{3}{14}$	0	$\frac{3}{14}$	$\frac{3}{7}$	0
2	0	0	0	0	0	0
3	0	$\frac{1}{7}$	0	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$
4	0	$\frac{1}{7}$	0	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{14}$
C bids	0	$\frac{1}{2}$	0	$\frac{1}{2}$		
C wins	0	$\frac{3}{14}$	0	$\frac{3}{7}$		

C: colluding bidder

N: noncolluding bidder

Table 2

Figure 3

JOINT DISTRIBUTION OF WINNING BIDS (DISCLOSURE RULES IN EFFECT)

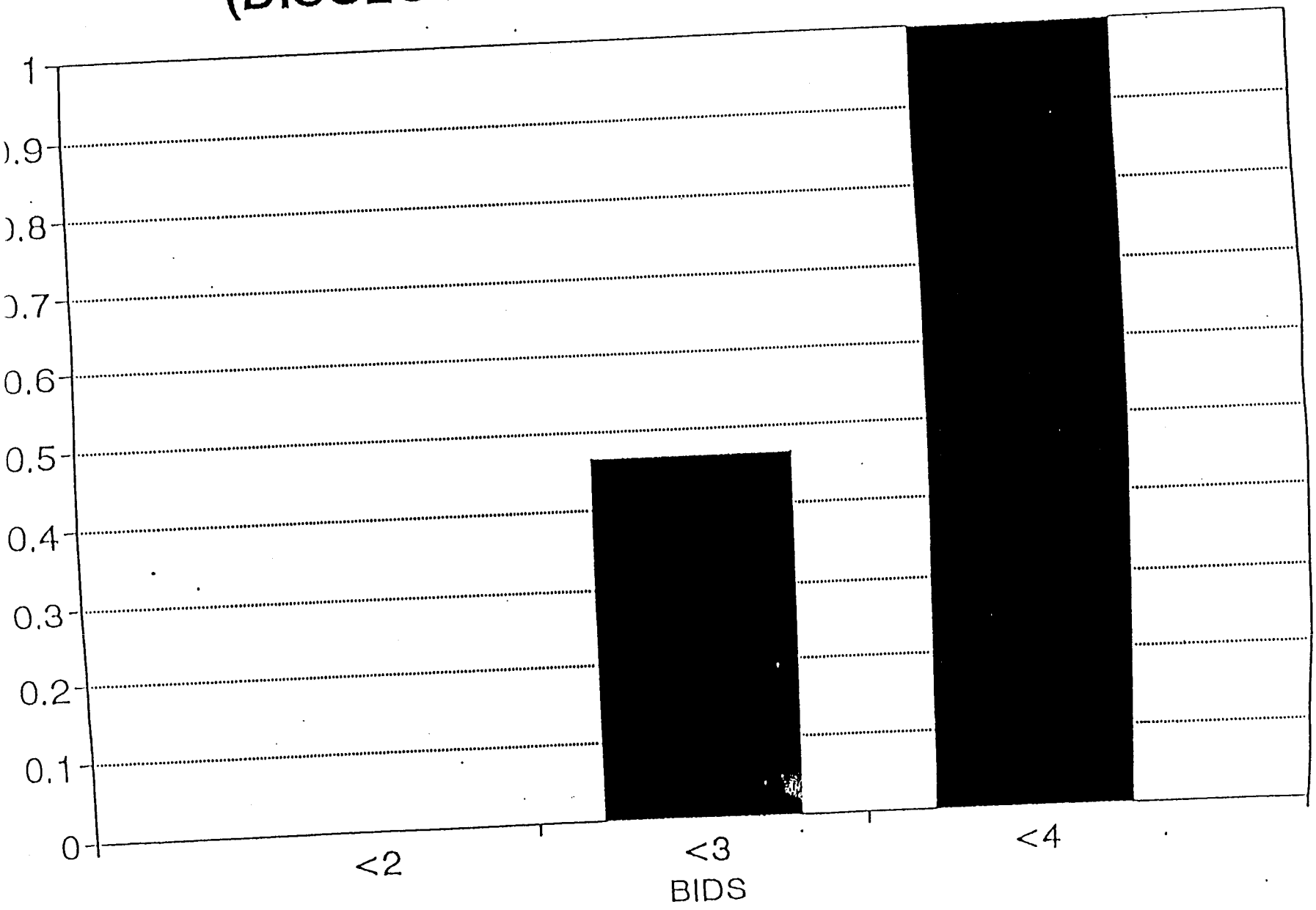


Figure 4

JOINT BIDS FOR GOOD COMPANY (DISCLOSURE RULES IN EFFECT)

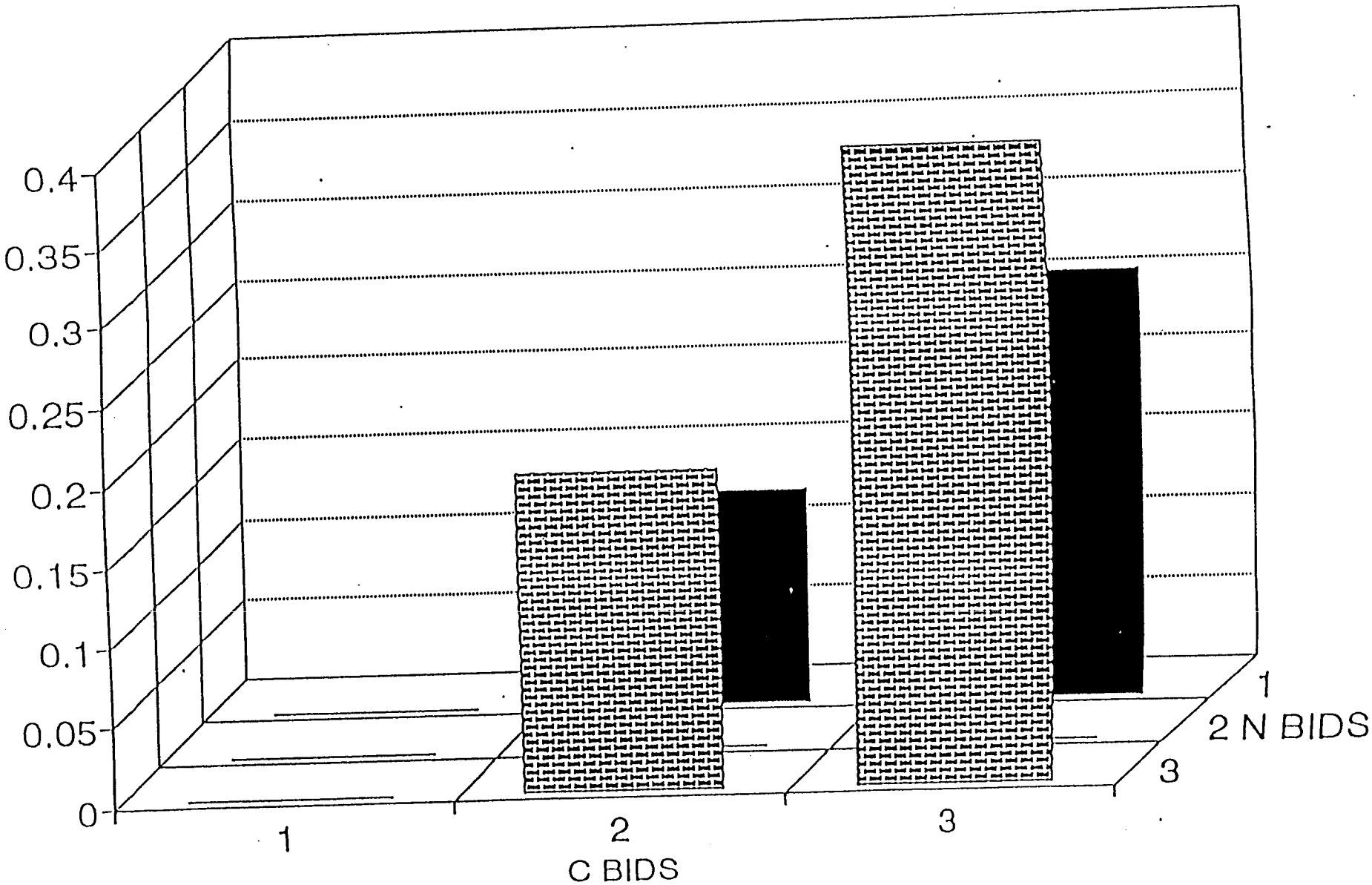


Figure 6

JOINT DISTRIBUTION OF WINNING BIDS (NO DISCLOSURE RULES IN EFFECT)

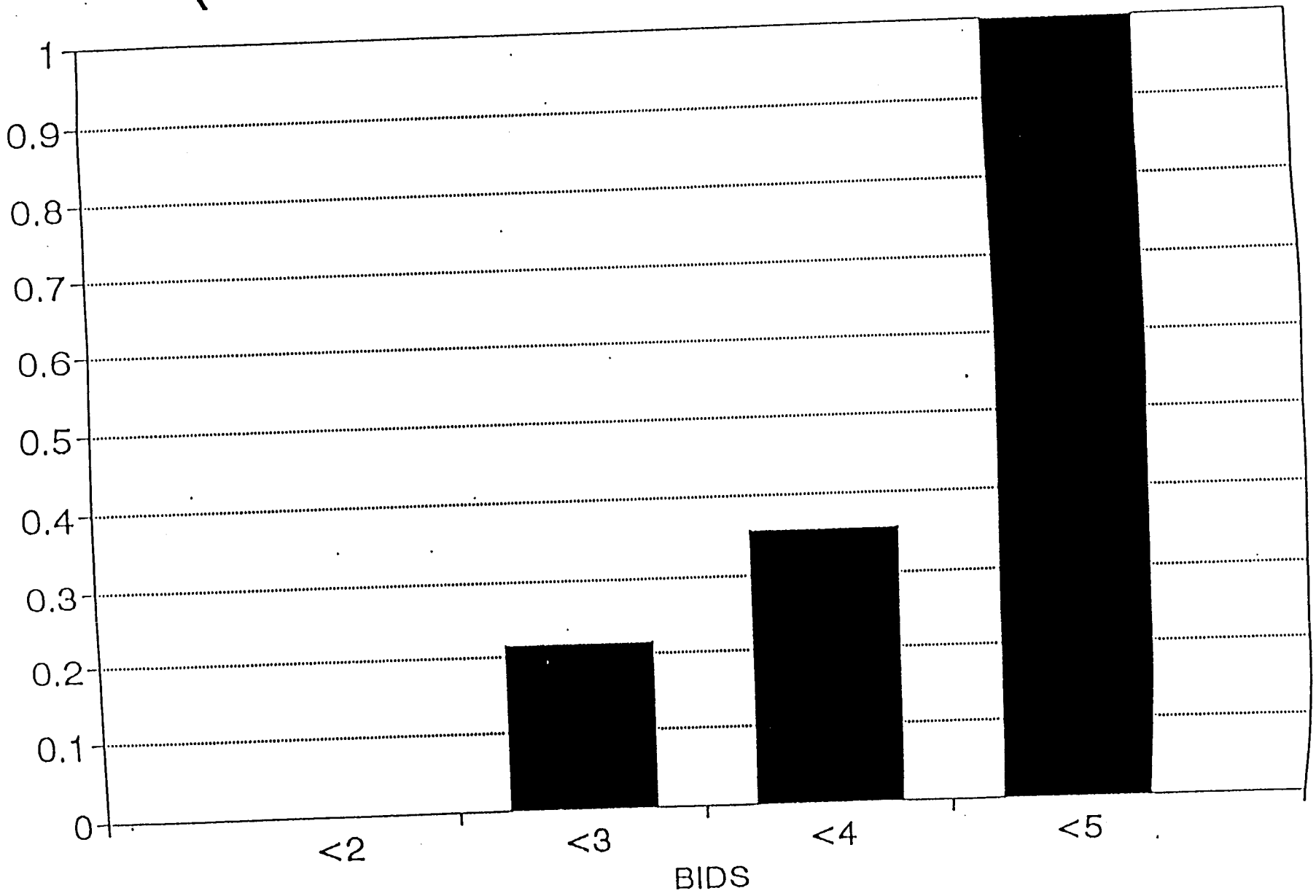


Figure 7

JOINT BIDS FOR GOOD COMPANY (NO DISCLOSURE RULES IN EFFECT)

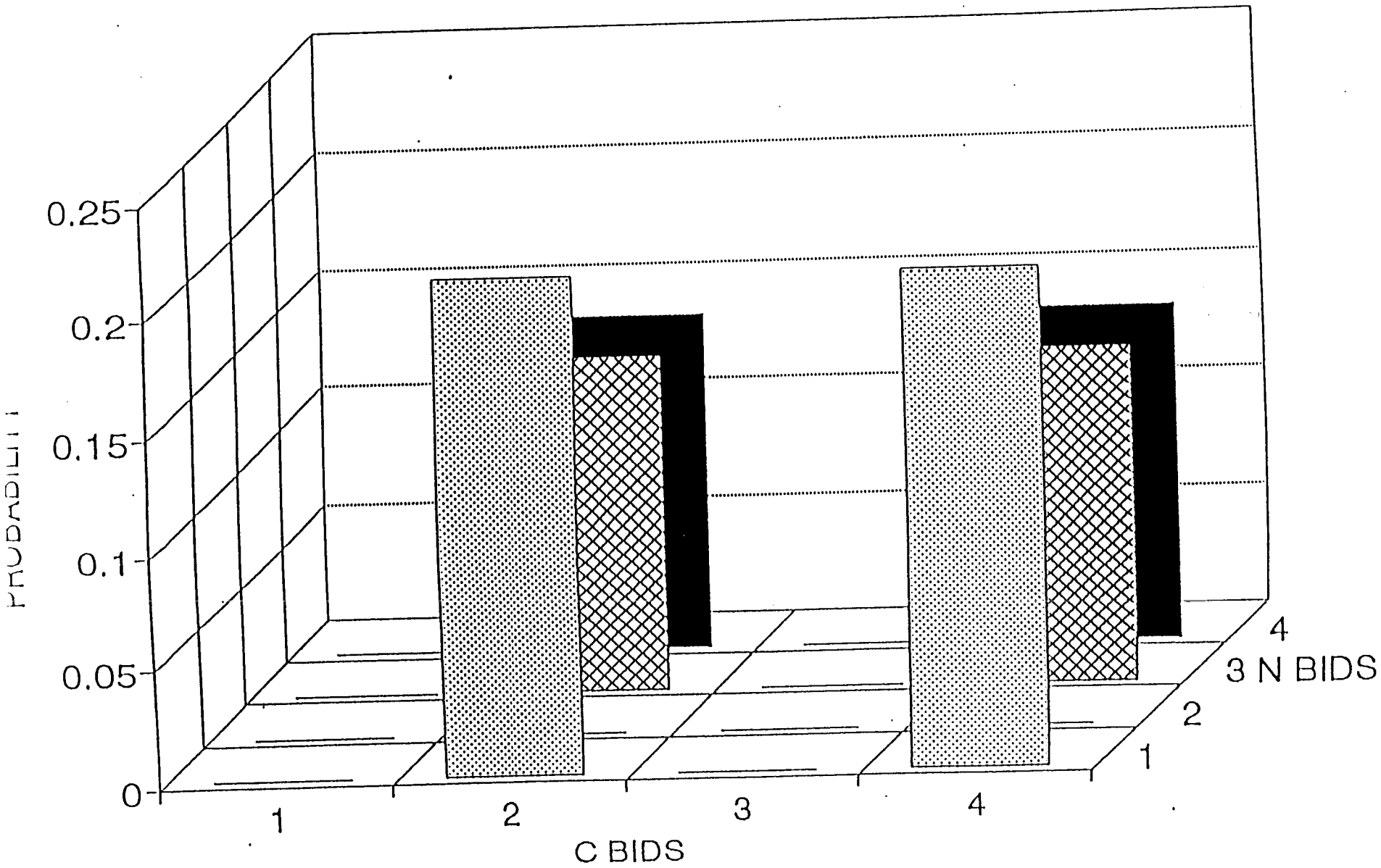


Figure 8

The perfect equilibrium when disclosure laws are in effect

An example when E(v)=6